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**THE SPATIAL DIMENSION OF
CLIMATE ADAPTATION**

**Assessment of spatial sensitivity of European
national climate adaptation policy planning,
monitoring and evaluation activities**

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List of acronyms

Acronym	Meaning
ANOVA	Analysis of Variance
AR	Assessment report(s) of the IPCC
ASEAN	Association of Southeast Asian Nations
BCE	Corvinus University of Budapest
CBC	Cross-border Cooperation
CCRA	Climate Change Risk Assessment
CIVAS	Climate Impact and Vulnerability Assessment Scheme
COP	Conference of Parties
CVA	Climate Vulnerability Assessment
DAS	Deutschen Anpassungsstrategie
DS	Decision Support
EBA/NBA	Ecosystem-based or Nature-based Adaptation
EC/COM	European Commission
EEA	European Environmental Agency
EIFCR	European Integrated Framework for Climate Resilience
ESPON	European Observation Network for Territorial Development and Cohesion
EU	European Union
EUCRA	European Climate Risk Assessment
FUA	Functional Urban Area
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Geo-information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit, a German state-run organisation for international cooperation
HDI	Human Development Index
INTERREG	Series of EU funding programmes supporting international cooperation
IPCC	Intergovernmental Panel on Climate Change
IR	International Relations
JSTOR	Journal Storage, a digital library of academic journals, books, and primary sources
MRE	Monitoring, Reporting and Evaluation
NAGIS	National Adaptation Geo-information system of Hungary
NAP	National Adaptation Programme or National Adaptation Plan
NAPA	National Adaptation Programmes for Action
NAS	National Adaptation Strategy
NCCAP	National Climate Change Action Plan(s) of Hungary
NCCS-2	2nd National Climate Change Strategy of Hungary
NDRDC	National Development and Regional Development Concept of Hungary
NUTS	Nomenclature des Unités Territoriales Statistiques
OECD	Organisation for Economic Co-operation and Development
PNACC	The French National Adaptation Strategy
RQ	Research Question
RSQ	Research Sub-Question
SDGs	Sustainable Development Goals of the UN
SWOT	Strengths, Weaknesses, Opportunities and Threats analysis
TA	Territorial Agenda of the EU
TSP	Territorial State and Perspectives of the EU, background document of the TA 2007 and 2010

Acronym	Meaning
UBA	Umweltbundesamt für Deutschland - German Environmental Agency
UK	United Kingdom
UKCIP	UK Climate Impacts Programme
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations Office for Disaster Risk Reduction
WMO	World Meteorological Organisation

1. INTRODUCTION

The idea of my PhD research and the topic of the dissertation itself came from two parallel considerations. On the one hand, from an objective necessity: its main scope, climate adaptation policy is dealing with the challenge framework that climate change presents to our world, and a research project that points to the direction of improving the effectiveness of these policy activities can be a useful contribution to the necessary responses to this problem package. On the other hand, my professional interest and 20 years of experience in strategic policy planning provide a good starting point for examining the features of climate adaptation policy instruments from a specific perspective.

There is no question that the complex process called summarily climate change is one of the most crucial global challenges of our time. Several sectors of the economy, numerous groups of society, different regions and municipalities (let's say it: all kinds of regions and settlements) are exposed to global warming, the growing extremity and intensity of weather events, their secondary impacts and socio-economic consequences. It is no longer enough to strive to mitigate the drivers [namely greenhouse gas (GHG) emissions]; humanity must adapt to and prepare for the impacts and consequences of climate change with adequate, well-planned and well-placed responses.

During my professional career so far, I have mostly dealt with strategic planning, evaluation and monitoring tasks, in connection with various fields of professional practice (urban and settlement network development, regional development, tourism policy, national strategy building, European Union (EU) support-related development policies, climate policy, etc.). Within my interest, consequently, planning, monitoring and evaluation of strategic development processes have always played a prominent role – it is a self-evident choice that my dissertation also focuses on these topics. The listed activities are equally important in climate policy and within it, climate adaptation policy: based on the measured/experienced climatic and societal/economic evidence and analysed exposure / sensitivity / adaptive capacity conditions, proper climate adaptation interventions can be planned and implemented, in coherence with the desired state and those long- and medium-term objectives of the related strategic planning activities. To refine these adaptation strategies further and to determine whether the planned objectives have been achieved, we also need to track changes, evaluate implementation, and ensure feedback is channelled into the next planning cycle.

These two starting points, namely the crucial global challenge and its spatially tailored perspectives, and the response activities, can be interpreted and considered as the basic pillars of the research project. The ornamentation on these pillars, which means the

essence of the research project, is a quite unique topic within climate adaptation, as we will see in the dissertation's chapters: the spatial dimensions and approaches within given instruments of climate adaptation policy planning; concentrating first and foremost on the geographical scale of space. Regarding the relative novelty of the topic, the dissertation's undertaking might be considered a courageous decision. Or an imprudent one? We will see in the following couple of dozen pages.

1.1. Significance and importance of the topic

The challenges caused by the impacts and consequences of climate change are key issues both globally and in Europe (SÜTŐ, 2024; 2025B). Climate change is perhaps one of the most important phenomena that has dominated the discourse of sustainable development recently (QURESHI, 2019). Beyond the changes in climatic factors (temperature, precipitation, humidity, wind conditions, etc.), the growing intensity and frequency of weather extremities can also be experienced in recent decades (BIRCHALL & BONNET, 2021). These changes can have serious environmental, social and economic consequences, causing growing vulnerability of the exposed sectors/communities / habitats. Additionally (or rather: principally), the changes occur in the geographical space. Their spatial impacts deepen existing regional and settlement network-related differences and economic/social inequalities (PÁLVÖLGYI ET AL., 2010; SÜTŐ ET AL., 2023).

Europe, especially the EU, plays a leading role in fighting against climate change at the policy level (SÜTŐ, 2025B). Since the second half of the 1980s, the EU has established itself as an international leader in climate policy, having significantly enhanced both its external representation and its internal climate policies (OBERTHÜR & ROCHE KELLY, 2008; SCHMIDT-THOMÉ & KLEIN, 2011). As expected, the Union will remain a progressive force in international climate policy for some time. The EU states' heads and governments regularly discuss the topic. On top of the European Green Deal and Fit for 55! packages, even the adoption of the new EU Adaptation Strategy as well as the European Integrated Framework for Climate Resilience (practically a new European Climate Adaptation Action Plan) being prepared currently, significantly strengthen adaptation's momentum, and demand the massive improvement of community resilience (EEA, 2020; OTTAVIANI AALMO ET AL., 2022). The EU's development policy environment exactly reflects this focus: climate policy interventions were, have been and will be among the main policy priorities of both the community's 2014-20 and 2021-27 (and as we see from the preliminary materials, the future 2028-34) programming periods (SÜTŐ, 2024). Significant sums have been / will be allocated to climate mitigation and adaptation from EU funds, which, together with

the fact that several medium- and long-term economic development objectives of states also focus on these fields, underline the importance of the issue. The above-mentioned leading role can be especially seen in mitigation, indicated by the ambitious European energy policies and internationally binding emission reduction targets (HEIDRICH ET AL., 2016); however, adaptation's weight within climate policy has slowly increased during the recent decade (EEA, 2016 and 2020; PRINGLE ET AL., 2017; SÜTÖ, 2023; SÜTÖ ET AL., 2023).

As a consequence of the processes mentioned above, within development policy the climate policy; and within climate policy, its adaptation pillar started to demand attention worldwide (SCHMIDT, 2009). Nevertheless, **there is a significant difference between the two climate policy pillars**. While GHG emissions cause global problems and their management requires transnational cooperation and negotiations, adaptation must provide spatially tailored solutions for specific regional/local climate impacts (HEIDRICH ET AL., 2016; BIRCHALL & BONNET, 2021; BIRCHALL ET AL., 2022; SÜTÖ, 2023, SÜTÖ 2025B). Local communities elaborate these responses through local planning and implement the actions. Adaptation is definitely more of a local/regional issue than mitigation, and it operates more effectively at lower spatial (at national or even lower) levels than at trans-/macroregional or continental ones. Adaptation responses can be more effective at the local/regional level (implemented by municipalities, microregions, or subnational regions), where local problems are known to locals, and potential responses can be identified relatively easily (SÜTÖ 2025B). A definite place-based logic can be detected here.

Climate policy in the previous decades was originally dominated by the mitigation pillar: the majority of the goals and allocated support focused on decarbonising different sectors (EEA, 2015 and 2020; PRINGLE ET AL., 2017; LEITER, 2021). However, it seems that mitigation has not fulfilled its intended function: the international and national GHG emission goals set for 2100 are not ambitious enough and will not be achieved, as things stand (FARAGÓ T., 2015; UNFCCC 2021 and 2023). At the same time, the impacts and consequences of climate change already exist and are expected to persist for decades, if not centuries, indicating a growing need to prepare for them. The necessity to implement more efficient adaptation measures is increasing, turning the attention to this pillar of climate policy in a growing extent, putting an ever-growing weight on adaptation policy activities and their spatially tailored responses.

Consequently, **adaptation faces geographically (spatially) specific challenges**. Therefore, **it can only be effective if it is able to take into account spatial differences**. Special climatic (and other geographical) factors of places determine the

geographically/regionally different effects and consequences of climate change, which are among the most important elements of geographical features (SÜTÖ, 2024). Sectoral/thematic vulnerability can be experienced locally (in settlements and regions), and, as we already mentioned, geographically distinct effects require spatially tailored adaptation responses. These responses also occur in the geographical space. Planning and implementing these measures require an adequate knowledge base to support these activities. This support usually comes from climate vulnerability studies and climate risk assessments, which are essentially spatially focused examinations that monitor relative spatial/territorial differences. All of these presuppose that the spatial approach and the emphasis on geographical features, places and settlements, spatial differences and structures of the different elements of space would be key in climate adaptation policy (SÜTÖ, 2025B). With some exaggeration, we can say that one key question arises: **whether climate adaptation policy**, and among them the planning, monitoring, evaluation and reporting activities, **take these spatial aspects into account properly or not?** The dissertation seeks to answer this basic question.

2. THE FRAMEWORKS OF THE RESEARCH

2.1. *Research objectives*

The rarity of qualitative/quantitative examinations of adaptation's spatiality and the relatively low number of comprehensive analyses of related national policy activities were identified as a significant research gap by the literature review. This, together with the general importance of the geographical space in climate adaptation, is the starting point of the research.

We can assume that adaptation policies that are more sensitive to spatiality may be more effective. For this reason, my work examines the extent to which spatial dimension is reflected in the practice of adaptation policies. To capture this, the dissertation introduces the spatial sensitivity of policies as a key concept and examines it through an analysis of three key instruments of adaptation policy: planning, monitoring, and evaluation.

As for **the basic logic of the research**, already in the Introduction chapter it was noted that long-, medium-, and short-term changes in climatic factors occur in spatial reality and exhibit significant diversity across different geographical locations, resulting in spatially distinct climate change impacts and consequences. Policy responses to these challenges could be appropriate and effective only if the spatial aspects/differences are properly considered. The dissertation aims to further strengthen the potential of climate adaptation policies to address the geographical manifestation and spatial dimensions of the present and future consequences of climate change.

The dissertation's main aim is to reveal the spatial sensitivity of current European national climate adaptation policies.

For this aim **(1)**, it creates the scientific concept of (geographical) spatial sensitivity of climate adaptation policies (conceptualisation);

(2) develops a system of analytical aspects capable of measuring this spatial sensitivity (as operationalisation);

(3) empirically assesses the spatial sensitivity of national climate adaptation policies by analysing four main tools of climate adaptation policy planning (strategies, programmes/action plans, evaluation reports and monitoring materials);

(4) analyses the connection between spatial sensitivity and different determinants;

and **(5)** formulates recommendations for making policy practices more spatially sensitive.

The research aims primarily to examine the current presence of spatial emphases in adaptation policymaking, specifically in planning and monitoring/reporting/evaluation (hereinafter MRE) activities. To conduct this research, as a first step, we must **define the essence of this spatial content**: what we understand under spatiality? Moreover, we must find a way to measure the degree to which climate adaptation policy instruments are sensitive to these spatial dimensions and how they contain them. The concept of space can, of course, be interpreted in different reference systems that are much smaller (e.g., in architecture) or much larger (e.g., in space exploration) than the geographical scale. We emphasise that the **research specifically examines the spatiality of climate adaptation at the geographical scale**. Among the space-related concepts **the dissertation definitely focuses on space itself** as a limitless, general, abstract concept as opposed to territory (which refers to delimited units, basically with administrative or functional purposes) or place/region (which concepts refer to rather lower-level localities in space with perceptorial and statistical-analytical content).

2.2. *Research questions and hypotheses*

To achieve the main objective of the research mentioned by Chapter 2.1, the dissertation concentrates on one main research question and five sub-questions.

- ***RQ: To what extent are European national climate adaptation policies spatially sensitive?***
 - *RSQ1: What does spatial sensitivity mean in climate adaptation policies?*
 - *RSQ2: How can spatial sensitivity be assessed in climate adaptation policies?*
 - *RSQ3: To what extent is spatiality emerging in national adaptation policy planning and MRE instruments of the European countries?*
 - *RSQ4: Do the geographical characteristics of the European countries influence the spatial sensitivity of national adaptation policies? The question analyses whether the national adaptation planning and MRE activities' spatiality reflect the different geographical natural/social/economic endowments of states or not.*
 - *RSQ5: Are there any macro-regional characteristics in European national adaptation policies' spatial sensitivity? (If there exist good practices, are they from the same macro regions of Europe, e.g. where adaptation planning and MRE systems are in a more advanced state, or is there no connection between location and the level of planning and MRE activities' spatial sensitivity?)*

In harmony with the research questions, we can define the hypotheses of the dissertation, which are as follows:

Main hypothesis: Due to the importance of geographical space and spatial differences/structures in climate adaptation, sensitivity to spatial considerations emerges in national adaptation practices across Europe.

- *Hypothesis#1 (H1): The ability of climate adaptation policies to recognise spatially specific (geographical) contexts and to tailor their interventions accordingly can be captured by a common concept.*
- *Hypothesis#2 (H2): Spatial sensitivity of national adaptation policy activities can be examined and measured by the analysis of their instruments.*
- *Hypothesis#3 (H3): Sensitivity to spatial dimensions emerges in national adaptation policy instruments in Europe, but to a limited extent.*
- *Hypothesis#4 (H4): Geographical characteristics of European countries fundamentally influence the spatial sensitivity of national adaptation policies of states.*
- *Hypothesis#5 (H5): Some macro regional differences can be identified in the presence of spatial sensitivity in European countries' national adaptation policy activities due to their differences in policy culture, with better performances of Western/Northern European countries.*

Through the expected results, the dissertation might support the improvement of climate adaptation policy activities in Europe, moving them in a direction that makes them capable of proper and spatially/territorially conscious planning of adaptation interventions, monitoring and regular evaluation of climate impacts, changes in vulnerability status, level of adaptive capacity and concrete actions' contribution to adaptation (SÜTÖ, 2023).

2.3. Research design

During the research, as the one of my latest related publications also indicated (SÜTÖ, 2025B) I analysed European adaptation policy planning and MRE practices and monitoring and/or evaluation system development examples (especially the internal logic of the MRE systems and the applied indicator sets) according to the degree of their spatial orientation. To reveal the level of spatial aspects' presence in the policy planning and MRE instruments (namely strategic planning, monitoring and evaluation documents), a new concept, spatial sensitivity, has been created. This spatial sensitivity depicts the weight of spatial aspects, content and considerations in the instruments. Space concepts and interpretations of different scientific disciplines and policy fields were reviewed to make a tailored understanding for the spatial sensitivity of the analysed instruments; and, based on this and the different spatial concepts, an analytical

tool (in the form of an aspect system) has been established for the empirical analysis of the European national adaptation documents / systems.

The dissertation **used mostly qualitative methods**, conducting (1) a comprehensive literature review of spatiality in climate adaptation; and different space concepts and interpretations of space-oriented disciplines and practical fields; (2) widespread desk research and document analyses, in cases complemented these with (3) questionnaire-based e-mail interviews. Throughout these empirical analyses, special attention has been paid to the practical applicability of the results.

The literature review was one of the main bases of the empirical work phase. It provided the context for the research (clarifying the concepts of climate adaptation and adaptation policy, planning, monitoring, and evaluation, as well as describing the main spatial levels and challenges of adaptation policy planning worldwide and in Europe). The review also identified the main research gap: the rarity of assessment of the spatial dimension in climate adaptation. Special subchapters are dedicated to the space interpretations of chosen geographical and social space-oriented disciplines. As the literature review underlines, among the different spatial/territorial levels of adaptation planning, monitoring, and evaluation the national and regional ones have received relatively weaker emphasis so far, compared to the local level. So, the dissertation concentrates on national adaptation-oriented strategic planning, and beyond that, monitoring, reporting and evaluation activities, and their characteristics in Europe (as the pioneer continent of climate adaptation policy planning).

A key element of the empirical analysis's qualitative toolkit was a **comparative document analysis**, focusing on existing national planning documents, monitoring and evaluation reports, and methodological background materials. At the centre of the analyses were, on the one hand, the national strategic planning documents of adaptation. Under the term national planning documents, similarly to Timo Leiter's 2021 analysis and using his umbrella definition, I understand both national adaptation strategies (NAS) and national adaptation programmes or action plans (NAP). These can be either documents covering both mitigation and adaptation or strategies concentrating only on adaptation. On the other hand, I also examined national-level monitoring and evaluation reports and assessments, methodological materials, and indicator descriptions elaborated or commissioned by national governmental organisations. Those NASs, NAPs and MRE reports were analysed from each state that are currently in force. The comparative analysis of these was based on a predefined analytical aspect system, with 7 main factors and for each factor 3-8 sub-factors. Attributed to each sub-factor, the proper principles/rules of classification had also been defined in advance to make sure

that subjectivity is avoided as much as possible. It must be declared that the comparisons were intended to take a critical lead, not just a pure description of the national characteristics. In addition to narrative document and system descriptions, the critical approach was essential – the explicit system of analytical aspects served this. Considering that adaptation is a relatively new field (the community level strategic frameworks have recently been established, and the regular national/regional/local planning cycles have begun only since the early 2010s in Europe) the research concentrates on the period of the last 1-1,5 decades, comparatively analysing mostly results of the first MRE cycle. **Based on the results of the comparative analysis, a composite indicator** was elaborated to measure the spatial sensitivity of climate policy activities of the analysed countries.

The logic behind the selection of the analysed countries is described in the subchapter on geographical context. According to that, I examined all EU countries and the European Environmental Agency (EEA) member states, supplementing the list with Balkan states that strongly strive for EU accession. Out of the dual group of the former socialist satellite bloc and the Soviet successor states I focus rather on the former group and leave the second out of the analysis (with the exception of the culturally, historically different Baltic states) due to the scarce availability of documents and data to be analysed; the somewhat lower emphasis on climate policy in these countries; and the even more “low-priority development policy field” status of adaptation.

To complement the comparative document analysis’s outcomes, questionnaire-based e-mail interviews have also been conducted, targeting all countries. Subjects (interviewees) were the related stakeholders of national policymaking and planning. The interviews, together with the comparative analysis, enabled the collection of detailed information on the spatial content of the analysed activities and on the attitudes of planners/decision-makers toward spatial issues. **The selection of the interviewees** followed an institutional logic, focusing on persons working at the national level of climate adaptation administration (in relevant ministries, governmental agencies, and background institutions).

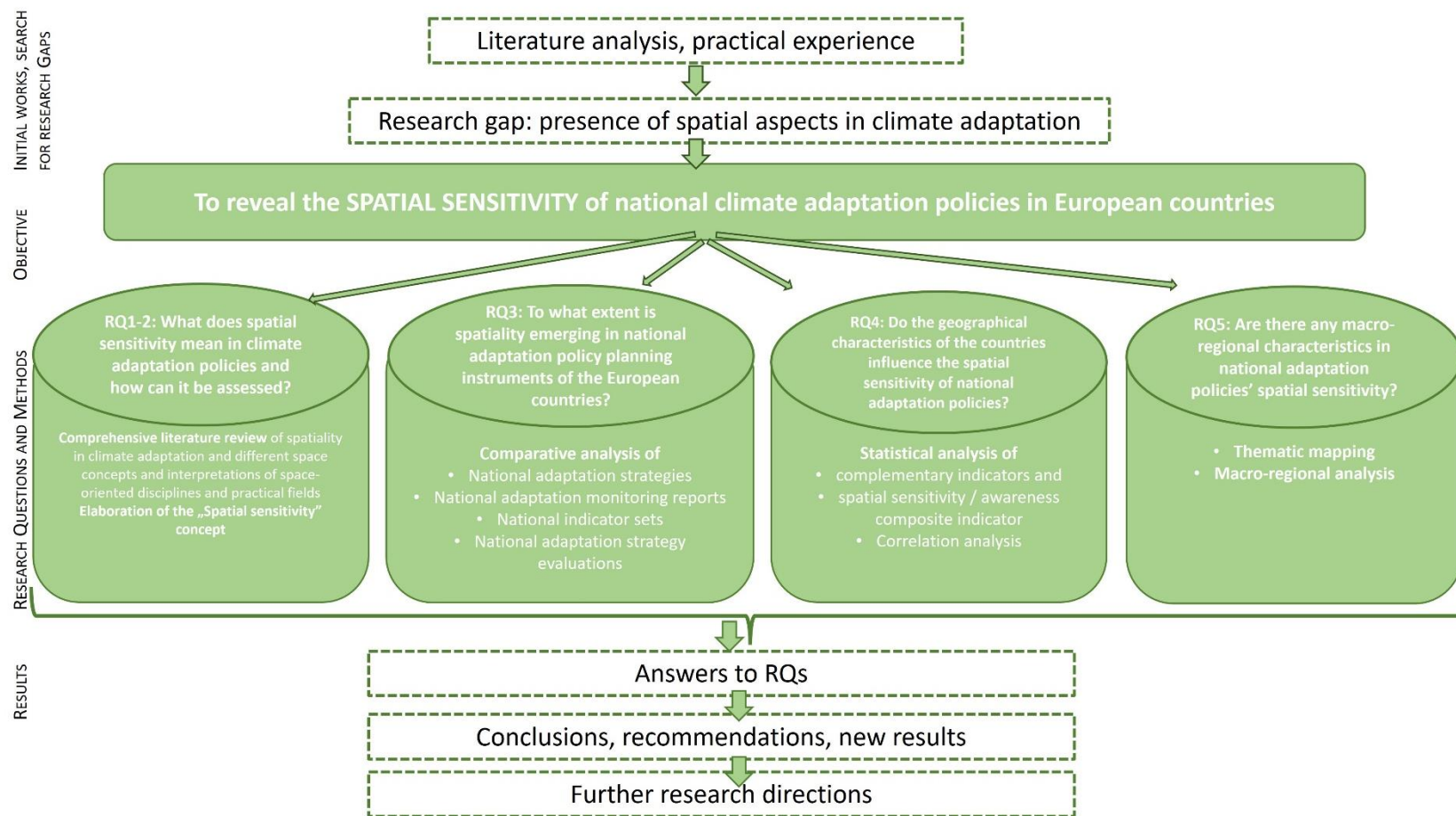
In Annex #4, the cases of the best-performing countries are presented in more detail based on the final ranking of the composite indicator. **The logic behind selecting the sample of benchmark countries** was based on the final results of the empirical analysis and the macro-regional classification. In Europe, the Anglo-Saxon countries with large planning and MRE traditions perform exceptionally well in climate policy and climate adaptation, too. From this group, Germany, the Netherlands, Austria and Scotland got dedicated subchapters in Annex #4a. Their pioneer role is represented by the fact that

even adaptation MRE system development has already been started in them, or they already have a functioning system. These countries can even serve as good examples for Eastern-Central European states, since members of this latter group are mostly yet to undertake their adaptation-oriented MRE system-building actions. Among the generally well-performing Northern European countries, Sweden, Norway, and Finland are presented in detail in Annex #4b. From Southern and Eastern Europe, the best-performing examples were introduced in the dissertation's Annex #4, too: Türkiye and Spain (Annex #4c); Poland and Hungary (Annex #4d).

In a next step, the dissertation tried **to identify the main determinants of adaptation tools' spatial performance**, through comparing the elaborated spatial sensitivity composite indicator of the given states to other national level social/economic/geographic or spatial administration-/spatial planning-/adaptation planning- or climate vulnerability-related indices in the form of a correlation analysis to **identify whether geomorphologic, natural geographic, social, economic or planning issues** influence more the spatiality of national adaptation policies.

Again, in a next step, **macro-regional determination** was also sought in the final ranking of the spatial sensitivity composite indicators **of European national adaptation activities** to determine which group of countries performs better in this field and whether there is a relationship between a country's macro-regional position and its spatial performance in climate adaptation. In other words, the dissertation examined and sought to identify the presence or absence of a connection between the given country's macro-regional position and the spatial performance of its adaptation policy planning activities.

Finally, **the responses for the RQs and hypotheses** and the presentation of **recommendations for climate adaptation policy practice** compose the first parts of the "*Conclusions and discussion*" Chapter. These are followed by the **dissertation's actual conclusions**, the introduction of **new scientific results**, together with the description of the **research's limits** and the **potential future research directions** (Figure 1).

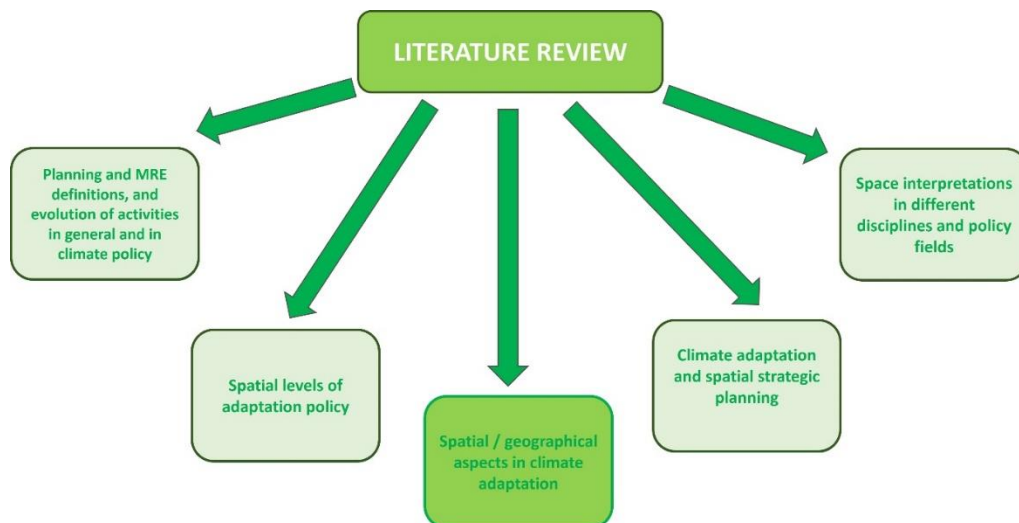


1. Figure: Design and internal logic of the doctoral research. Source: own editing.

3. THEORETICAL FOUNDATION AND LITERATURE ANALYSIS

3.1. Literature and scientific context

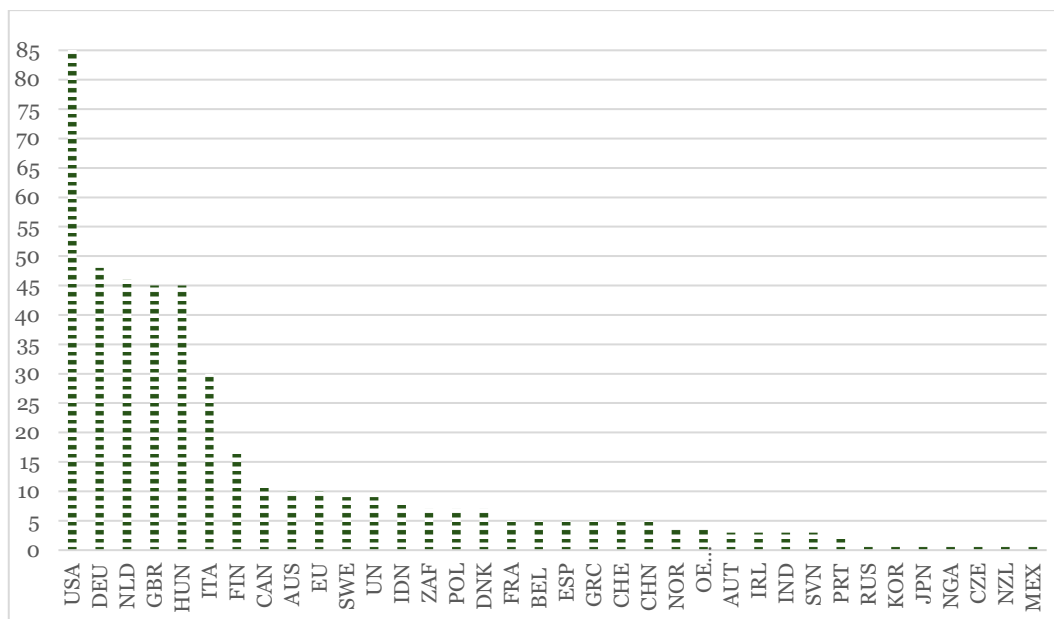
As already mentioned in Chapter 2.4, the literature review was one of the main tools of the research, serving as a theoretical basis for the empirical work phases. Among the vast terrain of climate adaptation-related scientific and grey literature, I focused especially on issues crucial to the dissertation's main topic. During the first part of the research near half a dozen literature review phases were conducted. In these I first dealt with *the evolution of concepts and definitions of planning, monitoring, evaluation, and reporting in general, and especially in climate adaptation policy*. In the dissertation, a given subchapter (3.2.) introduces the results of this overview based on scientific and grey literature items and my related development policy experience. I also reviewed the *timely evolution of the adaptation policy field* (Chapter 3.3.1) as well as *its main spatial levels* (Chapter 3.4.2) as the most important scenes of adaptation activities and planning. The central part of the literature review dealt with *spatiality and spatial, territorial emphases, approaches in climate (and particularly in adaptation) policy* (Chapter 3.4.). I especially collected information about *linkages between climate adaptation and (spatial) strategic planning* (Chapter 3.4.1.1.1). Finally, to find a proper definition for the spatiality in adaptation and the analysed activities' sensitivity to these dimensions, Chapter 3.6. analyses the above-mentioned *space-oriented disciplines' and practical policy fields' space interpretations* (Figure 2).



2. Figure: Main components of the literature review. Source: own editing.

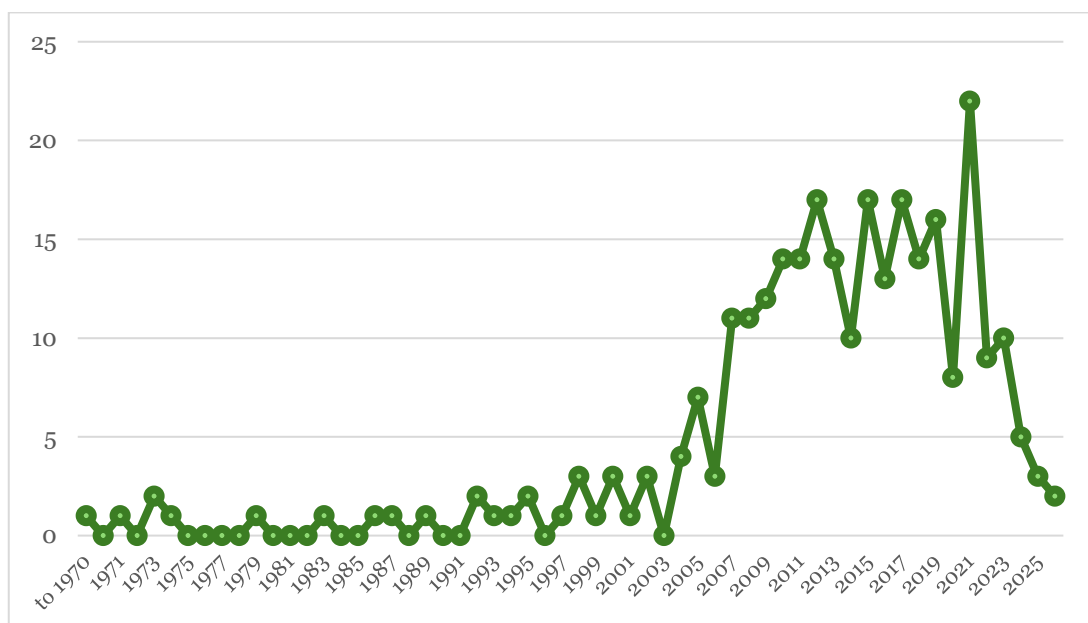
The principal subjects of the dissertation are national climate adaptation policy activities, instruments in European countries, with special focus on their spatial contents. Consequently, **climate adaptation policy-related planning, monitoring, reporting and evaluation (MRE)** are in the centre of my research interest, **positioned in the intersection of research areas**; there are many topics, theories, schools that are related to the topic. **I basically used a space-interpretation-centred approach during the research**, drawing on different disciplines to identify, from their perspectives, the “*geographical*” and “*spatial*” dimensions and the “*sensitivity*” to these dimensions. Beyond classic space-oriented disciplines (geography in general and especially its social/economic sub-branches; regional studies such as regional geography and regional economics; governance and administration studies, IR, geopolitics, etc.), even some practice-oriented fields (regional development policy, strategic planning) have also been used to support the basic theoretical foundations of the research and assign elements of the analytical aspect system that serves as a central element of the empirical phase of my work (SÜTŐ, 2023).

In the several literature review phases, I have collected cca. 250 pieces of literature. Most of the authors are from the USA and Western and North-Western Europe, principally from the Netherlands, the United Kingdom and Germany, clearly showing which nations are the leading ones in the analysed policy field (Figure 3). Authors like STEFAN GREIVING and MARKUS FLEISCHHAUER, TIMO LEITER (all from Germany), MIKE HARLEY, PATRICK PRINGLE (United Kingdom), ROB ROGGEMA, JELLE G. VAN MINNEN, JUDITH KLOSTERMANN, WILLEM LIGTVOET, KIM VAN NIEUWAL (all from the Netherlands) etc. can be considered as pioneers in climate adaptation policy-oriented studies. If we deepen the analysis into the theoretical background, definitions, and concepts of planning, monitoring, and evaluation in general, further Dutch, British, and American authors emerge in the research (e.g., HAUG, HUITEMA, MCGIBB, BOURS, VEDUNG, HAGGETT, AGNEW, etc.). As further related sub-topics, such as (spatial) governance, geopolitics and IR also emerged in the literature review, again further Western-European and North American authors appear, like ROSENAU, KELLY, COHEN, or BAYLIS ET AL. etc. From the field of regional science and regional economics, social geography and planning studies, even Hungarian authors emerge in greater numbers – good examples are NEMES-NAGY J., FARAGÓ L., KOROMPAI A., KEREKES S., PÉTI M., SALAMIN G., DUSEK T., or LENGYEL I. etc. (SÜTŐ, 2023).



3. Figure: The reviewed literature by the nationality of authors. *Source: own editing.*

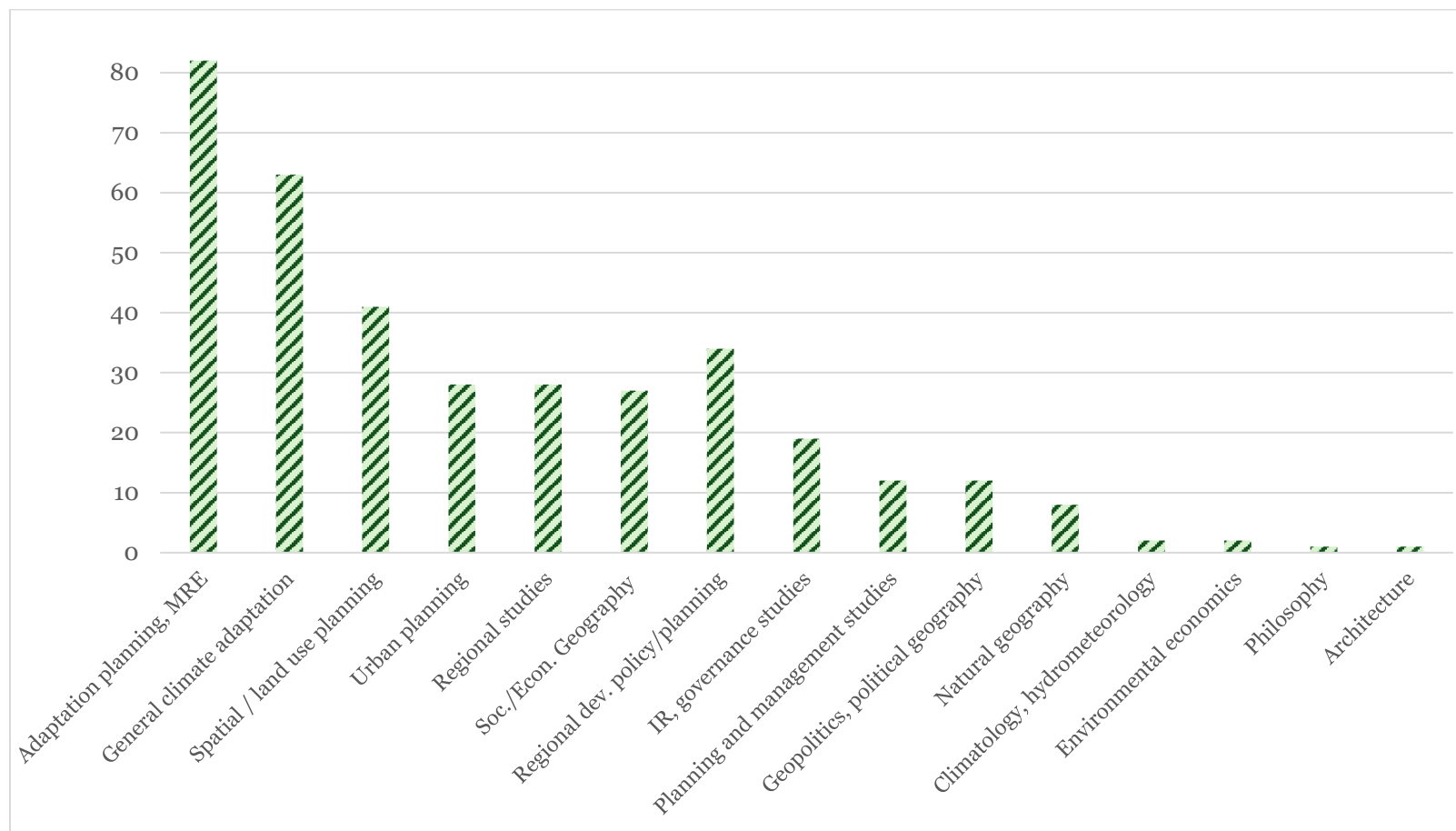
Climate change / climate policy, especially its adaptation pillar, constitutes a new field of research. Consequently, the year range of the listed literature is relatively narrow. Almost all climate adaptation planning- or MRE-oriented materials are from the recent two decades. When I complemented the review with topics of planning/MRE in general, spatial and strategic planning and geopolitics or IR, some older articles/books have also appeared (items from the 1990s, 1980s and 1970s) as mostly general strategic planning methodology-related, geopolitical position-, or (spatial) governance-oriented theoretical works (Figure 4) (SÜTÖ, 2023).



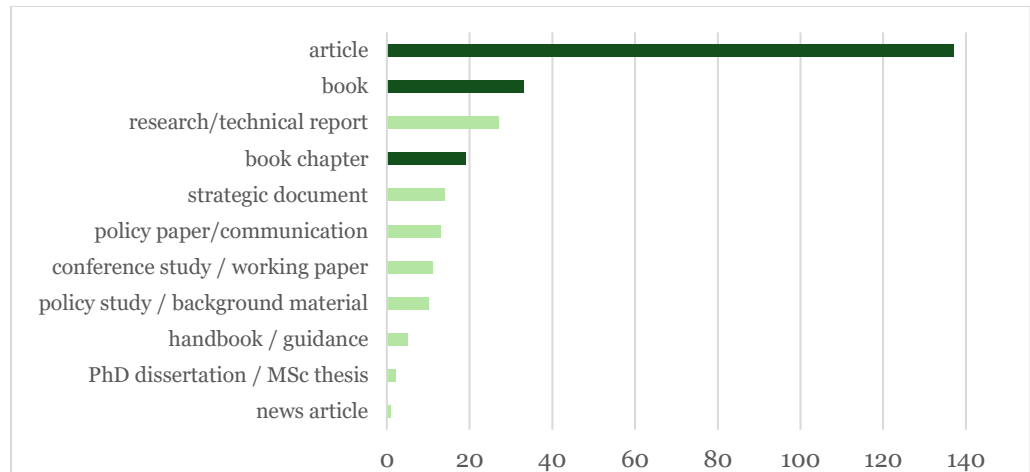
4. Figure: The reviewed literature by year of publishing. *Source: own editing.*

The dissertation's central topic is mostly practice-oriented: it focuses on strategic planning and MRE, especially their climate-adaptation policy-oriented versions. If I use a more exact disciplinary classification, spatial and land use planning, regional studies (regional geography, regional economics) and social geography, planning and management studies are the main spheres, where the research finds its sources. These space-oriented studies got special emphasis in my theoretical foundations because adaptation planning and MRE activities deal at least implicitly with spatial/territorial differences of climate change impacts and spatially/territorially different adaptive capacities. The other important direction of the research examines the differences between national adaptation planning and MRE systems and approaches. For this, governance- and administration-oriented studies proved also to be useful; while, in the analysis of the international spatial dimensions of national climate adaptation policies, geopolitics- and IR-related sources have added value, too (SÜTÖ, 2023) (Figure 5).

One of the implicit goals of the whole research is to support the development and space-oriented paradigm-shift of European and Hungarian climate and development policy planning activities, so the research pays special attention to the potential applicability of the results in practice: I applied this approach consistently throughout my doctoral studies. On the other hand, the topic of climate adaptation policy is strongly practice-oriented in itself, so significant part of the collected literature [policy papers and communications, technical reports, monitoring/evaluation background materials and actual reports, working papers, guidances, policy studies, etc.] were from the practical field. However, for the theoretical foundations I used, of course, mostly scientific or theoretical works; the vast majority of reviewed literature were naturally articles, books, or book chapters (SÜTÖ, 2023) (Figure 6).



5. Figure: The reviewed literature by disciplines/policy fields. Regional studies also include regional geography/economics/statistics in the classification. Source: own editing.



6. Figure: The reviewed literature by types. Dark green columns indicate the scientific, light green columns the grey literature. Source: own editing.

As results of the first 4 topics of the literature review, Chapters 3.2.-3.4. introduce excerpts from recent adaptation planning-related studies. These chapters concentrate on the evolution of climate adaptation and planning/MRE activities supporting them and of course, the emergence of the topic of spatiality within these contexts. Beyond the literature items and background materials collected from applied climate adaptation planning from the recent decades during my professional career, the literature selection was based on a detailed library and internet search. In the review process, I used databases of JSTOR (<https://www.jstor.org/>), Google Scholar and the Corvinus University of Budapest (BCE) Library (<https://hunteska.uni-corvinus.hu/>). The used keywords of the advanced search rounds were “*climate policy planning*”, “*(climate) adaptation planning*”, “*(climate) adaptation monitoring*”, “*(climate) adaptation evaluation*”, “*climate adaptation strategies*”, “*urban adaptation*”, “*national adaptation*”, “*national adaptation strategies*”, “*climate strategic planning*” or their combinations like “*climate adaptation + spatial planning*”, “*climate adaptation + strategic planning*” and their further permutations. The first extensive round of items found were narrowed further according to the below listed criteria (SÜTÖ, 2023).

Regarding the **selection criteria for the literature analysis**, I basically sought literature items from all spatial/territorial levels, from local through regional to national or even macro-regional, to find out which of those levels are the most relevant in adaptation planning. *I did not apply any regional selection criterion*; the processed literature came from all regions/countries of the world. Nevertheless, the number of the identified studies/articles from given countries clearly shows which the most advanced regions (Western and Northern Europe, North America) are in this field.

Another criterion of selection was the *up-to-date nature of the literature items*. Regarding the fact that climate adaptation is a relatively new topic, the chosen articles easily met this requirement and concentrated on the last 1,5 decades.

Considering the different scientific and/or practical fields, I focused mainly on literature that addresses strategic planning, monitoring and evaluation activities and/or methodologies in general, or the use of planning and MRE tools in a specific example. So *urban planning, land use planning, general strategic planning, climate policy planning and management studies* meant the main pool from that I could chose the reviewed items.

I sought principally *those studies that focus on comparative analysis of different states/regions*. Though numerous adaptation-oriented studies focus on specific sectors (agriculture, land use, financing, etc.), countries (e.g., Uganda, Nigeria, Nepal, Republic of South Africa, etc.) or regions (e.g., ASEAN countries, East-African states, Caribbean countries, etc.), these are rather regionally relevant documents. I preferred the *more horizontal, world- or continent-wide examinations* to draw general conclusions (SÜTÖ, 2023).

Annex #1 introduces all of the processed literature items in detail. In the following subchapters, the main results of the review phases are presented.

3.2. Clarification of basic concepts of adaptation policy and planning

The chapter intends to shortly clarify the basic concepts of the dissertation, reflected directly or indirectly already in the title of the whole research. These are climate adaptation, adaptation policy, policy planning instruments and spatial sensitivity. Some of these have detailed definitions in the literature, one of them not: the last element of the dissertation's title, which will not be discussed in this chapter, is the spatial sensitivity of these adaptation activities. To define this concept is one of the tasks of this dissertation. Consequently, Chapter 3.2. deals only with the adaptation- and planning cycle-related definitions – the dissertation dedicates special chapters for the concept of spatial sensitivity later (see 4.2.1.-4.2.2.).

Climate adaptation itself **basically means** the preparation for and adaptation to the unavoidable impacts of the process widely known as climate change, and the dissertation also intends to use this expression in this sense. This description is quite uniform in the known scientific and grey literature. Adaptation, according to the statement of the Intergovernmental Panel on Climate Change (IPCC), for example, refers to adjustments in ecological, social or economic systems in response to actual or expected climatic stimuli and their effects (IPCC, 2007). These adjustments can involve changes in practices, processes, and structures to make systems more resilient and better

cope with the impacts of a changing climate (IPCC, 2014). The newest IPCC definition describes adaptation as undertaking of actions to adjust to already observed or expected climate change and its effects, to protect natural and human systems against harmful effects, to exploit opportunities, and to ensure sustainability of investments and development despite current climate risks (IPCC, 2022). The second Hungarian National Climate Change Strategy (NCCS-2), as the main policy document in the field, even nominates the main goal of adaptation: preparation for the unavoidable changes in climate and their impacts, and adaptation to these changes (NCCS-2, 2018). The United Nations Framework Convention on Climate Change's (UNFCCC) definition is more policy-oriented: adaptation solutions should be developed at the state and community level as responses to current and future climate impacts. These solutions emerge in many forms, depending, among other things, on country or region-specific contexts¹. The definition of the United Nations Environment Programme (UNEP) is response-oriented (and resilience-oriented) again: adaptation aims at reducing vulnerability and building resilience. The latter is the ability of a system to absorb stress and cope with climatic hazards, recover and transform to improve its sustainability². The British adaptation knowledge platform, the United Kingdom Climate Impact Programme (UKCIP) emphasises the role of adaptation measures and policies to reduce the overall risk, to limit climate impacts and improve resilience within communities and systems. Adaptation planning at the local and regional levels, depending on the site, requires a thorough understanding of the relevant factors through a climate risk assessment³. The Climate-ADAPT website similarly defines adaptive capacity as the ability of people, sectors, or systems to adapt to potential damage, seize opportunities, or respond to consequences. Adaptive capacity involves adjusting behaviours, resources and technologies. Factors that hinder change or reduce resources decrease adaptive capacity, while openness to innovation enhances it⁴.

Adaptation, on the other hand, can be interpreted as **part of the climate vulnerability or climate risk impact chains**. The IPCC Fourth Assessment Report (AR4)-based framework considered adaptation as the strength and character of local social/economic answers to climate change impacts and the related exposure, and it is one of the basic components of vulnerability (IPCC, 2007). The current Sixth IPCC Assessment Report (AR6) states that adaptation plays a key role in reducing exposure and vulnerability to climate change. It is often considered as a notion around resilience as bouncing back

¹ <https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/introduction>, date of downloading: 01/08/2025.

² <https://www.unep.org/topics/climate-action/adaptation>, date of downloading: 16/09/2025.

³ <https://www.ukcip.org.uk/wizard/adaptation-options/>, date of downloading: 10/05/2025.

⁴ <https://climate-adapt.eea.europa.eu/en/mission/knowledge-and-data/regional-adaptation-support-tool/step-2-assessing-climate-change-risks-and-vulnerabilities>, date of downloading: 30/09/2025.

and returning to a previous state after a disturbance, describing not just the ability to maintain essential function, identity and structure, but also the capacity for transformation. At the same time, the new climate vulnerability assessment logic puts climate risks into the centre of the examinations. According to this, climate risk results from a combination of local conditions, including climate hazards, exposure and vulnerability. Adaptation, together with sensitivity, comprises the two parts of vulnerability (IPCC, 2022). Adaptation measures and policies are consequently essential in reducing the overall risk, aiming to limit climate impacts and improve resilience within communities and systems (EEA, 2025).

One of the dissertation's central topics is climate adaptation policy. The field is a relatively new policy area, both among the sectoral fields and within climate policy. As the IPCC declares, (planned) adaptation is deliberate policy decisions' outcome, based on the decision makers' awareness that climatic or other conditions have changed or are about to change. These circumstances require actions to return to, maintain, or achieve a desired state (IPCC, 2007). Climate adaptation policy comprises the planned actions to cope with the impacts of climate change, reduce vulnerability to them and tackle both current problems and anticipate future challenges as cost-effectively as possible. While earlier the related challenges were often handled through implicitly increasing adaptive capacities as part of other sectoral policies; during the recent decades, adaptation policy evolved into a separate policy field. As one of the three formal pillars of climate policy it is the activity of planning, implementing and following-up adaptation solutions aiming at the adaptation to and preparation for climate change-induced challenges. Benzie and Persson define **adaptation governance** as the collective efforts of multiple societal actors to address problems or exploit the gains associated with the impacts of climate change, including the design and use of institutions and ideas (BENZIE & PERSSON, 2019).

Tompkins and his colleague identified 3 groups of **adaptation actions**: those that address social vulnerability, those that aim at enhancing ecosystem resilience, and those that propagate actions against specific risks (TOMPKINS & AMUNDSEN, 2008). Similarly, other authors emphasise that adaptation activities comprise measures directed to reducing ecological, economic and societal vulnerability to climatic factors (FÜSSEL-KLEIN, 2006; KLOSTERMANN ET AL., 2018), adjusting these systems to actual or expected impacts and consequences and changing structures and processes to moderate potential damage and benefit from opportunities (FELDMAYER ET AL., 2019). According to Araos and his colleagues, adaptation interventions comprise five main groups: capacity building; practice and behaviour; information; financing; and last but not least

our central topic: planning and policy (ARAOS ET AL, 2016). As the sum of such activities, adaptation comprises natural, infrastructural and human system-related actions, based on an evidence-based, coordinated and systematic approach to strengthen climate preparedness (IPCC, 2007; WOODRUFF & REGAN, 2018).

Adaptation is definitely a multi-sectoral issue, addressing different challenges involving multiple stakeholders, various government levels, through communication, cooperation and coordination for synergies. It affects several fields from water management through energy supply, transportation and telecommunications, built environment and the housing sector, green surface management, tourism, nature conservation and forestry; to human health and social services. In its holistic and multidisciplinary/multisectoral character, climate adaptation (and risk management) shows strong similarity to territorial/spatial development and planning as it horizontally synthesises different sectoral development directions and interventions in a given geographic unit (SAPOUNTZAKI ET AL., 2011; SÜTÖ, 2023).

All in all, we can regard **adaptation policy as the sum of strategic directions, priorities as well as those measures and concrete actions that implement these directions and measures**. Its **typical tools** are legislation, strategic planning and monitoring-reporting-evaluation (MRE) activities, financial incentives, physical interventions and awareness-raising. The dissertation concentrates on the second group, namely the adaptation strategies/concepts that provide overarching vision, goals and systematic objectives as well as and cross-sectoral priorities; the adaptation programmes/action plans, which translates the strategy's objectives and action lines into specific measures with responsible parties for implementation and concrete financial background; and the monitoring and evaluation methodological studies as well as actual reports that secure feedbacks to be channelled back into the policy cycle and inform different stakeholders about achievements of strategies / programme objectives.

In my approach, I understand under **the wider concept of strategic planning the whole planning cycle**, from actual planning/design of interventions through implementation, monitoring, reporting and evaluation to elaboration of concrete feedback loops for the next planning period. In this, I follow the majority of the strategic planning-related literature that considers planning, monitoring, evaluation and feedback provision as the four most important steps of the planning cycle, both in general development policy (VEDUNG, 1997; GUSKEY, 2000; DUNN, 2004; HOGAN, 2007; KABEYI, 2019) and in climate policy (HAUG ET AL., 2010; HUITEMA ET AL., 2011; PRINGLE, 2011; BOURS ET AL., 2013 and 2014; EEA, 2015 AND 2022; PRINGLE ET AL., 2017; KLOSTERMANN ET

AL., 2018) as well. Leiter specifically notes that adaptation planning typically manifests as a policy cycle, including monitoring and evaluation (LEITER, 2021).

Within strategic planning, the research puts significant weight on the examination of **monitoring-reporting-evaluation (MRE) activities and systems in adaptation**, too. An MRE system means a comprehensive and iterative system of processes and products, including the assessment of impacts, vulnerability and risks, effectiveness of adaptation planning and implementation activities, focusing on a continuous learning. Climate policy MRE systems can operate at different levels, but their primary sphere is the national level, where they can apply to a broader scope of sectors, climate hazards and geographic areas. At the national level, we are also able to examine the embeddedness of adaptation aspects into national sectoral policies. The UNFCCC especially recognised monitoring and evaluation as important tools in the adaptation to climate change. After the Paris Agreement, not only were the non-annex parties encouraged to provide information about their national strategies and evaluate their documents, but all parties are now requested to do these activities, and the Conference of the Parties (COP) periodically monitors the collective process. However, it is important that the parties are only requested, not required, to conduct these data provisions (VALLEJO, 2017). The EU's Monitoring Mechanism Regulation's Article 15 requires Member States to regularly report on their adaptation activities to the European Commission, without setting a mandatory format for such reporting (EEA, 2020). The last rounds of such adaptation reporting took place in 2023 and 2025.

Definitions and emphasis on planning and MRE activities within the strategic planning cycle are quite stable; uniform, homogenous concepts emerge before us. Independently from the different concepts, common elements appear in numerous authors' definitions regarding the elements of the planning cycle. To synthesise the introduced approaches the following definitions can be defined for the planning and MRE (these definitions will be the basis of the research regarding the activities/documents to be analysed):

- **(Strategic) planning:** an effort to develop fundamental decisions, actions, milestones and methods to shape, explain and guide what an organization/sector/settlement/region does in a given time horizon and why it does it to achieve the intended results (FAYOL, 1916; VEDUNG, 1997; BRYSON ET AL., 2004; DUNN, 2004; KABEY, 2019). If we were to narrow our scope to adaptation planning, we must only modify the definition: an effort to develop fundamental decisions, actions, and methods to shape, explain and guide what a

sector/settlement/region does in a given time horizon to adapt to and prepare for climate change impacts and how it does it to achieve the intended results.

- **Monitoring** is a continuous data collection, processing, and provision activity that tracks the achievement of development objectives and the status of their implementation in a well-outlined format and responsibilities, regularly documenting the progress of a given planning document / development programme. In climate policy, it can even map climate vulnerability and risks as well as effectiveness of adaptation efforts and tracking financial resources spent on adaptation through indicators (FAYOL, 1916; HAYNES, 1974; WATERMAN & WOOD, 1993; HARLEY ET AL., 2008; VALLEJO, 2017; KLOSTERMANN ET AL., 2018; KABEYI, 2019; EEA, 2022).
- **Reporting** is the regular or ad-hoc dissemination of processed monitoring data and results of assessments for different target groups in the form of special queries/studies/papers and making lessons learned for decision makers or the broader public available (EDMUNDS-MARCHANT, 2008; EEA, 2016; EEA, 2022).
- **Evaluation** is the one-time or periodic analysis of a given planning level's (policy/concept, programme, project) functioning and/or the related intervention's results, comparing them with the initial goals/objectives (the original expectations). It identifies the direction of change and is based mostly on monitoring data/information, even qualitative information and on a well-defined methodology. In climate policy, evaluations can assess both the changes in climate vulnerability and effectiveness of climate adaptation efforts (GUSKEY, 2000; HOGAN, 2007; HUITEMA ET AL., 2011; EEA, 2015; VALLEJO, 2017; KLOSTERMANN ET AL., 2018; EEA, 2022).

3.3. Policy- and instrumental context

3.3.1. Climate adaptation policy context worldwide and in Europe

Climate policy could be described basically as the sum of policy activities, strategies, measures and actual interventions that aim either at mitigating climate change through minimisation of GHG emissions or at adapting to the already existing changes together with the preparation for future, unavoidable changes. Accordingly, both international and national climate policies (and among these, the Hungarian) basically comprise the following pillars: decarbonisation (mitigation), adaptation, preparation, and awareness raising. As GHG emissions are a global phenomenon, the climate policy's mitigation pillar needs transnational cooperation to cut global emissions. The EU plays a crucial role in this process, working bilaterally and multilaterally with non-EU countries.

Traditionally, mitigation (or decarbonisation) has been the main pillar within climate policy for decades. Only the last 10-15 years have started to bring changes in this situation.

Roots of **climate adaptation policy's history** go back to the mid-to-late 1990s when local causes and impacts of climate change first attracted attention (SÜTÖ, 2023). Of course, to get from the recognition of the importance of climate change impacts to systemised policy, climate adaptation went along a long road. The need for international climate research was first raised at the 1979 World Climate Conference. The World Meteorological Organisation (WMO) and the UNEP jointly founded the creation of the IPCC in 1988. The Panel's work is shared among three Working Groups. One of these, WG 2, focuses on impacts, adaptation and vulnerability to climate change.

Since its establishment at the 1992 Rio Conference, the UNFCCC has been the main international platform for climate policy-oriented cooperation, with the objective of preventing dangerous anthropogenic impacts on the climate system⁵. Adaptation is referred to specifically in Article 4(1) (e) which provides that all Parties shall *“cooperate in preparing for adaptation to the impacts of climate change; develop and elaborate appropriate and integrated plans for coastal zone management, water resources and agriculture, and for the protection and rehabilitation of areas, particularly in Africa, affected by drought and desertification, as well as floods”* (UNFCCC, 1992). All in all, the concept of global climate governance was formally recognised in 1992 – but mainly with an emphasis on mitigation. Although the norm⁶ about climate policy planning has existed since 1992, it has concentrated exclusively on national-level mitigation planning.

Nevertheless, only the 2001 **Marrakech Accords** was the first COP to the UNFCCC that **recognised adaptation as a possible element of climate policy**⁷ (SÜTÖ ET AL., 2023). The **first sign of institutionalisation of adaptation planning and development of adaptation regimes** at the national scale was the introduction of National Adaptation Programmes for Action (NAPAs) in 2001, a vehicle by which the Least Developed Countries received financial support in the framework of a work programme to prioritise

⁵ Even the current Austrian NAS mentions that though both the UNFCCC and the Kyoto protocol concentrate overwhelmingly on mitigation, the parties to the UNFCCC have also been required to adopt measures to minimise the negative effects of climate change (adaptation). It was the first and fundamental international agreement aimed at addressing climate change. Formally, it entered into force on 21 March 1994. The EU and its member countries were among the 197 Parties to the Convention. The Conference of the Parties (COP) is the decision-making body gathering annually, involving states, business organizations' representatives, international bodies, interest groups and associations can also join as observers to the COPs (AUSTRIAN NAS, 2024).

⁶ A new norm emerged with the establishment of the 1992 UNFCCC Convention text: *“All Parties shall... formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change... and measures to facilitate adequate adaptation to climate change”* (Article 4.1(b) (UNFCCC, 1992).

⁷ The Accord created even new funding mechanisms to help developing nations to adapt to climate impacts (SÜTÖ ET AL., 2023).

adaptation options to climate change. NAPAs were succeeded by NAPs in 2010, again as a vehicle for all developing countries to plan adaptation interventions and receive financial support for these (BENZIE&PERSSON, 2019).

Later, this **planning process reached the developed countries**, too. From 2005 onwards, developed countries have begun writing and adopting comprehensive national climate policy strategies as long-term plans to reduce negative climate impacts (WOODRUFF-REGAN, 2018; SÜTÖ ET AL., 2023). International and national programmes to facilitate the development of local climate action plans and support decision-making appeared, though this first generation of local documents, again, dealt rather with mitigation than adaptation (BAKER ET AL., 2012; GENELETTI & ZARDO, 2016; WOODRUFF & REGAN, 2018, SÜTÖ, 2023)⁸. At the same time, a growing number of research projects addressing the impacts and adaptive responses to climate change have emerged internationally. **Methodologies for adaptation-oriented strategic planning have been developed** by countries (e.g., the United Kingdom) and by United Nations-related agencies, including the IPCC (1995), UNEP (1998), and UNDP (2005). Since 2004, the European Environment Agency (EEA) has **regularly published reports** showing that climate change is already well underway in Europe. These reports (EEA, 2015, 2016, 2020, 2022) conclude that adaptation strategies need to be put in place at European, national, regional and local levels. At the time, the Organisation for Economic Co-operation and Development (OECD) also urged taking stock of the current state of adaptation to climate change in developed countries (SÜTÖ, 2023).

Targeting both developed and developing countries, in its communication “*COM (2005) 35 ‘Winning the battle against global climate change’ (February 2005)*”, **the European Union** dedicated a chapter to adaptation and the need to invest in it; and explored the role of the EU in reducing vulnerability and promoting adaptation (EC, 2005). Even a „*European Climate Change Programme - Working Group II - Impacts and Adaptation*” was established with the aim of producing a Green Paper by the end of 2006. The European Commission encouraged the development of national-level adaptation strategies by member states from 2009, too (BENZIE&PERSSON, 2019). According to Swart et al (2009) **by 2005 the first bigger wave of European national adaptation strategies** had started to emerge, triggered by international climate negotiations, related EU policies, growing intensity and frequency of weather extremities and damages, growing available pools of adaptation actors and related research projects, knowledge and political will (SWART ET AL, 2009; SÜTÖ, 2023).

⁸ The Austrian NAS also underlines that obligation to develop a national climate change adaptation strategy was already included in Article 10 (b) of the UNFCCC and in Article 10 (b) of the Kyoto Protocol (AUSTRIAN NAS, 2024).

In 2007, after a wide-ranging consultation throughout the EU, a Green Paper, “*Adapting to climate change in Europe – options for EU action*,” was published. Following this, in April 2009 the Commission published the **White Paper** “*Adapting to climate change: Towards a European framework for action*” which encouraged the further development of national and regional adaptation strategies with a view to considering mandatory adaptation strategies from 2012 (EC, 2008). The White Paper showed some spatial awareness, mentioning particularly coastal zones, river flood-prone areas, cities and urban areas (among others) to be particularly vulnerable to climatic changes. The document explicitly relates to spatial planning and territorial development (EUROPEAN COMMISSION, 2009).

Adaptation’ recognition, as an essential response to climate change complementary to mitigation, only emerged at the beginning of the 2010s and since then it has significantly increased its weight both in developing and developed countries⁹ (VELAZQUEZ, 2012; BAKER ET AL., 2012; PRINGLE ET AL., 2017; SÜTÖ, 2023). **Many EU countries developed and implemented national adaptation strategies** to cope with expected climate impacts (SWART ET AL., 2009). The today well-known differentiation between mitigation and adaptation started to emerge. i.e. mitigation as an international response to a global challenge vs adaptation that seeks locally tailored answers for regionally/locally specific impacts.

In April 2013, the European Commission adopted the **EU Strategy on Adaptation to Climate Change**, aimed at making Europe more resilient and setting out a framework and mechanisms for elevating the EU’s preparedness. In the Strategy member states are urged to elaborate national and lower (regional, municipal) level adaptation strategies¹⁰ (EC, 2013). Also, at the time the 525/2013 EU regulation signalled the start of the European Union level governance regulation process that began parallel with UNFCCC reporting as a biannual adaptation reporting process about national climate impacts,

⁹ Although no significant progress has been made in the Bali Action Plan’s implementation since 2012, although its importance was restated at COP 16 in Cancún, where elaboration of a strategy was required for the least developed countries to reduce foreseeable disasters, through international cooperation and financing (VELAZQUEZ, 2012). In Cancun an Adaptation Framework was established in 2010 as a first step into the direction that adaptation must be addressed with the same level of priority as mitigation, and adaptation efforts were endorsed by a strong structure of international cooperation. The Cancun Adaptation Framework (CAF) was structured into five main clusters. Among these implementation of adaptation activities and information channels, National Adaptation Plans and considering approaches to address loss and damage; supporting developing countries; establishment of an institutional background to promote the implementation of enhanced action on adaptation; taking into account principles such as country-driven approach, gender sensitivity, participation and transparency, guidance by science & local knowledge and adaptation mainstreaming; and stakeholder engagement emerge. These are strongly adaptation planning-related points, without spatial flavours, unfortunately (VELAZQUEZ, 2012; BAKER ET AL., 2012; PRINGLE ET AL., 2017; SÜTÖ, 2023).

¹⁰ It focuses on three key objectives: 1) Promoting action by Member States through elaboration and adoption of comprehensive adaptation strategies and supporting adaptation in cities based on the Global Covenant of Mayors for Climate & Energy initiative. 2) Climate change adaptation measures at EU level by further promoting adaptation in key vulnerable sectors such as agriculture, fisheries and cohesion policy, ensuring that Europe’s infrastructure is made more resilient, and encouraging the use of insurance against natural and man-made disasters. 3) Better informed decision-making by addressing gaps in knowledge about adaptation and further developing the European Climate Adaptation Platform (Climate-ADAPT) (EC, 2013).

strategic planning activities at national and lower spatial levels, adaptation-oriented MRE activities, financing and concrete adaptation actions. Parallel with these developments, the 2014 Fifth Assessment Report of IPCC described adaptation planning as an activity “occur[ring] at a number of spatial scales including at the national, regional, city, district, or local community level” (IPCC, 2014; BENZIE&PERSSON, 2019), underlining the national/subnational character of adaptation again.

During the period after the adoption of the first EU Adaptation Strategy, responding to one of the Strategy’s three main objectives, all but one EU and EEA countries elaborated their own National Adaptation Strategy,¹¹ and the number of EU member states having a National Adaptation Programme also doubled by the end of the second decade of the new century. Some countries even adopted a second, revised version of their NAS (KLOSTERMANN ET AL., 2018; EEA, 2020). Only a few of these first-generation national strategic documents accompanied by MRE programmes, and a common standard for these activities did not exist then, either (KLOSTERMANN ET AL., 2018). Similarly, worldwide, in the middle of the 2010s relative few countries had already operational adaptation MRE system. The majority of states were before these MRE-development processes which situation is also indicated by the then-recent proliferation of related guidelines, synthesis documents and framework concepts facilitating the intended developments¹².

2015 brought the adoption of three important agreements/documents influencing the history of international and national adaptation policies. The most important of the three was the **Paris Agreement**, drafted at the COP21, one of the most important COPs held in Paris. All UNFCCC Parties considered the Agreement as the first global-level, universal climate agreement with legally binding content. **It elevated the adaptation pillar of climate policy to an equal level with mitigation**; furthermore, it **set the first global goal on adaptation** (UNFCCC, 2015; FARAGÓ T., 2015; EEA, 2020; WRIGHT ET AL., 2021; FULDAUER ET AL, 2022). Its importance is indicated by the fact that to date, the Agreement has been ratified by 189 of the total of 197 parties. They agreed to limit the global-level increase of temperature from the industrial revolution to 2100 to 2°C, while aiming to limit it further to 1.5°C. The Paris Agreement emphasises the implications of climate change to local communities and the role that different levels of

¹¹ NAS is a planning document with adaptation vision to deal with climate impacts, clarify coordination structures, identify objectives and stakeholders to be involved (EC, 2013).

¹² As a good example, Christiansen and his colleagues elaborated a comprehensive overview of the key challenges and emerging practices of MRE in adaptation worldwide and introduced 5 fact sheets on 5 challenges (lack of standard off the shelf methodology; baseline problems; timing; proxy indicators; problem of attribution) (CHRISTIANSEN ET AL., 2016).

government play in climate policy. Article 7 urges Parties to engage, as appropriate, in adaptation planning processes and implement actions of relevant plans, policies and/or contributions¹³, particularly noting that the elaboration of a national adaptation plan is required as a possible part of adaptation planning processes (UNFCCC, 2015, Article 7.9). Here, the term “national adaptation plan” (NAP) is applicable to all countries, regardless of differences in national planning systems¹⁴, as an umbrella term for operational planning documents from a national government explicitly directed at adaptation to climate change, consisting of a mix of policies and measures to reduce a country’s vulnerability. Consequently, since its adoption, the Paris Agreement has provided additional momentum to national adaptation planning¹⁵ (LEITER, 2021). After local or national responsibility in adaptation had been questioned by several scholars pointing to borderless climate risks, the fact that the Paris Agreement included a “global goal” on adaptation (Article 7.1)¹⁶ and adaptation is for the first time explicitly recognized as a “global challenge” faced by all spatial levels, including the international one, somehow strengthened the emphasis on supranational dimensions in adaptation (BENZIE&PERSSON, 2019; LEITER, 2021).

The other 2015 document, the **UN’s 2030 Agenda on Sustainable Development**, reinforced further the international objectives on adaptation. It underlined the need for cooperation with regional and local authorities and encouraged countries to implement both mitigation and adaptation actions. Its Goal 13, “Climate Action,” calls for urgent interventions to combat the impacts of climate change (UN GENERAL ASSEMBLY, 2015). The third document, the **Sendai Framework for Disaster Risk Reduction 2015-2030**, provided a comprehensive approach to managing disaster risks, including those caused by climate change. It emphasised the importance of both local, subregional and regional actions, as well as international and transboundary cooperation, urging the elaboration of local and national disaster risk management strategies, and the need to empower local authorities and communities for action to understand specific local risks better (UNISDR, 2015). We can see: all three documents from 2015 underline the

¹³ Article 7.1, in particular, guides countries toward a global adaptation goal: “Parties hereby establish the global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature referred to in Article 2” (UNFCCC, 2015).

¹⁴ For example, some countries have action plans that jointly cover mitigation and adaptation (e.g., the Philippines) or use other designations such as a national adaptation strategy (e.g., South Africa) or a national adaptation programme (e.g., the United Kingdom) (UNFCCC, 2015).

¹⁵ The article clearly stipulates that the Parties to the Agreement should develop, implement, and update national and, where appropriate, regional programs. The 2020 progress report on national adaptation plans (NAPs) by the secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) found that out of the 154 developing countries 125 had undertaken activities related to the formulation of a NAP (UNFCCC, 2021). However, little is known about the extent to which these plans have been implemented and even less about their effects. (AUSTRIAN NAS, 2025)

¹⁶ The Global Goal On Adaptation (GGA) aims at creating a global framework, with specific objectives, to guide adaptation action around the world to improve adaptive capacity, strengthen resilience and reduce vulnerability to climate change in order to contribute to sustainable development and ensure appropriate adaptation measures within the framework of the temperature goal of the Paris Agreement (FRENCH NAS, 2024; SWEDISH NAS, 2024).

importance of adaptation planning, especially at national, subnational and local levels. They also emphasised the importance of multi-level governance and active involvement of settlements and regions. NAS and NAP documents from that period suggest that national governments increasingly take into consideration local climate action (OECD, 2023).

The last five UNFCCC COPs, after some idle years again tried to bring conclusions in some important issues with mixed results. Spatiality, unfortunately, emerged among these issues only on and off, as a side topic. The **COP26 in Glasgow** promoted the Paris Agreement's implementation by finalising the outstanding elements of Paris by targeting adaptation finance, technology transfer and capacity building (LEITER, 2021; OTTAVIANI AALMO ET AL., 2022). Several minor issues were solved, but no bigger ones were managed. The main problem was the lack of solutions in specific regulations and financial issues. The Glasgow Climate Pact was agreed upon with exclusively mitigation targets, and a new ETS framework was adopted. In the field of adaptation, all parties undertook to review and update their NASs.

After Sharm-el-Sheikh, the **COP 28 took place in Dubai** at the end of 2023 and closed with an agreement that laid the ground for a swift, just and equitable decarbonisation and transition process, marked by a strong cut of emissions and scaled-up finance¹⁷. The new targets set for 2030 were again exclusively decarbonisation-oriented, but to support the achievement of the still general global goal of adaptation, work on the elaboration of an indicator system started in Dubai. The first global review of the Paris Agreement concluded that climate adaptation work continued to fail in its implementation, support and evaluation. To improve the situation, the Parties must put in place updated impact, vulnerability and risk assessments by 2030; national multi-hazard early warning systems by 2027; climate information services for risk reduction and systematic observation by 2027; and country-led, gender-sensitive, participatory and transparent national adaptation plans by 2030. It was altogether a really promising COP, explicitly underlining the importance of phasing out fossil fuels, but operationalisation of its decisions has not happened since then (UNFCCC, 2023). In **Baku at COP 29** less successful discussions occurred in the absence of important world leaders and due to economic and geopolitical conflicts. Climate finance was the central topic in the COP, with dissatisfying results from the developing countries' point of view. The majority of

¹⁷ The meeting was an important milestone, having the biggest audience in the history of COPs, high level notabilities represented their countries, even thousands of representatives of the coal, gas and oil industry emerged. Several participants showed positive attitude to change, due to the increasing frequency and intensity of catastrophic events. Decision was made about the establishment of the Loss and damage fund supporting the developing countries. The central outcome was the so-called global stocktake that contains every element that was under negotiation. It recognizes that global GHG-emissions need to be cut 43% by 2030, compared to 2019 levels, to limit global warming to 1.5°C (UNFCCC, 2023).

the discussed issues have remained unsolved again. In the **COP30 in 2025 (Belém, Brazil)** as the result of the UAE-Belém Work Programme, 100 indices of the global indicator set for measuring progress to the achievement of the global adaptation goal were adopted. It means that the COP elevated adaptation MRE at the international and national level – spatial issues have not been improved by this.

Back to the EU scene, in December 2019, the **EU adopted its then-current strategic framework, the Green Deal document** - a strategy for achieving the sustainability of the EU economy by turning climate and environmental challenges into opportunities in all policy areas and making the transition just and inclusive. It describes how, by 2050, Europe will become the first climate-neutral continent without neglecting anyone. In earlier programming periods, however, the EU had always had a general development policy strategy (Lisbon Strategy, Gothenburg Strategy, EU 2020 Strategy) and, parallel with these, it always elaborated a dedicated energy and climate policy framework, too; the Green Deal merged these two functions. In the Green Deal's wake, the long-term vision and objectives of European climate policy and clean economic development were also elaborated, urging even member states to do the same planning at the national level. It also prescribed the revision of the first EU Adaptation Strategy (EC, 2021A).

As had been said, it was done - in February 2021, the European Commission adopted its **new, reviewed, ambitious EU Strategy for Adaptation to Climate Change** which sequel also indicates the growing general emphasis on adaptation. The updated strategy outlines the vision of a climate-resilient Europe and comprises more priorities and is a more solid document than its predecessor was. Based on the Strategy, Member States are again suggested to develop and implement national adaptation strategies and plans, taking into account the particular vulnerability of their sectors concerned, including agriculture, water and food systems, as well as food security, and to promote nature-based solutions and ecosystem-based adaptation and management (EC, 2021C). In June 2021, with the adoption of **the European Climate Law** [Regulation (EU) 2021/1119 (EC, 2021d)], the other important climate policy output of the first Von Der Leyen commission was born, too. It requires Member States to implement and enforce adaptation strategies¹⁸ to increase resilience to the effects of climate change, and to establish a legislative framework for achieving climate neutrality and adaptation (UBA, 2025). The **EU Mission on Adaptation** fosters local innovation in adaptation across the whole continent. We can see: more and more legislation, strategies, initiatives

¹⁸ In accordance with the Article 5 of the EU Climate Law and Article 7 of the Paris Agreement, Member States shall adopt and implement national adaptation strategies and adaptation plans, taking into account the Union Strategy on Adaptation to Climate Change to ensure continuous progress in increasing adaptive capacity, strengthening resilience and reducing vulnerability to climate change. (SWEDISH NAS, 2024)

concentrate directly on climate adaptation already at the EU level, making the recent period a proper era for elaborating effective, multi-level adaptation frameworks in the EU and in Member States and putting greater emphasis within this process on the spatial aspects of adaptation policy.

In addition to the European Commission, the European Environment Agency (EEA) is also strongly participating in developing the climate adaptation knowledge base, regularly publishing reports on relevant topics, such as monitoring and evaluating adaptation in Europe (EEA, 2020). In a 2022 report, the EEA examined national adaptation policy processes in 28 European countries. This study shows that all EU member states and Türkiye have climate risk analysis and national adaptation strategy (NAS) or action plan (NAP) and are addressing the issue of climate change adaptation (EEA, 2022).

In 2023, the first continent-wide climate risk assessment was carried out in Europe. The **European Climate Risk Assessment (EUCRA)** document, published in March 2024, identified 36 climate risks that threaten Europe's energy and food security, ecosystems, infrastructure, water resources, financial stability, and human health, with serious consequences and possibly requiring coordination at the European or transnational level. The report points out that many of these risks have already reached critical levels, requiring urgent and decisive action. The assessment calls for identifying European policy priorities, types of adaptation interventions, and regions/sectors/population groups that are particularly affected. Although basically a sectoral/thematic approach prevails in the document, it classified the continent into 4 macro regions (West, North, South and East) and highlights three regions (Southern Europe; low-lying coastal regions along the Baltic, Black Sea and West-Atlantic coasts; Overseas regions) as climatic hotspots. Nevertheless, this spatial logic is not reflected by the bigger part of the EUCRA: introduction of vulnerability situations, as the backbone of the report, after this spatially sensitive start, goes through sectors/themes, in a classic thematic logic. But at least, a sign of spatial thinking emerges.

As a current sequel, the European Commission is working on an operational action plan-like document, **the European Integrated Framework for Climate Resilience (EIFCR)** to ensure resilience and preparedness across Europe by systematically embedding adaptation into policies, governance activities and investments both at EU and member state levels. Furthermore, it aims to improve consideration of adaptation across all relevant EU and national sectoral decisions and to further encourage member states to elaborate/update their national adaptation strategies and action plans (UBA, 2025). Regarding its planned five priorities, issues of spatial thinking appear only

implicitly, mostly in the form of facilitating the creation of GIS-based decision-supporting systems and the improvement of MRE activities¹⁹.

If we take a look at the evolution of adaptation policies at international, EU, national and subnational levels during the last one and a half decades, we can observe that the number and depth of adaptation actions to address climate change have increased steadily across the world, with adaptation policies gaining momentum beside mitigation both in national planning and international agreements. The number of elaborated, adopted adaptation strategic documents, as well as finalised adaptation planning cycles (particularly in Europe) with monitoring and evaluation outputs, have grown significantly. It is now the proper time to analyse these strategic documents.

3.3.2. Instruments of strategic planning in general and in adaptation policies

Generally, the adaptation governance-related literature examines adaptation planning and mainstreaming rather than actual adaptation actions (LEITER, 2015; KLOSTERMANN ET AL., 2018). The Fifth Assessment Report of the IPCC observed that only a minority of academic literature provides information on the implementation of adaptation plans, in contrast with the large number of literature items discussing concepts, strategies, and plans of adaptation (IPCC, 2014; LEITER, 2021).

After reviewing the related literature, the conclusion can be drawn that a linear development can be observed both in the evolution of monitoring/evaluation activities and in the weight of MRE within project management, both in general and especially in climate adaptation policy. In Europe, the **types, methodologies and topics of development policy-related planning and MRE have basically developed** over the recent decades (SÜTÖ, 2023). Regarding the listed aspects, there are no obvious differences between the states²⁰. The main purpose of these national planning, monitoring and evaluation frameworks is to promote the efficient use of Community aid, while helping to improve the implementation of national operational programmes by providing feedback on their effectiveness (SÜTÖ, 2017; SÜTÖ ED. 2020).

Regarding the current situation, standards and methodologies of the **planning and monitoring, reporting, and especially evaluation activities in European climate policy show a significantly slower development** compared to other sectors with

¹⁹ The draft proposes improving data availability in relation to the priority of climate resilience in the insurance sector. Moreover, in relation to the priority of strengthening the legal framework, it calls for the renewal of EUCRA and the promotion and framing of national climate risk assessment activities based on appropriate information, alongside the establishment of a legal basis for monitoring, assessment and reporting activities. It urges “resilience by design” or in other words, the integration of adaptation aspects into relevant sectoral policies. In relation to the priority of reaching risk bearers, the development of appropriate digital decision support tools and GIS-based tools is also given high priority.

²⁰ We can see the development of vertical evaluation systems across several territorial levels to coordinate the growing volume of evaluation activities: at Community level in the case of individual EU policies; and as a framework for evaluating the implementation of ESIF supports in each Member State (SÜTÖ, 2017; SÜTÖ ED. 2020).

greater traditions in these activities (e.g., regional development, environmental protection, spatial planning). To make the situation even more interesting, **within climate policy**, a similar dual picture stands out: planning and MRE of **adaptation is even less developed/refined compared to that of mitigation** (both in Europe and in Hungary). Among the causes we can identify, based on the results of the literature review, both the more difficult quantification of adaptation impacts, outcomes and benefits (the reasons are methodological uncertainties and differences in conceptual approaches); and the delayed institutionalization of adaptation compared to mitigation (FÜSSEL H.M. & KLEIN, R.J.T., 2006; HARLEY M. & VAN MINNEN, 2009; HAUG, C., ET AL. 2010; HUITEMA, D. ET AL., 2011; PRINGLE, P. 2011; BOURS D., ET AL., 2013; EEA 2015 AND 2016; DAVIDSE ET. AL., 2015; PRINGLE, P. ET AL., 2017, KLOSTERMANN, J., ET AL., 2018; MEIJS, S., ET AL. 2018; SÜTÖ, 2023).

However, having overviewed the historical development and the characteristics of these activities, we can see that **MRE have at least started to become an important part of the adaptation cycle**. According to most authors (LEITER, 2013; VILLANUEVA, 2012; BOURS ET AL, 2013; EEA, 2016; KLOSTERMANN ET AL. 2018, EEA, 2022 and 2024), the implementation of adaptation (more exactly: adaptation actions' effectiveness, efficiency and overall utility) must be monitored, regularly evaluated and revised in terms of the appropriateness of projects and programmes. Leiter specifically mentioned that Europe is the only continent where adaptation MRE had become part of the regular adaptation planning cycle by the beginning of the 2010s, especially in Western and Northern European countries (LEITER, 2013). However, at the national level, evaluations in Europe still find nowadays that less than half of the countries that had planned a periodic review of their NAP were actually monitoring its implementation (EUROPEAN COMMISSION, 2018, LEITER, 2021).

Several literature items emphasise the **numerous reasons / demands for MRE in adaptation**. Because of the increasing number of adaptation actions, continuous monitoring is needed to follow up on adaptation policy objectives' achievement and implementation of policy measures/actions to strengthen accountability and gain a better understanding of the intended results and improve the effectiveness of policy implementation. Identifying climate risks, strengthening climate resilience and avoiding maladaptation (negative consequences of inadequate adaptation measures) as well as improving awareness of the necessity of adaptation are other causes of MRE activities. States should meet international reporting requirements, which also demand exact evidence, provided by national MRE activities. Integration of climate adaptation aspects into spatial development and other sectoral planning can also be tracked/controlled via

MRE activities. Outputs of MRE support adaptation at all spatial governmental levels and influence decision making, allowing better distribution of resources (EEA, 2015; CHRISTIANSEN ET AL., 2016; VALLEJO, 2017; KLOSTERMANN ET AL., 2018; EEA, 2020; LEITER, 2021).

MRE activities have their own special challenges/requirements in the general development policy²¹. Added to these, **climate change adaptation poses several further challenges to MRE** (KLOSTERMANN ET AL., 2018; GOONESEKERA-OLAZABAL, 2022). Adaptation itself cuts across sectors (involving a large number of responsible parties with different objectives, norms, interests and specific governance institutions), levels of intervention and timeframes (actions become measurable only after a long time, stretching far beyond common programme cycles, causing conflicting interests and time scales). Adaptation measures are frequently integrated into other sectoral policies rather than being a stand-alone intervention. Unclear division of tasks and responsibilities, uncertain social costs and future benefits are also problems. As opposed to mitigation, measuring progress in adaptation activities is always context-specific; there are no one-size-fits-all solutions and off-the-shelf methods. Consequently, there is a lack of standardised adaptation monitoring methodology. Further challenges are the lack of consensus on key concepts and definitions, the lack of clarity on what constitutes successful achievement of adaptation goals (adaptation policies often lack measurable targets or defined outcomes, which makes evaluation more difficult) and the lack of common metrics and a universal set of indicators (adaptation cannot be monitored by a single or limited indices). The frequent case of maladaptation is another challenge. Adaptation interventions' another feature is the uncertainty/unpredictability about the magnitude of climatic changes and probability of extremities. The problem of attribution (identification of factors which may shape adaptation outcomes) is also a frequent challenge. Particularly at the local level, the lack of both political commitment, scientific evidence base, and planning experience or related professional capacities also causes problems, resulting in weak prioritisation of adaptation interventions. At the urban level, risk and vulnerability assessments are rarely used by / connect with adaptation decision making. Furthermore, adaptation represents a new focus of development programming. Due to its newness the degree of implementation of adaptation measures has been limited to date, so there are less experience in adaptation evaluation than adaptation planning and monitoring (these latter activities have already started in numerous countries (VAN MINNEN ET AL. 2014

²¹ E.g. the need for credible and legitimate indicators, based on precise, robust objectives; indicators must be linked to appropriate datasets and meet the SMART criteria, while the MRE itself should be implemented by an independent organization (KLOSTERMANN ET AL., 2018; GOONESEKERA-OLAZABAL, 2022).

and 2018, SCHÖNTHALER&VON ANDRIAN-WERBURG 2015; EEA, 2015, 2020 and 2022; HEIDRICH ET AL., 2016; LIGTVOET ET AL., 2016; SÜTÖ, A. (ED.) 2017; VALLEJO, 2017; KIND ET AL., 2019; SÜTÖ, A. (ED.) 2020; WRIGHT ET AL., 2021; GOONESEKERA-OLAZABAL, 2022; SÜTÖ, 2023). These shortcomings should be addressed in the future. All in all, we can summarise our findings that the establishment of main conceptual and definitional frameworks (that already exist in development policy planning and MRE in general) seems to have started in climate adaptation planning and MRE, too. However, institutionalisation of these activities as well as their general methodological requirements are still being formed. Only a limited number of countries show advanced results in this field. Moreover, there are several challenges arising from adaptation's own characteristics that must be addressed with proper, locally tailored yet generally accepted methodological frameworks.

3.4. Spatiality and adaptation policies

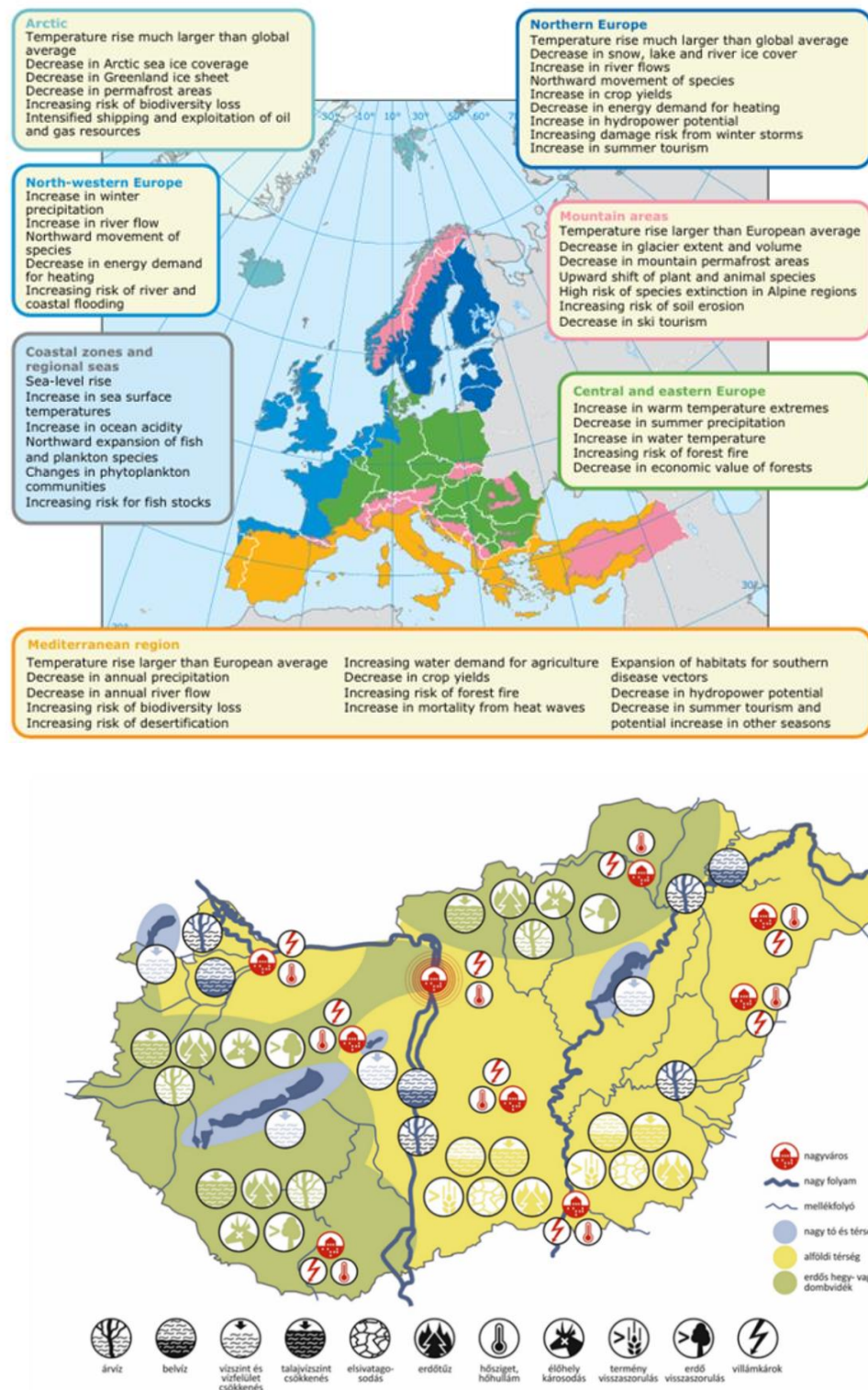
Already Chapter #1 (Introduction) and Chapter#3's contextual parts referred to the fact that climate policy, especially its adaptation pillar, cannot be handled separately from the (geographical) space. Thus, theoretically, integrating spatial/territorial aspects into adaptation policy making is of key importance (SÜTÖ, 2023). However, neither the role of spatial aspects in climate policy, nor the importance of spatially specific planning in climate adaptation seems to get adequate focus in relevant research activities. The following subchapters go through the issue of geographical and spatial characteristics and dimensions/aspects in adaptation policymaking, planning and MRE activities, to shed some light on the importance of spatiality in this strong geographic space-oriented policy field.

3.4.1. The importance of geographical/spatial aspects in climate adaptation policy

To examine the issue of spatiality in adaptation, the starting point could be, on the one hand, the nature of changing climatic factors as part of a region's basic geographical characteristics; on the other hand, the special feature of the adaptation pillar of climate policy. As for the latter, climate change is now widely perceived as one of the most important challenges mankind is facing; and this statement is particularly true for the second pillar of climate policy: adaptation. As opposed to the first pillar (mitigation), which area is handled basically through international agreements and mutually arranged emission restriction quotas; adaptation depends on spatially different climate impacts, consequences and adaptive capacities varying from region to region (BIRCHALL ET AL., 2022; SÜTÖ ET AL 2023).

Climatic factors are ab ovo among the most important elements of **geographic endowments** together with geomorphologic, topographic, ecologic, hydrographic and soil characteristics. They frequently influence the social and economic conditions of a given area. Temperature, precipitation, humidity, wind conditions, etc. define the locally / regionally / nationally / macro regionally different impacts and consequences of climatic processes and climate change (SÜTŐ ET AL, 2023; OECD, 2023, SÜTŐ, 2025B). The IPCC already at the beginning of the 2010s acknowledged the severity of understanding and managing the risks related to climate change, stating that while changes in the frequency and intensity of the physical events generated by climate change will affect risk, the **spatially diverse and temporally dynamic patterns of exposure and vulnerability** also need to be considered (IPCC, 2012). Robust geographical patterns of many variables can be identified at a given level of global warming, common to all scenarios considered, as the most recent IPCC materials conclude (IPCC, 2022).

As a consequence, each continent (among them Europe, too), and **each macro region is facing different challenges related to climate change, and each requires different countermeasures** (SÜTŐ, 2023, UBA, 2025). E.g., in Europe, the Atlantic coast suffers and will suffer from coastal erosion and expected sea level rise; the North from melting permafrost and decreasing snow volumes; the Mediterranean from extended drought periods and desertification, while Eastern-Central Europe is pressed and will be pressed in the double squeeze of water abundance and water scarcity (SÜTŐ, 2017; SÜTŐ, 2023).



7. a) and b) Figure: The regionally different impacts of climate change in Europe (above) and in Hungary (down). Source: EEA, 2012 (left) and Sütő (ed.) 2016 (right).

Even in relatively small countries like Switzerland, Austria, Slovenia, Slovakia and Hungary, significant geographic/spatial differences exist, too, in terms of climate impacts, climate exposure, sensitivity and adaptive capacities. E.g., in Hungary, the

Great Plain and the Small Plain are and will, for example, suffer from protracted drought periods, extreme floods, inland water inundations and desertification. The hilly and mountainous, wood-covered North- and West-Hungarian territories are and will be facing flash floods and forest damage through decreasing biodiversity and increasing danger of forest fires. The bigger towns, where physical infrastructure, society and economy are located next to each other and interacting with each other, are and will be affected by the geographically concentrated impacts of floods, extreme storms and heat waves (Figure 7) (SÜTÖ, 2023). And these spatially different impacts depending on geographical characteristics, need spatially tailored adaptation responses, indicating that a spatial approach and special emphasis on geographical and spatial endowments are of key importance in climate (particularly in adaptation) policy (SÜTÖ, 2024).

Several articles state that while **climate impacts and adaptation interventions occur in the geographical space, they do not respect political / administrative borders** (DAVIDSE ET AL., 2015; TAYLOR, 2023, PAASI, 2023, SÜTÖ ET AL, 2023, OECD, 2023). As Roggema wrote in 2009, climate change is not easily fit within the boundaries of recent administrative/political units (ROGGEMA, 2009). Authors, studies and reports point it out that climate change impacts in Europe emerge differently in the specific regions due to the spatial variation in climatic drivers. Some definite **spatial patterns of climate change impacts can be identified, revealing regions with similar challenges** (ESPON, 2011). These regional differences should be reflected in the national adaptation policy documents (SWART ET AL., 2009, GREIVING-FLEISCHHAUER, 2010; EEA 2015, 2020 and 2022; SÜTÖ, 2025B). Nowadays several national adaptation documents (e.g. the recent Hungarian or Turkish NAS) underline that local dynamics play a crucial role, as vulnerability to climate change and the resulting adaptation needs vary according to regional contexts.

Regarding the international processes and “environment” of climate policy, the literature mentions several times the new phenomenon coming up with globalisation²². The growing number of global challenges calls our attention to the well-known slogan of “*Thinking globally and acting locally!*” which emerges in various analysed literature items (ROSENAU, 1992 AND 1995; LENNOX, 2008; HEIDRICH ET AL., 2016; VOGLER, 2017; BIRCHALL & BONNET, 2021; BIRCHALL ET AL., 2022; SÜTÖ, 2025B). As one of the analysed documents of the empirical phase, the updated French NAS says, “*no one will act in our place*”. It means that the **lower spatial levels’ decision makers are responsible for responding the problems caused by the locally/regionally special**

²² E.g. ICT development, increasing global connections, globalization of economies and the environmental consequences of these (rising level of production & consumption and emissions, relocation of industry, population movements, export-based economies causing disrupted local economies and livelihoods) (LENNOX, 2008; VOGLER, 2017).

and diverse **climate impacts** in their public strategies, strongly taking into account the regional/local spatial endowments (BIRCHALL&BONNET, 2020; SÜTÖ, 2023; FRENCH NAS, 2024). Devine-Wright applies the above-mentioned slogan for climate adaptation policy and emphasises the relevance of “space attachments” and “space identities” in the systematic research on climate change (DEVINE-WRIGHT, 2012).

As it has already been mentioned, geographically specific climate impacts, their socio-economic consequences and the manifestation of sectoral vulnerabilities emerge actually locally (in municipalities and smaller regions). Consequently, **municipal leaders and micro-regional/regional decision-makers** have a fundamental interest in properly planned adaptation steps to identify local climate impacts on affected stakeholders/elements and find suitable solutions. For this, they **require better, more profound, up-to-date spatial knowledge of the issues** (PÁLVÖLGYI ET AL., 2010; EEA, 2020; SÜTÖ ET AL., 2023). Nevertheless, the national level cannot be neglected, either: national policymakers coordinate the works and adaptation directions of the lower territorial levels.

In practice, comprehensive adaptation-oriented **spatial situation analyses and risk and vulnerability assessments are among the main evidence-based tools** supporting the elaboration of policy objectives (UBA, 2025). Climate change vulnerability assessments (CVAs) are vital for identifying climate change hotspots that require urgent action. Consequently, they are important for decision makers to design and implement adaptation strategies (BOGALE, 2015). Velazquez also identifies climate vulnerability assessment as a tool that helps explain climate change and climate variability as the result of society’s own dynamics. Countries, regions and communities are highly vulnerable to dangers, so it is important to know the conditions of social territorial vulnerability prior to climate change-related strategic or development policy planning (VELAZQUEZ, 2012).

Vulnerability differs within communities and across societies, regions and countries (IPCC, 2022). Regarding the recent literature’s implications, the effects of climate change, the vulnerability to them, and the examination of adaptability are increasingly becoming the focus of attention (SÜTÖ ET AL., 2023). In the last one and a half decades, many important studies have dealt with the complex issue of climate vulnerability (e.g., IPCC, 2007²³, BOGALE, 2015), its modelling (e.g., FÜSSEL&KLEIN, 2006; KHAJURIA & RAVINDRANATH 2012; IPCC 2014 AND 2021), or its particular sectoral aspects (e.g.,

²³ The Intergovernmental Panel on Climate Change (IPCC) defined vulnerability as “*the degree to which a system is susceptible to and unable to cope with adverse effects of climate change, including climate variability and extremes*”. Vulnerability can vary depending on a system’s characteristics (exposure, sensitivity, and adaptive capacity). (IPCC, 2007).

FELLMANN 2012). These reviewed **vulnerability examinations are basically spatial: they trace relative spatial/territorial differences** (SÜTÖ, 2025B).

Approaches to analysing and assessing vulnerability have evolved as we progress in time through the different IPCC assessment phases [IPCC Assessment Reports (ARs) regularly collect and synthesise the internationally available vulnerability assessment methods every 7 years]. According to Isthiaque and his colleagues both IPCC AR 3-4 and 5-6 considers serious spatial implications when analysing vulnerability (ISTHIAQUE ET AL., 2022). In the methods suggested by **IPCC AR 3 and 4**, „**exposure**” (that is the changes of climatic factors in a given geographical area/administrative unit) is a **directly geographic region-dependent (climatic) variable**. Here, climate change-driven exposure is the basis of the whole vulnerability assessment, like in the case of the CIVAS model (see PÁLVÖLGYI ET AL., 2010; KAJNER ET AL., 2017; SÜTÖ&FEJES, 2019).

The IPCC 5 AR introduced a brand-new assessment framework, which was further developed in IPCC AR 6. It considers vulnerability as the propensity/predisposition to be adversely affected, encompassing a range of concepts and elements, including susceptibility to harm and a lack of capacity to adapt. IPCC’s most up-to-date CVA framework focuses on climate risks instead of actual vulnerability. This new **risk** concept is **determined by a combination of hazards** (a similar notion to IPCC 4’ exposure), **exposure** (now it means the local presence of affected parties in threatened areas) **and vulnerability, all of which are highly geographical context-specific**, and they rely on a wide range of local environmental and socio-economic factors²⁴. Past, current and future climate-related hazards vary considerably from one place to another. According to the framework, the degree of exposure to climate events depends on the characteristics of the local area and the spatial elements within it (ISTHIAQUE ET AL., 2022; OECD, 2023). **Territorial/spatial differences of impact chain elements** (exposure, sensitivity, adaptive capacity, vulnerability, risk) all show the **existing geographic context of climate vulnerability and risks**: site and situation of the impacted place, proximity to hazard sources and events, etc., influence the volume of the risk itself. The function of a climate change risk assessment (CCRA) is not only to identify the location of risk-related problems, but also to quantitatively/qualitatively determine risk significance, taking into account all risks related to a specific place²⁵.

²⁴ In IPCC AR 5-6 (though separates vulnerability from climatic drivers) the final target they strive for is the identification of risks still consider spatial implications. Exposure, independently from the climate-driven hazards, is now defined as the presence of affected parties (people, livelihood, species or ecosystems, services, resources, infrastructures) in places and settings that could be adversely affected by climate change. The definition put special emphasis on geographic location, and its biophysical attributes (ISTHIAQUE ET AL., 2022).

²⁵ Although the new methodology focusing on risks (IPCC, 2014; IPCC, 2022), as opposed to the previous IPCC methodology, which put vulnerabilities at the centre (IPCC, 2013), however, due to methodological inconsistencies and

Recently, scientists, in harmony with the new frameworks, have analysed the **spatiality of climate risks**. Velazquez explicitly addresses the problem of spatial risks (defined as processes that pose foreseeable threats to society and the environment in the absence of strategies to strengthen local communities' resilience to structural vulnerability) and climate change in his article. He concentrates on the social and human implications of climate change, saying that convergence of environmental, territorial, and social factors makes it necessary to identify the relation between territory and climate, dominant political systems and economic processes, because the current pace of anthropogenic climate change is the result of various territorial (in my dissertation's approach: spatial) activities (VELAZQUEZ, 2012). Davies et al. discuss riskscape (a.k.a. the "environment," the "landscape" of risks). The approach brings together two interlinked themes: governance and institutional responses on the one hand and vulnerabilities and inequalities on the other²⁶. Although riskscape highlight the unique characteristics and the context of specific places, they also draw together important lessons of governance, planning and socio-ecological engagement that are critical to building resilience at local, regional, national and global scales (DAVIES ET AL., 2020).

The number of **articles directly dealing with adaptation's spatiality** is low. As one of the few such works, Davidse and his colleagues in their 2015 article dedicate a special subchapter to the topic. They found, similarly to Koks et al., that spatial characteristics of the effects of climate change are often described by their objective geographical dimensions, e.g. in the form of risk maps, creating an objective depiction of risks' geographical distribution (KOKS ET AL., 2014; DAVIDSE ET AL, 2015). At the same time, the spatial character of adaptation measures is often defined, stating that there is a clear spatial / geographical dimension of interventions. All in all: both vulnerability to climate effects and adaptation measures have clear spatial characteristics (DAVIDSE ET AL, 2015).

Geographical implications in climate adaptation policy are examined recently by political geographers and IR experts/geopoliticians as well, especially in crisis zones (e.g. in the Middle East) where geophysical impacts of climate change is a catalyst of conflict²⁷. Within these zones that are very volatile, says the authors, climate change has

difficulties of the new methodology, in practical evaluations and planning the vulnerability assessment framework introduced in the IPCC 4th Assessment Report is still frequently applied (SHARMA & RAVINDRANATH, 2019), for example, by the Hungarian NAGIS.

²⁶ Riskscape here encompass different points of view in time and space on risk that highlight the "real-and-imagined geographies based on individual and collective experience. However, according to the authors, using the concept of riskscape highlights the social, temporal and spatial texture of risk and calls attention to interactions among risks and their "cumulative impact" across several dimensions of human life and the biophysical environment; identifying, mapping and managing risks and socio-spatial relations of the resulting riskscape (DAVIES ET AL., 2020).

²⁷ Respective climate reports to examine how certain discourses, such as the Israeli plan, gain the status of "truth" and in effect determine what can be said or known about reality. Alternative discourses, such as Palestine's plan, contest and resist this hegemonic exercise of power, while also exposing a form of entrapment. Climate reports are thereby positioned as discursive constructions, opening and foreclosing divergent realities. In the context of Israel/Palestine, climate

been gaining increasing attention, as a threat multiplier, influenced by states and geopolitical drivers. The key question in these research activities is the role of the sovereign state and higher spatial levels in climate policy planning (FRÖHLICH, 2017; WEINGER, 2021)²⁸.

Different scientific space concepts also emerge in **climate adaptation-oriented literature** items. Taylor, in connection with the geographical distribution of different types of extreme weather impacts, calls our attention to the absolutist space interpretations, to define regions of risk, not with clear boundaries like states, but with clear expanses of the risk itself, described by the declining probabilities of the said risk. At the same time adaptation policy development and implementation are state matters where a relativist approach is applicable (TAYLOR, 2023). Davidse and his colleagues had a similar conclusion: from an absolutistic point of view, the effects of climate change have a clear spatial character because of the physical impacts; while, impacts on anthropogenic structures and relational manifestations of climate effects underline the importance of the relativist approach (DAVIDSE ET AL., 2015).

3.4.1.1. Spatiality in climate adaptation policy -related literature

If spatial factors play such an important role in climate adaptation, as it was introduced by the previous subchapter, the question arises: to what degree **are these spatial approaches examined by the recent literature?** Over the last few decades, climate change research has first focused on the climate system and climate impacts in general, and mitigation. The emergence of climate adaptation policies and the elaboration of adaptation strategies in the 2000s marked a new research topic (SÜTÖ, 2023; SÜTÖ, 2025B) (although the first generation of documents in Europe was rather general, setting the stage for the next steps towards the development and implementation of adaptation actions). Environmental, economic and social impacts of adaptation (and mitigation) policies and their effects on other policies were also recognized. The acceleration of

discourses remain performative enactments of competing exercises of sovereignty, self-determination, occupation, and resistance that have long characterized the political geography of this territory (WEINGER, 2021).

²⁸ Contemporary political geographers questioned the coherency of the state as a unitary entity and the only legitimate arbiter of international politics. literatures ultimately move us toward the need to critically scrutinize the coherency of state climate planning. Weinger says that since 1992, the UNFCCC as the global governing apparatus of climate planning, has privileged the sovereignty of territorial states. Territorial politics are deeply embedded in climate change planning as climatic changes surely transcend political boundaries and logically invite cause for collective action. The UNFCCC serves in this framework as the supranational governing apparatus that organizes nationally coordinated adaptation and mitigation projects to climate change. Urgent questions arise around the role of non-sovereign states under military occupation or armed conflict within the project of planetary climate planning. Existing normative principles and the planetary scale of climate planning fail to perceive the systemic vulnerabilities that non-sovereign entities in protracted crises like Palestine bring forth. He used cartographic analysis as well as narrative analysis in the comparison of the IRS/PAL national reports. this comparative analysis of Israeli and Palestinian climate planning. Second, the histories, geopolitics, and settler colonial relations informing performances of Israeli sovereign violence and Palestinian territorial uncertainty render visible the power of discourse to script climate futures. Finally, positioning these discourses together, despite the oppositional paradigm that may speciously result, aims to defy the very territorial logics by holding Israeli and Palestinian. What environmental histories and new environmental futures are invented through climate discourses and the spatiality they produce (WEINGER, 2021).

international climate negotiations, related EU policymaking, experience of extreme weather events, and examples of adaptation actions contributed to the growing availability of knowledge and political will (SWART ET AL, 2009).

Although a **moderately increasing number of articles and research projects** have dealt at least implicitly with spatial issues in climate policy planning in the last two decades, they compose still a minor proportion of the climate policy-related literature. Moreover, **significant part of these literature concentrates rather on mitigation**. Some authors examined climate change's profound implications for global justice, assessing regionally different decarbonisation measures (e.g. VON LUCKE, 2021). Others dealt with geographical and institutional conditions that are important for initiating and sustaining decarbonisation at the local level, analysing local climate mitigation as a case of multilevel network governance (e.g. GUSTAFFSON ET AL., 2009²⁹). Other authors analysed multi-level governance failures through a nationwide survey reviewing all relevant government policies related to mitigation at local, regional and national levels (MCGLOUGHLIN&SWEENEY, 2011) or the role of cities in the EU's multilevel decarbonization intentions and governance (KERN, 2023).

Other part of the reviewed literature concentrated on **spatial implications of awareness raising and attitudes**. Two Finnish authors examined the spatial/territorial differences of climate change adaptation attitudes, saying that these behaviours and people's climate change-related knowledge are also spatially determined and expressed, showing significant regional differences³⁰ (WECKROTH&ALA-MANTILA, 2022). Attitudes and their spatial differences have been analysed by Hungarian authors recently, too (KISS ET AL, 2021 AND 2022; BÚS ET AL., 2021; BODOR&GRÜNHUT 2021). In these, qualitative methods (and their quantitative evaluation) dominate the assessments.

The **explicitly adaptation-oriented articles are smaller in numbers** and rather case study- or thematic vulnerability field-oriented ones (e.g. MCGRANAHAN ET AL., 2007; YARMAL., 2010; JENSEN ET AL., 2013; SKRYZHEVSKA ET AL., 2015; COBBINAH ET AL., 2019; BERKE ET AL., 2021). Eventually, a lack of comprehensive and rather case study-

²⁹ This Swedish group examined the case of two Swedish cities' different business structures and other local conditions that significantly influence both the ambition and quality of their climate-policy strategies (GUSTAFFSON ET AL., 2009).

³⁰ Recent economic geography works, according to the authors, have employed the concept of "spatially bounded rationality" and explored the behavioural foundations of populations in cities and regions, with a focus on geographically specific economic outcomes. The authors say, that on the one hand, these differences can be identified on the geographical (urban-rural and regional) dimension and on the other hand, personal socioeconomic positions and related wellbeing also influence the picture. Consequently, say the authors, environmental (and within it: climate) policies must be better linked to regional policy for making the urgent climate policy interventions more acceptable for everyone (WECKROTH&ALA-MANTILA, 2022).

based works that only slightly mention climate (adaptation) policy's general spatiality, can be detected³¹ (SÜTÖ, 2025B).

However, some **implicit emergence of spatial issues in the adaptation policy-related studies** and articles can be observed. Some studies emphasise explicitly **the role of the ab ovo space-oriented geography** as a discipline **in understanding climate change, climate adaptation and their spatiality** (SÜTÖ, 2024): either in education (CHANG&WI, 2018); or considering the historical contribution of the scholarship that uniquely links physical/environmental and human/social disciplines³² to the study of climate in two main ways (through statistical, descriptive climatology and climate-oriented research of society), to understand climate emergency (RANDALLS, 2017; TAYLOR&O'KEEFE, 2021, TAYLOR, 2023). Farbotko emphasises that geographic data and analysis depicting various aspects of climate change and security are needed in order to shape policy directions and support evidence-based policy making (FARBOTKO, 2018). Others mention the useful collaboration of physical and human geography in climate modelling (COLVEN&THOMSON, 2018). Pietta underlines geography's skill in the identification of climate policy's ethical, social, political and legal aspects³³ (PIETTA, 2023).

Taylor particularly underlines that regional geography, and regional sensitivity can be the most important future factors of climate change-related policy making. He even advocates for bringing back of regional geography's specific toolkit as an analytic and synthetic approach, into the centre of attention to tackling climate change³⁴. He again notes that regions are widely used across both the environmental and social sciences as useful units for comparative analyses to highlight similarities and differences across space. He presented three examples of experimenting with geographical regions representing human-environmental interactions as alternative spatial policy framings for the management of environmental/climate policy: intergovernmental resilient

³¹ Referring back to the previous list, although McGranahan et al. dealt with a global review of the population and urban settlement patterns in the Low Elevation Coastal Zone, their study is typically a single climate challenge-oriented analysis /coastal vulnerability/ and not a comprehensive adaptation policy overview (McGRANAHAN ET AL., 2007).

³² Bridging these two forms of knowledge having the potential to become strategically relevant in the concept of risk that links environment and people from the Natural Hazards paradigm - holistic Geography can take an important lead in worldwide – say Taylor and O'Keefe (TAYLOR&O'KEEFE, 2021).

³³ Looking at adaptation, the geographical literature highlights the need to link adaptation policies to broader processes of socioenvironmental change considering sociocultural, economic, political, financial, and governance processes and involving relations and negotiations at different geographical scales. Geographers are giving an important contribution in asking for a cultural shift on developing and managing climate change responses also thanks to the debate on scales, giving insights on the kind of processes that determine the production of scales of action, the kind of knowledge and expertise that dominate, and the priorities favoured at different scales. In particular, the geographical literature is focusing on the role of the rescaling of environmental governance in creating its own governance objects, like “the global climate” (PIETTA, 2023).

³⁴ He found that there is far more research on the climate change by physical than human geographers despite the fact that regional research in geography has been made largely by human geographers, often along with regional planning. Regions, says Taylor, are today understood dynamically as results of territorial/relational processes that are constructed, reproduced and annihilated by active human interventions – so understanding regions is of key importance in the context of climate change (TAYLOR, 2023).

regions for mitigation; localisation through urban sustainable regions³⁵; and regions for planetary stewardship of humans-in-nature³⁶ (TAYLOR, 2023). Paasi in 2023 offered commentary on Taylor's article, focusing especially on the contested (discursive) regional, geographical, and state-centric frames critically examined by the original author. He remarked that despite the plenty of literature items on climate change, ontological issues related to regionality/spatiality have been largely overlooked so far. Since regional/territorial, particularly state-centric frames are frequently taken for granted, Taylor's proposal is very welcome and provides a valuable addition not only to the debate on climate change but also to the ongoing resurgence of regional geography and regional thinking (PAASI, 2023).

Another group of literature items addresses the spatial implications of climate adaptation from the perspective of spatial planning, analysing the role of climate adaptation in spatial planning and vice versa; the relationship between strategic spatial development, physical planning activities and adaptation planning; or the connections between urban and climate adaptation planning (SÜTÖ, 2023). The next subchapter deal with these.

3.4.1.1.1. Relationship of climate adaptation planning and spatial planning in the literature

Already the earlier mentioned studies about climate risk assessments call our attention to the connection of spatial planning with these activities (SAPOUNTZAKI ET AL, 2011), indicating that **regional/spatial emphases in climate policy** can be detected also by **its linkage with spatial planning and development** (STORBJÖRK&UGGLA, 2014; WILSON&PIPER, 2010; UITTENBROEK ET AL, 2012).

In Rannow's definition, **spatial planning** means the development of **future-oriented, holistic** policies, integrating and **coordinating different sectoral and societal needs** into a desired future physical organisation of space. As a comprehensive, cross-sectoral, spatially oriented activity with the core objective of optimising land uses and spatial structures, it naturally requires regional/local level information, even about climate change (as the latter is one of landscape change's major driving forces). Through this information, spatial planning supports local authorities in adapting to climate impacts (RANNO ET AL, 2010).

³⁵ Producing credible sustainability regions requires identification of a different economic process that can generate localizations at one meaningful scale of activities - cities in their functional regions. Sustainable regions are urban regions: including their relations with their hinterland, their taking part in a regional group of cities and city networks through which individual city innovations are diffused (TAYLOR, 2023).

³⁶ The latter formation is, according to the author, about „outliving today's climate change through an ecological focus on mutuality rather than hierarchy. And this must include cities. Regions for mitigating change are defined by physical processes; the regions for building sustainability by social processes, while regions of stewardship as humans-in-nature bring forth the immensely difficult task of synthesis" (TAYLOR, 2023).

The **two main subjects of spatial planning** are the physical environment and the organisation of balanced spatial development. Furthermore, it integrates knowledge, intentions and interests from different fields (RANNO ET AL., 2010; HURLIMANN & MARCH, 2012; ROGGEMA, 2012B). Several authors consider spatial planning as a field that can increasingly address climate change. However, its full potential is not frequently exploited or is often overruled by other priorities (SCHMIDT-THOMÉ & KLEIN, 2011; ROGGEMA ET AL., 2012; HURLIMANN & MARCH, 2012; STORBJÖRK & UGGLA, 2014). Other authors emphasise that climate change adaptation must be embedded into existing and emerging structures and networks, where its relational perspective can play a definitive role (RANNO ET AL., 2010; DAVIDSE ET AL., 2015; TAYLOR, 2023). Pieterse and his colleagues explicitly examined the relationship between climate change adaptation and spatial planning, especially at the local level. They found three conceptual similarities between the two fields: both intervene in space, both anticipate change, and both support long-term sustainable development (PIETERSE ET AL., 2018). Climate adaptation's spatiality, as we see, is well indicated by its similarities and linkages with spatial planning; nevertheless, a clear definition of spatial planning's role in adaptation requires a careful use of the term spatial/territorial, to take into account these terms' various understandings in planning theory (DAVIDSE ET AL., 2015). Even some NAS documents to highlight the relationship between adaptation planning and spatial planning. Bosnia and Herzegovina's NAS, for example, mentions that spatial and urban planning are multidisciplinary activities that cooperate with several sectors through planning solutions; therefore, spatial plans are the main instruments for implementing climate policies (BIH CC STRATEGY, 2020).

The spatial distribution of climate impacts and the resulted spatially determined intervention zones already underline the connection between climate and spatial policies. Greek authors argue that **vulnerability and exposure of emergency facilities to their location/surroundings can be managed by spatial planning** that plays the role of piecing together response, prevention, preparedness and remediation actions and measures. Sapountzaki and his colleagues emphasise this importance of spatial planning in connection with flood zones and flood prone areas, but they found that in practice spatial policy plays minor or no role in the management of these challenges, being in a low hierarchical position in risk management compared to other sectors³⁷. In most hazard cases, inappropriate, **absent, inadequate or poorly implemented spatial planning is one of the hazard's causes**. Regarding spatial planning as a constant and continuous element of the risk management cycle, the authors suggest it should become

³⁷ Sectoral planning authorities frequently undervalue the significance of spatial patterns (SAPOUNTZAKI ET AL., 2011).

the coordinating policy platform to accommodate all relevant policy fields (SAPOUNTZAKI ET AL, 2011). Other authors also emphasise **spatial planning's crucial role in climate adaptation** (which is **currently not entirely utilised**), due to the significant impact of land use and land development on city level climate vulnerability (ROGGEMA, 2009; DAVIDSE ET AL., 2015; O'DONELL, 2019). Further good examples for the fact that in the strategic planning literature increasing attention has been received by relationships between adaptation-oriented, strategic and spatial planning activities, is the study of Stern. In 2007 he said that planning and planners play key role in reducing climate vulnerability (STERN, 2006). Similarly, already in 2009, the EU Commission argued that the importance of spatial planning and territorial development underlines the need for coordination of land uses at the EU level and the introduction of climate proofing in spatial planning processes (EUROPEAN COMMISSION 2009; GREIVING&FLEISCHHAUER, 2012).

However, studies of this era (like the earlier mentioned one of Sapountzaki et al.) showed that **spatial planning was only of marginal interest in climate adaptation**; instead, the state of implementation of national adaptation strategies and the included sectors were the central focus (SÜTÖ, 2023). Among those studies that still deal with the connection between the two fields, the different works of Greiving and Fleischhauer (FLEISCHHAUER ET AL., 2007; GREIVING ET AL., 2007; GREIVING&FLEISCHHAUER 2010 and 2012; GREIVING & SCHMIDT-THOMÉ, 2013) must be particularly mentioned, as some of the **very few works focusing either on spatiality in adaptation planning or adaptation in physical planning**. These works concentrated mainly on physical planning and adaptation. The Finnish SCHMIDT-THOMÉ, in his 2007 article, analysed the use of natural hazard- and climate change impact-related information in European countries' spatial planning activities and also gave practical recommendations for decision makers. Among his suggestions emerge the need for further integration of natural hazard analyses, multi-hazard approaches and vulnerability concepts into spatial (physical) planning at local, regional and European levels (SCHMIDT-THOMÉ, 2007). Greiving and Schmidt-Thomé introduce physical planning's role to undertake a coordinative role, conducting multi-risk assessments, considering all relevant hazards for a given region. They claim that vulnerability to natural and climate change-related disasters is the result of spatial planning's failure to consider the different hazards and risks when elaborating spatial development directions (GREIVING-SCHMIDT-THOMÉ, 2013)³⁸. Fleischhauer, Greiving & Wanczura also highlight the possibility of integrating

³⁸ After they had examined national level spatial plans in Europe, they found that risk assessments are not part of these and their elaboration is rather the responsibility of sectoral planning. However, spatial planning can also make use of hazard information and risk assessments' results at regional and local level. So, the authors say that spatial planning

elements of risk management into strategic environmental assessments, although they do not relate these aspects to climate change (FLEISCHHAUER ET AL., 2007; GREIVING&FLEISCHHAUER, 2012).

In their comparative study³⁹ in 2010, **from a spatial planning/regional development perspective**, GREIVING and FLEISCHHAUER provided an overview and systematic characterisation of different national approaches to develop climate change adaptation strategies⁴⁰ (SÜTÖ, 2023). According to their literature analysis, at the beginning of the 2010s, spatial planning was only given minor attention in adaptation and was seen as just one among the many other sectors. It was rather a matter of political willingness and existing capacities than the existence of particular instruments or high climate change vulnerability if spatial planning played an important role in a given NAS (GREIVING&FLEISCHHAUER, 2010 and 2012). In Dosch and his colleagues' article, special mention was made about **urban, regional and physical planning as tools** of sustainable and quality-wise development of the environment and spatial structures, if these fields take into consideration climate adaptation aspects properly. The study identifies spatial (physical) planning as a cross-sectoral field and a suitable instrument for determining cost-effective adaptation interventions and serving as an integrative framework for vulnerability and risk assessments, creating decarbonisation-oriented spatial structures and diminishing regional vulnerability (DOSCH ET AL., 2008). Swart and his colleagues also underline the **importance of spatial development planning instruments** in the assessment of adaptation's spatial development level; in the elaboration of regional and sectoral adaptation goals and the attributed indicators; as well as in the establishment of monitoring frameworks for continuous follow-up activities (SWART ET AL., 2009).

SCHUSTER in 2008, WILSON and PIPER in 2010, ROGGEMA in his different works in 2009 and 2012, LEDDA ET AL. IN 2015, and PÉTI also dealt with the relationship between changing climatic factors and spatial development planning (SÜTÖ, 2023) or **the linkages between climate challenges and spatial policy** (PÉTI ET AL., 2009; PÉTI, 2011 AND 2012;), seeking for theoretical/policy-oriented explanations of the challenges planning is facing with. Schuster even nominated those sectors which are especially relevant in the spatial planning - adaptation relation⁴¹, and beyond water management,

should undertake a coordinative role conducting multi risk assessments considering all relevant hazards for given regions (GREIVING-SCHMIDT-THOMÉ, 2013).

³⁹ Title: National climate change adaptation strategies of European states from a spatial planning/regional development perspective.

⁴⁰ Germany, Finland, France, Greece, Hungary, Poland, the Netherlands, the United Kingdom and Spain was analysed. First the authors assessed existing examinations and evaluations through a cross-section meta-analysis to identify what role spatial planning and development play in adaptation strategies. The results were used for comparing national adaptation strategic documents through case studies (GREIVING&FLEISCHHAUER, 2010, 2012).

⁴¹ These are water management, coastal regions, urban planning, housing, architecture, energy, transport, tourism/recreation and disaster risk management (SCHUSTER, 2008).

housing, architecture and energy efficiency, recreation and tourism, transport and energy infrastructure, he explicitly mentioned spatially oriented adaptation to local hazards and the need for mapping these risks; the management of coastal areas and the field of urban planning (SCHUSTER, 2008)⁴². Roggema in his 2009 book raised the question, whether how climate change is tackled in water management, ecology, coastal defence, urban development and energy; and how these sectors anticipate adapting to climate change considering its integrative character. (ROGGEMA, 2009). The reason for the author's interest might be the fact that Roggema is Dutch and that the Netherlands are the only country in Greiving and Fleischhauer's above-mentioned study that assigned a key role to spatial planning in climate change adaptation already in the late 2000s – early 2010s (GREIVING&FLEISCHHAUER, 2010 and 2012). In his 2012 article⁴³ Roggema especially calls our attention to the uncertainty and long-term nature of climate change impacts that, as he argues, demand new spatial planning approaches. He also nominates this new approach, called it “swarm planning” as a method that makes us capable of planning complex adaptive systems. The essence of this is the combination of networks and functions which are put in a common map⁴⁴ (ROGGEMA, 2012; ROGGEMA (ED) 2012; ROGGEMA ET AL, 2012, SÜTÖ, 2023).

If we go down on the spatial hierarchy, we find authors who concentrate on the town level, saying that **spatial configuration of cities has also significant effects on climate change impacts** and can be regarded as a crucial factor in enacting adaptive responses within a resilient framework (SÜTÖ, 2023). Other authors urge to understand why cities continue to engage in adaptation planning, saying that urban planning's vision-oriented strategies and action-based plans for adaptation towards resilience can bring the responses (BIRKMANN ET AL., 2014; BRUNETTA&CALDARICE, 2018). Wheeler emphasises the importance of creative and proactive urban planning strategies and introduces new tools (e.g., the use of sustainability indicators, green development rating systems, ecological footprint analysis and educational and consensus-building processes) that have also been developed in consideration of sustainable development and climate adaptation (WHEELER, 2013). Birkmann and his co-authors, in particular,

⁴² The author addressed specific spatial planning measures such as coastal protection (that would go beyond dike construction and maintenance), safeguarding of areas for fresh and cold air flow in the settlement development process, safeguarding and structuring of water supply, contributing planning input to adaptive agriculture and forestry as well as regulating intensities of land use (SCHUSTER, 2008).

⁴³ Title: Adaptation to climate change: does spatial planning help? Swarm planning does!

⁴⁴ Here must be mentioned, to avoid misunderstanding, that Dutch spatial plans are some kinds of a transition between Hungarian territorial development concepts with strategic development directions and physical plans depicting land use categories. In Roggema's approach spatial planning is no longer concerned with the whole picture but focuses on nodes (or as he calls them: tipping points) in the network and designs interventions for them. The effective spatial planning, argues Roggema introduces essential impulses into these tipping points to influence the whole system, coordinating the spatial natural, physical, societal, economic and political elements to achieve the state of optimal balance. The name of the new paradigm comes from the similarity to a flock of birds. “Swarm”, like these groups of birds, is able to change its shape constantly under influence/intervention and reshape itself after external impacts (ROGGEMA, 2012).

have a strong suggestion that **adaptive urban governance and strategic spatial planning must be linked** (SÜTÖ, 2023). They dealt with new challenges for adaptive urban and spatial governance, examining whether or not existing planning systems and tools meet the requirements of new conditions and processes⁴⁵. According to the article's conclusion, adaptive urban governance and strategic planning are both particularly relevant „in highly dynamic environments,” and consequently, formal planning tools must incorporate vulnerability information⁴⁶ (BIRKMANN ET AL., 2014). It is good to see that these directions have been increasingly integrated into Hungarian climate policy planning during the last years (indicated by the content of the 2nd National Climate Change Strategy or the county-level and municipal climate adaptation strategies) (SÜTÖ, 2023). More up-to-date articles suggest that contemporary urban planning should merge future threats (among them the climate-related ones) with older and unsolved problems (e.g. social inequities and urban conflicts). The so-called retrofitting planning processes and redefinition of urban objectives require the development of innovative spatial information frameworks. Within these, climate adaptation issues must be considered (MARAGNO ET AL., 2021).

Another Dutch group of authors, UITTENBROEK and her colleagues found in the middle of the 2010s that adaptation actions were not effective enough to solve emerging challenges. They said that to solve this problem, the **mainstreaming of adaptation objectives into** existing policy domains (especially **urban planning**) would be also necessary (SÜTÖ, 2023). According to the authors, for the better understanding of this process, a conceptual model is needed about adaptation mainstreaming, adaptation barriers and strategies to overcome these (UITTENBROEK ET AL., 2013). Regarding urban governance and planning SALAMIN in his 2018 dissertation also articulated important messages. **Proper management of climate impacts** has become **one of urban planning's hot topics** in the 2010s, so the field's increasing role in handling climate change impacts and consequences have been clearly recognized (SALAMIN, 2018)⁴⁷. He examined the changing emphases in European territorial policies and their

⁴⁵ They urge shifts in approaches of existing planning systems and formal tools towards more adaptive and strategic planning visions. The main strength of adaptive urban governance, according to the authors, is the continuous learning process enforced in planning in order to deal effectively with future environmental and societal changes (BIRKMANN ET AL., 2014).

⁴⁶ Moreover stronger incentives for data exchange are needed; the use of different hazard and vulnerability scenarios and risk profiles must be propagated; and more research is needed to develop practical planning tools. According to the authors the main challenges are as follows: lack of adaptation and risk reduction aspects in spatial planning; plans are not accountable enough for the differential and dynamically changing physical/social vulnerabilities; lack of broader participation of local stakeholders; lack of cooperation between different sectoral fields (physical planning/socio-economic development/environmental protection/climate policy); lack of prioritization and classification of different vulnerabilities of urban areas and critical infrastructures; the increasing ability of private business actors to influence urban development agendas; inequalities in capabilities of self-advocacy (BIRKMANN ET AL., 2014).

⁴⁷ According to the author the character of planning always represents a given period. So, the current competitiveness-oriented economic governance paradigm might soon be replaced/refined by a sustainability-oriented social perspective and if it really happens, says the author, it may handle the topic of climate policy as a flagship (SALAMIN, 2018).

implications on given sectors, e.g., urban planning. He underlines that since the 2011 Budapest Declaration and the publication of Hungarian EU Presidency's Climate Friendly Cities Handbook (SALAMIN G. ET AL (ED), 2011), aspects of demographic and climate change-related challenges have been increasingly integrated into European urban development and planning activities (SÜTÖ, 2023).

Another group of literature items seeks **signs of relevant changes in strategic, spatial and adaptation planning paradigms** (SÜTÖ, 2023). Looking at the historical evolution of strategic planning over the last century, for example, MALEKPOUR and his colleagues observed path-dependent attributes in strategic thinking that hinder new, alternative solutions. They found that the traditional incremental approach of strategic planning (that had been the dominant approach of infrastructure planning for decades) wanted and still wants to optimize the status quo instead of creating possibilities for change, making it difficult to meet the requirements of sustainable transitions and effective climate adaptation (MALEKPOUR ET AL. 2015)⁴⁸.

During the recent decades, with the increasing attention on global environmental and social challenges, quite new directions are outlined (SÜTÖ, 2023). Significant part of the reviewed adaptation-oriented literature concentrates on benefits of adaptation policy activities. Numerous important factors and notions of environmental economics and sustainability theories (e.g. decoupling, circular economy, socially equal development, ecosystem-based solutions) can be propagated and territorially different impacts, vulnerabilities and adaptation challenges answered among other things via conscious development planning activities to find at least partial solutions for complex problems, independently from the nature of the problems (CHEVALIER, 2017; ROGGEMA ET AL, 2012; SÜTÖ ET AL., 2023; EEA 2020, 2022; CSUTORA ET AL, 2021; OECD, 2023, SÜTÖ, 2023, 2025B)⁴⁹. Nevertheless, the nature of the analysed problem is an important factor, which is dealt with by plenty of authors. Differences between wicked and tamed problems have got greater emphasis even in the climate change-related literature of the recent decades. Wicked (social) problems were originally defined as those complex challenges with uncertain nature that need collective actions but at the same time increasing uncertainty can be detected about their possible solutions (RITTEL & MELVIN, 1973). Several current sources (e.g., ROGGEMA, 2012; ROGGEMA ET AL. 2012;

⁴⁸ „Despite the call for sustainability transformation of infrastructure sectors to confront global environmental problems, current strategic planning approaches in these sectors tend to perpetuate conventional infrastructure investments. Some explains this as an ‘entrapment’ or a ‘lock-in’ phenomenon, with reference to planning and highlight that conventional planning approaches are entrenched within current decision-making frameworks and long-term planning follows the path-dependent legacy” (MALEKPOUR, ET AL. 2015).

⁴⁹ Chevalier, for instance, also finds the proper responses for these challenges in the form of planning when she suggests that when managing climate change's unprecedented threat (with its long timescales and uneven impacts) an increasing focus must be put on programming and policy making. In these activities both incremental and transformative adaptation as well as community-based sustainable management of natural resources can play crucial role (CHEVALIER, 2017).

ROGGEMA (ED) 2012; KEREKES, 2021) concentrate on the **wickedness of sustainability and climate change and the implications of this “wickedness” in planning approaches** (SÜTÖ, 2023). The two authors in their respective studies point it out that although sustainable development is one of the most frequently discussed issues in current debates, everyone thinks about the future differently. Both Roggema and Kerekés came up with the idea that we should **make use of the results and approaches of the “wicked problem phenomena”, especially interdisciplinary and horizontal thinking** in sustainable development and climate policy planning (ROGGEMA, 2012; KEREKES, 2021). This holistic, multi-sectoral nature of sustainable development is emphasised also by Wheeler⁵⁰ (WHEELER 2013), while Birkmann and his colleagues underline the importance of synthesising different knowledge types in adaptive urban planning⁵¹ (BIRKMANN ET AL., 2014). We can see: the recognition of horizontal/interdisciplinary thinking has already become an integrative part of both sustainable development theories and adaptation planning activities, and they seem to be promising tools when tackling wicked problems (SÜTÖ, 2023).

The question is **what we can do with traditional, conscious, long-term planning in an unpredictable and rapidly changing environment** as RITTEL & MELVIN characterised the circumstances of wicked and non-ergodic problems. I agree with KEREKES, that, beyond solving tame problems, we can always find ways of approaching wicked/non-ergodic problems as well, for example in the form of planning activities concentrating on processes like the climate challenge, which takes place under conditions of complexity and uncertainty (JENSEN ET AL., 2013). Just in these cases we have to use new, tailor-made (and I must add that exactly geographically tailored) methods, taking into consideration the ambiguous and changing nature of stakeholders and high volatility of planning conditions. All in all: **planning remains a useful tool, only we must change our traditional viewpoint**, using multiple perspectives (KEREKES, 2021; SÜTÖ, 2023)⁵². Dealing with adaptation to climate change requires a shift in mindset; from a technical rational way of thinking towards an integral proactive one (ROGGEMA, 2009).

⁵⁰ Wheeler notes that in the past environmental, economic and social objectives were often been separated within urban planning and governmental decision-making. Sustainable planning concentrates on multiple fields, so, effective sustainability, according to Wheeler, means carefully harmonizing approaches and skills – similar problems and tools emerge as in the case of recommended management of non-ergodic and wicked problems (WHEELER 2013).

⁵¹ Exactly, strategic planning and adaptive urban governance both concentrate on problem definition through taking into consideration different knowledge types from different sectors (BIRKMANN ET AL., 2014).

⁵² As climate adaptation planning and MRE must always be based on meticulous mapping of local climate impacts and consequences, on which unique local responses can be based, the problems of “unpredictable and rapidly changing environment” versus “traditional planning approaches” emerge. Of course, in this case we do not tame a wicked problem but try to find potential answers for the more-or-less known consequences of a complex problem and at the same time also the ways to prepare for these challenges. Not because they can be forecasted – on the contrary, they cannot be. Nevertheless, these challenges have consequences and impacts, with similar and recurrent patterns, for that we must be prepared if we can no longer avoid them. And if we are familiar with the potential “pool” of impacts/consequences, we can constantly choose from the list of potential adaptation responses during planning (KEREKES, 2021; SÜTÖ, 2023).

We can see as climate adaptation cannot be handled separately from the geographical space, geographical and spatial dimensions are important in climate adaptation planning and MRE (SÜTÖ, 2023, 2025B). The first is indicated by the geographically different climate impacts, sensitivities and adaptive capacities as well as vulnerabilities of each specific location. The second is present in the spatially different adaptation responses, the strong connection between spatial and land use planning AND adaptation planning; and these connections are examined by the international literature in a detailed way. Adaptation to climate change gradually have become a guiding principle for all spatially relevant decisions, wrote Greiving and Fleischhauer (GREIVING&FLEISCHHAUER, 2012): today adaptation policy starts to include spatially determined and defined actions at national, regional nor local level. The next chapter reviews the related literature on these spatial governmental levels.

3.4.2. Main characteristics, trends, and challenges of adaptation planning and MRE at different spatial levels

One of the most important and frequently examined aspects of climate adaptation (policy) in the literature is that climate change's most characteristic impacts emerge in special geographic areas (EEA, 2015): both in big cities and in remote rural areas; both in coastal zones and landlocked continental plains; both in big, flat river valleys and hilly/mountainous areas. In these geographical areas special spatial answers have to be found for climate change-related challenges (SÜTÖ, 2023). This diversity of problems and responses gets us to the next question, in connection with spatiality and territorial governance: **on what spatial levels adaptation planning and MRE activities concentrate?**

The **multi-scale nature of the issue** is widely recognized in the adaptation literature (DAVIDSE ET AL, 2015; TERMEER ET AL. 2016; BENZIE&PERSSON, 2019; SÜTÖ, 2023; UBA, 2025). Yet adaptation governance to date has been strongly focused on the national and sub-national levels. Even in cases when one might expect the governing of borderless risks by cross-border or transnational organizations, transboundary co-governance of risks is rare. The UNFCCC or the EU can be considered in this context as the most important “arenas” for norm-setting, but decision making has remained a local and/or national concern and responsibility so far, characteristically defining the frames of spatial adaptation (BENZIE&PERSSON, 2019)⁵³.

⁵³ The international norm suggests that adaptation was primarily a national or local responsibility, however, it paradoxically calls for international responsibility and funding. Benzie and Persson point to the fact that the related multi-disciplinary and innovative epistemic community evolved around adaptation is rooted in environmental sciences. As a

Several articles underlined that **climate adaptation is well suited to local government levels**⁵⁴ (HURLIMANN&MARCH, 2012; PICKETTS ET AL., 2013; STORBJÖRK&UGGLA, 2014; DAVIDSE ET AL., 2015; UBA, 2025), where conscious, locally tailored, short-, mid- and long-term planning can bring solutions (SÜTÖ, 2023). Nevertheless, coordination of the lower spatial (territorial) levels' activities occurs usually at upper (regional, national) spatial hierarchical levels (HEIDRICH ET AL., 2016; SÜTÖ, 2023). The next subchapters summarize the literature's results about these different spatial levels of adaptation activities.

3.4.2.1. The local level

The **prominent role of the local level** in adaptation policy planning, its implementation and MRE is underlined by numerous literature sources: **majority of the adaptation-related articles, studies, books and reports deals with this level** (especially with larger cities) (LEITER, 2021; SÜTÖ, 2023), while the regional level got the smallest attention (BIRCHALL ET AL., 2022). In 2019, local and regional governments accounted for 63% of climate-significant public expenditure and 69% of related public investment in 33 OECD countries and EU countries (OECD, 2023). The local level is regarded as the most important level for implementing the intentions of national and regional adaptation strategies. This is due to local responsibilities for urban development and building permissions, but also to the fact that population trust in local authorities (GREIVING&FLEISCHHAUER, 2012). Among different types of municipalities **urban settlements' adaptation gets particular emphasis** in the literature, showing that climate change has emerged in urban areas as an important topic in the recent decades (SÜTÖ, 2023). Peltonen and his colleagues examined climate change's challenges and their implications in urban planning (PELTONEN ET AL., 2005). Feldmayer and his co-authors regarded cities as multifaceted systems that contain several sub-systems, so improving their resilience is a special challenge (FELDMAYER ET AL., 2019). Ricci and Mariano analysed territorial governance's role in climate adaptation, from the perspective of urban regeneration-related planning and development (RICCI&MARIANO, 2023). Several **comparative policy studies on urban climate actions** say that cities are taking an increasing role in climate policy, with well-documented mitigation experiences (SÜTÖ, 2023); these mitigation strategies were frequently precursors for adaptation documents (HEIDRICH ET AL., 2016; ARAOS ET AL., 2016; BIRCHALL& BONNET, 2020). Only a minority of European cities had their

result, their focus has always been on local impacts and spatial adaptation. At the same time, adaptation governance at levels above the national has been weak (BENZIE&PERSSON, 2019).

⁵⁴ The listed authors argue that local governments can involve citizens to participate in creating targeted adaptation strategies that will provide tangible benefits to the local population.

approved climate change strategies at the end of the 2010s, and Western European cities and larger municipalities performed better in this respect than Eastern European and smaller towns (WRIGHT ET AL., 2021). HEIDRICH and his co-authors conducted comparative evaluation of 200 European cities' climate change strategies from 11 countries. Based on their pan-European comparative study, the authors call our attention to the role of European climate-related and other thematic networks. According to the authors, participation in those networks often supports the development of an explicit attitude to climate change, through easier access to best practices. They also pointed out that European national and regional policies can also stimulate the development of local strategies (HEIDRICH ET AL., 2016; EEA, 2015). Other type of studies concentrates on specific local-level pilot cases, like that of BIRCHALL & BONNET, who investigated threats to local adaptation policy development and implementation in Canada through document analysis and stakeholder narratives⁵⁵ (BIRCHALL & BONNET, 2021).

It is clear, that **cities globally face significant risks from climate change, and are taking an active role in formulating adaptation plans/strategies** and implementing their climate adaptation policies (HALLEGATTE S. , 2009; ROMERO LANKAO & DODMAN, 2011; DAVIDSE ET AL., 2015; HEIDRICH ET AL, 2016; BRUNETTA&CALDARICE, 2018; PIETERSE ET AL., 2018; FELDMEYER ET AL, 2019; BIRCHALL & BONNET, 2021; YE ET AL., 2021; MARGANO ET AL., 2021; BIRCHALL ET AL., 2022; SÜTÖ, 2023), using risk assessments' results, climate models and scenarios for better prediction of climate change impacts (KERBLER, 2016). The **local-level-oriented adaptation planning literature mostly focuses on the characteristics of plans and potential ways to strengthen planning's effectiveness and implementation** (SÜTÖ, 2023). The literature sources identify **also barriers** to effective local climate adaptation planning⁵⁶ (RANNO ET AL., 2010; PRINGLE, 2011; BAKER ET AL, 2012; PHADKE ET AL., 2015; SHI ET AL., 2015; FORD ET AL., 2015; UNFCCC, 2015; ARAOS ET AL, 2016)⁵⁷. Others summarized the new research and literature results and discussed the **major methodological challenges to be overcome**

⁵⁵ They found that adaptation literature pays less attention to decision dynamics and adaptation's incorporation into long-term strategic planning. Their conclusion was that robustness of institutions (strategic planning, policy making) and systems (infrastructure, ecosystems) strongly influence the ability to implement goals and policies (BIRCHALL & BONNET, 2021).

⁵⁶ According to the studies these barriers are as follows: inappropriate political leadership/support; lack of clear roles and responsibilities of local governments; scarcity of fiscal and administrative resources; weak ability to obtain and communicate climate information; lack of local expertise; misconception of the problems; absence of statutory obligations; mismatch between scientific knowledge and the information-need for decision makers, vulnerability studies are characterised often by sectoral approach and lack of single available metrics for adaptation etc. The latter problem makes the quantification difficult, so it is important to develop standards, methodologies, indicators and baselines for assessing the achievements of adaptation (SÜTÖ, 2023).

⁵⁷ However, there are only very few (Shi, et al., 2015; Araos et al, 2016), if any, global assessments of adaptation taking place across cities. According to these the majority of urban adaptation interventions still focuses on adjustment to physical changes. Baker et al. suggest improving the quality of local adaptation plans through information base development; through establishment of specific adaptation planning standards and requirements; and through strengthened engagement in public participation programmes (SÜTÖ, 2023).

(SÜTÖ, 2023). Ye and his colleagues also identify future directions to advance quantitative assessments of urban-scale climate risks and improve related methodology⁵⁸ (YE ET AL., 2021). Others emphasise that different and diverse methodological approaches are used in urban level adaptation planning (both soft and hard tools, qualitative solutions and cost-benefit analyses etc.) (GOONESEKERA-OLAZABAL, 2022). Nevertheless, methodological and risk assessment-related literature remains limited in number, although quantifying and assessing these risks are of great importance for taking proactive measures against them (YE ET AL., 2021).

A different group of authors examined **changes in local adaptation-related strategic planning approaches** (e.g. LOMBARDI ET AL., 2011; MALEKPOUR ET AL 2015) **or in thematic fields** (e.g. BROWN, 2011; YANG ET AL., 2021). Some claim that over the last decades, planning focus has shifted from sustainability to climate change and resilience, and traditional planning approaches are challenged by the uncertainty of processes and institutional constraints (e.g. BIRCHALL & BONNET, 2020) (SÜTÖ, 2023).

Another new emphasis that came up in local adaptation planning (right at the linking point between sustainable development and climate adaptation) is the **evolution of the so-called ecosystem-, or nature-based adaptation measures** (EBA or NBA), whose promotion has recently been emerged both in the literature and in policies/practices at the local (especially the urban) level (JONES ET AL., 2012; GENELETTI-ZARDO, 2016; EEA, 2020)⁵⁹. Even the European Union's related policy documents [both the first EU Climate Adaptation Strategy (EC, 2013) and its updated version (EC, 2021), and the European Integrated Framework for Climate Resilience, currently under planning] explicitly encourage green infrastructure development and promote local ecosystem-based approaches to adaptation (SÜTÖ, 2023).

A group of articles focused directly on urban-level indicators (SÜTÖ, 2023). Feldmayer et al., in their study, based on literature review, online survey, validation workshops and sectoral experts' quality control, provided an indicator set to measure urban climate resilience and monitor adaptation activities. They finally identified 24 indicators distributed over 24 action fields. As we will see later at the national level, too, the authors emphasise that existing indicator sets at the local level are good starting

⁵⁸ The 4 main topics in which they conclude literature results were as follows: possibilities of downscaling climate change to a local scale; couple regional and local climate to project urban microclimate; assessment of urban climate vulnerability; integrated risk assessments for cities. The main challenges, according to the authors, are the followings: timescales between mesoscale and urban scale models are mismatched in many cases; there are inadequate capacities to convert different aspects of urban vulnerabilities into unified metrics; and aggregation of multiple hazards calls for more standardized procedures and comparable metric systems (YE ET AL., 2021).

⁵⁹ The co-benefits of the two fields contain, among others, biodiversity conservation through improved ecosystem conditions; climate mitigation through increased carbon sequestration; conservation of traditional knowledge and practices; or improved recreation and tourism opportunities and strengthened food security (GENELETTI-ZARDO, 2016, SÜTÖ, 2023).

points to adaptation indicator system development but adjusting them to the special local circumstances is also essential (FELDMAYER ET AL., 2019). Goonesekera and Olazabal surveyed the 136 largest coastal cities worldwide, concentrating on publicly available city-level adaptation planning documents to examine the indicators and metrics used to track climate adaptation. Out of the analysed city documents, only 13 identified adaptation indicators, showing the “globally embryonic state” of adaptation MRE⁶⁰. Therefore, the authors emphasise, connection between adaptation objectives and associated measures and results must be strengthened; MRE activities must play a key role in this (GOONESEKERA & OLAZABAL, 2022).

While urbanisation and climate change had already been acknowledged as important dimensions and drivers of global change for decades, the significant challenges for urban and spatial governance emerging at their interface were recognised only at the beginning of the 2010’s (SÜTÖ, 2023). The earlier introduced (Chapter 3.4.1.) works of Wheeler and Birkmann should be mentioned here again (WHEELER, 2013; BIRKMANN ET AL., 2014).

3.4.2.2. *The subnational level*

According to the reviewed literature, globalisation goes hand in hand with the growing role of sub- and supra-national levels in economic development and territorial governance. Numerous authors (above all ROSENAU, 1995; then LENNOX, 2008; VOGLER, 2017; and BAYLIS ET AL., 2017) mentioned (but the main thoughts come from Rosenau) the role of city regions or cities-and-their-hinterland units⁶¹ in this context. Taylor calls attention to the fact that the globalisation-caused growing regional complexity necessarily weakens state sovereignty, and sustainable regions also demand economic functions from modern states. Nevertheless, states would remain important political and cultural players (TAYLOR, 2023).

Spatial levels between the national and local comprise more than one scale: regions, sub- or micro-regions, groups of settlements, functional urban areas, etc. In the reviewed literature, only a few studies mention these (SÜTÖ, 2023). Heidrich and his colleagues emphasised that while national frameworks are not always appropriate to promote climate adaptation locally, regions, however, might often be the relevant scale for tackling climate adaptation-related challenges, e.g., in connection with urban sprawl’s

⁶⁰ Finally, the authors compiled and coded 1971 indicators of which 1841 focus fully or partially on adaptation related aspects. A majority of these measures’ outputs. Outcome indicators generally connect to users or beneficiaries of adaptation measures. Impact indicators relate mostly to human health. Outcome and impact indicators are rarer and more social and economic dimensions frequently remain unaddressed. Targets, timeframes and data sources are rarely defined (BIRKMANN ET AL., 2014).

⁶¹ These urban regions have been on the rise since the final part of the Cold War. Their influence, significance and importance are growing in international relations and policy: they are one of those levels whose improving role is one crucial characteristic of territorial / settlement network related processes induced by globalisation (ROSENAU, 1995; BAYLIS ET AL., 2017).

negative impacts or flood risk. They propose creating larger planning units for adaptation issues (e.g., by grouping municipalities) to facilitate and enable collective action (HEIDRICH ET AL., 2016).

Ottaviani Aalmo and her group recommended a new framework for improving and assessing climate adaptation and mitigation actions in Europe, and for strengthening the role of regions⁶² (SÜTÖ, 2023). They claim that existing adaptation interventions focus mostly on cities or countries with a much lesser role of regions in this process. However, the latter territorial level could be a proper geographical scale to tackle geographic specificities. The article, consequently, urges regional governance solutions in adaptation with flexible and integrated approaches and regional networking, promoting the involvement of subnational governments into the adaptation process (OTTAVIANI AALMO ET AL., 2022). The enhanced role of the regional government structures as a novel opportunity for coordinating local stakeholders to increase adaptation capacity and resilience is also underlined by Birchall and his colleagues (SÜTÖ, 2023). They emphasise the potential of the regional approach in tackling spatially broad and complex measures, such as climate change, through regional governments' greater political jurisdiction, authority and coordinative role⁶³ (BIRCHALL ET AL., 2022).

Wright and her colleagues, through document analyses, data assessment and map analysis, compare impact assessments done in two regional climate adaptation processes in a Dutch and a German region. They conclude that there is a need for detailed, visualised and well-communicated spatial information and evidence base in regional climate impact assessment to stimulate adaptation planning⁶⁴ (WRIGHT ET AL., 2021).

Summing up the described tendencies, moderately growing attention has been paid on the regional level climate adaptation processes and the role of regional government in these so far, but when comparing the weight of this spatial level to the local one, it seems still minor (SÜTÖ, 2023).

⁶² They found that small-scale adaptation initiatives are flourishing in the continent with several nature-based solutions. However, these initiatives are seldom coordinated or integrated enough and not always lead to generalized national frameworks (OTTAVIANI AALMO ET AL., 2022).

⁶³ Their comparative qualitative study analysed adaptation within two distinct regional governments, examining how regional governance structure influence local resilience. They found that unique structural character of regional governments can support certain climate strategic adaptation planning processes and increase adaptive capacity through greater access to resources. They urge better utilization of regional governments' strengths (BIRCHALL ET AL., 2022).

⁶⁴ Based on Neset (2016) they even identified 4 main types of that visualization tools Climate Data viewers; impact viewers; Climate data explorers; impact Explorer. Moreover, the authors underline that systematic consideration of both socio-economic changes and climate dynamics are necessary together with a stronger focus on visualization of the conclusions for different stakeholder groups and linking the results to funding opportunities. Not only the conduction of examinations, they emphasise, but also the communication of their results (via availability and accessibility of impact assessment studies) to policymakers and other stakeholders is essential. Careful communication even enhances stakeholder participation (WRIGHT ET AL., 2021).

3.4.2.3. *The national level*

Despite the primary importance of finding relevant answers for local problems and the vital role of municipalities / micro regions in these processes, national governments still play a crucial role in adaptation to climate change (SÜTÖ, 2023). Though there is currently more experience in designing adaptation activities at the project level than at the national level (VALLEJO, 2017), states nevertheless crucially contribute to planning and governance of adaptation, as one of the dominant parts of adaptation's spatial framing (BENZIE & PERSSON, 2019).

Climate adaptation's national administration **coordinates domestic adaptation efforts at different subnational levels** (SÜTÖ, 2023) through national adaptation plans by setting basic directions, agendas, providing methodological/strategical guidance to government agencies, municipalities, the private sector and other relevant stakeholders (e.g. HEIDRICH ET AL., 2016; WOODRUFF & REGAN, 2018) and by the pure strategic planning activities and policy inputs that trigger sub-national authorities to develop their own plans (EEA, 2022). Vallejo says that this coordinative role is especially useful in countries with a large territory or decentralised administration (VALLEJO, 2017).

Effective integration of climate adaptation aspects into sectoral policies can also be helped by (national) planning and coordination. According to DI GREGORIO and her co-authors, this integration comprises 4 main levels, which are all necessary to develop a policy environment that implements a proper, resilient development pathway combining adaptation, mitigation and sustainable development aspects (DI GREGORIO ET AL., 2016). Similarly to UITTENBROEK ET AL.'s urban analyses, DI GREGORIO and her colleagues emphasise the importance of the "*adaptation mainstreaming*" (SÜTÖ, 2023). Leiter concludes in his review that literature on (national) adaptation governance concentrates mostly on adaptation planning, concepts, strategies and the aforementioned mainstreaming; while adaptation actions' impacts, implementation and potential effectiveness are getting only lesser attention (LEITER, 2021).

Despite these important roles of the national level in adaptation planning, however, **only limited number of studies deals with comparative analysis of national adaptation planning activities** worldwide and they have contradicting results. For example, Morgan et al. analysed 54 national documents and drew the conclusion that significant proportion of them put serious effort into MRE activities during planning (MORGAN ET AL, 2019)⁶⁵. At the same time, Woodruff and Regan studied 38 NAPs and found that the monitoring and implementation parts of these were weak, which fact makes the

⁶⁵ As Leiter indicates it, Morgan and his colleagues used a three-point Likert scale with very low thresholds. In the analysed documents a simple acknowledgement of the importance of MRE and consideration of MRE issues were sufficient to score the middle or highest categories (LEITER ET AL., 2017).

implementation of these documents questionable. The authors recommend continuing to research on evaluating adaptation progress (WOODRUFF-REGAN, 2019). Timo Leiter and his colleagues found in 2017 that very few national adaptation MRE systems had advanced beyond initial steps then (LEITER ET AL., 2017).

Mickwitz and his colleagues analysed through selected case studies the policy integration of mitigation and adaptation efforts in different policy areas in different countries. The explicit adaptation planning did not get special emphasis in their study, but spatial planning did; however, they identified significant relevance of spatial planning in the adaptation process (MICKWITZ ET AL, 2009).

In Europe, the first national adaptation plans, as we saw in the previous chapters, emerged in the mid-2000s. The article of Dosch, Porsche and Schuster summarises the results of their research from that time right after the adoption of the first generation of national adaptation policy and sectoral adaptation documents of Europe. Before that time, under the UNFCCC states committed themselves to elaborate adaptation interventions under other sectoral strategies but special national adaptation strategies were not really formed by the second half of the 2000s⁶⁶. The basic tool applied by the research was a narrative description of national adaptation strategies, concentrating especially on the interventions identified within these or in other sectoral national strategies. No quantitative assessment of spatial performance or emergence of spatial aspects in the strategies were applied (DOSCH ET AL., 2008)⁶⁷.

SWART and his colleagues presented in 2009 another comparative analysis of national adaptation strategies from chosen European countries and identified policy-relevant findings and recommendations for the future, mentioning at the beginning of the study that so far climate research had concentrated rather on mitigation and climate impacts and to a lesser extent to adaptation – one of the main objective of the study was to call attention to the topic⁶⁸. The applied methodology was based on national expert

⁶⁶ The article analysed 27+3 (EU member states + Norway, Iceland, Switzerland) European national adaptation strategies and national sectoral adaptation strategic documents, as it declares the EU member state level as the basis of adaptation policies. They analysed the potential meaning of these strategies for the German spatial (physical) planning activities, through the systematization of adaptation actions into 5 main spatial planning-relevant fields (water and flood management & coastal territories; recreation & tourism; urban planning, housing, architecture & energy efficiency; transport, infrastructure & energy; spatial risks & environmental hazards), especially concentrated best practices from Belgium, Finland, UKG, Austria, Italy and the Czech Republic (DOSCH ET AL., 2008).

⁶⁷ They detected no connections between spatial planning, adaptation policy and the risk governance cycle. Nevertheless, numerous adaptation- and spatial planning-related sectoral actions had been identified in the analysed countries by the article, first of all in water and flood management, but risk management and urban planning also showed some perfect examples (DOSCH ET AL., 2008).

⁶⁸ In the first round 14 countries were preliminarily analysed ten the final number of examined states were narrowed to 9. Along six themes that were identified by experts on brainstorming events based on a preliminary, initial inventory of national strategies, the researchers examined the different countries' approaches to enhance implementation of adaptation. The authors found that the first generation European NASs were mostly based on climate system-, and impact research results as well as on CVAs. Furthermore, no clear communication followed the adoption of these climate policy strategies, and their significant parts still concentrated on mitigation. Nearly all the NASs emphasise the need to take action at the regional or local level with a shared responsibility across administrative scales. Nevertheless, only few countries have set out clearly defined responsibilities for the different levels of governance, nor set up co-ordinating bodies. There is limited recognition of the international scale in the NASs (SWART ET AL, 2009).

involvement, in the form of desk research (one from each analysed country), guided by an analytical aspect system along six topics (facilitating strategic development; science-policy interaction; communication; multilevel governance; sectoral mainstreaming; role of policy monitoring). “*Where it was necessary and possible*”, even additional interviews with policy makers were also added. Results of the analysis showed that in Europe, actions on adaptation happen at all spatial governmental levels (international, national, subnational, local). Although the analysed adaptation strategies covered wide range of sectors, many of these were common to all countries: water management issues, agriculture, biodiversity, energy, forestry, human health, finance, construction/building stock, fisheries, coastal management, tourism, etc. This uniformity in covered sectors and the related objectives indicated the weak spatial awareness in these documents at that time. The strategies, content-wise were general, rather paving the way to next steps (development and implementation of adaptation projects). The authors even identified the serious barriers to effective planning then⁶⁹. The study identified the fewest NAS action lines in the area of MRE, although it emphasises that flexible solutions are needed to implement, evaluate, and revise adaptation strategies (e.g. indicators to measure policy progress and effectiveness). In 2009 only the United Kingdom, Finland and Germany showed signs of these MRE activities amongst the analysed countries (SWART ET AL., 2009).

Greiving and Fleischhauer also examined the first European generation of national adaptation planning documents that had been elaborated during the first decade after the Millennium. The article provides an overview and systematic classification of different national approaches to developing national adaptation strategies from a spatial planning/regional development perspective, even elaborating recommendations that can contribute to the implementation of the then-current TA of the EU. The hypotheses assumed that climate change leads to regionally differentiated impacts in Europe, and these different impacts influence the main focus of NASs; while, differences in the political-administrative systems also play decisive role because the instruments and procedures of spatial planning should have an important influence on strategies⁷⁰ – this idea is close to my dissertation’s starting points and hypotheses as well. To answer these questions, the comparative analysis of the study covered countries from the most relevant “climate challenge regions” of Europe and with different planning system

⁶⁹ E.g. the lack of committed resources and public support; and the weak coordination between territorial levels. Further findings were that among climate impacts mainly the negative ones were in the focus of the NASs; only Finland and Sweden mentioned the possibility of capturing opportunities as positive impacts of the changes. Global context, export of adaptation knowledge got minor emphasis, only France and Portugal as former colonist states mentioned this aspect in their strategies (SWART ET AL., 2009).

⁷⁰ As an example, the study mentions the setting of legally binding and spatially specific objectives to keep an area free of further settlement development, that means that there are laws enabling the enactment and enforcement of such spatial objectives (GREIVING&FLEISCHHAUER, 2010, 2012).

types. In a first step, in the form of a meta evaluation, the already existing assessments and studies about national adaptation strategies were assessed, examining the role spatial planning and spatial development play in national adaptation strategies. The examined studies were mostly from the same countries (the “pioneers” in climate adaptation planning, e.g., Finland, Germany, or the Netherlands). The results were based on the national case studies in the second step, in which nine country studies⁷¹ (as cross-sectional analyses) were elaborated. The structure of the country reports was unified following a standardised set of research questions, which were developed from the meta-evaluation of adaptation assessments. The main focus of the country studies was the extensive characterisation of the spatial planning-oriented approach of the different NASs. The three main analytical aspects (climate change typology, climate change vulnerability, and character of the national planning system) through which the authors examined the main elements of the NASs and the role of spatial planning in national adaptation are more or less reflected in my dissertation’s work phases as well. The authors finally classified the 9 analysed countries into 4 groups⁷². The results showed that although sectoral planning, especially in water management, is highlighted throughout the then-actual NAS documents, the role of spatial planning or regional development mostly remains unclear or is not touched upon. Similar to Swart, the two German authors also saw that MRE issues were not specified; and, interestingly, objective structure and the covered sectors of these strategies were quite similar, regardless of the geographic specificities. Special differences can only be detected at the level of measures which are tailored to specific bio-geographical and socio-economic conditions of localities/regions. In other words, although differences existed between the strategies’ scope and spatial focus, their addressed sectors and development directions were quite similar to each other. Moreover, no significant correlation between the speediness of national adaptation strategy development and the degree of climate change exposure can be identified⁷³ (GREIVING&FLEISCHHAUER, 2010, 2012).

Around and **after** the “planning boom” that followed the adoption of **the 2013 EU Adaptation Strategy**, several further studies analysed national adaptation policy activities in Europe, e.g. FÜSSEL & KLEIN, 2006; HARLEY & VAN MINNEN, 2009;

⁷¹ Germany, Finland, France, Greece, the Netherlands, Poland, Hungary and the United Kingdom (GREIVING&FLEISCHHAUER, 2010, 2012).

⁷² 1) Countries, where due to not yet existing adaptation strategies there are no statements possible concerning the role of spatial planning; 2) countries, where the role of spatial planning is mentioned but not specifically specified; 3) states, where to spatial planning is assigned a specific role, which is yet to be implemented in practice; 4) states where the adaptation strategy and subsequent documents that directly focus on spatial planning are already in the implementation process (GREIVING&FLEISCHHAUER, 2012).

⁷³ In regard to climate change adaptation all country reports foresee similar tasks for spatial planning, such as keeping areas free from further development, which are already prone to natural disasters or might even be more endangered in the future; developing climate adaptive building guidelines; planning adequate settlement patterns with open spaces for limiting the effects of urban heat islands; managing urban water resources in a sustainable way, etc. (GREIVING&FLEISCHHAUER, 2012).

BOURS ET. AL, 2013 and 2014; EEA, 2015 and 2016; or PRINGLE ET AL., 2017 (SÜTÖ, 2023). Catrien Termeer and her colleagues examined the existing institutions' ability to cope with new challenges of climate adaptation⁷⁴. They found that five institutional weaknesses existed at the beginning of the 2010s in Europe in this field⁷⁵ (TERMEER ET AL., 2011). Pringle and his colleagues summarised the national situations of the EEA countries' adaptation policy activities in 2017 (SÜTÖ, 2023). Most countries, concluded the authors, had focused by the mid-2010's on planning and monitoring in adaptation; evaluation was then only at an early stage because implementation of adaptation actions had only just begun. According to the report, until 2015, 14 countries had established national systems for adaptation MRE or were working on their development (PRINGLE ET AL., 2017).

Some studies even summarized the requirements of effective adaptation MRE (e.g. VAN MINNEN ET AL., 2014 AND 2018; KLOSTERMANN ET AL., 2018) or characteristics of national adaptation-related indicator sets worldwide (VALLEJO, 2017) or the main types of used indicators in Europe⁷⁶ (e.g. VAN MINNEN, 2014; CHRISTIANSEN ET AL., 2016; VALLEJO, 2017; KLOSTERMANN ET AL., 2018; GOONESEKERA-OLAZABAL, 2022; EEA, 2022; OECD, 2023) (SÜTÖ, 2023). The key message of these works was that an

⁷⁴ They introduced aspects of successful adaptation governance in six qualities of governance institutions and apply them to National Adaptation Strategies of 4 countries (the Netherlands, The United Kingdom, Finland and Sweden). These are as follows: variety, as an ability to deal with manifold uncertainties; learning, as ability and willingness to engage in loops of learning; room for autonomous processes, as a continuous capacity for adjustments; ability to secure proper financial and human resources; leadership, as the ability to link time scales, access to necessary resources and build coalitions; fair governance as the encouragement of equity. Based on these they investigated how national governments are incorporating local climate action into national mitigation and adaptation plans and strategies. Third, they examined how cities and regions reflect their local needs and interests into their own climate goals and targets while ensuring alignment with the Paris Agreement. Other analytical aspects were also used (in connection with climate-proof nature regional development policy at all territorial levels they analysed how urban, rural, metropolitan and neighbourhood-level development policies are mainstreaming climate dimensions. At the same time, in connection with scaling up local climate action they looked at how national and subnational governments can facilitate local climate action, notably by removing legal and institutional barriers, enhancing funding and financing mechanisms, engaging multiple stakeholders and sharing local knowledge. In each dimension, the analysis covered the rationale and the concrete policy practices, gaps and challenges and the ways to overcome them, applying a territorial approach to drive systemic and transformative climate action and resilience (TERMEER ET AL., 2019).

⁷⁵ These are: lack of openness toward learning; strong one-sided reliance on scientific experts; tension between top-down development and bottom-up implementation; distrust in the civil society's problem-solving capacity; and wickedness of reserving funding for long-term actions (TERMEER ET AL., 20119).

⁷⁶ Indicators, according to the EEA, mostly measure the changes in the climate system (climatic indicators), provide information on consequences/impacts (impact indicators) or monitor vulnerability and identify adaptation needs (human and socio-economic indicators) (EEA, 2022). Mainly the first two types are widely applied, while adaptation progress is rarely monitored. Dutch authors differentiate 3 main indicator types: process-based indicators describing the steps and decisions; output-based ones describing the level of implementation; and the outcome-based ones describing effectiveness of actions (VAN MINNEN, 2014; KLOSTERMANN ET AL., 2018). Most of the used indices are proxy indicators, relying on indicators originally developed for other sectoral/thematic purposes. They give an indication of the direction in resilience increase but do not offer accurate measurement of real improvements' volume in that resilience. These weaknesses of using individual proxy indicators can be diminished by development of complex vulnerability indicators (CHRISTIANSEN ET AL., 2016; KLOSTERMANN ET AL., 2018). All in all, Klostermann and her colleagues said that combined focus on processes, outputs and outcomes is necessary to reveal the complexity of national adaptation policies (KLOSTERMANN ET AL., 2018). Goonesekera and Olazabal agree with this and additionally mention target indicators that express general targets of the adaptation action. In their approach output indicators focus on activities and products; outcome indicators on behaviour changes (GOONESEKERA-OLAZABAL, 2022). Other sources also mention financial indicators as important tools to evaluate implementation effectiveness (VALLEJO, 2017). The OECD territorial climate indicator framework uses the "pressure-state-response" approach to structure the indicators. Pressure indicators primarily cover aspects related to climate mitigation, encompassing trends and drivers of GHG emissions. Conversely, "state indicators" predominantly feature indicators associated with climate adaptation and resilience, including the exposure to climate-related hazards and socio-economic factors driving vulnerability. "Response indicators" focus on actions and opportunities to address climate challenges (OECD, 2023).

increasing number of European countries had been taking action on MRE of adaptation at the national level by the middle of the 2010's. Klostermann et al., for instance, even set up a recommended framework for effective adaptation MRE, with 4 main steps⁷⁷ (KLOSTERMANN ET AL., 2018). The momentum for initiating adaptation MRE activities at that time was often provided by national adaptation strategies and European policies (EEA, 2015). Lamhauge and his colleagues examined development organisations' documents on adaptation evaluation and concentrated mostly on methodological issues (use of Logical Framework and Result-based Management approaches and Theory of Change methods) (LAMHAUGE ET AL., 2012). Leiter overviewed good practice examples of 10 adaptation MRE pioneering countries: he analysed the context of their systems, the institutional arrangements and their level of development, and the systems' content. The analysis underlined the complexity of national systems and the importance of learning from each other (LEITER, 2013). Several studies underline that, as opposed to mitigation, measuring progress in adaptation activities is context-specific and touches numerous sectors facing several challenges (e.g. EEA, 2015; EEA, 2016; PRINGLE ET AL., 2017)⁷⁸ (SÜTÖ, 2023). According to the newest related EEA studies, in Europe only a limited number of EU countries have set up and/or made operational their national adaptation indicator sets so far (EEA, 2020). They rely rather on indicators, indices developed for other purposes or fields (e.g., sustainable development, biodiversity, disaster risk management). Although some countries have already completed their first policy cycle and based the next one on lessons learned from planning, far fewer states reported explicitly on how their MRE is providing feedback into the policy cycle. So, effective feeding of MRE findings back into making or revising policies remains a challenge (EEA, 2022).

In one of the newest examinations, Timo Leiter in 2021 analysed the extent to which national adaptation plans are implemented, and the role MRE systems play in this process. Previous studies of NAPs like Morgan et al. (2019) or Woodruff and Regan (2019) have treated MRE in simplistic ways, usually distinguishing only the presence or absence of MRE in national adaptation activities. Leiter thought that given the large differences between NAP-related MRE systems, the meaningfulness of such simplistic accounts is very limited. He had first reviewed the relevant literature on adaptation

⁷⁷ Identification of the system of interest (what specific sectors, functions and geographical areas must be monitored?); the selection of indicators (determined by the adaptation context and based mostly on existing indicators); the identification of responsible organisations; and identification of procedures, stakeholder involvement and incorporation of active learning into the processes (KLOSTERMANN ET AL., 2018).

⁷⁸ The most important challenges to be solved in the middle of the 2010s in national adaptation MRE were the strengthening of knowledge base of national efforts to foster learning from experiences; the improvement of the use of existing data sources; further coordination between adaptation planning and MRE through more specified policy goals and measurable outcomes; the enhanced integration of MRE feedbacks into planning activities through improved communication tools; and further integration of vulnerability and risk information into MRE activities (EEA, 2015). Majority of these challenges still exist.

governance and examined whether countries are tracking and reporting on the implementation of their NAPs. He actually conducted the first evidence-based global stocktake of NAP-related MRE systems, comparing in 60 countries the 2021 situation (which substantially exceeds previous accounts) to 2017. In contrast to previous studies, it assessed the actual evidence on MRE practices rather than stated MRE intentions in government documents. The article's invention is the systematic and transparent search for relevant information to answer the respective research questions. Leiter applied three steps. First, publications on NAP-related MRE were identified and screened for relevant evidence. These showed that relevant literature traditionally examined processes of adaptation planning and mainstreaming rather than the actual implementation of adaptation actions⁷⁹. The findings highlight the importance of adequate assessment of the implementation and its effects. He concluded that since 2017, a 40% increase could be observed in the number of countries that develop/use MRE systems in adaptation, and the number of NAP evaluations almost doubled⁸⁰; numerous countries had been developing adaptation MRE systems by 2021 (but few were operational then). These results are mainly due to the existence of targeted support from specialist organisations and increased anchoring of MRE provisions in national climate laws. However, altogether less than 40% of countries that adopted a NAP were found to monitor or evaluate their implementation. Among the reasons he found: 1) MRE mechanisms are often developed only after NAPs have been adopted, and 2) it typically takes several years before reporting commences. Among the best performances, the proportion of European, mainly Western European countries, is significant, due to the early start of adaptation planning in the region and the efforts of the EC to promote adaptation MRE in member states. The continent, says the author, is the only one where MRE has already become part of the regular adaptation planning cycle. Overall, there is a clear trend of more and more MRE systems becoming operational, resulting in a growing number of monitoring/evaluation reports. MRE activities' importance is getting included in climate laws as well. NAPs are also tending to comprise MRE guidance and directions.

⁷⁹ Leiter considered two comparative NAP MRE systems as possible analytical frameworks (MRE supplementary materials to the NAP technical guidelines by Price-Kelly et al., 2015 and a study of three European NAP MRE systems by Klostermann et al., 2018.). Based on these he combined multiple sources of published (documents, monitoring and evaluation reports by government entities) and unpublished (evidence from key informants: government officials, employees of international organizations) information and assess their completeness through a triangulation with two global reports from the UNFCCC secretariat and UNEP, respectively (the NAP progress report from the UNFCCC secretariat and a review of country submissions to UNFCCC by Möhner et al. (2021)). In a second step, the main international organizations and NGOs supporting developing countries were contacted. The information was then qualitatively analysed. For the first research question, countries included in the inventory were plotted on a continuum from the least advanced to those with fully operational MRE systems. The plot showed common stages where multiple countries had advanced to a similar level. Countries were then grouped according to the newly defined stages which answered research question 2 ("do countries have dedicated arrangements for MRE?"). To analyse changes since 2017 (third research question), the baseline from 2017 was adjusted to be comparable to the new stages. To structure responses to the fourth research question, three themes and corresponding aspects were defined (LEITER, 2021).

⁸⁰ He used the term NAP as an umbrella in the article, referring to those operational planning documents from the national level that are directed at adaptation to climate change and included mixed policies and measures (LEITER, 2021).

Also, the number of those countries that have gone through more than one implementation/reporting cycle and institutionalised their NAP reporting is increasing. UK and Germany are good examples for this. The study did not examine the quality and usefulness of the individual NAP-related MRE systems but contributed to a better understanding of the development and practice of NAP MRE activities (LEITER, 2021). Fuldauer and her colleagues examined the linkage between national adaptation plans and the UN's Sustainable Development goals and recommended a methodological process to strengthen this linkage to support the development of more spatially explicit adaptation strategies. They conclude that, despite numerous calls to integrate sustainable development, national adaptation documents under the Paris Agreement seldom emphasise their contribution to the implementation of the SDGs (FULDAUER ET AL., 2022).

Beyond the realm of scientific articles/works, even **the grey literature of international organisations** can provide us with valuable information **about climate adaptation activities at the national level – comparative stocktakes** mainly come from this scene. The importance of the topic of adaptation planning and MRE, otherwise, is further indicated by the growing number of these related grey literature items by relevant institutions such as UNEP, GIZ, UKCIP or OECD (CHRISTIANSEN ET AL, 2016). A good example is the German GIZ institute that elaborated a synthesis of the experiences made so far in adaptation monitoring and evaluation to provide key messages for adaptation practitioners and decision makers. Their practical recommendations for MRE system development at national level nominated 5 steps: analysis and description of the context; identifying levels and methodologies; defining indicators with baselines and data sources; setting up the concrete system; and utilization of MRE results (GIZ, 2013).

One of the most up-to-date reports from the grey literature on climate adaptation planning and MRE in Europe is elaborated by the EEA in 2022 (SÜTÖ, 2025B). It analysed through 5 aspects the related activities in EU member states and EEA countries and found that in Europe in 2021, already 20 member states had reported engaging in at least one form⁸¹ of climate policy MRE activities. Formal evaluations occur less often than monitoring and reporting, but in general, member states' MRE-engagement is strengthening (EEA, 2022). The report concludes, similarly to Swart and Greiving & Fleischhauer, that despite the variation of current and future climate impacts in Europe, there is still no significant differences between member states regarding their affected

⁸¹ E.g. adaptation policy implementation and development MRE; climate impacts identification; monitoring the reduction climate vulnerabilities.

key sectors. Measures are quite homogeneous and distributed only across a few thematic fields, types⁸². Multilevel governance arrangements and sub-national level activities have intensified in several countries. The report states, similar to that of Vallejo's, that macro-regional strategies, international and transboundary cooperation can also strengthen transnational adaptation efforts in the form of joint strategies, planning and implementation; moreover, effective multilevel governance can support the development and implementation of local strategies as well. (EEA 2022).

In 2024, the EEA continued its work on analysing European national adaptation efforts. In their new study, they provide a deeper understanding of the diverse adaptation policy frameworks and tools of 38 European Environment Agency members and cooperating countries. The report provides an assessment of adaptation policy documents and reports published by July 2024 and identifies challenges in integrating monitoring and evaluation systems. Among the main results, they mentioned that an increasing number (exactly 21) of countries have already completed their first/updated climate change risk assessments (14 countries even require these legally), and although integration of risk assessment results into the adaptation policy cycle is evident, their connections with MRE systems remain limited. Most countries have elaborated at least their first NAS, serving as high-level frameworks for coordinating adaptation efforts. NAPs with detailed, specific actions were used by two-thirds of countries to operationalise their NAS. Sectoral Adaptation Plans are less common but are gaining momentum (especially in agriculture and public health sectors). 18 countries already have their own dedicated national climate law that includes adaptation elements⁸³. All in all, the adaptation policy landscape is diverse, with varying degrees of coordination across sectors and levels of governance. Regarding MRE, numerous countries have established some aspects, however, there are still challenges in linking these systems across different governance levels. The absence of measurable adaptation goals complicates the effectiveness of MRE efforts in each country. Spatial issues do not emerge in the report (LEITNER ET AL., 2024).

As a beacon in the sea of sectoral logic-oriented stocktakes of national climate adaptation policies, the **OECD's 2023 study about the territorial approach in**

⁸² Although situation analyses differ somehow, reflecting some national geographic specialities; the sectors, themes and general objectives are very similar, independently from the national geographical position and characteristics. None of the documents speak about spatial orientation or put special emphasis on given geographical regions / territorial units or urge the mainstreaming of spatial aspects into adaptation. According to the report knowledge gaps regarding climate risks-related assessments (CCRAs) must be tackled. MRE activities are identified as one of the main sources of these CCRAs. The report mentions that the number of conducted sectoral/thematic or multi-sectoral climate risk assessments (CRAs) are increasing, mainly the first type. These CRAs improve the knowledge base on climate risks and vulnerabilities⁸², support the update of newer generation of NASs and NAPs. There are legal requirements or political commitments to institutionalise their periodic updating in several countries – however, regular renewal of them is scarce for now. The focus still seems to be on incremental, cautious interventions and not on real transformative adaptation (EEA 2022).

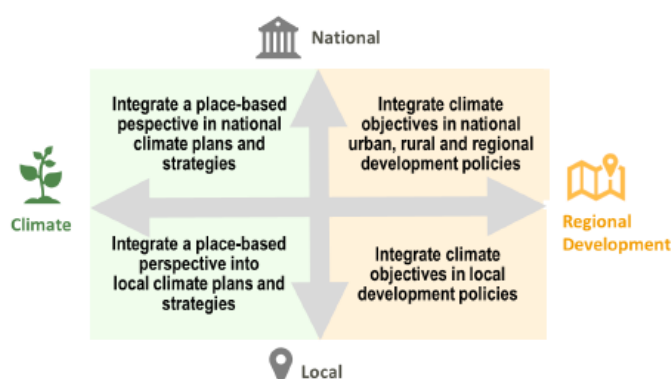
⁸³ The only country with a specific and standalone adaptation law is Germany (as of July 2024) (LEITNER ET AL., 2024).

climate adaptation and resilience stands out. Even in its title, but of course in its very content, the study deals with spatial implications of climate policy (and within it: adaptation) planning and actions. The authors underline the non-negligible nature of territorial disparities of climate impacts, identifying an „*untapped opportunity in adopting a territorial approach to adaptation and resilience*”. The report proposes a policy framework to help decision makers develop more effective climate and resilience policies through a “territorial approach”. This territorial approach, in their view, is “*a comprehensive policy framework that integrates a place-based perspective into national and subnational climate policies and mainstreams climate objectives into urban, rural and regional development policies, to effectively drive climate action at all territorial scales*” (OECD, 2023, pp. 12). (My dissertation, as we will see later, concentrates partly on the first half of this definition, namely, place-based perspectives of national adaptation policies – later, in Chapter 3.5. the explicit distinctions between the OECD study and my dissertation are introduced in a detailed way). The authors’ spatial approach aims to combine top-down and bottom-up measures to maximise policy performance at different territorial scales⁸⁴. With these, through a more granular understanding of climate impacts and risks, systemic climate resilience for the most vulnerable people and places could be enhanced, helping national governments to focus on the most vulnerable territories. Moreover, cities and regions can apply a spatial approach within their own geography to tailor their climate policies to further disaggregated spatial scales (neighbourhoods, districts) to address their specific needs. Regarding the methodology, the authors analysed the national adaptation plans or strategies (NAPs/NAS) of all OECD countries and the extent to which national, regional, and local climate policies can integrate a place-based perspective. They focused on the measurement and understanding of cities’ and regions’ local climate risks and impacts. The assessment draws on a selection of 36 leading practices mostly from OECD countries, regions and cities collected mainly from the literature review. These examples were analysed to identify success factors and lessons through 4 aspects⁸⁵. Three categories were used: extensively discussed, slightly discussed, not discussed; moreover, mandatory or explicit requirement and voluntary or encouraged nature of activities were also indicated. This method is quite strongly resembled logic-

⁸⁴ The implementation of this requires effective multi-level governance mechanisms, setting and implementing ambitious national goals and targets that integrate local climate actions and defining clear roles and responsibilities of subnational governments, national legal and institutional frameworks. This latter allows for innovative local climate action, stronger funding and financing mechanisms to support and scale up subnational climate action, and an enabling environment facilitating partnerships and mutual learning. This territorial approach could be a „game changer” according to the authors, as it helps promote integrated climate actions across sectors, making public expenditure more effective (OECD, 2023).

⁸⁵ (1) Emergence/involvement of local governments mentioned by NAS/NAPs in connection with climate risk assessment information; (2) adaptation planning; (3) adaptation implementation and (4) adaptation measurement (OECD, 2023).

wise to that I use in the empirical phase of the dissertation, but it uses different categories for the degree of the given aspects' presence in the analysed documents.



8. Figure: A conceptual diagram of climate resilience's territorial approach. *Source: OECD (2023).*

When applying the spatial approach, according to the authors, it is critical for national and subnational governments to better address locally specific climate impacts affecting mostly the most vulnerable stakeholders. The study found that although more than 80 OECD countries have their own NAS/NAP, national climate policies occur mainly on a sector-by-sector basis, leading to conflicting policy interests and competing priorities (similar results could be seen in the studies of Swart, Greiving & Fleischhauer and the EEA). There is still a lack of comparable data helping to understand locally specific climate impact and risk situations. Place-based responses are rare; one-size-fits-all solutions cause inefficient and unequal distribution of resources. The assessment of strategic documents suggests that, in practice, governments at different spatial levels show the lack of a “place-based” perspective in climate policy as well as the lack of climate policy aspects/objectives in traditional “place-based” policies (i.e. urban, rural and regional development policies). The study even recommends three types of actions: 1) Integration of place-based perspectives into climate policy through CCRA and CVAs and NAS/NAP documents; 2) climate proofing regional development policy at all spatial levels (mainstreaming climate objectives into urban, rural and regional policies, promoting climate action at special scales, like FUAs); 3) enabling and scaling-up local climate actions and resilience (clarifying roles and responsibilities and financial mechanisms) (OECD, 2023). Out of these directions, in my dissertation topic's point of view, the first has significant implications on national adaptation activities; the second concentrates on the other side of the coin, spatial planning; the third on adaptation again, but at the local level.

The new scientific opinion paper of the German Federal Environmental Office (UBA), in connection with its recommendations on the coming European climate resilience and

risk management framework (currently called the European Integrated Framework for Climate Resilience), also deals with MRE (which group of activities they call “MERL”, complemented MRE with “learning”) issues, mentioning that so far the most EU member states has established national adaptation policy monitoring systems, especially about climate impact monitoring but their quality and methodologies differ from each other and evaluation of policies’ and measures’ effectiveness remains a challenge. The new EU framework, accordingly, should promote the development of measurable European and national adaptation targets with indicators across different governance levels, concludes the German experts (UBA, 2025).

According to EEA reports, there is a need to take one more step forward from simply tracking current adaptation interventions towards a thorough understanding of results and impacts, resilience and vulnerability at the national level. Climate change risk assessments (CCRA), and vulnerability analyses (CVA) (that take into consideration even cascading hazards and transboundary impacts as well) can play an important role in this process. This also calls our attention to the importance of setting up more explicit, clear and measurable objectives that can be more easily monitored (EEA 2020; EEA 2022). We must add: adequate tracking of adaptation processes, deeper interpretation of local impacts and outcomes, brings us closer to the meaning of understanding of spatiality and spatial differences in adaptation.

All in all, with the exception of the almost dozen mentioned examples (DOSCH ET AL., 2008; SWART, ET AL., 2009; GREIVING & FLEISCHAUER, 2010; EEA, 2015; PRINGLE ET AL., 2017; LEITER, 2021; FULDAUER ET AL., 2022; EEA, 2022; OECD, 2023; UBA, 2025), only few Europe-wide national-level comparisons exist that focus on adaptation, and they are rather practical than scientific. Spatiality, spatial issues emerge explicitly only in a scattered form and in very few studies (SWART, ET AL., 2009; GREIVING & FLEISCHAUER, 2010; OECD, 2023).

3.5. Conclusions of the climate adaptation-related literature review

The chapter below is based on the results introduced by the first publication about the research (SÜTÖ, 2023); however, the original article’s statements have been updated significantly according to my recent findings. The sheer number of available adaptation policy planning- and MRE-related literature sheds some light on the fact that **adaptation’s importance is steadily growing** in both everyday life and in policy making. Several items of the reviewed literature mentioned the growing intensity and frequency of climate change-related challenges and the momentum adaptation has recently gained both in development policy and within climate policy itself. The strong locality/spatiality in adaptation as opposed to the mostly globally managed mitigation

is another topic that comes up several times, emphasising the existence of geographically different challenges and therefore the need for spatially/territorially tailored adaptation responses. The exact identification of local climate impacts and challenges and the elaboration of adequate responses demand rich information/evidence background and accessible data on the spatially different exposure, sensitivity, adaptive capacity and vulnerability of regions/localities and local effectiveness of the policy responses. Out of the reviewed literature, several studies emphasised these functions of planning and MRE in adaptation and refer to these activities as important tools to design development directions, implement and follow up on the intended results (SÜTÖ, 2023). The growing intensity of adaptation policy activities and the increasing number of strategic documents at different spatial levels indicate serious progress in this field. Among the **spatial levels**, the national and the local show the strongest signs of systematic adaptation-oriented thinking and planning, with urban areas playing a pivotal role in the related planning activities. The reviewed literature, regarding these distinguished spatial levels of adaptation planning and MRE, **mostly deals with local (principally urban)** mitigation and adaptation problems and their management, and a significant proportion of them focuses on the **national scale** as well. The **regional and other subnational levels** above the municipal one, their activities, especially in planning, mainstreaming and MRE, got lesser emphasis. In spite of this existence of different spatial levels' activities, however, the strongly geographical space-connected, optimally locally tailored adaptation policy, regarding its methodological approaches, does not seem to put enough emphasis on spatial/territorial aspects: **sector-oriented approaches still prevail** (at the national level in a particularly strong way) (SÜTÖ, 2023).

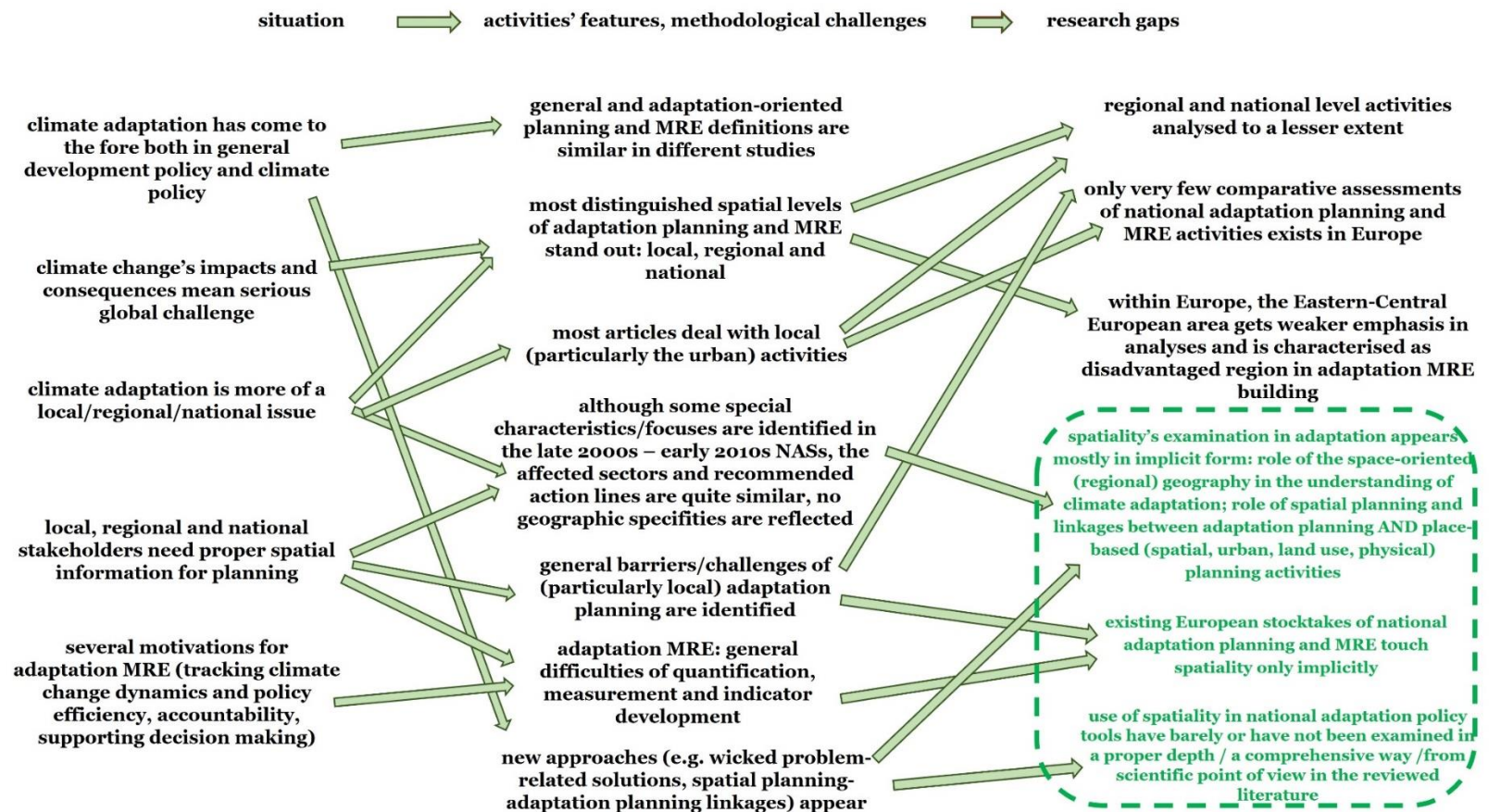
The international literature, dealing with the local, regional and national adaptation policies and measures **goes rarely further than identifying planning practice-, approach- or method-related problems and structural or financial limitations** at different spatial levels (SÜTÖ, 2023). **Only a limited number of studies use comprehensive / comparative analysis**, and most of them concentrate on **local examples; national strategies are analysed less frequently**. Additionally, the larger proportion of these few national-level oriented ones are from the grey literature (GIZ, 2013; PRINGLE ET AL., 2017; EEA, 2020, and 2022; OECD, 2023, LEITER ET AL., 2024), e.g., technical reports introducing national-level adaptation planning and MRE in Europe with the most crucial challenges and current processes. Beyond these evidence-based reports real scientific studies are rarer (e.g., SCHUSTER, 2008; DOSCH ET AL.,

2008; SWART ET AL., 2009; GREIVING&FLEISCHHAUER, 2010 AND 2012; MORGAN ET AL., 2019; WOODROFF & REGAN, 2019; LEITER, 2021, etc.) (SÜTÖ, 2025B).

Spatiality in adaptation is usually examined implicitly, through some space-related topics. Several authors analyse the role of *regional geography* (as a space-oriented discipline) *and its tools* in the understanding of the spatiality of climate change (RANDALLS, 2017; CHANG&WI, 2018; FARBOTKO, 2018; COLVEN&THOMSON, 2018; TAYLOR&O'KEEFE, 2021; TAYLOR, 2023; PIETTA, 2023; PAASI, 2023); others focus on *linkages between adaptation planning and spatial planning* [both with physical (FLEISCHHAUER ET AL., 2007; SCHMIDT-THOMÉ, 2007; GREIVING ET AL., 2007; GREIVING & SCHMIDT-THOMÉ, 2013) and spatial development (DOSCH ET AL., 2008; SWART ET AL., 2009; GREIVING&FLEISCHHAUER, 2010 and 2012; ROGGEMA, 2012; OECD, 2023) planning] or *adaptation planning and urban planning* (UITTENBROEK ET AL., 2013; WHEELER, 2013; BIRKMANN ET AL., 2014; BRUNETTA&CALDARICE, 2018; SALAMIN, 2018; MARAGNO ET AL., 2021). Out of these studies the OECD's analysis shows the most explicit content regarding spatiality (even in its title it is about territorial approach) and is the closest to my dissertation's topic, so it is worth briefly summarizing the similarities and differences between the two studies. I met this material only at the latest stage of the doctoral research, after I had almost completed my empirical part; nonetheless, it was reassuring that although both studies had similar starting points and analytical ideas, the implementation differs significantly in both cases. The OECD's study concentrated on more than one key topic: it analysed besides territorial emphases in adaptation planning and resilience the adaptation-related focus of spatial planning, too; GHG emissions and climate impacts across OECD countries; and the territorial indicator framework of the OECD. While my dissertation focuses solely on spatial aspects' presence in climate adaptation planning and MRE instruments, the OECD study concentrates both on place-based aspects' presence in adaptation planning documents (but not in MRE documents) and adaptation's integration into place-based type of planning documents (as well as on scaling up local adaptation actions). While my dissertation covers almost the whole of Europe; Malta, Cyprus, Croatia and all the Western-Balkan countries were left out of the OECD analysis. Both the OECD material and my dissertation basically build on qualitative assessments as it was already described in Chapter 3.4.2., and the general working logic behind the analytical aspects regarding the spatial aspects' weight in adaptation planning documents were also similar but my dissertation on the one hand focuses not only on strategic planning but monitoring and evaluation documents as well; on the other hand it applies a more comprehensive and detailed analytical aspect system (with 7 main and 34 sub-aspects versus the OECD's 4 main simple aspects) than the OECD study did.

Some authors focus on the speciality of the challenge of climate change and the *need for new ways/methods of planning* (LOMBARDI ET AL., 2011; MALEKPOUR ET AL 2015); some even recommend the *use of approaches such as horizontal and interdisciplinary thinking* from the wicked problem phenomena (ROGGEMA, 2012; KERÉKES, 2021). The role of spatial planning in adaptation or the growing importance of hazard assessments and risk information in spatial planning also have been recognized in some cases (SÜTŐ, 2023). However, while adaptation's and risk management's role in spatial planning is quite well described (e.g. SCHMIDT-THOMÉ, 2007; GREIVING & SCHMIDT-THOMÉ, 2013), **the possible use of spatial aspects in adaptation policy making and in the related tools do not get proper emphasis**, which fact underlines the novelty of the dissertation's empirical part (Figure 9).

The **importance of proper, spatially conscious planning, monitoring and evaluation; the role of spatial approach and aspects in these activities simply do not appear directly in the reviewed literature items** (SÜTŐ, 2025B): neither geographers nor scientists from other fields paid serious attention to spatiality of climate change (PAASI, 2023; SÜTŐ, 2024). Spatially specific focuses, geographical scopes, and spatial aspects in adaptation got small emphasis. Very few studies concentrate on these issues. Those few that do, do it mostly implicitly (SCHUSTER, 2008; DOSCH ET AL., 2008; ROGGEMA, 2009 and 2012; LEITER, 2021; EEA, 2022, etc.); explicit focus on the topic can be observed only in very few works (SWART ET AL., 2009; GREIVING&FLEISCHHAUER, 2010 and 2012; OECD, 2023).



9. Figure: Main outcomes of the literature review. *Source: own editing.*

The listed studies' main conclusion is that although some special geographic characteristics/foci can be identified in national adaptation strategies' situation analyses in the late 2000s – early 2010s, the addressed sectors and development lines are quite similar. No geographic specificities are reflected in the objective systems and measures (SÜTÖ, 2025B). Despite the variation of current and future climate impacts in Europe, there is still no significant differences between member states' strategies, regarding their identified key sectors in their NAS documents. Measures are quite homogenous and distributed only across few thematic fields. Differences in national physical, social and environmental circumstances do not correspond with preference given for definite action types. These findings point unambiguously to the direction of a new research gap (SÜTÖ, 2025B). Figure 9 summarises the main findings and the research niche that stands out consequently.

It can be observed as well that focus on spatial issues, after a significantly busy period characterised by the relatively frequent publication of scientific research results, policy background documents, reports and related strategic document content at the turn of the 2000s and 2010s, especially between 2008 and 2011 when some kind of a “spatial planning and thinking renaissance” could be experienced in the European development planning sphere, topics like spatial planning's relation with and its role in adaptation policy as well as regional geographical approach's role in the issue nowadays get only smaller emphasis again. Explicit spatiality of adaptation policy practice, moreover, has never or barely got proper emphasis in the literature. My dissertation tries to contribute to turning the tide or at least take the first steps on a long road to the reinventing of spatiality in climate adaptation.

3.6. Space interpretations of different scientific disciplines and practical fields

Chapter 3.6. about the space interpretations-related results of the literature review is basically based on the content of my 2024 conference article on the topic. The text has been significantly updated since then, but the main statements remained the same (SÜTÖ, 2024).

To support the improvement of climate adaptation policy planning instruments in Europe to move them in a direction that makes them capable of performing the proper and spatially conscious planning, monitoring and regular evaluation of climate impacts and adaptation responses one needs some basic information about the current situation. For this, the dissertation examines the current presence of spatial (geographical) content and emphases in adaptation policy making. To conduct this analysis, as a first step, we

must define the essence of spatiality from our point of view: what do we understand under the terms “*spatial aspects/dimensions*” or “*spatial approach*” and under the concept “*spatiality*” in general and in climate adaptation policy tools, particularly. Or, in other words, **how can we approach spatiality in adaptation?** To secure our analysis some depth, **we turned to the different space interpretations** of those relevant **space-oriented disciplines** [*environmental geography, human (social and economic) geography, regional sciences and regional geography, political and administrative sciences and international relations, geopolitics and regional/environmental economics*] and fields of professions [*regional development, spatial planning, land use planning, strategic planning*] that particularly deal with the concept and characteristics of space(s). The research is linked to these disciplines, mostly of the external (geographical, physical) and partly of the internal (social) spaces that have relevance and connection with climate adaptation. This chapter introduces the results of this overview based on scientific and grey literature review and my related development policy experience. The method followed the logic of the first literature review part, introducing short excerpts, this time from space interpretation-related articles (SÜTŐ, 2024).

Beyond the literature items and practical policy materials I collected from my regional and spatial planning experience during the recent decades, the literature selection was based again on a detailed library and internet search. In the review process, I used the same databases of JSTOR (<https://www.jstor.org/>) and Google Scholar as well as the BCE’s Library (<https://hunka.uni-corvinus.hu/>). The used keywords of the advanced search rounds were, “*spatiality*”, “*territoriality*”, “*space interpretation*”, “*spatial thinking*”, “*territorial thinking*”, “*spatial aspects*”, “*territorial aspects*”, “*spatial sensitivity*”, “*territorial sensitivity*”, and their further permutations, complemented with the name of a given discipline (e.g., *spatial sensitivity + regional study; territorial thinking + geopolitics*, etc.). I must emphasise that **the review concentrated explicitly on spatiality** (with delimited/limitless space as a general concept at the centre) **and not on territoriality** (where statistically/administratively delimited units of the surface are in focus); **but to cover as wide a literature basis as possible, I used both spatiality and territoriality as keywords** (SÜTŐ, 2024).

Regarding the **selected criteria for analysis**, I basically sought literature *from previously chosen disciplines / practical fields* that I consider spatially interesting. I did *not apply any regional selection criterion*; the processed literature came from all regions/countries of the world. As opposed to the first phase of the literature review, I did *not apply any limit regarding the year range* of the literature items because I was

interested in all kinds of space interpretations independently of the time of their creation (SÜTÖ, 2024).

All literature items were analysed according to a predefined aspect system. I sought in the articles 1) *the presence of related concepts* (space, territory, place, region, etc.); 2) *the mentioning of spatial elements*; 3) *spatial dimensions* or 4) *spatial structures*; and 5) *the concrete description of actual space interpretations*. Finally, both the possible relevance of these aspects in climate policy and their potential utilisation in the dissertation's comparative document analysis were also considered (SÜTÖ, 2024).

The review preferred the conceptual or synthesiser works of authors that can provide us with a comprehensive picture of space considerations. As an initial step I turned both to definitive space concepts like that of AGNEW, MASSEY or CRESSWELL and to synthesizing or collective works like that of HAGGETT (who defined the basic territorial concepts of the geographical space), FARAGÓ (who introduced the main interpretations and approaches of territorial reasoning and evolution of space concepts and notions), NEMES-NAGY (who introduced the development of concepts and examination methodologies of the relationship between space and society in regional science) and DUSEK (who summarized the basic issues of social space research as a foundation of territorial analyses) (SÜTÖ, 2024).

The detailed introduction of the different notions, interpretations and concepts of space is introduced by **Annex #2**. In this chapter, we restrict ourselves to presenting the main conclusions.

Summarising the different concepts' main meanings, **territory means a delimited, administrative unit principally**, while **space is a more general/abstract spatial concept**. **Place and region**, as occupied localities in space have a perceptorial and statistical-analytical content. In case of adaptation policy's spatial performance, the dissertation concentrates rather on the more general space concept and to a much lesser extent on territory, taking into consideration even regional analytical aspects in the empirical work phase.

As it was already mentioned earlier, Annex #2, to support the definition of adaptation's spatiality, collected space-related theories and approaches of space- or territory-oriented disciplines and practical fields/policy domains. As the result, a wide variety of concepts/interpretations emerged before us showing potential connections to adaptation policy, and in several points, they can be linked to the dissertation's comparative analysis of national adaptation policy activities' spatiality (Figure 10).

In the dissertation's spatial sensitivity concept and analytical aspect system (see Chapter 4.2.) we can make use both of **absolutist** (the container-like, 3-dimensional space with

its ordering force) and **relative interpretations** (where the relation system between spatial elements is the basic regulator). The former is utilisable in the depiction of the geographical space as the place where climate change processes occur. *Environmental geography's absolute space interpretation* and its space, place and territory concepts preserved their significant impact on human space interpretations even today. The relativist approach can be used in the analysis of the spatial dimensions of climate change and climate adaptation policy. *Social and economic geography's space considerations* as a system of relations between objects is consequently essential because the research concentrates on spatial/territorial differences, as climate policy monitors different spatial impacts of and adaptive capacities/vulnerabilities to climate change in given places and spatial (territorial or functional) units. The examination of different spatial elements (movements, points and point formations, hierarchies, networks, and surfaces) as affected parties' presence in a given region and vulnerability assessments themselves also use relative space interpretations. The **interpretative approach** is also remarkable, because adaptation policy crosscuts several sectors, harmonising different sectoral considerations of space that require different interpretations.

Objective spaces, and within this category, **external space**, as a localised outer space of given spheres, must be especially focused on. In climate adaptation policy, a given territorial or functional unit's economy or a sector of the economy; the society or a group of society are mostly the subject (or examined sphere) of adaptation-related analyses. However, as Annex #2 shows, the evolution of space interpretations brings economic and social space-oriented studies into our attention. *Regional study*, for example, focuses simultaneously on external, localised outer spaces of social/economic spheres with geographic space-attributions and on **internal spatial structures and concepts of given spheres**. It applies **regional analysis** instead of the sector-oriented one; concentrates on different space categories parallel with each other, implementing given social spheres' localisation and connection to geographical space where differences/structures within a given thematic space can be transformed into spatial inequalities. Regional study nominates the **two main components of the spatial dimension: spatial/territorial inequalities** (internal differences within the functioning system, examined by quantitative analyses) and **spatial/territorial order/configuration** (the functioning systems' spatial structure depicted by thematic maps) (NEMES-NAGY, 1998).

Regional studies consider **different (geographical, social, economic) spaces as different layers upon each other**. This approach cannot be neglected in the case of

climate policy, let alone climate adaptation, that, with its comprehensive, horizontal nature integrate numerous sectors, overarching them with a climate vulnerability- or risk assessment-oriented umbrella. Similar to spatial planning, adaptation policy and planning also synthesises different sectoral development directions onto a spatial unit. For doing this, the multi-layered approach's benefit is unambiguous.

Relativist, constructivist spatial approaches also emphasise the relational dimension, regarding **space as a direct product of society** made up from societal relations. These socially constructed internal and social space interpretations can influence a given society's administrative spatial structures used in practice, too. The research is also interested in the extent to which differences in national adaptation planning and MRE system-building practices in different countries are rooted in national administrative and governmental features.

The **main geopolitical and regional economic spatial approaches** also play their parts. The mentioned disciplines through the **geographical re-orientation of their mother disciplines** (politics and economics) identify their spatial approaches. Space interpretations in geopolitics are basically identical with the already introduced external spaces (geographical space with physical environmental elements) as localised outer perspectives of politics, where geographic proximity and places' locations influence political decisions even in adaptation policy. Moreover, the relativist approach emerges here again: in the research, we focus on how given states can use their climate adaptation policies in strengthening cooperation with or exerting influence on other regions. The relations between spatial elements (here: countries) come to the centre of attention. Similarly, regional economics concentrate on their respective localised outer spaces.

The dissertation's main research subjects, climate adaptation planning and MRE are practical issues, so even **applied policy-oriented space interpretations** ought to be used. Therefore, **regional development policy's territorial cohesion-oriented conceptual background**, and the **related strategic and spatial planning activities**, as applied practical manifestations of regional geography and regional economics also play crucial part in the analytical aspect system. All of the territorial cohesion-related notions and concepts indicate a special space interpretation, rooted in the approaches of regional study and social/economic geography.

Adaptation planning might also touch the **problem of functional territories versus administrative units**: different sectors and thematic fields are operating in particular spatial frameworks, different from administrative districts (in climate adaptation this is particularly valid, if we think about climate impacts crossing national borders or river valleys/natural macro regions as real sites of occurrence of climatic challenges). The

presence of functional space concepts of regional geography and regional development policy was also considered when we examined the adaptation planning documents.

We see: the issue of space interpretations is a multidimensional question, as well as space itself. Consequently, when identifying spatiality in a policy field (in our case: climate adaptation), or when elaborating a comprehensive aspect system for a planned comparative analysis of national climate adaptation policy documents, we must draw from several sources. This fact does not make the task easier, but we cannot count on easy ways if we are dealing with two such complex issues as climate adaptation and spatiality (SÜTÖ, 2024).

	Main space interpretations	Essential implication for adaptation policy	Potential utilization in the research
(Natural) Geography	- absolute space interpretation: 3 dimensions, no preferred points, container analogy - space's substance: the ordering force - space is an objective entity, there is the special dualism of continuity of space and division of the things	- natural geography's absolute space interpretation and geography's space, place and territory concepts (delimited/limitless geographical areas with abstract or concrete meaning) still have relevant impact on human space interpretation - natural space, geographical space as the scene of climate change	Description of climate factors' regional characteristics and spatial descriptions of natural spaces as part of documents/reports
Social/economic geography	- relative approach: system of relations between objects creates the continuity of space. Substance: order of coexistence. Focus on places, positions, regions, relational systems and networks. - social space: external space of human activities	- places, positions and regions are central aspects in natural adaptation activities - considerations of space's materialized elements (impact-induced movements, particularly vulnerable points (settlements), point formations (settlement groups), hierarchies (urban networks), networks (infrastructure elements) and surfaces (vulnerable regions) are essential adaptation planning subjects	- territoriality in adaptation: differences of territorial impacts of climate change and different adaptive capacities / vulnerabilities of given territories - Analytical aspect: presence of territorial analysis/assessment/approach in documents
Regional studies	- Interpretative approach: different manifestations of space require different interpretations - parallel focus on localized outer spaces of social/economic spheres with geographic space-attributions AND internal structures and concepts of given spheres - central method: regional analysis; spatial dimensions; territorial inequalities (differences) and territorial order (configuration) - spaces considered as different layers upon each other; different space categories applied parallel with each other (objective and real spaces, external and internal spaces, etc.)	- interpretative approach: different manifestations of space requires different interpretations to identify how the society, or the planning scene interpret the "subject-spaces" of their policy activities - adaptation implements given social spheres' localization and connection to geographical space. - complex and multi-sectoral climate adaptation, or climate vulnerability with its impact chain-based elements the application of multi-layered approach considering both external and internal spaces and different spatial elements/aspects via regional science's complex double-sided methodology	- Presence of application of different space categories parallel with each other (objective and real spaces, external and internal spaces) - Emergence of regional analyses in the planning/evaluation activities - Focus on spatial dimensions (differences and configurations)
Political / administrative sciences, IR	- relativist and constructivist spatial approaches: space is a direct product of society, made up from societal relations. A nation's belief system explains policy efforts and behaviour. Not only geography, BUT also ideas, norms and rules define states' identities and interests - Socially constructed "internal" & "social" space interpretations might influence the space structure of society (regionalism, decentralism)	- Differences in climate adaptation planning and MRE system-building practices may root back to different national administrative and governmental features. - Manifestation of societal space interpretation into political/administrational space structures can influence the territorial levels of adaptation policy	- Spatial/ territorial governance and administrative structures' features as analytical aspects - Adaptation planning's and MRE's territorial levels as analytical aspects
Geopolitics / regional economics	- geography itself is the essence of geopolitics: impact of geography on politics is the main focus - known external spaces (geographical space with physical environmental elements), as localized outer space of politics - regional economics concentrate on society/economy and its territorial features instead of the social space; and examine not only the relation of the society/economy with the natural space but the relation between society/economy and outer conditions (among them the natural and social space) in general	- Geographical factors (discovery/depletion of natural resources, movement of people and capital, proximity, differences in population density, places' locations) are important decision influencer factors in geopolitics. - MRE of adaptation activities might use environmental and regional evaluation approaches	- The degree how given nations/states can use their climate adaptation policies in strengthening cooperation with or exerting influence on other regions is also worth examining. - quantitative environmental and regional evaluation methods, sustainability theories might also be taken into consideration especially in case of national monitoring activities and territorial implications of quantitative environmental evaluation methods and indicator systems.
Regional development policy, strategic / spatial planning	- territorial cohesion-related notions constitute a special practical space concept, rooted back partly to regional study and social/economic geography - main elements: mainstreaming of territorial aspects into sectoral development directions, comprehensive and integrated (spatial) planning approach, territorial optimum, territorial harmony, territorial potential and capital, territorial governance, problems of functional and administrative units - mostly external spaces and territorial analyses of social/economic spheres are in the centrum	- Beyond scientific concepts even policy considerations must be taken into account in a practice-oriented field, like climate adaptation - different sectors and thematic fields are operating in special territorial frameworks, different from administrative districts	- Adaptation is similar to spatial policy: it synthesises sectoral elements onto a territorial unit - The enlisted territorial (cohesion) concepts' presence must emerge among the research's analytical aspects - Emergence of functional territories as subjects/targets of adaptation planning and MRE as analytical aspects

10. Figure: Space interpretations and their possible application in an analysis of adaptation policy's spatiality. Source: Sütő, 2024.

4. MATERIALS AND METHODS OF THE EMPIRICAL RESEARCH

Chapter 4 introduces the scope, subjects and tools of the empirical work phase. A dedicated subchapter even details the dissertation's concept of spatial sensitivity, developed by the author, elaborated especially for the comparative document analysis, on the basis of the space definitions and interpretations of disciplines/fields described by Annex #2 and Chapter 3.6.

4.1. Subject of the empirical research

As outlined above, the main goal of the research is to examine the presence and degree of spatiality-related content/emphases in European national climate adaptation policy activities. Within the framework of the dissertation, a comparative analysis has been conducted, focusing on explicit national-level policy planning and MRE instruments. The analysis was based on a predefined analytical aspect system (SÜTÖ, 2025B). The main tool (the document analysis) has partly been complemented with questionnaire-based e-mail interviews to gain soft information as well; and a complementary correlation analysis to examine the main factors influencing the national adaptation policies' spatial sensitivity.

Regarding the **chosen spatial level of the analysis**, the national level was selected, focusing on European states. As the literature review already has shown, the local level is "overexamined"; while the regional and the national levels were analysed to a lesser extent. Out of these two levels, the national gets somewhat bigger emphasis in the literature, but to make a Europe-wide comparison of the regional level (NUTS 2 or 3) units, the difficulties in managing the number of analytical units due to the time and resource constraints of my one-man project proved to be overwhelming. The dissertation preferred finally the **comparative assessment of national-level policy planning tools from European countries** instead of the same analysis of all or a chosen pool of European regions. Although spatial diversity can be considered stronger at the regional level than at the ab-ovo coordinative, comprehensive national one, some spatial characteristics, if they exist, could also be grasped in state-level documents and activities as well. With this in mind, we can start the comparative assessment.

4.1.1. Adaptation policy planning instruments

What we consider adaptation policy instruments in the framework of the research is the **entirety of the tools related to the climate adaptation-oriented strategic planning cycle**, from strategic planning through monitoring and reporting to evaluation. Consequently, the empirical research implemented a comparative analysis of European

countries' national-level adaptation planning (national adaptation strategies – NASs; and programmes/action plans - NAPs) and MRE materials (monitoring background materials, indicator set descriptions, evaluation methodology studies, actual monitoring and evaluation reports, etc.). Due to time and resource constraints, different generations of the documents (e.g. NASs, NAPs) have not been compared to each other; so, monitoring the possible changes in approaches and spatial emphases in a given country was not part of the research. At the same time, in each analysed country, when more generations of NAS/NAP documents were available, I examined only the most up-to-date and accessible ones.

Swart and his colleagues in 2009 defined adaptation strategies, based on the UNDP definition, as a planning document comprising directions to manage impacts and consequences of climate change, providing policies and measures to reduce a country's vulnerability. These policies and measures, according to the authors, can either target different vulnerable sectors, regions and populations, or can concentrate only on one or two sectors/territories (SWART ET AL, 2009). Similarly to Swart and his colleagues, we worked with National Adaptation Strategies and National Adaptation Programmes/Action Plans developed by the respective ministries/background institutes/agencies for adoption by national decision makers. The **number of available MRE materials was significantly smaller** – in these cases we tried to **consider all available documents, even more generations of them from a given country**. All in all, the vast majority of the analysed materials were NASs/NAPs.

4.1.2. Geographical and time context

One of the most important basic conditions of an adequate analysis is the proper definition and description of the research's time and geographic frames. The latter, beyond the spatial extent of the analysis, comprises macro-regional contexts within the continent too, as foundations to define positions of the countries within Europe.

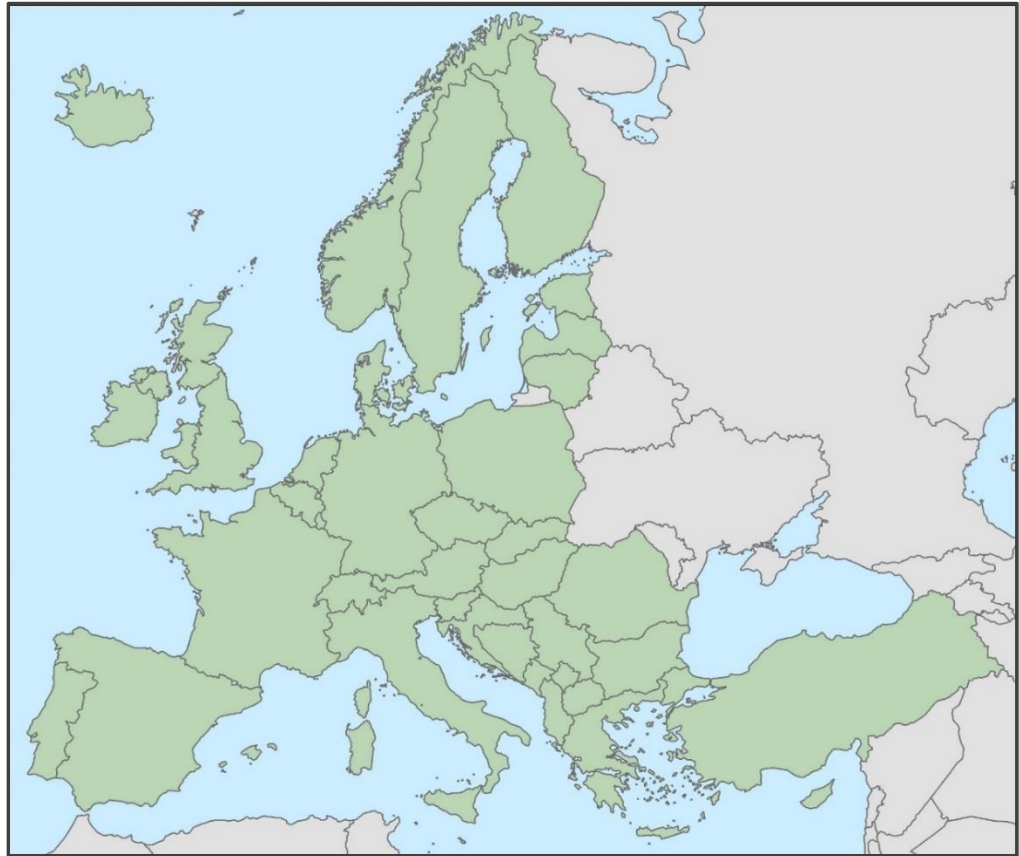
4.1.2.1. *Geographical and time scope of the analysis*

As for the **geographical frameworks** of the research, **the analysis concentrates** first and foremost on Europe, more exactly **on the majority of the continent's countries**. The majority, because not all countries of the continent are part of the analysis: the empirical part includes only the EU countries, complemented with Iceland, Norway, Switzerland and the UK from the European Economic Area, all of the Western Balkan states as countries that strongly strive for EU accession and Türkiye. From the former Central-European socialist bloc and Soviet successor states, I focus rather on the former group and leave the second out of the analysis, concentrating explicitly on the “Eastern-Central-European” area. Thus, **basically, the European Environmental Agency**

member states compose the group of analysed countries. The mini states (Lichtenstein, the Vatican, Andorra, Monaco, San Marino) were also left out, with the exception of Luxembourg, which is somewhat bigger than the others: the main topic of the research, spatiality and spatial differences cannot be adequately interpreted at the national level in too small countries. Due to document and information availability reasons and the lower emphasis put on explicit climate adaptation planning and MRE issues, Russia and the Soviet successor states were also left out from the above mentioned group of eastern socialist countries, with the exception of the Baltic states, which area, due to its historical and social roots, is closer to the Eastern-Central-European region than to the former Soviet-Union (SÜTÖ, 2025B).

There is one more special approach in the geographical framework of the empirical work phase. Although the UK is officially one state, due to the presence of strong devolution processes affecting even adaptation policy, **the four main parts of the UK (England, Scotland, Wales and Northern Ireland) were analysed separately** in the comparative assessment. The richness of planning and MRE documents and the content-wise depth of these materials in these country parts, as well as the internal logic of the national climate adaptation policy in the UK, made it worth treating these country parts as individual analytical units.

Regarding **the time scope**, considering that adaptation is a relatively new field (the EU-level strategic frameworks has been recently established and regular national/regional/local planning cycles have only begun since the early 2010s in Europe) the research concentrates on **the period of the last 1-1,5 decades**, comparatively analysing the national level planning and MRE documents of adaptation policy, and results of the first complete MRE cycles from the different states (SÜTÖ, 2025B). As we have already mentioned, **the analysis is static, focusing on the most recent planning documents. The collection of materials was closed in August 2025.** NAS, NAP or MRE documents that were published or made available only after that date had not been taken into consideration in the research.



11. Figure: Delimitation of the analysed area. *Source: own editing.*

4.1.2.2. Context of macro regional differences

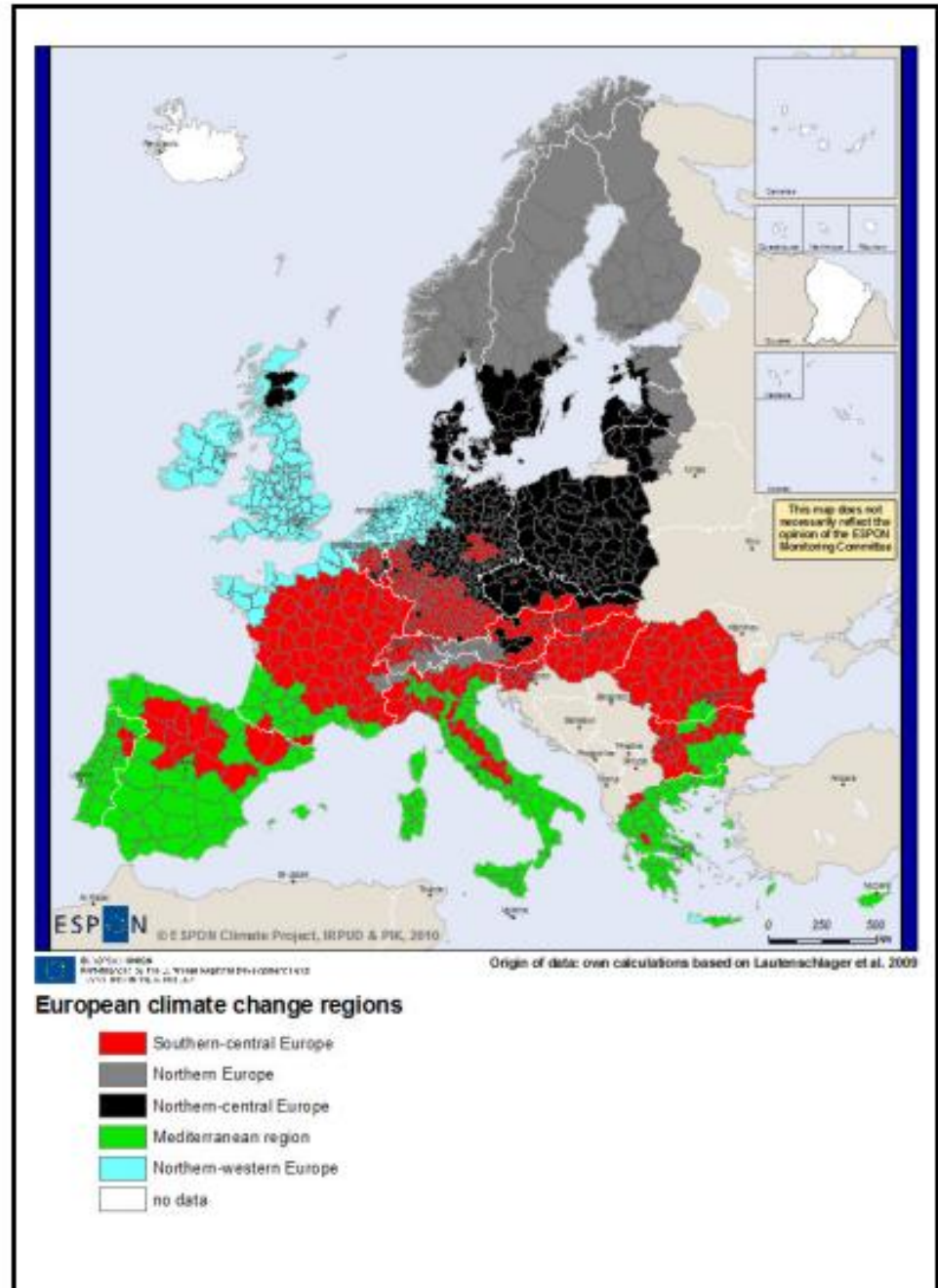
The last part of the empirical analysis focuses on potential (macro regional) differences between the different groups of countries in terms of climate adaptation planning, MRE and these activities' spatiality. The basis of the research logic roots back, on the one hand, to Greiving and Fleischhauer's study, which stated that in 2010, climate change impacts in Europe were distributed differently in regions due to the variation of climatic endowments, showing some common spatial (regional) patterns (macro regions suffering from challenges). These regional differences may influence the design of the national adaptation strategies (GREIVING-FLEISCHHAUER, 2010 and 2012). On the other hand, according to my practical professional experience in planning and MRE so far, independently from the covered sector (regional development, settlement development, physical planning, tourism development, economic development, development policy planning) and based on the related literature (ILLÉS, 2002; DAMSGAARD ET AL., 2011; EEA, 2015 AND 2022; PRINGLE ET AL., 2017; SALAMIN, 2018, etc.), a basic spatial picture stands out. In accordance with these the Western and Northern parts of Europe show significantly greater traditions of long-term, conscious strategic planning than Eastern and Central Europe, thanks to the earlier-began spreading of these activities in the more developed, urbanized parts of Europe, and due to the fact that straight after the

1989-90 regime changes in the former Eastern bloc, the four decades of centrally planned economies depreciated the concept and activity of “planning” in the region. Although a renaissance of planning could be observed around the Millennium in Eastern-Central Europe, it is still difficult to catch up with Western and Northern regions and overcome the decades-long disadvantage.

To decide whether sensitivity to spatial aspects in adaptation policymaking depends on the macro-regional location of a given European country or not, countries must be compared, but first, European macro-regions **must be delimited in the research**. By grouping the analysed European countries, as a practical side effect, we could also split the empirical work phase into some different, consecutive sections, analysing countries of a given macro region in a given stage (SÜTÖ, 2025B). The question is, what kind of macro regions should be delimited within Europe? The description of delimitations below is based on my latest publication about the research (SÜTÖ, 2025B); however, the original article’s statements have been updated according to my recent findings.

The most frequent examples of European macro regions in the different literature items or policy documents are basically the results of the traditional Northern/Western/Southern Europe division, complemented with Eastern Europe. The first three macro regions’ delimitation is more or less clear. A similar group of countries are classified into these regions in different works. At the same time, Eastern-Europe is a bit tricky. Probáld, after having reviewed the several nomenclatures, delimitations and the social, economic and geographic characteristics of European countries, grouped the states into 5 main regions (Western, Southern, Northern and Eastern Europe, plus the Baltic states). The fourth group was split into 2 additional sub-groups: Western-Central and Eastern-Central Europe. Regarding the latter, Probáld said it comprises the Eastern parts of Central and Southern Europe (the latter is the Balkan Peninsula without Greece) (PROBÁLD ET AL., 2000)⁸⁶.

⁸⁶ Regarding Eastern Europe, Probáld said it comprises the Eastern part of Central-Europe and South-Europe (the Balkan Peninsula without Greece). He overviewed the several nomenclatures and delimitations and considered the region as a group of small and medium sized states created/evolved during the 19th-20th centuries. Their common character is the location on the frontier of West and East (I must add: geopoliticians would call the corridor the border of German and Russian interest zones), and as a consequence, followed special historical development pathways and show economic structural features as heritage of the second half of the 20th century. The mosaic-like social landscape caused by political and ethnic fragmentation resulted in turbulent centuries rich in border conflicts. Probáld emphasises that before 1990, the cold war era discussions considered everything through the mirror of East-West dichotomy, so the Central-Europe concept was getting lose its importance. In Hungary economic studies used the term Central-Eastern Europe (actually Eastern- AND Central-Europe meant Russia and the Socialist bloc). Other works applied the term Central Europe’s eastern half for Russia and the satellite states. Today even the EU uses the Central-Eastern Europe terminology for this area, however, in Hungarian Central-Eastern Europe means the central part of Eastern Europe and not the Eastern part of Central Europe (PROBÁLD ET AL., 2000).



12. Figure: “Climate Change Regions” of Europe according to the ESPON Climate project. *Source: ESPON CLIMATE (2011).*

Similarly, Illés also collected different history-, ethnography-, politics- and economics-oriented Eastern- and Central-European definitions and delimitations, especially emphasising the role of politics. He mentioned that some theories, such as the Mitteleuropa or the Zwischeneuropa concepts, even differentiate a third region between East and West, an area with special geopolitical position and unique strategic

challenges⁸⁷. After 1990, the ex-satellite states of the Soviet Union composed this group, whose countries often emphasised their differences from Balkan states then (ILLÉS, 2002).

Applied research-related approaches also emerge. The ESPON Climate project's interim and final reports presented in 2011 the results of a cluster analysis of eight indicators, which led to a typology of regional climate change in Europe (see Figure 12)⁸⁸. The project delimited 5 different climatic subregions (South-Central, North-Central, Northern, North-Western and Southern Europe and distinguished even the Alpine mountainous region) (ESPON, 2011). In a then-recent DG Regio study from 2009 concentrating on climate challenges of European regions, the foundation of the selection of applied country studies was that all five above-mentioned regions identified by ESPON, must be represented by at least one case study (DG REGIO, 2009).

If we are looking for even more practice-oriented delimitations, approaches of EU-level strategic documents/regional policy tools can be mentioned. The 2011 Territorial State and Perspectives of the European Union (TSP) document⁸⁹, as the background document of the then actual Territorial Agenda of the EU, dedicated an individual chapter for the spatial potentials and challenges of Europe, presenting four main macro regions facing similar challenges (Figure 13). Besides Western, Southern and Northern Europe, the Eastern part of Central Europe („the Central-Eastern”) was also identified (Figure 13). It included most of the then-new (post-2004) EU Member States⁹⁰ (DAMSGAARD ET AL., 2011).

⁸⁷ Similarly to Probáld, Illés also collected the different history-, ethnography-, politics- and economics-oriented Eastern- and Central-European definitions and delimitations in his 2002 book called “Central- and South-eastern Europe in the Millennium: Transformation, integration, regions”, especially emphasising the role of politics in the creation of these delimitations. He mentioned that some concepts used the traditional East-West dichotomy, while some others even differentiate a third region between East and West, an area with special geopolitical position and unique strategic challenges. These latter ideas concentrate especially on political and historical endowments. One group of this approach focuses on “Central-Europe” based on the German “Mitteleuropa” concept, under which they initially understood the eastern territories inhabited by German population, later the territories of the German and Austro-Hungarian empires, depicting the German orientation of Central Europe. The other main subgroup is called “Zwischeneuropa” or “In-between-Europe” concepts. These have weaker historical but stronger geopolitical roots. The essence of the idea strived for counterweighing the influence of German and Russian dominance. The creation French-based cordon sanitaire of Petite Entente states after 1918 is a good example for this (ILLÉS, 2002).

⁸⁸ The typology was developed on the basis of the so called CLM climate model and calculated with the A1B emission scenario. The cluster analysis was based on projected climate changes between the time periods 1961-1990 and 2071-2100. Obviously, such a typology has to be rather rough and can only reflect regional specifics in a limited way (ESPON, 2011).

⁸⁹ The document was presented at the Informal Meeting of Ministers responsible for Spatial Planning and Territorial Development on 19th May 2011 Gödöllő, Hungary

⁹⁰ Regarding their characteristics, similar features emerged than in the studies of Probáld and Illés, complemented with demographic, economic and settlement network-related development endowments. The TSP also described the characteristics of the Western and Northern macro regions, as the regions of the most developed and highly urbanised areas with high levels of GDP per capita and high standards of living, highly developed competitive and considerably specialised economy, post-modern and healthy society and net migration gain. The driving forces of their development are innovations, knowledge and socio-economic transformation. Furthermore, the more developed culture of strategic planning, monitoring and evaluation activities is mentioned (DAMSGAARD ET AL., 2011).



13. Figure: Main European geographical regions (zones). *Source: Damsgaard et al, 2011.*

The EU's regional development policy has addressed European macro regions since the middle of the 2000s (ILLÉS, 2002). In the current programming period, transnational cooperation, coordinated by the Interreg B programme, allows for collaboration over larger transnational territories or around sea basins,⁹¹ promoting better cooperation across countries within the designated regions. Out of the current 12 macro regions, different groupings of them compose the above mentioned 4 macro regions (Northern, Southern, Western, Central-Eastern) e.g. the Central, the South-Eastern and the Danube regions cover roughly the territory of Eastern-Central-Europe; South-Western Europe, the Mediterranean region and the Adriatic-Ionian region, the territory of Southern Europe, etc.⁹² (Figure 14).

⁹¹ In some programmes, even non-EU countries (third countries such as Iceland or Lichtenstein), enlargement and neighbourhood partner countries, and OCTs (The Overseas Countries and Territories) are also involved, with the aim of achieving stronger territorial integration (ec.europa.eu, time of downloading was 29/09%2025).

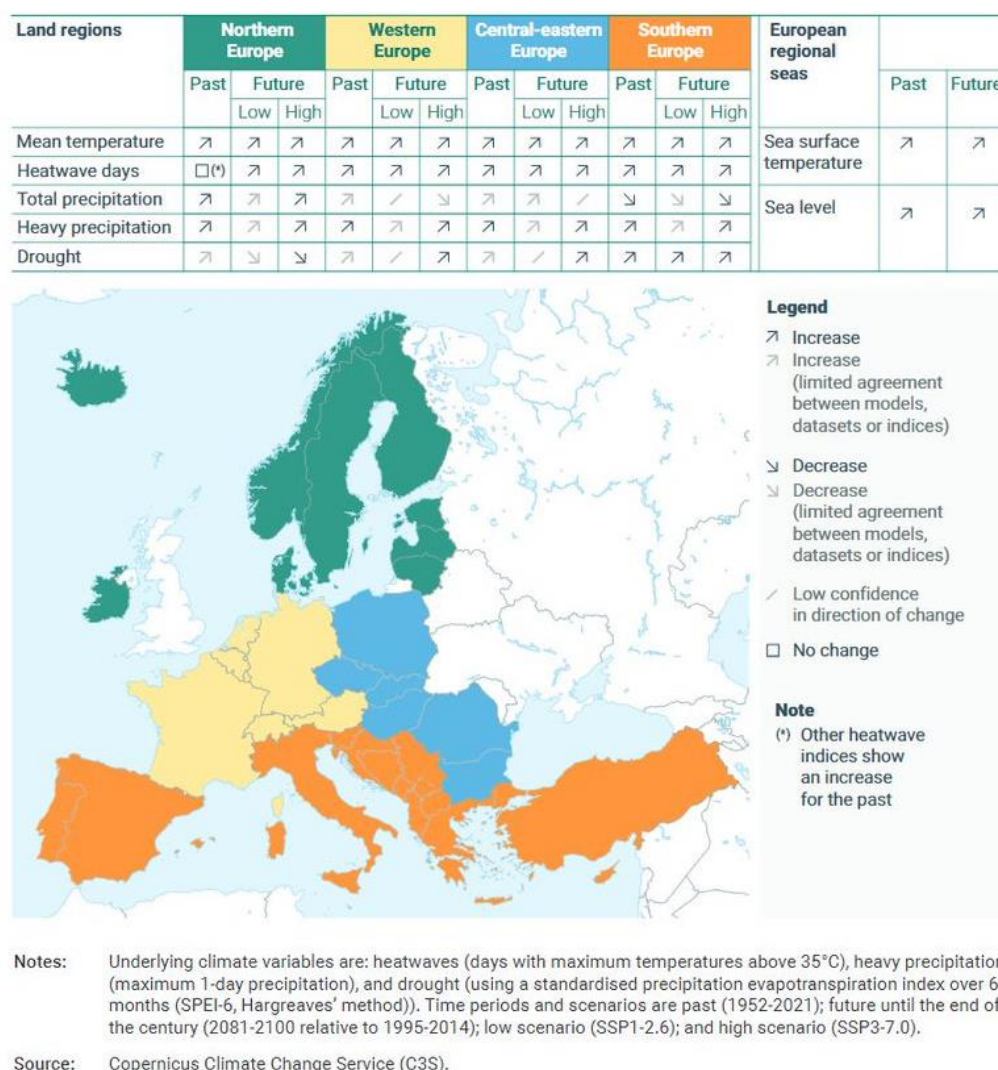
⁹² https://ec.europa.eu/regional_policy/policy/cooperation/european-territorial/trans-national_en ; downloaded on 18.05.2025.



14. Figure: The macro regions of the 2021-27 EU Interreg programme. *Source: Interreg B Programme, ec. europe.hu.*

The most up-to-date climate change-related practice-oriented delimitation is that of the first European Climate Risk Assessment Report (EUCRA). The document supports the identification of adaptation-related policy priorities at EU level, identifying 36 climate risks across Europe with potentially severe consequences. It assessed risk severity for Europe as a whole, comprising the 38 EEA member and 6 cooperating countries. However, the EUCRA also considers four subcontinental macro regions within the continent (see Figure 15). The logic behind this classification is that if the severity of a given risk in one of the sub-continental regions is substantially higher than the European average, then it is assessed particularly for the given region. The 4 macro regions basically correspond with the above-introduced 4 main ones – small differences can be detected, however. The Baltic states and Ireland in this delimitation belong to Northern

Europe and the Western Balkans to Southern Europe; otherwise, the logic follows those of the above-introduced ones (EEA, 2024).



15. Figure: Observed and expected major climate risk factors in different European macro regions interpreted by the EUCRA. Source: EUCRA, based on Copernicus climate change service (C3S).

In my geographical and political-historical delimitation, I basically follow the mixture of the EUCRA and TSP-classifications, with some adjustments (Table 1). The Northern, Western and Southern regions are more or less the same as the EUCRA ones. However, in my research, the Eastern region's delimitation is based on the above-mentioned Eastern-Central European (Mitteleuropa, Zwischeneuropa, TSP's Central-Eastern region) concepts with greater emphasis on historical and cultural roots, connections and development pathways than on natural environmental issues. I practically complemented the EUCRA's Eastern region, including the Baltic states and the three southern Slavic countries of the Carpathian Basin (Slovenia, Croatia, and

Serbia), plus Bulgaria. I considered other Balkan countries, similarly to the EUCRA, as part of Southern Europe. Another difference is that my Western Europe category comprises even Ireland and the parts of the UK as opposed to the pure climate impact-based EUCRA classification.

1. Table: Classification of the analysed countries into macro regions. *Source: own editing, based on EUCRA and TSP 2011.*

Macro regions	Northern Europe	Western Europe	Southern Europe	Eastern-Central Europe
states	Finland, Denmark, Iceland, Norway, Sweden	UK (England, Scotland, Northern-Ireland, Wales), Ireland, France, Belgium, The Netherlands, Luxembourg, Germany, Switzerland, Austria	Spain, Portugal, Italy, Greece, Malta, Cyprus, Türkiye, Northern-Macedonia, Kosovo, Albania, Bosnia and Herzegovina, Montenegro	Hungary, Czech Republic, Slovakia, Slovenia, Romania, Bulgaria, Poland, Estonia, Lithuania, Latvia, Serbia, Croatia

4.2. Measuring spatial sensitivity

To define the spatial content, or more exactly, the sensitivity to spatial content of the above-mentioned policy planning instruments (planning and MRE documents), or in other words, to measure the degree of spatial approach within them, a new notion/concept, “spatial sensitivity” is introduced by the research. This complex model tries to integrate the most important, utilisable elements of different space interpretations and approaches into an integrative concept (SÜTÖ, 2025B).

4.2.1. Model of spatial sensitivity

To make a proper theoretical foundation for the empirical analysis of the emergence of spatial/geographic aspects in climate adaptation policy planning activities, first, the dissertation collected space interpretations and concepts of given space-oriented scientific disciplines and practical fields (see Annex #2 and Chapter 3.6). Having done this, as Chapter 3.6. and the related article (SÜTÖ, 2024) already indicated, a wide variety of space interpretations emerges before us. The empirical analysis, seeking meanings and approaches of spatiality in climate adaptation policy, concentrates mostly on absolute and objective space interpretations of natural sciences and environmental geography, as well as on the relative approach of social and economic geography, regional geography, geopolitics, and regional studies. The research partly considers interpretations of those disciplines that focus mostly on internal space concepts (political and administrative studies, and partly even the regional studies), too. On top of these, even spatial approaches and related concepts of some practical fields (regional

development policy, strategic spatial, urban and land use planning) were also examined (SÜTÖ, 2025B).

Another interesting question is whether **awareness to spatial aspects emerge or is analysed in other policy fields**. Overviewing the available international literature, the notion “spatial sensitivity” mostly appears in medical, biophysical, biogeography-, or ecology-related articles, or in connection with land use- and risk management-oriented modelling (e.g. analysing subsurface permeability) or general spatial modelling utilizable for natural studies (e.g. analysing groundwater contamination, species habitat patterns) (e.g. BOLLIGER ET AL, 2007; LILBURN & TARANTOLA 2008; GILBERT ET AL, 2016; KOCH ET AL, 2017). The „spatial performance”- or “spatial content”-related meaning of my spatial sensitivity approach could be captured rather by the notion of territorial sensitivity, territorial dimension or territorial aspects. Territorial and spatial dimensions are usually examined in individual policy fields (GEOGHEGAN & GRAY, 2005, STEPNIAK & ROSIK, 2016, HAJDUGA 2023) or in spatial/territorial evaluations (GOLOBIC&MAROT 2011) or in governance techniques (MEDEIROS, 2017). Another group of works concentrates on the spatial contents of EU cohesion policy and sectoral policies and the ways to strengthen these through integration of spatial/territorial issues into sectoral activities either at European (FALUDI 2006 and 2013; SÜTÖ ET AL., 2010; ZAUCHA ET AL, 2012; MEDEIROS, 2017; ZAUCHA, 2017; HAVLÍK, 2021) or at national level (PÉTI ET AL., 2009; SALAMIN ET AL., 2010; BÖHME ET AL, 2020). But similar comprehensive analysis of sectoral policy documents or comparison of different sectors from a spatial point of view as is presented by my dissertation, did not emerge among the reviewed literature items during the last one and a half decade.

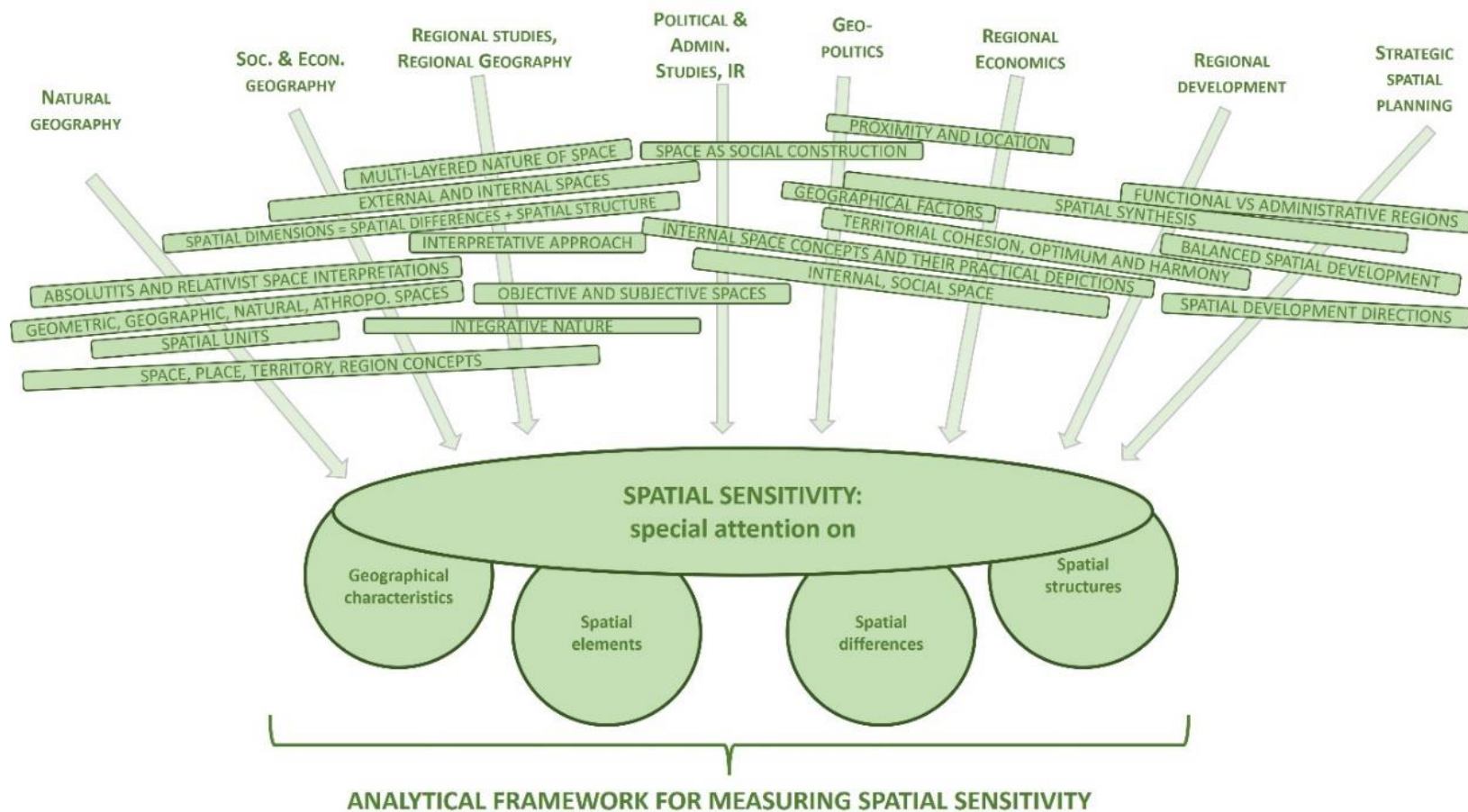
In the elaborated analytical aspect system (see Chapter 4.2.2.) the dissertation makes use of both **absolutist** and **relativist space interpretations**, concentrating on **objective as well as relative spaces**. Within the first category, both external space (localised outer space of given spheres with geographic space-attributions) and partly internal spatial structures and concepts of given spheres play an important role. Nevertheless, the **main focus of the dissertation’s spatiality concept is external spaces**; in the case of internal space, we analyse their external geographical manifestations at best. Regional studies’ regional analysis method and multilayered space interpretation are particularly useful aspects, **considering spatial dimensions as the presence of spatial elements** (points, networks, movements, etc.) within space, focusing on their **spatial differences and inequalities** as well as their **spatial configuration**. The main geopolitical and regional economics-related spatial approaches also play an important role through the geographical re-orientation of their mother disciplines, using basically the already

introduced geographical space with physical environmental elements as localised outer perspectives of politics and economics, with such decision-influencing factors as geographic proximity and places' locations. **Relativist, constructivist spatial approaches** emphasise the relational dimension, with space as a direct product of society made up from societal relations, where socially constructed internal and social space interpretations can influence society's practical (administrative) applied spatial structure, too. Even **applied policy-oriented space interpretations** were used, such as regional development policy's territorial cohesion-oriented conceptual background, strategic and spatial planning approaches and methodologies as well as the problem of functional territories versus administrative units (SÜTÖ, 2024).

Summarising the usability of these different space approaches and interpretations [introduced by Annex #2 and Chapter 3.6 as the updated form of my related conference article on the topic (SÜTÖ, 2024)], we can draw the conclusions in the form of an indicative definition for spatiality in adaptation policy planning (Figure 16 visualises this). So, a **spatially focussed approach**, in our point of view, means the consideration of the spatial/territorial aspects and interpretations listed by Annex #2 and Chapter 3.6. in thinking and activities. **Spatiality in policy making** means the constant and consequent taking of external and internal spatial elements and their geographic characteristics, spatial/territorial differences and spatial order into consideration within the absolute or relative space in the examined activities, namely planning and MRE. In other words, if the examined policy documents, their content, development directions and actions are significantly influenced by the geographic characteristics, spatially/territorially different natural/social/economic endowments and spatial structures (SÜTÖ, 2024); furthermore, they use some or any of the introduced space concepts and interpretations, that is understood as the presence of spatiality. It means the conscious consideration and analysis of regional differences, the application of a place-based and spatially integrative approach and the setting of spatially tailored objectives and actions for spatial units / region types.

Consequently, we consider **climate adaptation policy activities spatially sensitive** if they put significant weight on spatial dimensions and use any of the introduced space concepts and interpretations both in their evidence seeking phases (during elaboration of situation analyses, climate vulnerability or risk assessments), during decision making (climate adaptation vision- and objective system design and elaboration of adaptation measures), during setting up climate adaptation indicator sets, and conducting evaluations or establishing adaptation-oriented decision supporting systems. If these aspects are at least equal to the weight of the traditional sectoral approach (i.e. separated

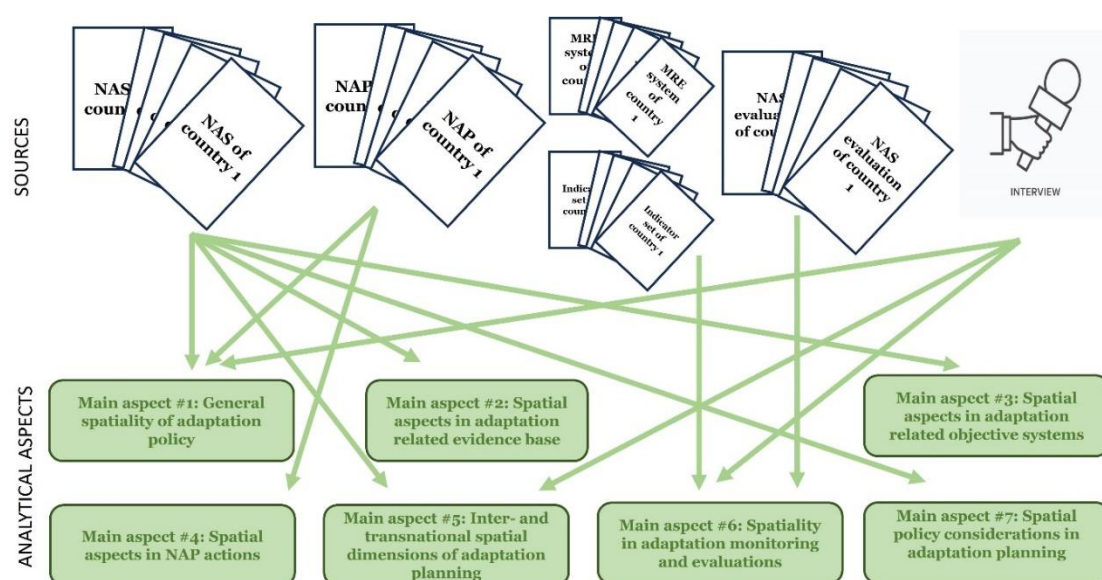
handling of different thematic fields parallel with each other) or even dominate it, then we can talk about a **spatially oriented approach**, or **spatial sensitivity** of these activities (SÜTÖ, 2025B). It is very important to note that the described connection between the currently observable two main directions of planning logic (the spatial and the prevailing sectoral approach) is not mutually linear: we do not suggest that if we simply diminish the weight of sectoral approach in adaptation planning and MRE it automatically means that spatial emphases would be growing. Nevertheless, if the consideration of spatial aspects and dimensions is increasing in the above-mentioned activities, it means that the former sectoral focus would diminish, as a matter of course. This spatial sensitivity has not (or barely) been examined yet scientifically and explicitly in the field of climate adaptation policy planning and MRE, however, the connection between the policy field and the geographical space and spatiality is inevitable as we saw from several points of view in the literature analysis. To make the initial research steps in this area, the dissertation's empirical work phase conducted a comprehensive pilot analysis (SÜTÖ, 2024).



16. Figure: The logic of the concept of “spatial sensitivity”. Source: own editing, based on Sütő, 2025.

4.2.2. Analytical aspects of national adaptation policy planning's spatial sensitivity

The comparative assessment of spatial sensitivity of the analysed countries' national adaptation policy planning was based on a predefined analytical aspect system, applying 7 main factors and for each factor 3-8 (altogether 34) sub-factors (Table 2). The exact methodology has been constantly refined over the last 3 years, articles published during the research show a continuous development (e.g. SÜTÖ, 2025B; SÜTÖ, 2025C). Through the analytical aspects (factors) and sub-aspects (sub-factors) the dissertation compared national-level adaptation planning and MRE-related documents (NASs, NAPs, monitoring or evaluation methodological background materials, actual monitoring and evaluation reports) of European countries. The analysis takes a critical lead, offering not just the description of the national characteristics parallel with each other but really compares the different countries' performances (SÜTÖ, 2025B) - the explicit system of analytical aspects serves this comparison.



17. Figure: Logic of the empirical work phase: sources and aspects of the comparative analysis.

Source: own editing.

The identification and selection of the final pool of aspects and sub-aspects followed a logic based on consideration of the available resource materials, the weight of the different phases within the planning cycle and complementary information. Taking into account these parameters, the majority of the analytical aspects concentrates on the strategic adaptation policy planning documents (NASs and NAPs) and their characteristics, dedicating 1-1 main analytical aspect for the situation analyses and the objective systems, 1-1 main aspect for the NASs' general international spatial and geopolitical emphases and for the coherence of these documents with spatial policy

priorities. A further main aspect concerns the spatiality of NAP actions. The reason for this is that within the planning cycle the actual planning itself still plays the most crucial role compared to the later phases (implementation, monitoring and evaluation), serving as a foundation of the later steps. Moreover, NAS and NAP documents are more widely available than MRE-related materials in the majority of the countries (mainly in Eastern, Northern and Southern Europe). Monitoring and evaluation are also important parts of the adaptation planning cycle, but they could be considered relatively less developed activities in this field so far, thus get only one main aspect in the analysis. At the same time, the assessment of the general spatial issues-related sub-aspects (the space phraseology of the documents, the emphasis on lower spatial levels' adaptation actions and planning activities) as well as the MRE- and the inter- and transnational spatial activities-related sub-aspects were based beyond the document analysis on information received from interviews. (Nevertheless interview-based soft information has also been used in the case of analytical aspects #2 and #3 as well) (Figure 17).

The following Table 2 summarises the analytical aspects, sub-aspects and their disciplinary connections and foundations – thus making connections between the actual analysis and its theoretical base described by Annex #2 and Chapters 3.6. and 4.2.1. Through the table, the reader can follow the internal logic of the analytical aspect system – in case of each sub-aspect the table indicates those disciplines/practical fields, whose main space concepts/interpretations meant the basis of the given analytical sub-factor.

2. Table: The analytical structure. *Source: own editing. The first column contains the main aspects (factors) of the analysis; the second column the sub-factors.*

Main aspects	Sub-aspects	Disciplines /fields							
		Environ- mental geography	Human geography	Regional study, regional geography	Political and admin. studies, IR	Geo- politics	Regional econo- mics	Regional develop- ment	Strategic and spatial planning
General spatiality of adaptation policy	<i>Space phraseology of NAS/NAP documents</i>								
	<i>Spatial /sectoral character of adaptation policy</i>								
	<i>Spatial levels of adaptation planning</i>								
	<i>Propagation of adaptation planning at lower spatial levels</i>								
Spatial aspect in adaptation	<i>Basic logic of the situation analyses</i>								

Main aspects	Sub-aspects	Disciplines /fields							
		Environ- mental geography	Human geography	Regional study, regional geography	Political and admin. studies, IR	Geo- politics	Regional econo- mics	Regional develop- ment	Strategic and spatial planning
	<i>Spatial visualization of the situation analyses</i>								
	<i>Spatial content of situation analyses</i>								
	<i>Consideration of European positions regarding climatic challenges</i>								
	<i>Spatial content of SWOT</i>								
	<i>Spatial content of narrative situation assessments</i>								
	<i>Spatial planning focus of situation analyses</i>								
Spatial aspects in adaptation-related objective systems	<i>Basic logic of NAS visions</i>								
	<i>Spatial content of NAS visions</i>								
	<i>Spatial content of the whole NAS objective system</i>								
	<i>Spatial focus of overall / strategic objectives</i>								
	<i>Proportion of lower-level objectives with spatial content</i>								
	<i>Spatiality's presence in horizontal goals</i>								
	<i>Spatial MRE focus of objective system- and vision-planning</i>								
	<i>Spatial visualization of the vision /objective system</i>								
Spatial aspects in adaptation- related actions	<i>Proportion of measures with spatial content</i>								
	<i>Proportion of spatial planning- related measures</i>								

Main aspects	Sub-aspects	Disciplines /fields							
		Environ-mental geography	Human geography	Regional study, regional geography	Political and admin. studies, IR	Geo-politics	Regional econo-mics	Regional develop-ment	Strategic and spatial planning
	<i>Proportion of spatial MRE-related measures</i>								
Inter- and transnational spatial dimensions of adaptation planning	<i>Emergence of climate change - related global spatial challenges as aspects for national security</i>								
	<i>Emergence of strengthening macro regional / international co-operations in climate adaptation</i>								
	<i>Emergence of strengthening macro regional / international influence in climate adaptation</i>								
Spatiality in adaptation monitoring and evaluations	<i>Spatial levels of data collection and adaptation monitoring activities</i>								
	<i>Spatial content of adaptation indicator sets</i>								
	<i>Presence of GIS-based DS system(s) in adaptation planning</i>								
	<i>The degree of spatial content in adaptation evaluations</i>								
	<i>Spatial visualization in adaptation evaluations</i>								
	<i>Spatial levels of adaptation evaluation</i>								
Spatial policy considerations in adaptation planning	<i>Consideration of national spatial policy objectives in NAS documents</i>								
	<i>Consideration of European regional development policy objectives in NAS documents</i>								
	<i>Emergence of territorial cohesion-related concepts in NAS documents</i>								

The list of the applied analytical aspects and sub-aspects are based basically, but not in its entirety on my latest publication of the research (SÜTÖ, 2025B) - the analytical aspect system has been further developed since the publication at several points. The final set of aspects is as follows:

1) **General spatiality of climate policies.** Here, the weight and character of spatiality in climate adaptation policy were examined in general through the „*space phraseology*” (*emergence of space-related concepts in the NAS/NAP documents’ text*) and the *basic logic and structure of climate adaptation in a given country* (are adaptation activities organised according to sectors or to territorial units/region types?). *Spatial levels of adaptation activities* have also been assessed to determine whether the NAS/NAP documents identify the main spatial/territorial levels of adaptation planning. A sub-aspect also searched for *signs of propagation of adaptation planning at lower spatial (regional/local) levels* in the NAS/NAP documents.

2) **Spatial aspects** have been examined *in evidence-based work phases*, exactly in the situation analyses and situation assessment parts (including SWOT analyses) of NAS/NAP documents. Here, the *basic logic* (sectoral or spatial) *of the situation analyses*, as well as the *degree of their spatial visualisation* (use of maps and regional figures/diagrams), were analysed. *The spatial content of situation analyses* has been examined through the appearance of region types, spatial units, spatial difference-searching logic, and settlement-network-related subjects in the respective chapters’ texts. *The spatial planning focus in situation analyses* is also interesting: to what extent do situation analyses/assessments deal with the connection between adaptation planning and spatial planning? The consideration of the *given countries’ position within Europe or their respective macro region from climate adaptation point of view* in the respective chapters was also examined. *SWOT analyses’ and narrative situation assessment chapters’ spatial content* have also been checked.

3) **Spatial aspects in NAS objective systems** were similarly in the focus of the empirical research. The *basic logic* (sectoral or spatial) and the *general spatial content* and *spatial visualisation of the adaptation visions and objective systems* have been analysed through the degree of appearance of region types, spatial units, spatial difference-searching logic and settlement-network related issues. *Spatial focus of general/specific/horizontal objectives* and the *proportion of lower-level objectives* (fields of intervention) *with spatial content* have been analysed. *Emphasis on spatially oriented MRE activities* within the objective system was evaluated as well.

4) Continuing the analysis with the operational planning level, **spatial aspects and content in adaptation-related actions** were examined. Here we applied as quantitative indices as possible, measuring the *proportion of NAP actions with general spatial focus*, *region type- or concrete place-related contents*; the *proportion of NAP actions with spatial planning-related* and *with spatial MRE-related contents*.

5) ***Inter- and transnational spatial dimensions of adaptation planning*** aspect examined the emergence of *climate change-related global or geopolitical risks* (migration, potential competition for resources, problem of supply chains, etc.) as *aspects for national security* within the introduced challenges of NAS/NAP documents. The *presence of strengthening macro-regional / international co-operations between countries in the field of adaptation policy* was also identified in some documents, while the *appearance of the intention to exert influence on other countries in the form of adaptation knowledge export or financial supports* were also identified in some cases.

6) ***Spatiality in adaptation monitoring and evaluations*** aspect sought traces of spatiality in adaptation-related monitoring activities. These have been analysed through the *identification of spatial levels of data collection and monitoring activities* within the description of MRE activities in NAS/NAP documents or in monitoring background materials. Where they exist, we try to identify *spatial content in adaptation indicator sets*. The *presence of geo-information-based decision support system(s) in adaptation activities, or the idea to develop such a system* has also been examined in the countries. Similar to monitoring activities, spatial aspects in adaptation-related evaluations have also been assessed. We tried to identify *the degree of spatial focus/content* as well as of *spatial visualisation in existing adaptation evaluation products*. Where *evaluation activities* exist, the *spatial levels* of them have been also identified.

7) The last aspect (***spatial policy considerations in adaptation planning***) was based partly on planning hierarchy and concentrated on the emergence of higher-level spatial objectives in national adaptation planning. It checked *the appearance of European-level spatial directions* (in the form of priorities of the then-actual Territorial Agenda of the EU) and *the emergence of national spatial/regional development objectives within the NAS/NAP documents' objective system*. Last but not least, the *presence of territorial cohesion-related phraseology of the European spatial policy* was also examined in NAS documents through the emergence of basic territorial cohesion-related concepts in the respective NAS chapters.

To complement the document analyses with soft or complementary information, I also conducted a questionnaire-based survey in the form of e-mail interviews targeting adaptation policy professionals, decision makers, planners in the examined countries. Unfortunately, from the 41 states/country parts I approached only 13 (Slovakia, Slovenia, Romania, Austria, Germany, the Netherlands, Lithuania, Estonia, Poland, France, Türkiye, Sweden, Finland) responded, but at least in their cases the national analyses could work with more nuanced information base. The transcripts of the interviews are presented by Annex #5a. Annex #5b also contains additional interview

results from another, related applied research project of mine, from 2020, with useful parts that have been utilised during my PhD studies (parts from interviews with adaptation professionals from Wales, the Netherlands, Germany and Switzerland).

As the main outcome, complex spatial sensitivity indicators have been calculated for each analysed country, based on the above-listed aspects. For each sub-factor, a country gets a given value: 5 points if the state were classified in the best, 3 if in the upper-middle, 1 if in the lower-middle and 0 if in the worst category. Attributed to each sub-factor the proper principles/rules of classification were defined in advance (see Table 3) to avoid subjectivity as much as possible (SÜTÖ, 2025B).

3. Table: Aspects and sub-aspects of the comparative document analysis. *Source: own editing.*

Main aspect	Sub-aspects	Best category	Upper-medium category	Lower-medium category	Lowest category
General spatiality of adaptation policy	<i>Space phraseology of the document</i>	<i>If the strategy and the action plan together applies space and other related concepts (space, spatiality, place, region, regional, territory, territorial, local, location, geography, geographical) relatively frequently (more than 700 mentionings) in their texts, the county goes into the best category; if there is only a strategy then more than 400 mentionings means the best category.</i>	<i>If in the strategy and the action plan together the number of mentionings is between 699-350, or if there is only a strategy and the number of mentionings is between 399-150.</i>	<i>If in the strategy and the action plan together the number of mentionings is between 350 and 50 or if there is only a strategy, and the number of mentionings are between 149 and 10.</i>	<i>If in the strategy and the action plan together the number of mentionings is under 50, or if there is only a strategy, and the number of mentionings is under 10.</i>
	<i>Spatial /sectoral character of adaptation policy</i>	<i>Beyond the national documents there are also formal regional adaptation strategies for special regions/spatial units as a systematic solution, elaborated and updated regularly, based on legislation.</i>	<i>There are scattered or ad-hoc planned regional strategies or large number of municipal strategies beyond the national one but without strict legislative basis.</i>	<i>Only sectoral adaptation strategies exist at maximum beyond the national level adaptation document, though the latter has some implicit mentioning of spatial logic.</i>	<i>Only sectoral adaptation strategies exist, and no spatial issues are detected in national climate policy documents.</i>
	<i>Spatial levels of adaptation planning</i>	<i>A dedicated NAS strategy chapter / part deals with the issue of national, regional and local level adaptation tasks.</i>	<i>Both national and lower (regional, local) levels are mentioned by the strategy/legislation as levels of adaptation actions, activities, but no dedicated chapter exists.</i>	<i>Only vague references are there to national and regional OR national and local level.</i>	<i>Only the national level is mentioned in the NAS.</i>
	<i>Propagation of adaptation planning at lower spatial levels</i>	<i>The national level strategy propagates adaptation planning at lower territorial levels explicitly, as a nominated objective/measure of the strategy/action plan.</i>	<i>The national level strategy propagates adaptation planning at lower territorial levels strong implicitly, in the descriptions of the objectives or other chapters of the strategy.</i>	<i>Only sectoral planning is urged and there are only vague references to planning at lower spatial levels in the NAS.</i>	<i>No propagation of such activities emerges in the NAS.</i>
Spatial aspects in adaptation-related evidence base	<i>Basic logic of the situation analyses</i>	<i>The situation analysis has special spatial logic, structured according to spatial units/region types.</i>	<i>The situation analysis has a separated spatial chapter or 2 or more region type-oriented subchapters or concentrates on territorial differences throughout its entirety.</i>	<i>No spatial chapter but all/majority of sectoral chapters mention even relevant spatial issues or there is one region type oriented subchapters.</i>	<i>The situation analysis is structured exclusively by sectors.</i>
	<i>Spatial visualization of the situation analyses</i>	<i>The situation analysis subchapters contain several thematic maps and regional data-related figures in connection with each sector (altogether more than 7).</i>	<i>The situation analysis subchapters contain 4-7 thematic maps/ figures of regional data.</i>	<i>The situation analysis subchapters contain 1-3 thematic maps/ figures of regional data.</i>	<i>There are no thematic maps/regional figures in the situation analysis subchapters.</i>

Main aspect	Sub-aspects	Best category	Upper-medium category	Lower-medium category	Lowest category
	<i>Spatial content of situation analyses</i>	<i>Dedicated situation analysis subchapter(s) deal consequently with all of the listed topics (region types, concrete places, functional territories, settlement network elements, territorial differences) with great emphasis.</i>	<i>Situation analysis subchapters deal consequently with 2-3 of the listed topics with great emphasis.</i>	<i>Only scattered presence of territorial/spatial references, with 1-2 types of the listed spatial topics in few subchapters.</i>	<i>The situation analysis does not mention any of the listed topics.</i>
	<i>Consideration of European positions regarding climatic challenges</i>	<i>A special, dedicated chapter or subchapter deals with the topic of climate impacts in the respective macro region and the topic is recurring throughout the whole strategy.</i>	<i>A part of a subchapter deals with the macro regional situation of climate change or only the climatic chapters have related parts.</i>	<i>There is global or European outlook maybe with maps, but special macro regional emphasis is lacking.</i>	<i>No European or macro regional outlook at all.</i>
	<i>Spatial content of SWOT</i>	<i>The SWOT mentions 4-5 of the listed topics (region types, concrete places, functional territories, settlement network elements, territorial differences).</i>	<i>The SWOT mentions 2-3 types of the listed topics.</i>	<i>The SWOT mentions only 1 type of the listed topics.</i>	<i>The SWOT does not mention any of the listed topics.</i>
	<i>Spatial content of narrative situation assessments</i>	<i>The situation assessment part mentions 4-5 of the listed topics (region types, concrete places, functional territories, settlement network elements, territorial differences).</i>	<i>The situation assessment part mentions 2-3 types of the listed topics.</i>	<i>The situation assessment part mentions only 1 type of the listed topics.</i>	<i>The situation assessment part does not mention any of the listed topics.</i>
	<i>Spatial planning focus of situation analyses</i>	<i>The situation analysis dedicates a special chapter/subchapter to the introduction of spatial planning's role in adaptation.</i>	<i>The situation analysis mentions spatial planning in one or more subchapters as an important activity.</i>	<i>Only weak reference to spatial planning can be detected (e.g. spatial contexts of some region/settlement type's climate-related problems are mentioned or coherence with national spatial planning is introduced in general).</i>	<i>The situation analysis does not mention anything regarding the issue.</i>
Spatial aspects in adaptation-related objective systems	<i>Basic logic of NAS visions</i>	<i>The Vision chapter is structured according to a spatial logic (by spatial units/region types).</i>	<i>Within the Vision a separated part/paragraph is dedicated for special spatial aspects.</i>	<i>The Vision chapter mentions spatial issues/places implicitly (e.g. emphasizing diversity or importance of different spatial levels or talks about areas in general).</i>	<i>The Vision chapter is structured exclusively by sectors/themes.</i>
	<i>Spatial content of NAS visions</i>	<i>The Vision explicitly mentions 1) special geographic areas' or 2) settlement network elements', 3) region types' or 4) functional areas' (FUAs, CBCs, macro regions) vulnerability characteristics, 5) general spatial logic, spatial approach (e.g. focus on spatial mapping, spatial differences).</i>	<i>The Vision mentions only 2-3 types of the listed aspects.</i>	<i>The Vision mentions only 1 type of the listed aspects and rather in a general form.</i>	<i>The Vision does not mention any of the listed aspects.</i>
	<i>Spatial content of the whole NAS objective system</i>	<i>The different levels of the objective system explicitly mention 1) special geographic areas' or 2) settlement network elements', 3) region types' or 4) functional areas' (FUAs, CBCs, macro regions) vulnerability characteristics, 5) general spatial logic, spatial approach (e.g. focus on spatial mapping, spatial differences).</i>	<i>The different levels of the objective system mention only 2-3 type of the listed aspects.</i>	<i>The different levels of the objective system mention only 1 type of the listed aspects but only vaguely (emphasizing diversity in a given sector, or tasks of different spatial levels or areas in general).</i>	<i>The different levels of the objective system do not mention any of these topics.</i>

Main aspect	Sub-aspects	Best category	Upper-medium category	Lower-medium category	Lowest category
	<i>Spatial focus of overall / strategic objectives</i>	<i>Both the general and all or the majority of specific objectives target at given territorial unit / regional type or generally deal with spatial differences/structures.</i>	<i>Some specific objectives target at given territorial unit / regional type or generally deal with spatial differences/structures.</i>	<i>Only 1 specific objective deals with spatial issues or one or more refer in their description to national level spatial vulnerability inequalities / spatial structures.</i>	<i>Neither the general nor the specific objectives mention any territorial unit / regional type / general spatial differences.</i>
	<i>Proportion of lower-level objectives with spatial content</i>	<i>Proportion of lower-level objectives dealing with spatial issues (territorial unit / region type or general spatial differences/structures) even in their title or their description is above 40%.</i>	<i>Proportion of lower-level objectives dealing with spatial issues is between 20-40 %</i>	<i>Proportion of lower-level objectives dealing with spatial issues is between 5-20%</i>	<i>Proportion of lower-level objectives dealing with spatial issues is below 5% OR the given NAS/NAP does not contain lower-level objectives anyway.</i>
	<i>Spatiality's presence in horizontal goals</i>	<i>More than one horizontal goal/goals nominate spatial issues (e.g. use of spatial logic, focusing attention on regional vulnerability and resilience, taking into consideration spatial diversity, propagation of place-based approach, and principles of sustainable land use, etc.).</i>	<i>Only one horizontal goal deals with spatial issues explicitly.</i>	<i>Only related principles emerge (e.g. subsidiarity, decentralization, governance, etc.).</i>	<i>No horizontal goal deals with the listed topics.</i>
	<i>Spatial MRE focus of objective system- and vision-planning</i>	<i>Among the objectives and vision paragraphs a higher-level objective and/or a Vision paragraph nominate the importance of national or regional MRE development in adaptation.</i>	<i>One lower-level objective/one Vision sentence deals with the MRE aspects directly.</i>	<i>Only weak references emerge to adaptation-oriented sectoral MRE issues in the descriptions of the objectives or in the text of the Vision.</i>	<i>Neither the Vision, nor any of the objectives mention the importance of national or regional MRE development in adaptation.</i>
	<i>Spatial visualization of the vision /objective system</i>	<i>The Vision chapter and/or the objective system chapters contain more than 3 figures (cognitive objective maps, graphs, figures about spatial directions of adaptation interventions, photographs) in connection with the intended goals or the localization of the objectives.</i>	<i>The Vision chapter and/or the objective system chapters contain 2-3 visual elements about spatiality or regional examples.</i>	<i>The Vision chapter and/or the objective system chapters contain only 1 visual element about spatiality or regional examples.</i>	<i>There is no visual element about spatiality or regional examples in the vision chapter and the objective system chapters.</i>
Spatial aspects in adaptation-related actions	<i>Proportion of measures with spatial content</i>	<i>Proportion of the actions focusing on spatial issues (spatial unit or region/settlement type or general spatial differences or structures) even in their title or in their description is above 40%.</i>	<i>Proportion of the actions focusing on spatial issues even in their title or in their description is between 30-40 %.</i>	<i>Proportion of the actions focusing on spatial issues even in their title or in their description is between 20-30%.</i>	<i>Proportion of the actions focusing on spatial issues even in their title or in their description is below 20%.</i>
	<i>Proportion of spatial planning-related measures</i>	<i>Proportion of the actions dealing with spatial planning issues even in their title or their description is above 10%.</i>	<i>Proportion of the actions dealing with spatial planning issues even in their title or their description is between 5-10 %.</i>	<i>Proportion of the actions dealing with spatial planning issues even in their title or their description is between 0-5%.</i>	<i>No actions dealing with spatial planning issues neither in their title nor in their description.</i>
	<i>Proportion of spatial MRE-related measures</i>	<i>Proportion of the actions dealing with spatial adaptation MRE issues even in their title or their description is above 10%.</i>	<i>Proportion of the actions dealing with spatial adaptation MRE issues even in their title or their description is between 5-10 %.</i>	<i>Proportion of the actions dealing with spatial adaptation MRE issues even in their title or their description is between 0-5%.</i>	<i>No actions dealing with spatial MRE issues neither in their title nor in their description.</i>

Main aspect	Sub-aspects	Best category	Upper-medium category	Lower-medium category	Lowest category
Inter- and transnational spatial dimensions of adaptation planning	<i>Emergence of climate change -related global spatial challenges as aspects for national security</i>	Explicit, nominated reference to the issue emerges among the objectives/measure groups' titles or in the form of a dedicated situation analysis chapter.	Explicit reference to the issue emerges in the document in the description of objectives/measures' or in the title of several individual measures or in the situation analysis' textual parts.	Only implicit reference to the issue emerges in the description of objectives/measures or in the situation analysis.	There is no reference to the topic in the NAS.
	<i>Emergence of strengthening macro regional / international co-operations in climate adaptation</i>	Explicit, nominated reference to the issue (international scientific or knowledge sharing cooperation, macro regional or cross-border development or sectoral cooperations) emerges among the objectives/measure groups' titles or in the form of a dedicated situation analysis chapter.	Explicit reference to the issue emerges in the document in the description of objectives/measures' or in title of several individual measures or in the situation analysis' textual parts.	Only implicit reference to the issue emerges in the description of objectives/measures or in the situation analysis.	There is no reference to the topic in the NAS.
	<i>Emergence of strengthening macro regional / international influence in climate adaptation</i>	Explicit, nominated reference to the issue (financing of interventions or development programmes in, or exporting adaptation knowledge to developing countries) emerges among the objectives/measure groups' titles or in the form of a dedicated situation analysis chapter.	Explicit reference to the issue emerges in the document in the description of objectives/measures' or in the title of several individual measures or in the situation analysis' textual parts.	Only implicit reference to the issue can be detected in the description of objectives/measures or in the situation analysis.	There is no reference to the topic in the NAS.
Spatiality in adaptation monitoring and evaluations	<i>Spatial levels of data collection and adaptation monitoring activities</i>	There is a functioning monitoring system in adaptation, using lowest-as-possible level spatial data.	Monitoring system is planned in adaptation, in the form of an action or objective of the NAS/NAP, with hints for spatial data use.	Only sectoral monitoring is planned /exists or a general climate policy monitoring system is planned in the form of an action or objective of the NAS/NAP, without spatial references.	No monitoring system exists in adaptation anyway.
	<i>Spatial content of adaptation indicator sets</i>	There are both impact/result and output indicator sets in adaptation, concentrating among other things on special geographic areas / regions / administrative units.	There are lower-level objective-related impact/result indicators (and possibly output indicators), but neither territorial breakdown nor any geographic/regional specification can be identified.	Mostly output indicators are gathered in the indicator system, (at maximum few result indicators exist related to specific objectives) without spatial focus; or the indicator system is just under planning.	No adaptation indicator system is present in the country.
	<i>Presence of GIS- based DS system(s) in adaptation planning</i>	There is a functioning adaptation-oriented multi-thematic GIS-based decision support (DS) tool in the country.	Adaptation-oriented thematic GIS-based DS tool is planned in the form of an action or objective in the NAS/NAP or a functioning system concentrates only on climatic data.	Adaptation knowledge base website exists in the country, or several sectoral websites are functioning /planned but without signs of GIS/DS functions.	Neither thematic GIS-based DS tools nor climate adaptation websites are present in the country.
	<i>The degree of spatial content in adaptation evaluations</i>	Explicitly (in some cases even in their title) geographically/spatially oriented evaluation products (rich in spatial chapters, analytical aspects, evaluation questions) exist in the country.	Large number of adaptation-oriented evaluation products exists, within an established system but with minor or no spatial content.	Only 1 NAS evaluation is available without or with minor spatiality; or only the NAS/NAP aims the setting up of an evaluation system or elaboration of assessments, but no evaluation products is available in practice yet.	Neither the NAS/NAP mentions evaluations, nor any assessment documents are available.

Main aspect	Sub-aspects	Best category	Upper-medium category	Lower-medium category	Lowest category
	<i>Spatial visualization in adaptation evaluations</i>	Consequent and frequent emergence of explicitly geographically oriented maps or diagrams or info graphs can be detected in the evaluation product(s).	Only scarce use of geographically oriented maps or diagrams or info graphs can be detected in the evaluation product(s).	Only scattered diagrams or photos indicating spatial issues emerge in the evaluation documents.	No use of these tools is detected.
	<i>Spatial levels of adaptation evaluation</i>	Explicitly spatially oriented evaluation reports in adaptation at subnational and local levels exist, and the NAS/NAP refers to these.	Only national level evaluation(s) exist but the NAS/NAP plan to elaborate evaluation reports at lower spatial levels, but no evaluation products are available in practice yet.	Only national level evaluations exist in the country, but no comprehensive evaluation system is planned.	No evaluations are available.
Spatial policy considerations in adaptation planning	<i>Consideration of national spatial policy objectives in NAS documents</i>	All or almost all of the then-current national spatial policy objectives emerge explicitly (in nominated form) in the documents' vision / objective system / measures.	Majority of objectives/priorities of the then-current national spatial development directions identified in national spatial or regional development concepts is present among the adaptation policy objectives/measures, in titles or in the textual parts.	Only a minority of objectives/priorities of the then-current national spatial development directions identified in national spatial or regional development concepts is present among the adaptation policy objectives/measures, in titles or in the texts.	None of the then-current national spatial policy objectives emerge in the NAS.
	<i>Consideration of European regional development policy objectives in NAS documents</i>	All or almost all of the European regional development objectives from the then-current TA emerge explicitly (in nominated form) in the documents' vision / objective system / measures.	More than half of the European regional development objectives /priorities (defined in the then-current Territorial Agenda of the EU) is present among the NAS objectives/measures, in titles or in the textual parts.	Only a minority of European regional development objectives /priorities (defined in the then-current Territorial Agenda of the EU) is present among the NAS objectives / measures, in titles or in the textual parts.	None of the European regional development objectives from the then-current TA emerge in the NAS.
	<i>Emergence of territorial cohesion-related concepts in NAS documents</i>	The NAS mentions at least 4 out of the 6 territorial cohesion-related concepts (territorial cohesion, territorial capital, territorial harmony, territorially balanced development, territorial optimum, place-based approach).	The NAS mentions only 2-3 of the listed concepts.	The NAS mentions only 1 of the listed concepts.	The NAS does not mention any of the listed concepts.

5. EMPIRICAL RESULTS

5.1. *Analysed climate adaptation policy documents of the European countries*

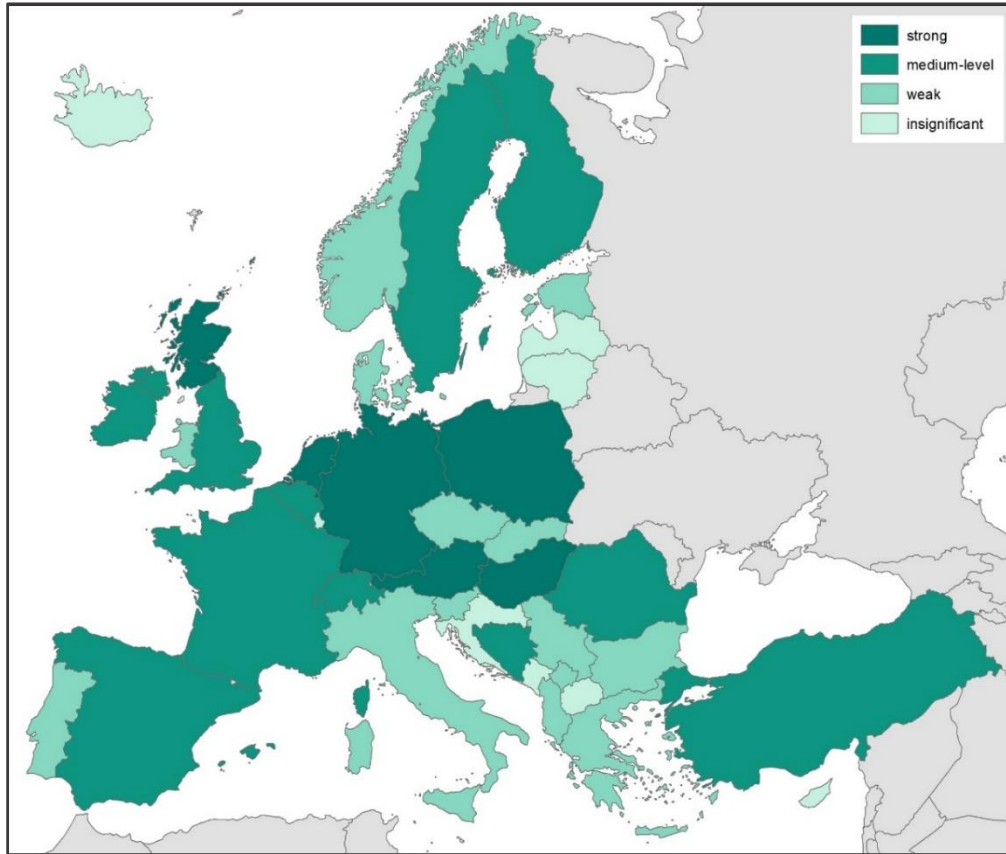
Altogether 176 documents were analysed during the empirical work phase. Out of these, there were 45 national adaptation strategies or integrated national climate change strategies, 20 operational adaptation action plans, 14 MRE methodology studies and 57 actual monitoring and evaluation reports. In Annex 3 the presented tables summarise the examined documents and their basic features; one table is about the NAS and NAP documents and background situation analysis-like documents (Annex #3a); the other table is about MRE methodological materials and actual reports/assessments (Annex #3b).

5.2. *Comparing the spatial sensitivity of national adaptation policies*

After conducting the analysis, the results of the 7 main aspects and their 34 sub-aspects were grouped into 7 main subchapters. In the following pages the outcomes are introduced according to this grouping, first summarising the main conclusions of a given main aspect then going through all of the examined sub-aspects under a given main analytical topic. The following subchapters are based partly on the latest publication of the research regarding the Eastern-European results (SÜTÖ, 2025B) but the findings were complemented to a great extent with the Northern, Southern and Western European outcomes as well.

5.2.1. General spatial aspects of adaptation planning

Regarding the first four analytical sub-aspects, called summarily the “*general spatial aspects of adaptation planning*” and covering the adaptation planning document’s space phraseology, adaptation planning’s basic approach (regional or sectoral), emphases on lower-level adaptation planning, as well as the intensity of adaptation activities at lower spatial levels, the best performing country is *Germany* (18 points of the maximum available 20), followed by *Austria, the Netherlands, Scotland, Hungary* and *Poland* (16). These are mostly North-Western states, complemented with two well-performing Easterners. The second class (11-15 points) is composed by *Romania, Bosnia and Herzegovina, Switzerland, England, Finland, France, Belgium, Northern Ireland, Ireland, Sweden, Türkiye* and *Spain*. It is seemingly a mixed group geographically, but North-western Europeans emerge again with greater weight. The weakest category (below 5 points) is mostly made up by South-eastern (*Montenegro, Malta, Cyprus, Macedonia*) and Eastern ones (*Latvia, Lithuania, Croatia*) together with the strongly sectoral-minded planner *Luxemburg* and *Iceland* (Figure 18).



18. Figure: General spatial emphases in the analysed countries' adaptation policies. *Source: own editing.*

Basis of the calculation: sum of the values of the analytical sub-aspects in each country. Strong category means values above 15 points; medium-level category 10-15 points; weak category 5-10 points; insignificant category under 5 points. Maximum available points in the main aspect: 20. Further information in Table 11.

Going from sub-aspect to sub-aspect, **the space phraseology** was the strongest in the countries that are uniformly strong in using all (*Hungary* and *France*), or the majority of the examined concepts (e.g. the *Czech Republic*, *Türkiye*, *Serbia*, *Bulgaria*, *Scotland*, *Austria*, *France*, *Switzerland* or *Italy*) in their NAS documents. Two outstanding concepts emerge in *Romania* (“place”, “local”) and *Finland* (“space”, “region”). 1-1 outstanding concept can be mentioned in connection with *Ireland*, *Northern Ireland*, *Kosovo*, *Croatia*, *Norway*, or *England*. If we examine the results from the concepts' point of view, “space” gets special emphasis in *Hungary*, *Austria* and *Switzerland*; “spatiality” in *Hungary*, *Kosovo* and *Switzerland*. Altogether, *Hungary* and *Switzerland* are outstanding in both space-related terms. The word “region” is mentioned numerous times in several countries from all over Europe (*Czechia*, *Hungary*, *Greece*, *Türkiye*, *Switzerland*, *France*, *Finland*, *Norway*), while “regionality” is mentioned in *Hungary*, *Bulgaria*, *Türkiye* and *Austria*. *Hungary* and *Türkiye* are especially strong using the region and similar concepts. “Territory” emerges mainly in *Central* and *Southern*

European NAS/NAP documents, where the national languages use the word territory, territorial usually as synonyms of space and spatial, and understand under the term not only administrative units (*Austria, Czech Republic, Hungary, Slovakia, Serbia; and Italy, Portugal*, but from Western-Europe *France* and from Northern-Europe *Finland* can also be mentioned here). “Territoriality” is outstanding in *Hungary, Portugal* and *France*. “Place” appears extremely often in the documents of Romania, where administration is strongly locally focused. “Local”, from similar reasons, emerges mostly in *Southern-European, Balkan* and *UK countries/country parts* (*Hungary, Romania, Albania, Bulgaria, Serbia; Italy, Türkiye*, furthermore *France, Ireland, Northern Ireland, Scotland, England* and *Wales*). “Locality/location”, on the other hand, does not get special emphasis in any country. Geography and geographic, compared to other analysed concepts/notions, show generally weaker presence in the analysed national documents, and out of the two, rather the latter appears. Mainly *Southern-European countries* mention these concepts (*Spain, Italy, Greece, Türkiye* and *Portugal*, complemented with *Austria* and *Denmark*) (Figure 19).

The spatial/sectoral character of adaptation policy sub-aspects’ best category means that, beyond the spatially oriented national documents, there are also regional adaptation strategies for special regions/spatial units. *Portugal, Austria, Belgium, the Netherlands, Norway* and *Sweden* performed the best – mostly federal states or traditionally strong regional planners. In *the Netherlands* the Delta Programme in itself is the manifestation of a region- (or estuary area-) oriented adaptation planning and activities. An interesting situation emerges in *Finland*, where although there are sectoral adaptation documents instead of regional ones, in some of them an indication of some regional thinking can be detected (e.g. in the health-related sectoral adaptation plan out of the 6 implementation areas, one is dedicated to the Arctic region and its Sami population). In 10 more countries there are scattered emergence of regional strategies beyond the national one or large number of municipal strategies exist beyond the national one but without strict legislative basis. *Estonia, Hungary, Poland, Slovenia* and *Slovakia* from *Eastern-Europe; France, Germany, Scotland, Switzerland* and *Wales* from *Western-Europe* belong to this category.

As for the **spatial levels of adaptation activities**, more than half of the countries are in the upper two categories (9 in the best, 15 in the second-best). *Poland, Austria, Switzerland, Belgium*, the parts of the *UK, Ireland* and *Finland* compose the best category where a dedicated NAS chapter/part deals with the issue of national, regional and local level adaptation tasks. 15 countries (*Hungary, Slovakia, Estonia, four Balkan,*

three South European and five North-western European countries) got into the second-best category where both national and lower (regional, local) levels are mentioned by the strategy/legislation as levels of adaptation actions, activities, but no dedicated NAS chapter exists; in these countries elaboration of regional or municipal level strategies are frequent practices. The weakest results can be perceived in *Eastern-Central Europe* and in some *Southerners (Italy, Malta, Portugal, Cyprus)* where there are either only vague references in the examined documents to regional or local levels, or only the national level is mentioned. This weak emphasis can be explained by the mostly unitary structure of the analysed country administrations (SÜTÖ, 2025B).

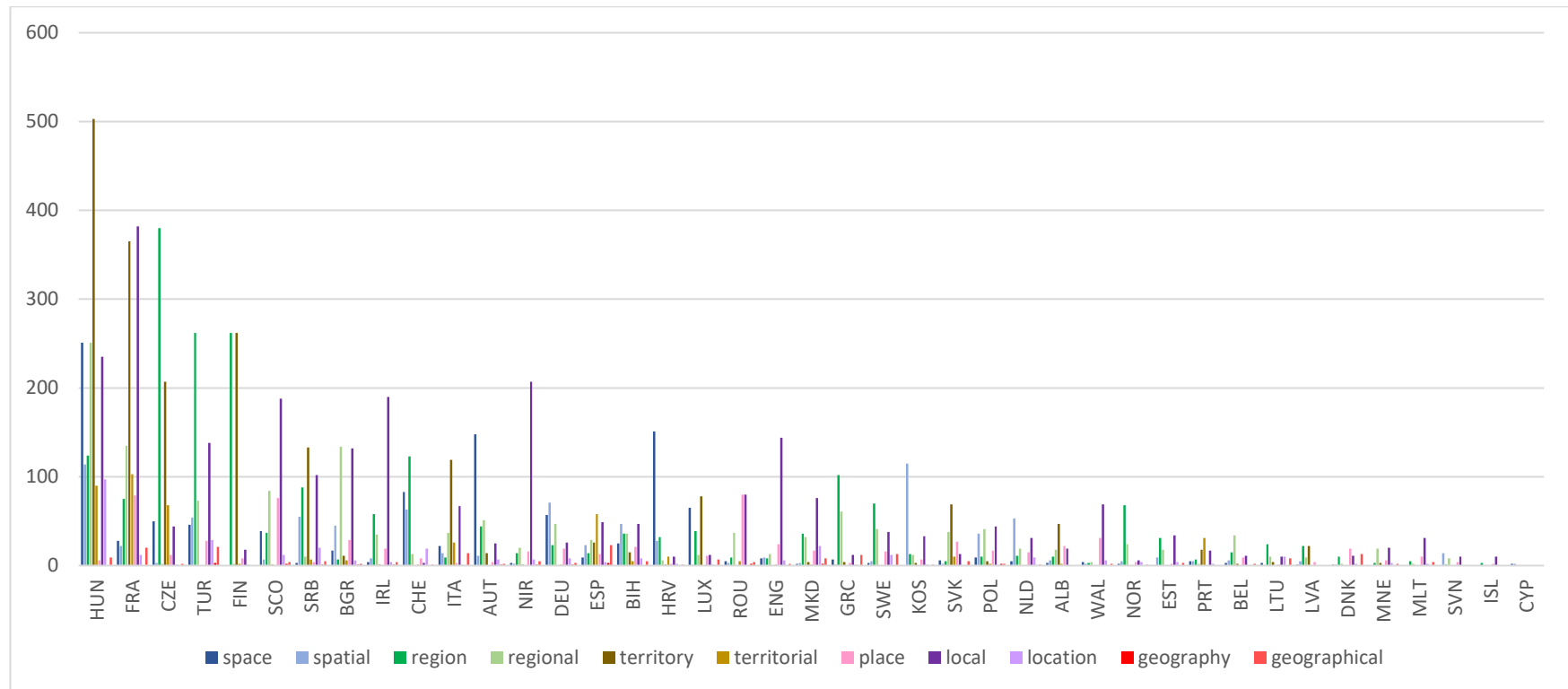
Propagation of adaptation planning at lower territorial levels showed basically good results. Half of the countries are in the upper two categories. The best performances can be seen in *Hungary, Poland, Romania (Eastern-Central Europe), Albania, Bosnia, Bulgaria (Balkans), Türkiye (South), Germany, England, the Netherlands* and *Finland (North-western Europe)*. An especially good example is *the Netherlands*, where the Delta Decision on Spatial Adaptation encourages local authorities to devote attention to heat stress as part of a local climate scan. In *Hungary*, a specific subgoal of the NCCS-2-NAS mentions the need for elaboration of vulnerable regions' strategies; some action lines in the settlement development chapter also mention local strategy building (SÜTÖ, 2025B). In *Poland*⁹³ and *Romania*,⁹⁴ several objective system levels refer to the issue. *Albania*'s strategy and programme also nominate the activity at the level of goals and priority actions⁹⁵. Several of *Bosnia*'s NAS sectoral situation analysis subchapters talks about related topics⁹⁶. *Bulgaria*'s NAS Chapter 2 about national sectoral frameworks mentions the planning tasks of municipalities and other sectors (tourism, transport, forestry) at local level. In *Finland*, the NAS propagates the issue at the sub-objective and measure level.

⁹³ NAS objective system's introductory "Horizontal actions" aspect list contains "Operational actions" aspect that talks about spatial and sectoral strategic planning in local and regional level in these areas, urging these activities. Action lines 4.2.1.- 4.2.2 focus on urban spatial policy making and urges development of local adaptation plans and adaptation mainstreaming into spatial documents. Action line 6.1.4. also urges community planning through which tool local plans are supported (SÜTÖ, 2025B).

⁹⁴ Romania's NAS 7.1. NAS sub-objective directly focuses on local adaptation planning; subobjectives 11.5. and 12. 3 too on tourism adaptation and industrial adaptation local planning; measure 5.3.1. urges involvement of citizens in local planning; 3.4.4. natural habitat management oriented local planning. The second part of Chapter 8 consequently emphasises the importance of local planning (Local Adapt Action Plans, tourism destination related planning, connections with settlement planning) (SÜTÖ, 2025B).

⁹⁵ e.g. Goal 8 of the latter is about "Territorial Planning and Coastal Plan Regulations are directing measures for climate change adaptation to be taken by local municipalities"); Priority Action No. 12 is directly about Initiative for municipal adaptation.

⁹⁶ Reservoir management planning's focus is to be oriented to spatial uneven redistribution of water, and their multisectoral nature; River Basin management plans and local adaptation planning are propagated by Chapter 7.1.2. capacity building. NAS Action 3.16. urges to develop and adopt Flood Risk Management Plans.

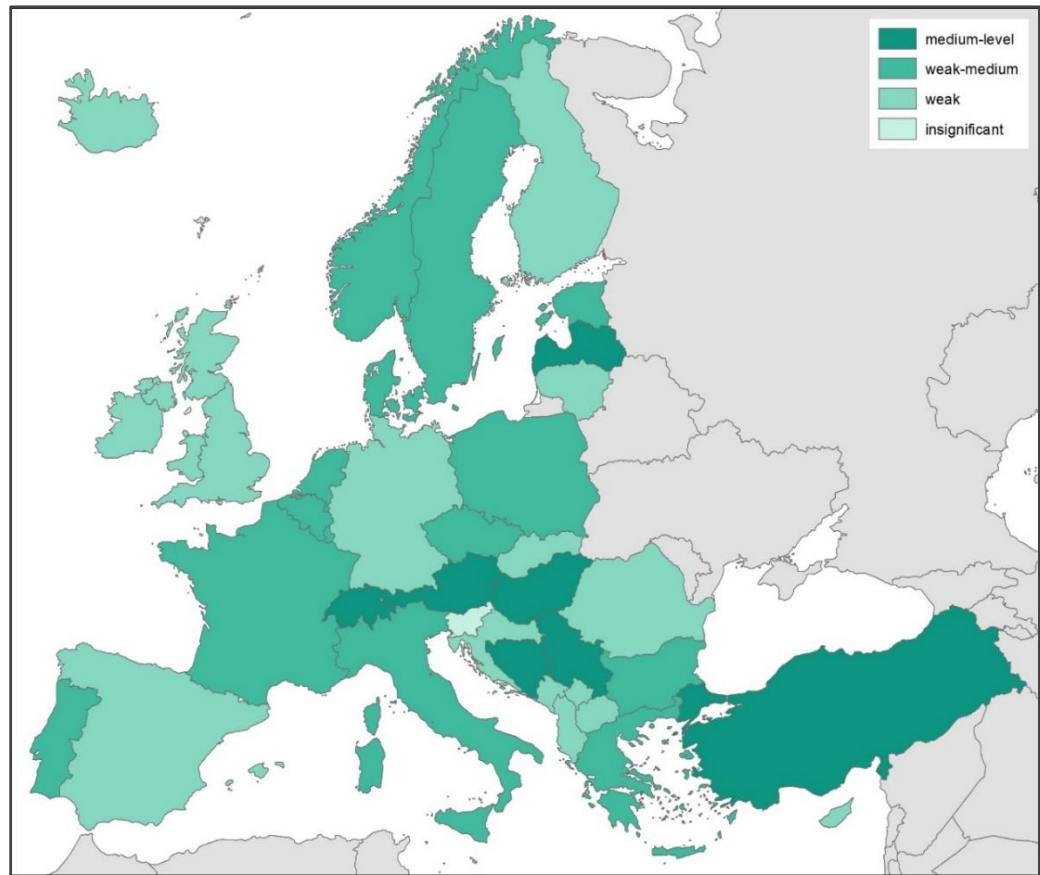


19. Figure: Number of mentionings of different space-related concepts in the analysed NAS documents. *Source: own editing.*

5.2.2. NAS situation analyses' spatial awareness

The analytical aspect dealing with NAS situation analyses performed generally mediocre/weak. Even the best-performing states did not reach 50% of the available points. The generally spatially oriented *Bosnia and Herzegovina*, where 3 different administrative parts of the state are in the focus of the whole situation analysis; furthermore, *Austria*, *Switzerland*, *Serbia*, *Türkiye*, *Hungary* and *Latvia* compose the highest category. The second group is mixed, composed by both Easterners (*Czechia*, *Poland*, *Bulgaria*, *Estonia*), Westerners (*Belgium*, *the Netherlands*, *Luxemburg*, *France*), or Southerners (*Italy*, *Greece*, *Portugal*). Several Westerners got surprisingly in the worst category, but the reason is that they mostly do not have actual situation analyses within their NAS, while having a national CCRA fulfilling the evidence-based providing function. But even these CCRAs reflect rather a sectoral approach (Figure 20).

In the **basic logic of the situation analyses** signs of spatial thinking are stronger only in a few countries. *Hungary's* situation analysis shows outstanding spatial logic, dedicating a separated spatial vulnerability chapter to the topic that introduces district-level spatial differences of given climate challenge topics. (Moreover, as things stand, the update of the national strategy, being conducted currently, will strengthen further the spatial emphases in the document, both in the situation analysis and the objective system). *Poland* applies quasi-consequent spatial unit- or regional type mentioning in all sectoral situation analysis subchapters (SÜTÖ, 2025B). In *Italy's* NAS the analysis and assessment of the state of knowledge on risk and vulnerability to climate change at the national level is organised by relevant sectors. However, already the Introduction mentions the Alpine and Apennine areas and the Po valley, which regions show later regular recurrence through the whole situation analysis. However, the vast majority of countries performed weaker or showed the total lack of spatial aspects.



20. Figure: Degree of spatial content of the NAS situation analyses in the examined countries.

Source: own editing.

Basis of the calculation: sum of the values of the analytical sub-aspects in each country. Medium-level category means values above 10 points; weak-medium-level category 5-10 points; weak category 1-5 points; insignificant category 0 point. Maximum available points in the main aspect: 35. Further information in Table 11.

Regarding the spatial visualization of the situation analyses *Türkiye* is outstanding (having 25 mostly climate vulnerability/risk maps throughout its NAS), followed by *Hungary* (14 maps), the *Czech Republic* (12), *Poland* (9+ one regional table), *Serbia* (9) and *Switzerland* (8 spatial visual maps for almost each introduced climate impacts – this solution makes the Swiss NAS a unique example of spatial visualization in Europe). *Denmark* and *Norway* are two interesting examples, using larger number of photographs (8 and 9) instead of maps about regional impacts. *Latvia*, *Bosnia* and *France* used 6-7 maps in their NAS, *Austria* 3-3 maps and regional diagrams. Seemingly *Eastern-Central Europe* is overrepresented a bit in the two higher categories, while traditional spatial/adaptation planner nations, surprisingly, do not put enough emphasis on this issue. The reason is similar to that of the previous sub-aspect: these countries use rather comprehensive CCRA documents for that function, but the map provision in these CCRA is not always satisfying, either.

As for the **actual spatial content of situation analyses**, dedicated situation analysis subchapter(s) dealing consequently with all of the important spatial topics (region types,

actual places, functional territories, settlement network elements, spatial differences) with great emphasis can be detected only in *Türkiye*. In its NAS all sectoral chapters have their own situation-introductory part with very strong spatial content. They generally include provincial-level vulnerability maps, and there are also implicit and nominated spatial references in the textual parts. Half of the countries got into the upper-middle category, mainly *Balkan states* (*Croatia, Albania, Bosnia, Bulgaria, Kosovo, Serbia*), *Western European countries* (*Austria, Switzerland, Benelux countries, England*) *Italy, Greece, Hungary, Poland, Romania* and *Scandinavian countries* excluding Iceland, with concrete spatial contents (2-3 out of the listed spatial topics) emerging here and there in the majority of situation analysis chapters but there is no nominated spatial chapter within the national strategy (the *Polish* and the *Italian NASs* are good examples).

Examining the **consideration of intra-European/macro regional positions regarding the climatic challenges** within the situation analyses, not a single country can be found that dedicates a special subchapter to the topic. Some countries are in the upper-middle category, where at least part of a subchapter deals with the macro regional climate change-related situation, or the climatic chapters have a related part; or macro regional position is a recurring side topic in the document. However, consideration of the given state's own geographic position within Europe gets weak emphasis in the documents generally (SÜTÖ, 2025B). As a few best practices, *Lithuania* and *Estonia* can be cited as they consequently mention their Baltic position; *Bosnia* recurrently applies comparisons with other Balkan/Southeastern European countries throughout its NAS document; *Italy*' NAS dedicates a given subchapter to "*European context and the Mediterranean area*", and furthermore there are other scattered references to intra-European position, too, all along the situation analysis subchapters. The *Portugal* documents slightly mentioned the Southern-European position of the country (in Chapter 4.2. of the Framework and even more by the Situation Analysis parts of the NAP as well as the Introduction of the Framework's NAS Annex.)

SWOT analysis chapters emerge only in three countries, *Lithuania, Albania* and *Bulgaria*, and the spatial content in these chapters is also weak (SÜTÖ, 2025B). *Lithuania*'s NAS contains scattered mentionings about existing risk management GIS facilities and the lack of a NAGIS-like system. In *Bulgaria*, region types are present but only scarcely (urban areas, destinations, forest territories and urban/rural green infrastructure are mentioned in 1-1 SWOT points). As for the **spatial content of situation assessments**, similarly to SWOTs, these parts are generally also lacking from the overwhelming majority of national documents. Such a type of chapter emerges only

in three countries, *Lithuania, Bosnia and Bulgaria*, but the spatial content in these chapters is practically missing, anyway.

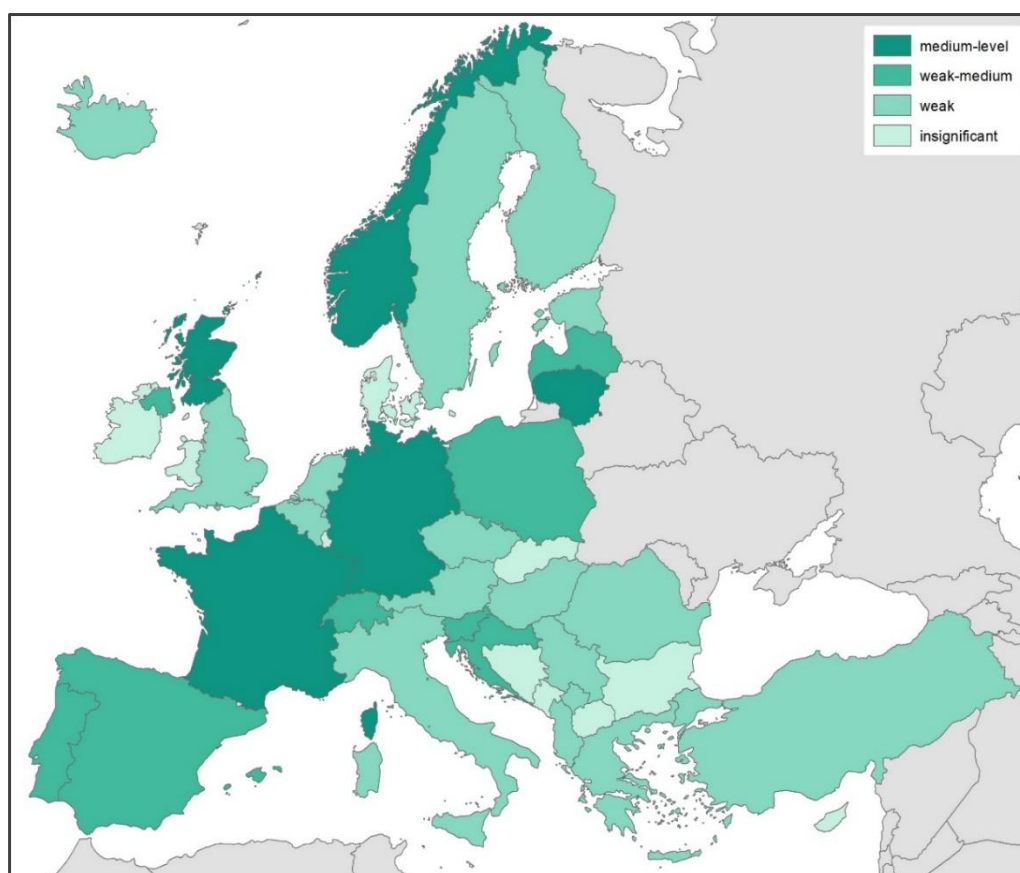
The spatial planning focus of the NAS situation analyses shows not very strong performance, either. Seven, mostly North-Western European countries (*the Netherlands, Denmark, Switzerland, Austria*), together with *Bosnia, Estonia and Latvia*, got into the best category, dedicating a special chapter/subchapter to the introduction of spatial planning's role in adaptation. The *other Scandinavians*, together with *Serbia and Czechia*, compose the second-best category (where situation analyses mention spatial planning in one or more subchapters as an important activity). Surprisingly, some traditional spatial planner state's current strategies (e.g. *England, Germany*) do not emphasise spatial planning's role very strongly. The reason for this is perhaps the triviality of the issue in these countries that long ago recognized the importance of spatial planning in adaptation, and they do not feel necessary to emphasise the issue further in their adaptation strategies. Majority of the European countries shows only weak reference to spatial planning in their NAS, only mentioning spatial contexts of some regional/settlement type's climate-related problems or the coherence with national spatial planning documents is introduced; or they do not mention anything regarding the issue.

5.2.3. Spatiality in the NAS objective systems

Similarly to the situation analyses, the NAS objective systems also showed basically weak performances generally: 16-20 points out of the available 40 meant the best category (with *France, Germany, Scotland, Norway* from *Northwestern-Europe* and *Lithuania* from the *Eastern-Central* part of the continent). The second-best category with 11-15 points consisted of Southerners (*Spain, Portugal*), more developed Easterners (*Slovenia, Poland, Croatia and Latvia*) and a few Westerners, too (*Switzerland, Northern Ireland*). Surprisingly, generally well-performing other Western- or Northern-Europeans got only into the third category (*Austria, England, the Netherlands, Finland*) as well as some of those countries that had outstanding situation analyses (*Türkiye, Hungary, Italy*). The weakest category contains two additional Western-European countries with entirely sectoral-oriented objective systems (*Denmark and Luxemburg*) and numerous Southeastern-European states (*Malta, Cyprus, Bosnia, Macedonia, Montenegro, Bulgaria*) (Figure 21).

As for **the basic logic of vision chapters**, 15 NAS documents do not contain such chapter at all; the others do but only three NASs contain elements dedicated for spatial aspects. The best category with spatially structured visions is totally missing. In the upper-middle category *Scotland's* Vision is basically sectoral, but it is organised into 5

main pillars, among which one is directly ("*Nature connects across our land, settlements, coasts and seas*") and one is indirectly spatial ("*Communities are creating climate-resilient, healthy and equitable places*"). In *Germany* a vision paragraph is dedicated to cities, towns and villages, but cities/towns also emerge in the impact-related paragraph, and small watercourses, rivers and peatlands in the water- energy- and raw material supply-related paragraph. *Romania*'s NAS vision mentions „areas”⁹⁷ in general. Scarce spatial hints can be detected in some parts of the vision of *Wales*, *Bosnia* or the previous *Austrian* NAS. Other countries either do not have Vision chapters or who does, does not apply spatial references.



21. Figure: Degree of spatial content of the NAS objective systems in the analysed countries. *Source: own editing.*

Basis of the calculation: sum of the values of the analytical sub-aspects in each country. Medium-level category means values above 15 points; weak-medium-level category 11-15 points; weak category 6-10 points; insignificant category below 6 points. Maximum available points in the main aspect: 40. Further information in Table 11.

The Visions' spatial content sub-aspect's result is very similar to the situation of the previous analytical sub-aspect. The best category is totally missing again. In the upper-middle category *Germany*'s vision mentions settlement network elements and land use

⁹⁷ The slogan says, "*The strategy aims to improve the ability to adapt and increase the resilience of socio-economic and natural systems to the impact of variability and climate change on different areas and time intervals, facilitating Romania's transition to a circular economy with low carbon emissions and the achievement of climate neutrality by 2050*" (SUTÖ, 2025B).

(habitat) type -related vulnerability characteristics. *Scotland's* vision talks about region types (coasts, seas), settlements in general, land in general and communities' places in general as well. From the lower-middle category, *Croatia* (whose vision mentions multilevel governance implicitly), *the Czech Republic* (where only landscape issues come up), *Latvia* (half of one vision bullet point focuses on climate risk-oriented spatial planning and necessary changes in spatial planning are especially nominated), *Albania* (the spatial idea is not really present in the Vision but it mentions the Mediterranean area, where the effects of climate change are more pronounced), *Northern Ireland* (all outcome objectives, or using their other name, lower-level objectives have an introductory short sentence, serving as vision; out of these almost all are general, only NC1 mentions habitats and water bodies in general, NC2 coastal communities, and habitats, P1 communities resilient to flooding and extreme weathers - these are weak contents); *Finland* (no territorial/regional/spatial reflections can be detected, but some hints to geopolitics) and *Iceland* (where the NAS "Core goals" chapter can be considered as vision; among its 10 points spatial references are missing, #5 refers to multilevel governance implicitly through regions and municipalities) can be mentioned. In the other countries the Vision chapter does not mention any of these aspects, or the Chapter itself is missing from the documents.

The sub-aspect **"spatial content of the whole objective system"** brought best performances in six countries (*Lithuania, Poland, Türkiye, Switzerland, Germany, Scotland*), where the different levels of the objectives explicitly mention special geographic areas or settlement network elements, region types or functional areas (FUAs, cross-border or macro regions), spatial vulnerability characteristics or general spatial logic (e.g. focus on spatial mapping or spatial differences). In *Lithuania* region- or land use- and settlement-types (vulnerable/urban areas, coastal zones, forests, swamps, deprived agrarian landscapes and agricultural areas), as well as actual territories (the Baltic Sea) are mentioned. In *Poland* the NAS mentions in general in its narrative sub-objective descriptions coastal areas, mountainous areas and urban zones. Moreover, spatial planning also gets recurring stable emphasis (SÜTÖ, 2025B). Spatial monitoring and GIS-based decision supporting tool development appear in Action line 1.5. *Switzerland*, considering its NAS structure, regards sectoral chapters as lower-level (thematic) objective fields. Within these, we can find spatial references here and there, in different forms⁹⁸. *Scotland's* objective system talks about region types, concrete

⁹⁸ Direct spatial content (region and settlement network types) emerges in water management chapter that talks about riverine zones, the forestry chapter low-lying areas, and lowlands; the energy chapter's hydropower subobjective mentions high mountains; the tourism chapter talks about low lying areas, mountainous regions, Alpine tourist regions, while the spatial planning chapter mentions large cities and agglomerations suffer from natural hazards; furthermore agglomerations, cities, suburban open areas. Concrete territories are mentioned by water management chapter (Rhein), by natural hazard chapter (Alpine floods, Miltelland and Jura Floods), by forestry chapter (Ticino, Valais and

places, settlements (cities, city regions) and even general spatiality. The second, mixed group of countries (*Czech Republic, Latvia, Albania, Serbia, Greece, Italy, Austria, France, Northern Ireland, England, Iceland and Norway*) mentions only 2-3 types of the listed spatial aspects. Majority of the *Eastern-Central European and Balkan countries* together with some *Southern (Spain, Portugal)* and *Northern states* and the *three Benelux countries*, mention only 1 type of the listed spatial aspects and only vaguely. Other countries do not mention any of these.

Spatial focus of the overall / strategic objectives varied highly. The *overall objectives* are almost always thematic (only *Estonia's* overall objective mentions explicitly regional and local levels, while *France's* NAS (PNACC-3) overall objective aims "*protecting the population, ensuring resilience of our territories, adapting our economy, preserving our heritage, mobilising society*". The overall objective in *Austria's* NAS is again general but mentions the levels of "*Bund*" und "*Ländern*". The specific objectives in the NAS documents are usually thematic - the exclusions are *Croatia, Poland, Romania, Estonia, Spain, Austria, France and Norway*. Seeing these examples in detail, *Croatia's* objective system⁹⁹ is a mixture of sectoral and spatial specific objectives. *Poland* also applies mixed types of objectives, out of which two („*Efficient adaptation in rural areas*"; „*Sustainable regional and local development*") are typically spatial. *Estonia's* subgoals (=specific goals) are basically thematic, but one subgoal deals with regional types - and this subgoal at least directly (SÜTÖ, 2025B). *Norway's* NAS overall objective is basically thematic, and it is followed by no specific goals but 8 lower-level objectives, out of these 2 are spatial (1 for sea level rise in coastal areas, 1 for Sami territories). In *France* out of 5 specific objectives 2 indirectly and one directly are spatial, the latter is Axis #2 (*Ensuring the resilience of territories, infrastructure and essential services*). In *Austria* the strategic objective level is basically thematic, going through 6 thematic paragraphs (quasi specific objectives) and 15 sectoral fields, only the latter ones contain one settlement(network)- and one spatial planning-related chapter. *Spain's* overall objective¹⁰⁰ is quite general. To achieve this goal, 9 specific objectives and 19+7 lower-level objectives have been defined. The first specific objective promotes regionalised climate projections; the second knowledge

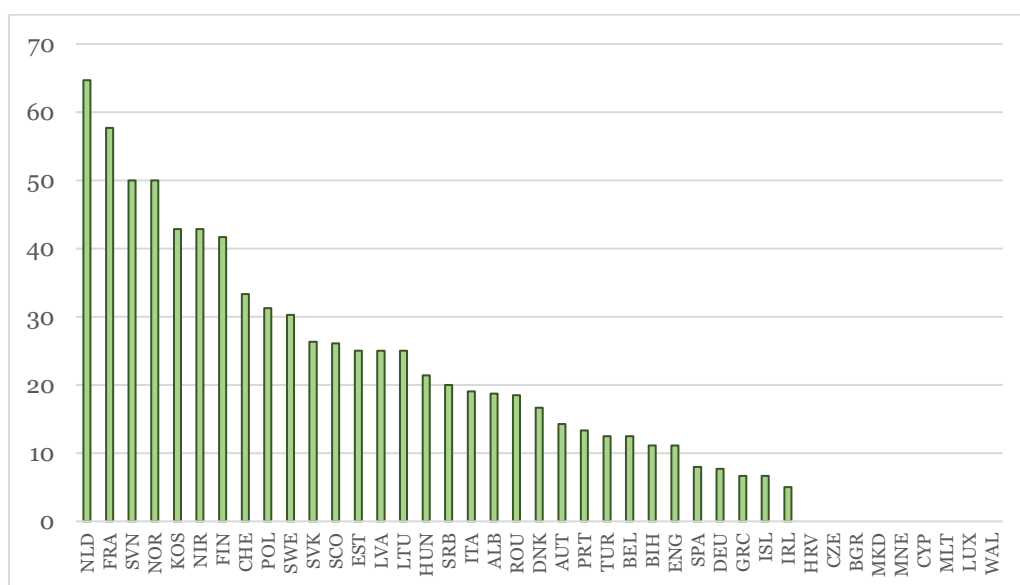
Graubünden cantons). General spatial statements emerge in the water management chapter: regional and temporary bottlenecks; regionalization of the drinking water supply management, regional modelling of climate and water regimes; the subchapter 4.2.1.'s end is an actual territorial synthesis, mentioning a spatial summary; agriculture chapter mentions that "*the features of the natural landscape (topography, soil type and exposure) and climatic conditions are among the factors that determine the suitability of a site for agricultural production.*" Spatial planning chapter mentions regional adaptability in tourism.

⁹⁹ Priorities #1 and #2 (these are actually specific objectives) are directly region type-oriented: #1 aims at ensuring sustainable regional and urban development; #2 aims at ensuring prerequisites for the economic development of rural areas, coasts and islands; #4 and #5 even include implicit contents (#4 the importance of local/regional level in risk management; #5 the GIS-based monitoring development) (SÜTÖ, 2025B).

¹⁰⁰ To promote coordinated and coherent action to address the effects of climate change in Spain in order to avoid or reduce present and future damage from climate change and to build a more resilient economy and society.

generation but without spatiality; the sixth involvement of all territorial levels in adaptation - multilevel governance emerges here implicitly; the eighth the importance of international cooperation and the ninth the adaptation MRE activities but without spatial hints. Among the 19 “*areas of work*” one is for cities, one for coastal areas already in their very names; and out of the 7 transversal issues one is explicitly for spatiality and one for cross-border issues directly.

The proportion of lower-level objectives with spatial content brought basically expected outcomes but also some surprising ones, too (Figure 22). The best performances were detected in the traditional strategic spatial and adaptation planner countries (*the Netherlands, France, Norway, Finland, Northern Ireland*) with some surprising odd-one outs (like *Kosovo or Slovenia*) among the best categories, where more than 40% of the lower-level objectives comprises spatial references in their title or in their detailed description. The above listed states and from the second-best category (between 20-35%) *Switzerland, Sweden, Scotland* are those *North-Western European states* where spatial planning has great traditions and adaptation planning has already seen 2-3 cycles so far. *Slovenia* in the best and some other, basically well-performing *Eastern-Central European countries* (*Poland, Slovakia, Hungary* and the *Baltic states*) in the second-best category are those that are catching up in this field (i.e. adaptation planning). Surprisingly, other great spatial planners, like *Germany, England, Austria* and *Belgium* emerge only in the third category (5-20%) - in their cases strategic planning is still strong, but their spatial emphasis is not so much in adaptation planning, at least at national level.



22. Figure: Proportion of lower-level NAS-objectives consisting of spatial references. *Source: own editing.*

Regarding the **spatiality of horizontal objectives**, the picture is basically weak. Real horizontal objectives are missing from the majority of documents: in these cases, we analysed the horizontal principles identified in several NAS documents (SÜTÖ, 2025B). Five countries have more special horizontal goals/principles dealing directly/nominally with spatial/territorial issues. *Lithuania's* NAS nominates in its 37.8. subgoal spatial equality and the coordination of national/regional/local authorities' works; in its 37.11 subgoal geopolitics-related issues of climate policy. *Portugal's* NAS declares six thematic, horizontal areas within the objective system. Out of these, #4 concentrates among other things on GIS-based National Adaptation Platform development; #5 urges the connection with spatial planning and adaptation activities taking into consideration local/regional specificities; #6 emphasises the consideration of local/regional/river basin-level specialities in water resource management and monitoring. In *Spain* the NAS sets out a number of guiding principles (Chapter 5). These contain among other things the consideration of social and territorial dimension (social components of exposure and vulnerability, as well as their geographical distribution, should be taken into account in climate risk analyses and in the planning of adaptation initiatives according to the NAS). As a complement to the sectoral actions, the Spanish NAS defines 7 transversal aspects (Chapter 8), which must be promoted in the different areas of work: among these aspects the first is focusing again on the deepening of the geographical and social components of vulnerability to climate change; the third is on the analysis of cross-border effects¹⁰¹. Altogether, the NAS urges incorporation of spatial analyses and identification of high-risk-areas into adaptation planning and calls the attention to climate change's different forms in different geographical areas, like mountains, rural areas and islands. *France's* NAS Chapter 2 introduces 6 main strategic principles, among them the directly spatial "Differentiation: derivation the national strategy at territorial level". Furthermore, there are three horizontal objectives after the 5 main axes (specific objectives): out of these, "Taking into account the specificity of our Overseas territories in the face of the challenge of adaptation" is directly spatial. Moreover, the "Zoom on Transversal Issues" chapter introduces three additional horizontal issues: again "Overseas"; "Research" and "Europe and international" (context). Out of these the first is directly, the third is indirectly spatial-minded. The *Belgian* NAS's Chapter 5 ("Strategy") in its "Principles" subchapter mentions several relevant points¹⁰². In other national NAS

¹⁰¹ The "deepening in the geographical and social components of vulnerability to climate change" is particularly worth for mentioning. It says "The actual and potential impacts of climate change are unevenly distributed across the territory. These territorial differences (...) must be identified in risk studies and taken into account in the definition of adaptation measures".

¹⁰² Point 1 mentions coastal areas, areas prone to river floods, cities and urban areas as especially vulnerable parts of Belgium: geographic sensitivity appears here. In Point 2 place-based approach emerges It says that "Needs and measures differ greatly between different policy areas and between different geographic areas (such as the woodlands in the Walloon Ardennes, the coastal regions in Flanders or the urban environment of the Brussels area). Therefore, it is not

documents only one special horizontal goal deals with spatial/territorial issues explicitly (*Croatia's* and *Slovenia's* NAS mention the importance of spatial planning/regional development, *Norway's* national document the essential role of spatial or territorial level reflections, emphasising the role of local actors). However, beyond these instances, the vast majority of the countries shows weaker performance. 15 NAS documents mention only related principles (e.g. subsidiarity, decentralization, governance, etc.) and in 5 NAS documents no horizontal goal deals with the above-mentioned topics. 13 more documents do not use horizontal goals/principles at all.

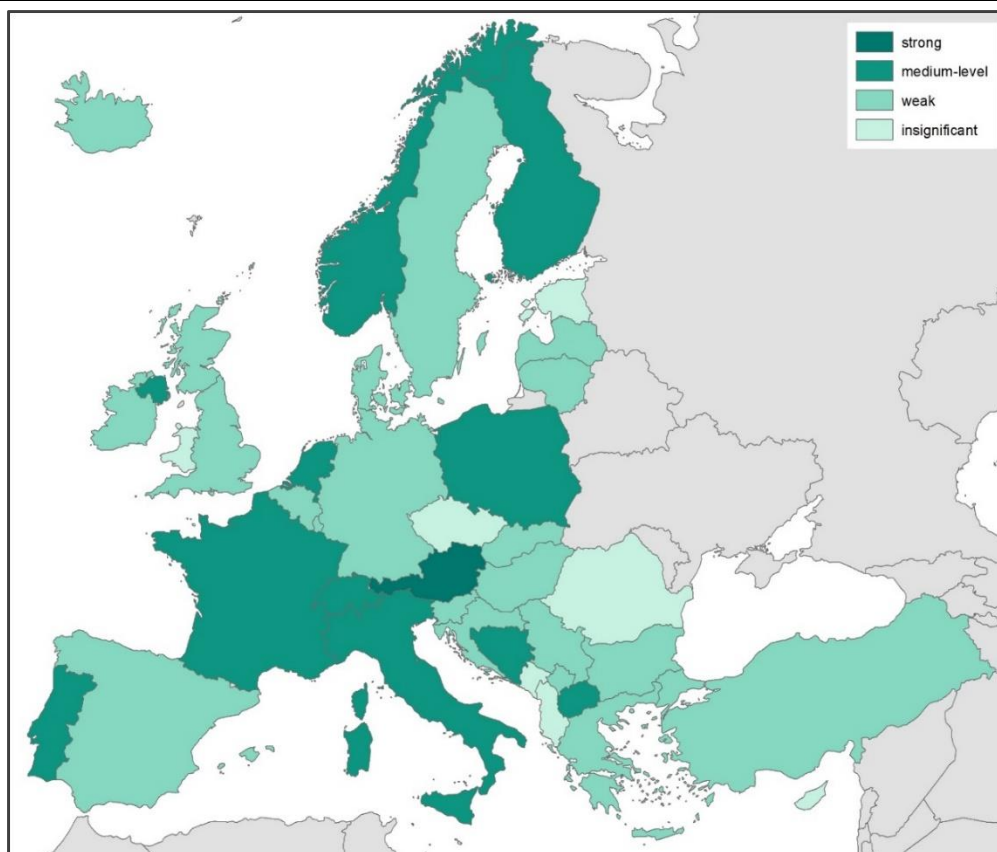
Spatial MRE focus of objective system- and vision-planning is not so strong, either, with the exclusion of a few good examples. Altogether six countries (*Croatia, Hungary, Latvia, Slovakia, Portugal* and *England*) got into the best category, where among the NAS objectives and/or vision paragraphs a higher-level objective and/or a Vision paragraph nominates the importance of national or regional MRE development in adaptation. Eight further countries dedicated at least one lower-level objective/one vision sentence to the topic of MRE aspects (*Lithuania, Poland, Slovenia, Switzerland, France, Germany, the Netherlands* and *Norway*). In the overwhelming majority of the countries, however, only weak references emerge to adaptation-related sectoral MRE issues in the textual parts of the objectives, or they do not mention the topic anyway.

Spatial visualization of the vision /objective system is absolutely weak. None of the countries apply any visual solutions, with the exclusion of *Denmark*, but even that country does it without any spatial consideration. Altogether this sub-aspect's uniformly weak results indicate a missed opportunity in European nations' adaptation planning.

advisable to try and create one single 'adaptation rule'. Point 3 says that "*An important thread through the NAP, is the need for cooperation at all levels and organisations*"- it emphasises multilevel governance implicitly. Point 4 propagates a coordinated approach and search for synergies between sectors - territorial harmony and territorial optimum emerges here. Point 6 emphasises the importance of lower spatial levels (regional, local) in adaptation. Point 7 advocates for place-based approach in the field of action planning and MRE and the development of GIS-based DS system in climate policy. Point 8 propagates both effective and balanced adaptation plans, while Point 9 directs attention to potentially vulnerable social groups- implicitly spatial thinking also appears here.

5.2.4. Spatial aspects in adaptation actions

At the operational level, NAP documents' measure sets or NAS documents' action lines were analysed from a spatial content-wise point of view. Here we applied a quasi-quantitative solution, measuring the proportion of actions with general or actual spatial content; actions with spatial planning; and actions with spatial MRE-related elements. The best performing state was *Austria* with 13 points out of the maximum available 15. The group of followers were composed mostly by *North-Westerners* (*France, the Netherlands, Switzerland, Northern Ireland, Finland and Norway*, together with *Poland* and some *Southern or South-Eastern European ones*, between 6-10 points. However, the overwhelming majority performed between 3-5 and 1-2 points (*Montenegro* was the only one with 0 point), indicating that spatial considerations during action planning is still not mainstream (Figure 23).

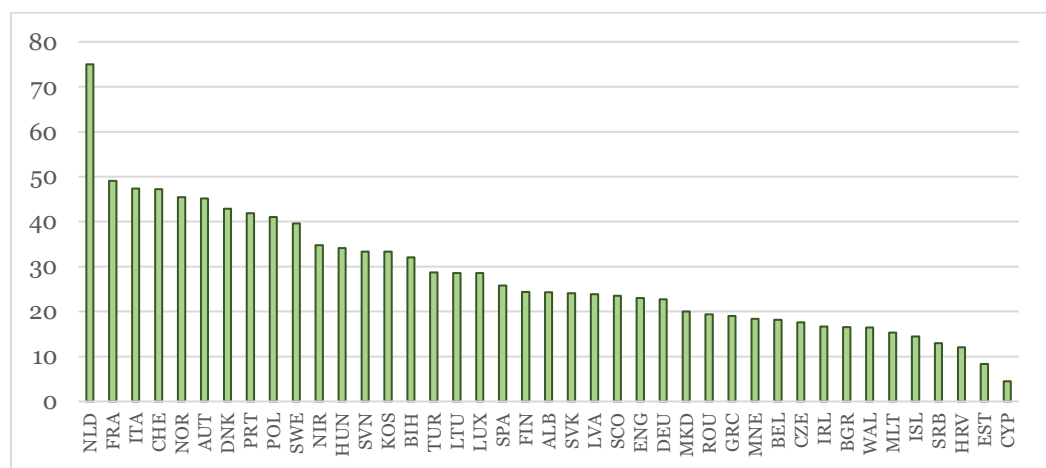


23. Figure: Spatial content of the NAP actions in the analysed countries. *Source: own editing.*

Basis of the calculation: sum of the values of the analytical sub-aspects in each country. Strong category means values above 10 points; medium-level category 6-10 points; weak category 3-5 points; insignificant category under 3 points. Maximum available points in the main aspect: 15. Further information in Table 11.

To see the details, **proportion of NAP measures with spatial content** is the highest in a strong group of countries from mainly *North-Western Europe* (*Austria, the*

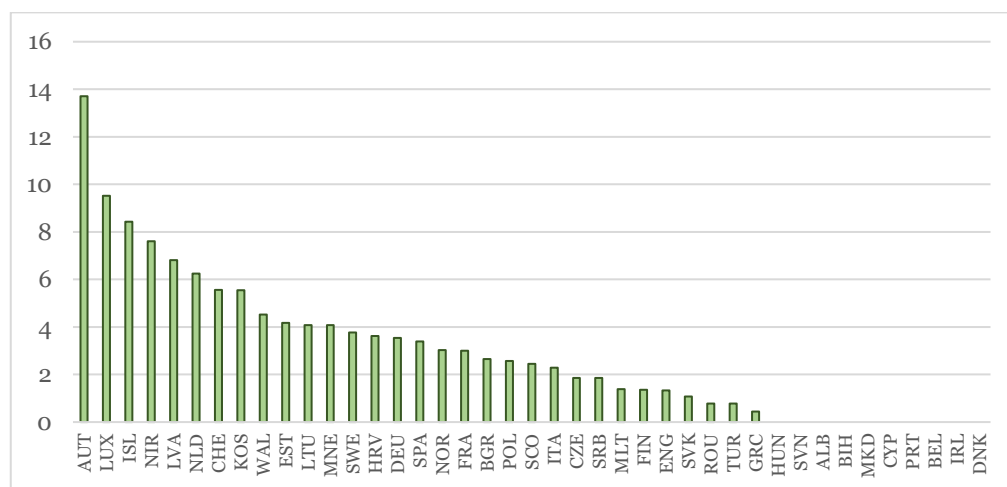
Netherlands, Switzerland, France, Denmark, Norway). *The Netherlands* is especially outstanding, more than 70% of its NAP measures refers to some spatial content in their descriptions. Surprisingly, *Italy, Portugal and Poland* also got into the best category, with more than 40% of measures showing spatial characteristics. The upper-middle category comprises besides *Sweden and Northern Ireland*, and surprisingly, Eastern countries (*Hungary, Slovenia, Bosnia, Kosovo*), too. *Kosovo* is a really interesting instance: out of its 18 recommended actions 9 are somehow spatial, and out of these 6 refer even in their title to a region type, a concrete place or settlement network element, or perhaps general spatiality. Theoretically spatially interested larger countries (*Germany, Spain*); classic spatial planning practitioners (*parts of the UK, Finland*); or emerging adaptation planners (*Türkiye*) got only into the lower-middle category (Figure 24).



24. Figure: Proportion of NAP actions consisting of references to region or settlement types, actual places or general spatial logic. *Source: own editing.*

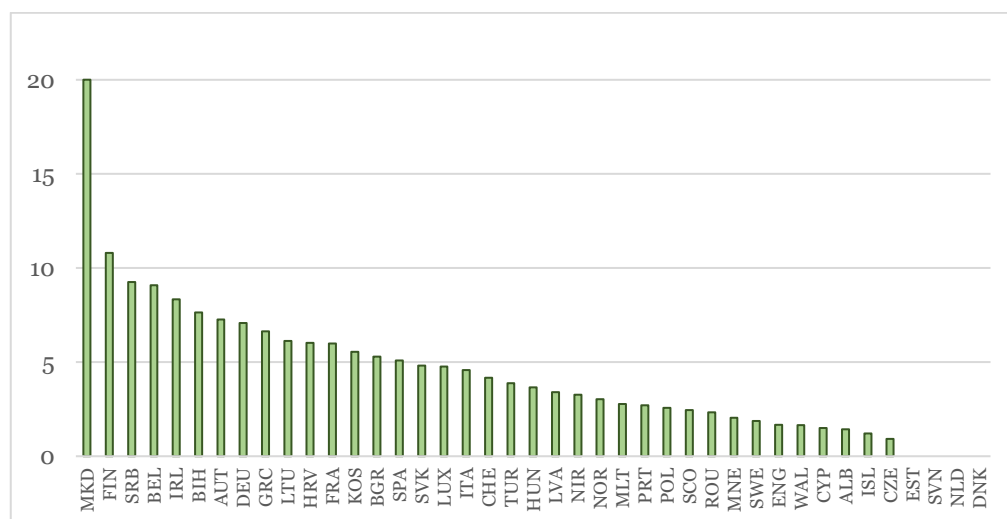
The “**proportion of spatial planning-related measures**” sub-aspect’s best category is composed only by *Austria*, where more than 10% of the NAP measures are dealing with spatial planning, followed by *Luxemburg, Iceland, Northern Ireland, Latvia, the Netherlands, Switzerland*, and surprisingly *Kosovo* (the latter is an odd-one-out, because even its only one spatial planning-related measure out of its 18 actions means a relative good result). *The Netherlands, Northern Ireland, Switzerland* are also traditional spatial planner and adaptation MRE-oriented countries. However, the similarly strongly spatial planning-minded *Germany* and other *parts of the UK* got only in the 3rd category. The reason for this could be that the degree of development of these topics in the countries makes it not necessary to dedicate special actions to the development of spatial planning-adaptation planning connections within the measure set in the newer generations of NAPs. The overwhelming majority of the analysed countries (33)

performs below 5%; out of these 10 states reached 0 point in this sub-aspect (Figure 25).



25. Figure: Proportion of NAP actions consisting of references to spatial planning. *Source: own editing.*

As for the **proportion of spatial MRE-related measures**, similar results can be registered. Surprisingly, *North-Macedonia* (and not surprisingly, *Finland*) performed the best with more than 10% of their NAP measures contain spatial MRE-related contents. The group of follower countries comprises in a mixed way Southerners (*Spain, Greece*), Eastern- and South-Eastern- (*Bulgaria, Bosnia, Lithuania, Kosovo, Croatia*) and Western-European (*France, Germany, Ireland, Belgium*) countries, with the traditional spatial planner nations at the helm again. The most extended group, however, is again the lower-middle category: 22 countries stand below 5%. 4 states actually do not have MRE-related adaptation action (Figure 26).

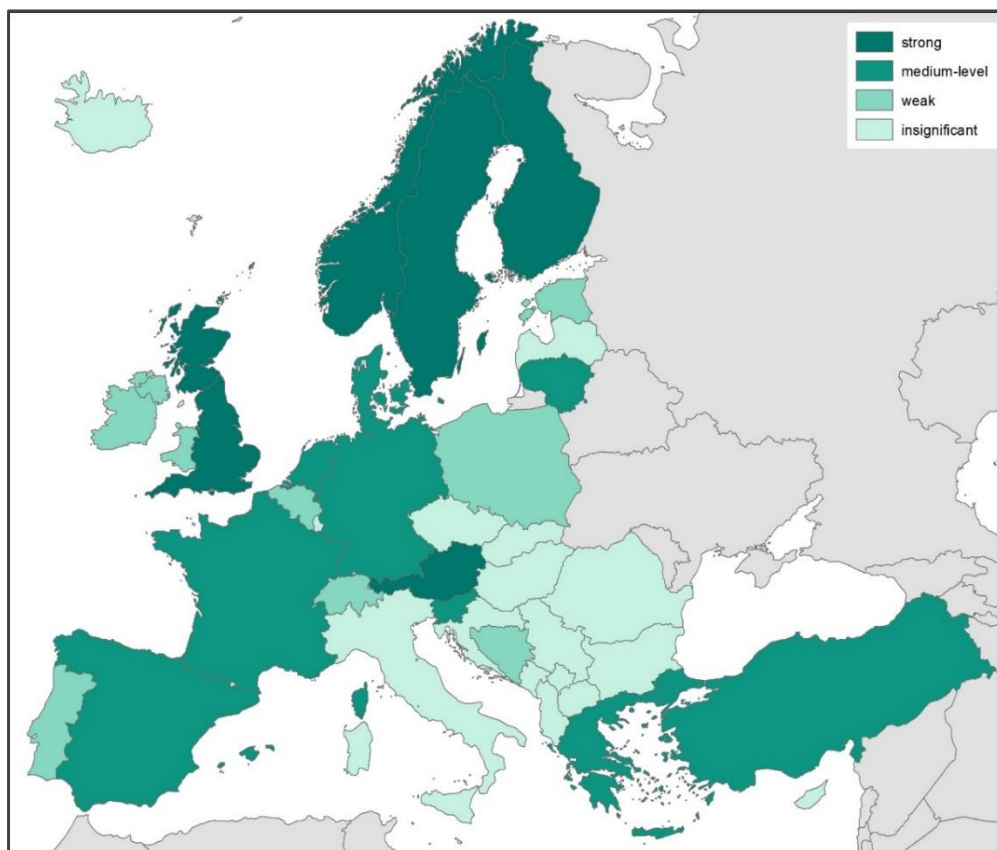


26. Figure: Proportion of NAP actions consisting of references to (spatial) adaptation MRE. *Source: own editing.*

5.2.5. Inter- and transnational spatial dimensions and content of NAS documents

The degree of inter- and transnational spatial content in NAS/NAP documents, similarly to NAP actions' spatiality, performed relatively better than the objective systems and situation analyses. The leading parts of Europe in this aspect are *Northwestern-Europe* and *Southern Europe* (more exactly the bigger southern states). The best performing countries are *England* and *Sweden* (both with maximum of the available points), moreover *Scotland*, *Finland*, *Austria* and *Norway* all show higher values than 10 out of the maximum available 15 points. The upper-middle category comprises *Spain*, *Greece* and *Türkiye* (all emphasise Mediterranean linkages, and common macroregional climate change-induced spatial challenges); *the Netherlands*, *Denmark*, *France* and *Germany* as big international financial supporters in climate adaptation; *Lithuania* with consequent and constant mentioning of its connections within the Baltic area throughout the NAS and *Slovenia*, where international intentions got special emphasis in the whole strategy. The weakest categories are made up by 16 countries, mainly *Eastern*, *South-eastern* and *smaller Southern states* (Figure 27).

As for “**the emergence of global geographical climate-related risks**” sub-aspect, only a very low number of NASs perform exceptionally well. These are mostly the national documents of the different parts of the *UK*, *some Southern countries* (*Spain*, *Greece*) and *Northern ones* (*Norway* and *Sweden*). Their NASs include explicit, nominated references to these issues among the objectives/measure groups' titles or deal with them in the form of a dedicated situation analysis chapter. *Spain* especially emphasises the importance of recognising global risks as pandemics and climate change; out of the “*Objectives of areas of work*”, “*Peace, Security and Social Cohesion*” mentions global climate risks explicitly and the importance of promoting peace and security in the face of the climate change impacts at the national level through the early detection of potential spatial conflicts for its prevention, strengthening mechanisms to promote peace, security and social cohesion and the integration of risk-related knowledge into national security.



27. Figure: Inter- and transnational spatial dimensions and content of the NAS documents in the examined countries. Source: own editing.

Basis of the calculation: sum of the values of the analytical sub-aspects in each country. Strong category means values above 10 points; medium-level category 6-10 points; weak category 2-5 points; insignificant category below 2 points. Maximum available points in the main aspect: 15. Further information in Table 11.

Greece's NAS in its Chapter 5.10. (*Climate adaptation and international security*) directly deals with climate migration. Austria's NAS subchapter 6.5. "*Security policy dimensions of climate change*" nominates these issues and talks about regionally different worldwide challenges, concentrating on the global South in a dedicated chapter (*Globaler Kontext*), particularly mentioning small island states, the Arctic, South Asia, Central and South America, and large parts of sub-Saharan Africa. In the *English* NAS climate change-related global risks (such as impacts on global supply chains and food production) are mentioned already by the Ministerial Foreword. Moreover the "*Business*" chapter's "*Physical assets*" subchapter mentions again supply chain-related risks. In Norway the "*Foreign defence and security policy*" measure group is dedicated to the issue. Moreover, geopolitical risks appear in several other parts of the document. In Sweden's situation analysis a dedicated subchapter directly deals with global risks (e.g. border-transcending issues like migration, prolonged conflicts, uncertain food supply lines, migration pressure on Southern-Europe, cross-border climatic risks) and the country's Nordic macroregional position. Chapter 3's Vision also mentions this

perspective. The NAS specific objective 1's lower-level objective 8 ("Climate adaptation, disaster risk reduction, crisis preparedness and civil defiance") is partly mentioning several global climate risks and geopolitical issues. Specific objective 4's lower-level objective 7 "*International work on climate adaptation*" is directly about international cooperation and influence exertion in its entirety but it talks about global climate risks, too. *Lithuania, Türkiye, the Netherlands, Northern Ireland, Scotland, Wales* and *Finland* compose the upper-middle category (the group of followers) with explicit reference to global spatial climatic risks in the NAS' descriptions of objectives/measures but without dedicated chapters. 23 countries are in the lowest category with no reference to the topic at all.

The **“emergence of strengthening adaptation-oriented macro regional / international co-operations”** sub-aspect finds 9 countries [both from the *Northwestern (Scotland, England, Finland, Sweden)*, *Southern (Spain, Greece, Portugal)*, and *Eastern parts (Estonia, Slovenia)* of Europe] in the best category, either with explicit, nominated reference(s) to international scientific/knowledge sharing cooperation or macroregional or cross-border cooperations among the objectives/measures groups' titles or in the form of a dedicated situation analysis chapter. *Spain* is especially great: the NAS sets out a number of guiding principles – among them integration of international commitments into domestic adaptation policy emerges as well as international coordination within the Iberian Peninsula with Portugal¹⁰³. *Sweden* also puts significant emphasis on the topic. Its NAS Vision mentions the importance of knowledge on how other countries' vulnerabilities and climate adaptation affect Sweden, indicating the need for cooperation, too. NAP specific objective #2's lower-level objective 5 „*Resilience of the Oceans*” urges active regional and international cooperation in the field of marine issues; specific objective #5's lower-level objective 6 in the field of cultural heritage and environment; specific objective #4's lower-level objective 6 in the field of human health. Within specific objective #4, the lower-level objective „*International work on climate adaptation*” particularly focuses on the topic, even in its title. Its subpoints "*Biodiversity on land and in the sea*", "*Health*", "*Secure food supply and sustainable food systems*" and "*Water*" all mentions the importance of adaptation-related international cooperation in their own sectors. Within the same lower-level objective, "*Cooperation in the Nordic Region and the Arctic*" is a dedicated subpoint focusing particularly on macro regional cooperation. Also dedicated subpoints deal here with

¹⁰³ Regarding geopolitical changes it mentions that climate change can impact international relations, affecting humanitarian assistance, defence or cooperation policies. This line of action is aimed at identifying chains of impacts associated with climate change that connect spaces beyond our borders with the country; defining strategies and initiatives that can contribute to reducing the vulnerability of Spain, while avoiding negative impacts on European and global vulnerability".

"Cooperation with the EU" and "Cooperation with the UN", saying that the Government will also continue to push for ambitious and effective climate adaptation work within the framework of cooperation at regional, EU and UN levels. 9 more states (*Ireland, Malta, the Netherlands, France, Switzerland, Austria, Lithuania, Bosnia, Türkiye*), though do not dedicate particular measure group to the topic, still use explicit references to the issue in the description of objectives/measures' or in the title of several individual measures or in the situation analysis' textual parts. The majority of the countries, however, are in the lowest two categories (9 in the lower-middle, 13 in the lowest), showing either minimal and implicit, or no signs of thinking in adaptation-related international cooperations.

Considering the **emergence of strengthening the macro regional / international influence in the field of adaptation policy activities**, six countries got into the best category with explicit, nominated reference(s) to the issue (mostly in the form of either financing of interventions in developing countries, or setting up development programmes in or exporting adaptation knowledge to these countries). In *Germany* a dedicated target (Wi-4) focuses on German companies that should operate successfully on national and international markets to constantly improve their aggregated value added in the field. In *Scotland's* NAS the intention of strengthening international influence emerges already in IA objective's general introduction. IA1 sub-objective particularly concentrates on financing foreign vulnerable communities; IA2 sub-objective (*International Advocacy*) urges to influence and facilitate developing countries' adaptation activities. In *England* the NAS's "*International impacts*" chapter focuses especially on helping to adapt and build resilience in vulnerable communities to climate related disasters and on driving international action and consensus in negotiations on climate adaptation in this direction. A dedicated chapter, "*International dimensions*" in its "*Cascading risks*" subchapter particularly concentrates on these issues. *Finland's* NAS in its Objective #19 focuses on international collaborations with and support of the most vulnerable countries; while Objective #20 on the facilitating of adaptation tool development in third-world countries. In *Norway's* NAS "*Aid and development cooperation*" measure group is dedicated to the same issue. International influence already appears in the introduction, emphasising the need for helping vulnerable regions of the World: East, Central and West Africa, South Asia, Central America, the Caribbean and Island states. Its Chapter 6.8.3. about "*Climate adaptation and international security*" and chapter 6.9.1. about "*Reducing climate vulnerability in developing countries*" also touch the issue. *Sweden* has a leading role in international climate finance, too. Its NAP lower-level objective 4.7. "*International work on climate adaptation*" is directly, among other things, about international cooperation and

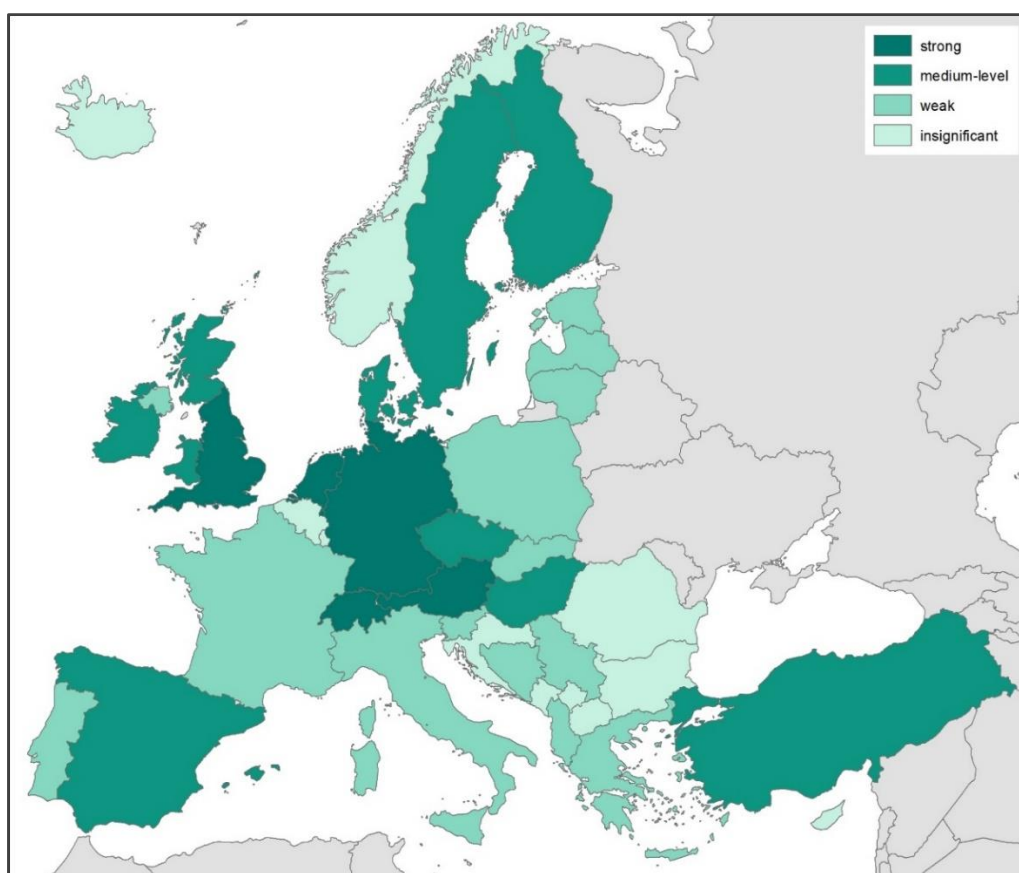
influence exertion in its entirety: especially its sub-point called "*International financing and global resilience to climate risks*" deals with the latter. Similarly, the "*Sweden as an international actor*" point says that the Government intends to keep its ambitious global commitment to adaptation and to expand and make Swedish climate assistance more efficient. With that, says the Strategy, they can mobilise private capital and technological innovation, concentrating on major investments and local capacity developments in developing countries. *Denmark's* NAP in its "*International climate change adaptation*" part mentions also related intentions. In the upper-middle category *Slovenia, Lithuania, the Netherlands, Belgium, Austria* and *France* explicitly refer to the issue in their NAS document – but without a dedicated main chapter or measure group. Three, otherwise well-performing countries (*Hungary, Switzerland, Wales*) only implicitly refer to the issue in their document in their objective/measure descriptions or in their situation analyses. 25 countries (more than the half of the analysed states, mostly *Central-, Southern- or South-Eastern-Europeans*) do not show any reference to the topic.

5.2.6. National adaptation MRE activities' spatiality

The MRE-related main aspect's performance was altogether weak, or mediocre: considering the summarized values of the 6 MRE-related sub-aspects, with the exclusion of the 5 best-performing states, the other countries reach only the half of the maximum available points at best. The few outstanding performances, with between 19-24 points out of the maximum available 30 are presented by *Germany, Switzerland, the Netherlands, England* and *Austria* – again the pioneer states of adaptation planning and consequently, in this case, MRE. The group of followers is composed by *Hungary* and the *Czech Republic* from *Eastern-Europe*; *Türkiye* and *Spain* from *Southern-Europe*; *Ireland, Wales, Scotland, Denmark, Finland* and *Sweden* from *Northwestern Europe* – mostly the aforementioned pioneers again, supplemented with some Eastern and Southern catching-up adaptation planners. Among the weakest performances, below 6 points, mostly *South-Eastern European* states emerge, together with, surprisingly, *Norway, Iceland, Belgium* and *Luxemburg*: developed countries, where adaptation planning show outstanding qualities, but regarding the related MRE activities, they are only at the beginning of the road (Figure 28).

As for the **spatial levels of data collection and reporting activities in adaptation monitoring**, real spatially oriented activities emerge rather rarely. *Switzerland, Germany, Austria* and *the Netherlands* compose the best category, with a (more-or less) functioning national monitoring system in adaptation, using lowest-as-possible level spatial data. In *Finland, Sweden, Wales, England, Scotland, Ireland* (*North-Western*

Europe), Türkiye, Italy, Spain, Greece (Southern-Europe) and Bosnia, Slovenia, Lithuania, Latvia, Hungary (ex-Eastern bloc countries) MRE systems are planned in adaptation, in the form of an action or objective of the NAS/NAP, with hints for spatial data use. In other words: theoretical establishment of MRE activities have at least started in the analysed countries and out of its pillars monitoring shows the strongest sign, but only implicit information is available about the planned activities' actual spatiality (SÜTÖ, 2025B). In 20 more countries (mostly Eastern-Central Europeans and Northerners) adaptation MRE systems are planned /exists only in sectoral terms (in one or some of the affected sectors), or a general climate policy MRE system is under planning but without hints of spatiality. The rest has neither functioning MRE system nor related development ideas in adaptation anyway.



28. Figure: Spatial emphases in the national adaptation MRE activities of the analysed countries

Source: own editing.

Basis of the calculation: sum of the values of the analytical sub-aspects in each country. Strong category means values above 15 points; medium-level category 11-15 points; weak category 6-10 points; insignificant category under 6 points. Maximum available points in the main aspect: 30. Further information in Table 11.

Considering the **spatial content of adaptation indicator sets**, the picture is mixed again, but in average a rather mediocre situation can be observed. Regarding actual indicator sets, existence of real spatial indicator collections is rare (SÜTÖ, 2025B). In altogether 3 countries (Switzerland, Denmark, Germany) there are both impact/result

and output indicator sets in adaptation MRE practice, concentrating even on special geographic areas/regions/administrative units. In several *Eastern-Central* or *Southern European* countries (*Türkiye, Portugal, Italy, Spain, Serbia, Slovenia, Hungary, Latvia*), together with *England* and *Ireland*, some lower-level objective-related impact/result indicators (and possibly output indicators) are used, but neither spatial/territorial breakdown can be identified nor any geographic/regional specification detected. 15 countries apply only or almost only output indicators in their adaptation policy indicator system, but without spatial focus; or adaptation indicator systems are only under planning. In 7 countries (*Norway, Iceland, Malta, Cyprus, Montenegro, Romania, Lithuania*) no indicator system is present/available/planned in adaptation policy.

The **presence of GIS-based decision support system(s) in adaptation planning** also varied throughout Europe. To date the number of real decision support tools has significantly increased at all spatial levels in the continent. However, though several countries are contemplating about development of GIS-based decision support system in adaptation, the number of countries, where these intentions have already been implemented is not so extended. Scattered examples show that some countries, e.g. from *Eastern-Central Europe* (*Hungary, Latvia*), *Southern-Europe* (*Spain, Türkiye*) and from classic, long-time spatial planner pioneer and/or federative *Western European states* (*Austria, Switzerland, France, Germany, the Netherlands, Ireland, England, Denmark*) have already a functioning adaptation-oriented, sometimes multi-thematic, GIS-based decision support tool (or tools). *Hungary's* National Adaptation Geo-Information System is an outstanding example regarding its thematic coverage, complexity and spatial vulnerability-orientation. *Türkiye* has recently made operational its climate portal (<https://iklimportal.gov.tr/>), similar in its structure and target groups to the Hungarian solution. In *Switzerland*, based on a NAS priority theme, “*CH2018 Climate Scenarios*” project produces valuable information and bundle them in cantonal fact sheets. Corresponding figures are available in the CH2018 web atlas. On the nccs.admin.ch website under the regional information menu, macro regional data (Grossregionen - present and future projections with diagrams), canton-level downloadable factsheets and projections are available. City and settlement-level data supporting decisions can be obtained from the www.onlinetool-klimaanpassung.ch website. In *Germany* multiple types of decision supporting websites can be found. In *the Netherlands* the Climate Impact Atlas (klimaateffectatlas.nl/en) provides an initial impression of the (future) threats of flooding, waterlogging, drought and heat. *England's* NAP in its „*Infrastructure*” chapter/”*Cascading Failures*” subchapter talks about the Critical National Infrastructure Knowledge Base and Mapping Tool, which

identifies risks and interdependencies across and within sectors, working with infrastructure owners and operators. The so-called United Kingdom Climate Projections (UKCIP) site provides information on anticipated changes of climate variables such as precipitation, temperature and sea-level rise and is used to inform the regular UK Climate Change Risk Assessments (CCRAs – both the national version and its country-part volumes) and, based on this, the NAP. In *France* the „*DRIAS Futures of Climate*” portal offers regionalised climate data for a variety of users. In the upper-middle category, namely with *Central-Europeans (Serbia, Slovenia, Slovakia, Romania, Poland, Czech Republic)* *Southern-Europeans (Portugal, Greece, Italy)*, and a traditionally best-performing *Western-European (Scotland)* adaptation-oriented thematic, GIS-based decision support tool’s establishment is only planned by the states currently, in the form of an action or objective in the NAS/NAP, or there is only a climate data-oriented GIS-based system, without risk, vulnerability, sensitivity or adaptive capacity measurements. The other 15+5 countries are those where either though an adaptation website is functioning /planned but without signs of GIS/decision supporting functions; or there is a lack of any thematic GIS-based tools or general climate adaptation knowledge base websites.

Moving on to the evaluation pillar of MRE, regarding **the degree of spatial content in adaptation-related evaluations** there is no outstanding country in this sub-aspect. The best category, where explicitly geographically/spatially oriented evaluation products exist, rich in spatial chapters, aspects, evaluation questions, simply does not contain any states. The upper-middle category comprises only a few countries, too (*Austria, Switzerland, the Netherlands, Finland and parts of the UK*) with large number of adaptation evaluation products, established evaluation systems but minor or no spatial content in these materials. In 21, mostly *Eastern-Central* and *Southern-European countries* (e.g. *Hungary, Serbia, Czechia, Lithuania, Poland, Slovakia; Spain, Greece, Italy, Türkiye*) only the NAS/NAP aims the setting up of an adaptation evaluation system or the preparation of actual assessments, but no evaluation product (or only one NAS evaluation) exists in practice yet. Even in this group of countries can we find interesting cases: e.g. *Hungary* has only a recent NAS-evaluation that followed a sectoral logic basically, yet it also examined the presence of spatial emphases in sectoral adaptation activities and climate policy itself and urged the strengthening of spatial logic during the actual NCCS-2 update (SÜTÖ, 2025A). In 11, mostly *Eastern-Central European* states the NAS/NAP do not mention evaluations, anyway.

Spatial visualization in adaptation evaluations, as a consequence of the previous analytical sub-aspect’s results, is mostly weak or lacking, too. There is only one more-

or-less outstanding country, *Germany*, that, according to the classification, shows consequent and frequent emergence of explicitly geographically oriented maps or diagrams or perhaps info graphs in its evaluation product(s) (VAN RÜTH ET AL. 2019). Honestly saying this judgement of Germany's performance is a bit benevolent, because even in that country the consequent system of spatial evaluations is still lacking but its rather mediocre performance in this sub-aspect is still outstanding in European comparison. Germany is followed by the five upper-middle category countries (*Croatia, Austria, Scotland, England, Wales*) where the existing evaluation products and monitoring reports show only very scarce use of thematic maps or geographically oriented diagrams / info graphs (but at least a minimal number of these emerge in the documents). As for the evaluations of *Estonia, the Netherlands, Northern Ireland* and *Norway* only diagrams or photos indicate the weak emergence of spatial issues in the documents. 10 other countries do not use these tools at all in their documents. In the majority of countries, mainly from *Central-, South-Eastern* and *Southern-Europe* no concrete adaptation-related evaluation documents were available for analysis and/or the NAS/NAP does not mention these activities.

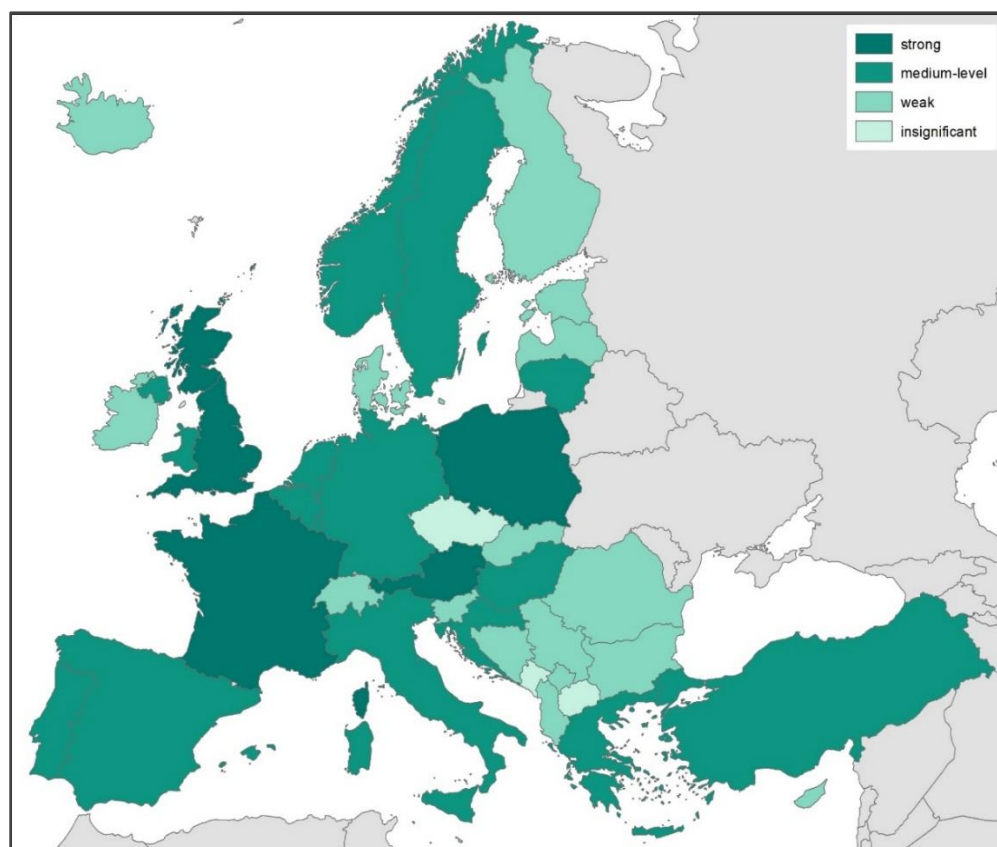
Examining the real **spatial levels of evaluations** there is one outstanding country in this respect: *the Netherlands*, with emergence of explicitly spatially oriented evaluation reports in adaptation at subnational and local levels (partly due to the Delta Programme, partly to provincial and municipal evaluation activities), and the NAS/NAP refers to these, too. In the upper-middle category six states' (*Sweden, Finland, England, Ireland, Austria* and *Hungary*) NAS/NAP plans to elaborate evaluation reports at lower spatial levels, too, but no such evaluation products have emerged in practice yet. 19 countries from all parts of Europe (*Northern- and Western-Europe* is overrepresented here, nevertheless) got into the third category where only national level evaluations exist/available in adaptation and there are not any plans for evaluation system development. In *Estonia* and *Greece* no evaluations exist yet; either the importance of MRE and evaluations are indicated in the documents or only sectoral MRE is urged by the NAS. In 14, mostly *Central-, South-Eastern* and *Southern-European countries* evaluations are not available currently and the NAS/NAP does not talk about these kinds of activities, either.

5.2.7. Emergence of European and national spatial policy considerations in the NASs

The last main analytical aspect dealt with the emergence of respective national and European spatial policy priorities in the national adaptation planning documents. The summarized results showed the best performances (above 11 points reached out of the available 15) in *France, Scotland, Poland, Austria* and *England* – those countries that performed the best in the aggregated composite spatial sensitivity indicator, too (Figure 29). These countries are, with the exclusion of Poland, among the main adaptation policy planning pioneer states of Europe. This small group is followed by a wider, mixed one, composed by the bigger and medium-sized Southern countries (*Türkiye, Spain, Italy, Greece, Portugal*), some Eastern-Central Europeans (*Croatia, Lithuania* and *Hungary*) and traditional North-western adaptation policy pioneers again (*Belgium, the Netherlands, Luxemburg, Norway, Sweden, Wales, Northern Ireland*). The reasons for the higher values are the adequate consideration of European spatial directions (*Türkiye, Spain*), or stronger national spatial planning implications (*Italy, Greece, Portugal*) or significant consideration of territorial cohesion-related concepts (*Belgium, the Netherlands, Luxemburg, Norway, Sweden*). The weakest values were found mostly among the *South-eastern* and *Eastern states*, with some surprisingly weak performances (*Switzerland*, together with *Ireland, Finland* and *Denmark* reached only 5 points, *Iceland* 3) – in these cases the respective NASs simply left out considerations of spatial policy documents' directions.

Seeing the details, **consideration of national spatial/regional development objectives** appear in all of the NAS documents, but usually not directly and not entirely. *France* and *Sweden* are the only two examples for the best category, where namely all or almost all then-current national spatial objectives emerge explicitly (in nominated form) in the respective NASs. In *France*, for example, all five priorities of the “FRA2030” document appear almost word-by-word in the new NAS; while *Sweden* in its NAS refers to all 3 main challenges identified in the national regional development concept as well as to the 4 priorities of the same concept. 14 further countries compose the upper-middle class where majority of the objectives/priorities of national spatial development directions is present among the NAS objectives/measures, in titles or in the textual parts, but mostly implicitly. *Parts of the UK, Norway* and *Southern-European countries (Portugal, Italy, Greece, Malta)* appear in the category. Nevertheless, the overwhelming majority, 25 countries (mainly from *Eastern-Central Europe, the Balkans*, and *continental Western-Europe*) compose the lower-middle category, where only minority of the spatial policy

directions is present in the NAS. Particularly interesting example is *Hungary*, where the then-fresh National Development and Regional Development Concept (NDRDC in 2014) contained an energy and climate policy chapter, whose content was based on the current NAS parts (at that time under elaboration). Sectoral action lines of the climate strategy were also reflected in the relevant national spatial development lines. But altogether there were few references in the NAS about cross-fertilization with the NDRDC (SÜTÖ, 2025B). The worst category, similar to the other two sub-aspects, is empty.



29. Figure: Emergence of national and European spatial policy directions in the NASs of the analysed countries. Source: own editing.

Basis of the calculation: sum of the values of the analytical sub-aspects in each country. Strong category means values above 10 points; medium-level category 7-9 points; weak category 3-6 points; insignificant category below 2 points. Maximum available points in the main aspect: 15. Further information in Table 11.

As for the **consideration of European spatial development objectives**, the then-current highest level European spatial goals and objectives appear in the NAS documents, but again, usually not directly and not explicitly. Only four countries have been found where all or almost all European regional development objectives/priorities from the then-current Territorial Agenda emerge explicitly (in nominated form) in the documents' vision/objective system/measures. *Spain, Türkiye, France* and *Scotland* represent all or almost all priorities of the TA2030. Characteristically the last three TA2030 priorities are the most frequently reflected ones in European NAS documents

elaborated after 2018, cherry picking those sectors that are most affected to climate change. The 10 countries in the upper-middle category are from various parts of Europe: from the South (*Greece*), Eastern-Europe (*Lithuania, Poland, Croatia*) and North-Western Europe (*Luxemburg, England, Wales, Germany, Austria, Sweden*). The latter subgroup is composed by those adaptation policy leader countries who showed the best performances in the whole analysis. They refer in their NAS to the majority of European spatial policy objectives/priorities in objective titles or in the textual parts, but mostly implicitly (in the form of cognate contents). The lower-middle category consists of 27 countries, composing the overwhelming majority of the continent. Majority of the *Northerners* and *Balkan countries*, significant part of *Southerners, Westerners* and *majority of Easterners* can be found here. They refer only to a minority of European spatial development objectives. The weakest category is empty here, too.

The analysis examined the **emergence of the basic territorial cohesion-related concepts** in the NAS documents, too, as manifestation of the European spatial policy terminology in adaptation policy. Out of the concepts, multilevel governance is present almost in every analysed NAS document (with three exclusions), while given countries mention even further notions: balanced sustainable spatial development, place-based approach, territorial optimum-searching or spatially integrative nature of adaptation planning. In 6 countries (*Poland, Austria, the Netherlands, Belgium, England, Scotland*) the situation analysis, the vision and the objective system mention at least 4 out of the 6 (territorial cohesion, territorial capital, territorial harmony, spatially balanced development, territorial optimum, place-based approach) concepts. 2-3 of the listed aspects appear in some Eastern-Central European (*Hungary, Lithuania, Romania, Bulgaria, Kosovo*) and bigger/medium-sized Southern countries (*Spain, Italy, Türkiye, Portugal*), furthermore in significant proportion of the Western and Northern European states (*Switzerland, France, Germany, Luxemburg, Ireland, Northern-Ireland, Wales, Norway* and *Sweden*). The other countries apply only one of the listed aspects in their NAS textual parts (mostly, as it has already been mentioned above, multilevel governance; sometimes place-based approach or implicitly territorial capital) or they do not mention any of these.

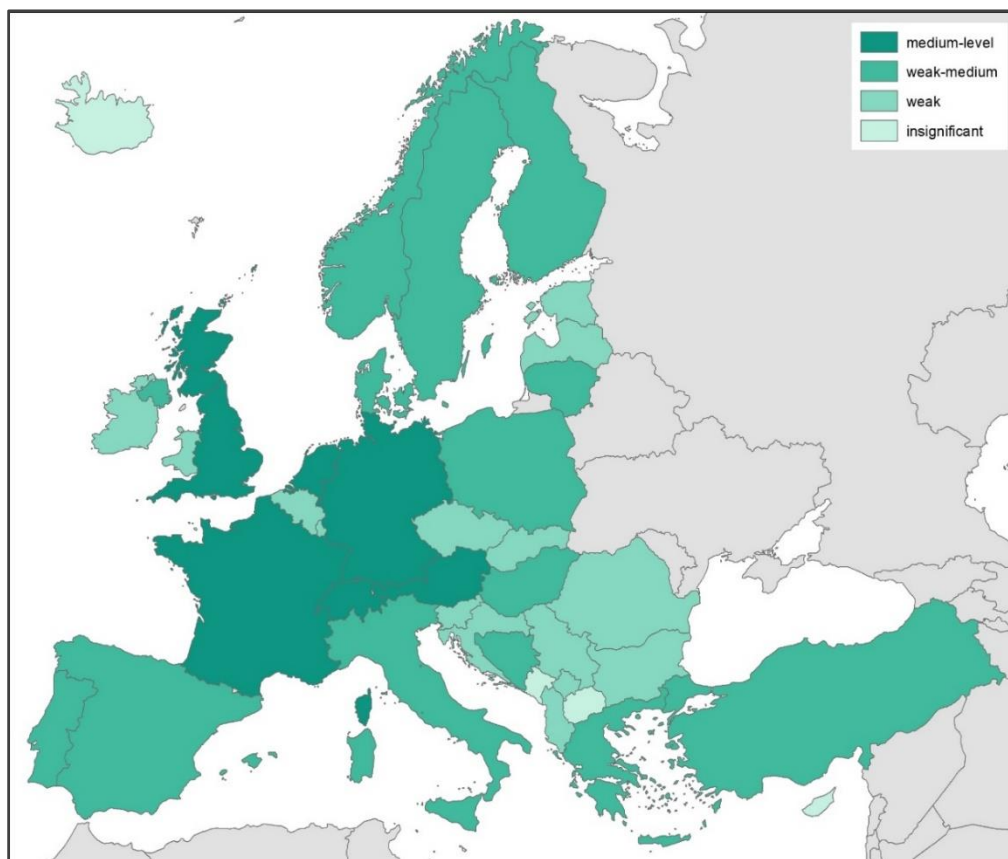
5.2.8. Aggregated spatial sensitivity of the analysed countries

Following the logic of the dissertation's spatial sensitivity model, values given for the individual sub-aspects were added together in case of each country. The final results were also ranked, and so we have gotten a list of European countries' spatial performance in the field of adaptation policy planning and MRE.

As for the concrete results, the best performances can be observed in the traditional pioneer states of spatial and adaptation planning & MRE from Western Europe: *Austria* showed outstanding results, followed by *the Netherlands, Scotland, France, Germany, Switzerland, and England*. These countries perform exceptionally or relatively well compared to others in the general spatiality of adaptation policy; furthermore, in the spatial MRE-, the action-level's spatiality-, the international spatial aspects- and the spatial policy considerations-related main aspects. The second-best group also consists of Northerners (*Sweden, Denmark, Finland, Norway*) and a Western country part (*Northern Ireland*), but here emerge the best Eastern-Central Europeans (*Poland, Hungary, Lithuania*), and the big/medium-sized Southerners (*Türkiye, Spain, Portugal, Greece, Italy*) as well. The *Eastern-Central European countries* perform well in the general spatiality of adaptation policy and the situation analysis-related sub-aspects, the *Southerners* in the international spatial considerations, the situation analyses' spatiality and the action-level planning's spatiality. The weakest results are shown mostly by *Eastern-Central (Romania, Slovakia, Bulgaria)* and *South-Eastern (Balkan) countries (Montenegro, Macedonia, Kosovo, Albania)* as well as the smaller *Southerners (Malta, Cyprus)* (Figure 30).

The other thing that comes to our mind is the level of the values: basically weak (or mediocre at maximum) results can be observed as the outcome of the analysis. Even the best-performing countries show medium-level performance at best, reaching only the half or a bit above than the half of the maximum available points. This outcome calls our attention that spatial thinking and the prevalence of spatial approaches have not become the dominant direction in climate adaptation planning in Europe yet, at least at the national level.

Among the main aspects, “*general spatiality of adaptation policy*” (with an average of 49,26% of the available points were reached by the countries), and “*consideration of national and European spatial policy objectives*” (40,97%) performed relatively better; while “*spatiality of operational actions*” (30,4%), “*inter- and transnational spatial aspects of adaptation*” (31,7%) and “*spatiality of adaptation MRE activities*” (32%) are closer to the *average value of the aggregated composite indicator* (30,63%). These average results cover a few very good individual performances of course, but the majority of the countries perform mediocre or weak in these main aspects.



30. Figure: Aggregated spatial sensitivity of the analysed countries' adaptation policy planning and MRE. Source: own editing.

Basis of the calculation: sum of the values of all the analytical sub-aspects in each country. Medium-level category means values above 75 points; weak-medium-level category 51-75 points; weak category 26-50 points; insignificant category 25 points and below. Maximum available points in the whole comparative analysis: 170. Further information in Table 11.

The two weakest-performing main aspects, “*spatiality of situation analyses/assessments*” (≈19%) and “*spatial emphases in NAS objective systems*” (21,16%) indicate that while the more tangible operational actions and MRE activities put somehow stronger emphasis on spatial considerations, the first steps of strategic planning, namely evidence-based assessments and objective planning put the smallest weight on spatial differences and spatially oriented topics in the analysed national climate policy activities. This fact is a good indicator of the general weakness of spatial approach in the adaptation planning cycle, right at the roots of the related activities.

5.3. Determinants of spatial sensitivity in climate adaptation policy planning

Chapter 5.3., in the same way as a few previous ones, is based partly on my latest publication on the topic (SÜTÖ, 2025B), but the Eastern Europe-oriented outcomes of that article have been complemented by the inclusion of the other three European macro regions' countries into the assessment, and even the number of involved indices has

increased as some climate vulnerability- and risk-oriented indicators were added to the correlation analysis.

An interesting challenge is to identify whether which factors the most influential are regarding the spatial sensitivity values of the analysed countries. To find an adequate answer to this question **the dissertation collected several indices with a potential to depict a given perspective of the multidimensional environment** influencing the performance of adaptation planning and MRE activities from a spatial point of view. Some of these indices are physical (size of the country, number of climatic zones in a given country according to the EEA classification, population, population density, urbanisation), some are economic (GDP/capita, GINI index, use of renewable energy sources), some are social (HDI, life expectancy, education level), spatial governance- (type of governance, type of spatial planning sector) or adaptation policy-related (number of adaptation cycles started) ones. To find out which the strongest influence has on spatial sensitivity, a correlation analysis has been conducted for these indices and the spatial sensitivity composite indicator.

The idea of involving additional, vulnerability, risk, or similar type of indices into the group of examined indicators came up during the internal thesis defence. Originally, I was reluctant to use a complex vulnerability (or sensitivity/adaptive capacity) index in the analysis exactly due to the specified nature of these indices. Majority of the known vulnerability and risk indices concentrates on individual affected parties (e.g. group of society, branch of economy, etc.) or risk/vulnerability topics (e.g. heatwaves, flash floods, etc.) and not on all affected parties/all kinds of vulnerability thematics in a whole country. Entirely integrated vulnerability analyses covering all available risk topics are rare, let alone at national level, and their results are in question¹⁰⁴. On the other hand, in case of vulnerability or risk analyses the proper spatial levels seem to be the subnational and the local ones; the national level is too abstract, especially in case of bigger countries, to easily identify the most affected parties/most relevant risk topics; whereas integrating too many parties and topics into a single analysis and index make the results too general again, eliminating or neutralising the characteristics of region-specific vulnerabilities. On top of that, as opposed to my other national, climate-related chosen index, the number of climate zones in a given country, an integrated vulnerability index does not reflect to intra-state spatial differences.

¹⁰⁴ E.g. in Greenwatch's 2019 analysis Lithuania, Latvia, Estonia and Finland are the most affected states in Europe, while Iceland, Hungary or Greece are barely affected; Norway's and Sweden's vulnerability is medium level; German Watch's global risk index is although loss & damage - based, the different ends of the scale are illogical – Pakistan, Nicaragua, Guatemala and the Indochina-peninsula are strongly affected; while Africa is barely; Western Europe strongly and Eastern-Europe barely. To make the picture even more confused, the 2022 edition of the same risk index shows strong risks in Hungary, Romania, Central Africa and in the USA. Detailed explanations are not attached to these changes.

Finally, I chose to add two indices of the Notre Dame University from Indiana, that assess and rank all countries regarding their complex climate vulnerability and combined vulnerability plus readiness; together with a calculated “loss and damage per capita”-based index using the EEA’s and the United Kingdom’s Climate Change Risk Assessment document’s climate-related economic losses data as a basis. Table 4 below shows the applied indices and their data sources.

The correlation analysis of the chosen indices with spatial sensitivity (Table 6) shows that, based on the categories of the connections’ strength (Table 5), **mostly weaker-than-medium-level connections** can be identified. Only two indices showed **above-medium-level strength of connection**: the *spatial administration type of the country* (with a correlation coefficient 0,616) and the *number of adaptation planning cycles started* (with a correlation coefficient 0,595). The former is a good indication of spatial emphasis’ presence in a country’s national public administration and the role of spatial administration levels even in adaptation activities (the more decentralised/federal a country is the stronger emphases will be put on different spatial levels’ role in adaptation strategies and activities) (SÜTÖ, 2025B); while the second shows the advancement and experiences of adaptation policy planning. The more experience and traditions a country accumulated in adaptation planning the bigger the chance that adaptation policy planners and practitioners have the sensitivity to such special aspects like avoiding maladaptation, applying nature-based solutions, or, in our case, spatial emphases in the related planning and MRE activities. **Weaker-than-medium, but still relative significant connection** can be traced between spatial sensitivity and *population* and *size of the countries*: 0,470 and 0,460 respectively – unsurprisingly, bigger (and sometimes more populated) a given country is, the more diverse its geography is and this fact is reflected even in the consideration of spatial differences in adaptation and in the spatiality of adaptation planning directions (SÜTÖ, 2025B).

HDI index tells us something about the development level of a given society. Here the correlation with the spatial composite index is 0,405. At the same time among the weakly correlating indices life expectancy at birth (0,308) and the type of the spatial planning sector (0,285) show the highest values. The other economic (GDP/capita, GINI, renewable energy use), physical (urbanisation, population density) and social (life expectancies, level of education) indices register only very weak or totally insignificant correlation with spatial sensitivity (between + and – 0,223 coefficients). Altogether, in Table 6 medium blue cells indicate “stronger-than-medium-level” connections; light blue cells indicate “weaker-than-medium-level” connections; white cells with bold italic

numbers indicate the three strongest weak connections, while general white cells the lack of connection.

Out of the newly added indicators the *combined vulnerability and social-economic readiness Notre Dame index* shows the strongest correlation (0,528 coefficient, meaning an above-than-medium level connection) with spatial sensitivity; while the *pure vulnerability index of the same university* shows weaker-than-medium level (and reverse) correlation (-0,465 coefficient). The *calculated climate-related economic losses indicator* shows even weaker but still not utterly weak connection (0,362 coefficient) with the composite indicator.

4. Table: Spatial sensitivity composite indicator values and other physical, social, economic, spatial planning-, spatial administration-, adaptation planning- and vulnerability-related indicators of the analysed countries. *Source: own editing.*

Country (or country part)	Spatial sensitivity composite indicator <i>SOURCE: own calculation</i>	Size of the country (km ²) <i>SOURCE: Eurostat, 2025; CIA world factbook (CYP); UNECE (ALB, BIH, MAC, ICE, MON, NOR, SWI, SRB) and Britannica.com (WAL, SCO, ENG, NIR).</i>	Nr. of climatic regions within the country <i>SOURCE: EEA 2017.</i>	Population (1000 capita) <i>SOURCE: World Bank (2024)</i>	Population density (capita / km ²) <i>SOURCE: UNECE</i>	Urbanization (% of urban pop.) <i>SOURCE: World Bank, 2024.</i>	GDP/pop. (PPP, \$) <i>SOURCE: UNECE, 2024.</i>	GINI-index. <i>SOURCE: World Bank, 2018.</i>	Population with tertiary education (%) <i>SOURCE: OECD, 2023.</i>	HDI-index. <i>SOURCE: UNDP, 2023.</i>	Life expectancy at birth (year) <i>SOURCE: UN Our Worlds in Data, 2023.</i>	Type of spatial governance ¹⁰⁵ <i>SOURCE: Egger, Magni-Berion, de Saint-Phalle (ed.), 2024. and Hague; Harrop; McCormick (ed.), 2021.</i>	Spatial planning sector's type ¹⁰⁶ <i>SOURCE: Dombi, 2021.</i>	Adaptation planning cycles started <i>SOURCE: EEA and NAs</i>	Proportion of renewable sources (+ waste) energy in electr. prod (%) <i>SOURCE: International Energy Agency (2023).</i>	Combined vulnerability and readiness score. <i>SOURCE: ND GAIN index, Univ. of Notre Dame, 2023.</i>	Complex vulnerability score. <i>SOURCE: ND Vuln. index, Univ. of Notre Dame, 2023.</i>	Climate-rel. economic losses per capita <i>SOURCE: own calculation based on EEA (2025), Statista, UKG Office for National Statistics (2024).</i>
ALB	36,00	28748,00	2,00	2714,63	97,82	65,38	26693,00	30,10	17,32	0,81	79,60	1,00	4,00	1,00	100,00	52,10	0,38	212,92
AUT	97,00	83882,00	2,00	9178,48	108,90	59,82	71962,00	30,80	33,60	0,93	82,00	5,00	6,00	3,00	86,28	69,00	0,30	2152,53
BEL	46,00	30667,00	2,00	11876,85	385,88	98,22	72289,00	27,20	39,10	0,95	82,10	5,00	2,00	1,00	35,86	62,60	0,34	1549,57
BGR	37,00	110996,00	3,00	6444,37	58,08	77,04	72289,00	41,30	26,70	0,80	75,60	1,00	2,00	1,00	25,11	55,50	0,35	976,36
BIH	56,00	51197,00	3,00	3164,24	67,45	50,71	20630,00	33,00	14,70	0,80	77,90	5,00	4,00	1,00	43,10	51,20	0,35	1687,92
CHE	80,00	41285,00	2,00	9034,10	215,31	74,33	94015,00	33,10	40,30	0,97	84,00	5,00	6,00	2,00	66,60	72,00	0,25	4143,64
CYP	12,00	78871,00	1,00	10882,17	137,75	74,74	55803,00	25,00	23,50	0,92	79,80	2,00	6,00	1,00	16,01	57,70	0,36	488,32
CZE	42,00	9251,00	1,00	939,95	103,56	67,08	59152,00	32,70	45,70	0,91	81,60	1,00	2,00	1,00	20,48	64,70	0,26	5615,46
DEU	83,00	357569,00	3,00	83510,98	233,28	77,90	71282,00	31,90	29,00	0,96	81,40	5,00	6,00	3,00	55,09	69,00	0,30	97328,55
DNK	51,00	43925,00	2,00	5976,99	454,18	88,63	78603,00	28,20	35,50	0,96	81,90	1,00	8,00	1,00	88,84	70,90	0,35	858,93
ENG	77,00	130278,00	1,00	67690,32	519,58	68,73	51407,20	35,00	40,00	0,95	81,10	1,00	8,00	3,00	41,50	69,70	0,29	53641,86
ESP	63,00	505983,00	3,00	48807,15	95,56	81,80	56898,00	34,70	37,10	0,92	83,70	4,00	2,00	1,00	52,90	61,00	0,31	6270,64

¹⁰⁵ Classification: (5: federal; 4: devolved, 3: regionalized unitary, 2: decentralized unitary, 1: unitary states.

¹⁰⁶ (8: state-led; 6: market-led; 4: misled performative or proto-conformative; 2: conformative spatial planning systems.

Count- ry (or country part)	Spatial sensitivity composite indicator <i>SOURCE: own calculation</i>	Size of the country (km ²) <i>SOURCE: Eurostat, 2025; CIA world factbook (CYP); UNECE (ALB, BIH, MAC, ICE, MON, NOR, SWI, SRB) and Britannica.com (WAL, SCO, ENG, NIR).</i>	Nr. of climatic regions within the country <i>SOURCE: EEA 2017.</i>	Population (1000 capita) <i>SOURCE: World Bank (2024)</i>	Population density (capita / km ²) <i>SOURCE: UNECE</i>	Urbanization (% of urban pop.) <i>SOURCE: World Bank, 2024.</i>	GDP/pop. (PPP, \$) <i>SOURCE: UNECE, 2024.</i>	GINI-index. <i>SOURCE: World Bank, 2018.</i>	Population with tertiary education (%) <i>SOURCE: OECD, 2023.</i>	HDI-index. <i>SOURCE: UNDP, 2023.</i>	Life expectancy at birth (year) <i>SOURCE: UN Our Worlds in Data, 2023.</i>	Type of spatial governance ¹⁰⁵ <i>SOURCE: Egger, Magni-Berion, de Saint-Phalle (ed.), 2024. and Hague: Harrop; McCormick (ed.), 2021.</i>	Spatial planning sector's type ¹⁰⁶ <i>SOURCE: Dombi, 2021.</i>	Adaptation planning cycles started <i>SOURCE: EEA and NAS</i>	Proportion of renewable sources (+ waste) energy in electr. prod (%) <i>SOURCE: International Energy Agency (2023).</i>	Combined vulnerability and readiness score. <i>SOURCE: ND GAIN index, Univ. of Notre Dame, 2023.</i>	Complex vulnerability score. <i>SOURCE: ND Vuln. index, Univ. of Notre Dame, 2023.</i>	Climate-rel. economic losses per capita <i>SOURCE: own calculation based on EEA (2025), Statista, UKG Office for National Statistics (2024).</i>
EST	49,00	45336,00	1,00	1371,99	30,29	70,02	49237,00	30,30	36,00	0,90	79,20	1,00	6,00	1,00	38,50	63,90	0,33	5,20
FIN	72,00	338363,00	1,00	5637,22	16,51	85,87	64033,00	27,30	35,70	0,95	81,90	1,00	8,00	2,00	52,69	73,30	0,28	1765,32
FRA	81,00	638475,00	4,00	68516,68	123,97	82,04	61258,00	32,40	37,60	0,92	83,30	5,00	8,00	3,00	27,94	67,20	0,30	24498,62
GRC	56,00	131694,00	1,00	10388,81	79,05	80,98	43478,00	32,90	29,90	0,91	81,90	1,00	2,00	1,00	49,39	59,90	0,34	267,25
HRV	38,00	56594,00	3,00	3866,29	68,20	58,95	47758,00	29,70	24,80	0,89	78,60	1,00	2,00	1,00	70,20	55,60	0,38	456,45
HUN	66,00	93012,00	1,00	9562,29	103,11	73,18	47637,00	29,60	25,70	0,87	77,00	1,00	2,00	2,00	27,40	57,00	0,35	18906,12
IRL	46,00	69647,00	1,00	5380,26	75,59	64,76	131060,00	30,60	46,60	0,95	82,40	1,00	8,00	2,00	46,78	64,20	0,32	505,42
ISL	25,00	103000,00	1,00	404,61	3,75	94,09	81904,00	26,60	37,50	0,97	82,70	1,00	8,00	1,00	100,00	68,60	0,32	66,73
ITA	54,00	302073,00	2,00	58986,09	195,74	72,29	60867,00	35,20	19,20	0,92	83,70	4,00	2,00	1,00	45,50	59,80	0,34	26062,25
KOS	36,00	10887,00	1,00	1980,00	140,29	50,00	18619,80	44,60	68,73	0,76	78,00	1,00	4,00	1,00	12,70			4,46
LTU	56,00	65284,00	1,00	2888,05	43,98	68,94	54414,00	35,70	41,00	0,90	76,00	2,00	6,00	2,00	86,20	61,90	0,36	1593,61
LUX	31,00	2595,00	1,00	677,72	257,54	92,27	150612,00	35,40	45,70	0,92	82,20	1,00	6,00	2,00	96,60	67,20	0,31	7,62
LVA	45,00	64594,00	1,00	1862,44	29,06	68,82	43901,00	35,10	34,00	0,89	76,20	1,00	6,00	1,00	76,70	61,00	0,36	852,47
MKD	19,00	25713,00	2,00	1792,18	71,44	59,87	24387,00	33,00	20,00	0,82	77,40	1,00	4,00	1,00	32,00	55,10	0,37	138,20
MLT	14,00	316,00	1,00	574,35	1750,00	95,01	67725,00	28,70	30,50	0,92	83,30	3,00	2,00	1,00	13,50	58,60	0,32	2104,78
MNE	9,00	13812,00	2,00	623,83	44,82	68,84	32614,00	36,80	21,80	0,86	77,10	1,00	4,00	1,00	60,90	55,10	0,36	144,51
NIR	55,00	13562,00	1,00	1920,38	141,60	86,73	49007,90	27,00	32,10	0,91	79,70	1,00	8,00	3,00	45,60	69,70	0,29	147,33
NLD	84,00	37391,00	1,00	17994,24	430,50	59,87	83354,00	28,10	38,40	0,96	82,20	5,00	6,00	2,00	48,29	65,90	0,35	158,55
NOR	69,00	323769,00	4,00	5572,27	17,05	84,32	101008,00	27,60	41,90	0,97	83,30	1,00	8,00	1,00	98,61	75,50	0,26	2489,70

Count- ry (or country part)	Spatial sensitivity composite indicator <i>SOURCE: own calculation</i>	Size of the country (km ²) <i>SOURCE: Eurostat, 2025; CIA world factbook (CYP); UNECE (ALB, BIH, MAC, ICE, MON, NOR, SWI, SRB) and Britannica.com (WAL, SCO, ENG, NIR).</i>	Nr. of climatic regions within the country <i>SOURCE: EEA 2017.</i>	Population (1000 capita) <i>SOURCE: World Bank (2024)</i>	Population density (capita / km ²) <i>SOURCE: UNECE</i>	Urbanization (% of urban pop.) <i>SOURCE: World Bank, 2024.</i>	GDP/pop. (PPP, \$) <i>SOURCE: UNECE, 2024.</i>	GINI-index. <i>SOURCE: World Bank, 2018.</i>	Population with tertiary education (%) <i>SOURCE: OECD, 2023.</i>	HDI-index. <i>SOURCE: UNDP, 2023.</i>	Life expectancy at birth (year) <i>SOURCE: UN Our Worlds in Data, 2023.</i>	Type of spatial governance ¹⁰⁵ <i>SOURCE: Egger, Magni-Berion, de Saint-Phalle (ed.), 2024. and Hague: Harrop; McCormick (ed.), 2021.</i>	Spatial planning sector's type ¹⁰⁶ <i>SOURCE: Dombi, 2021.</i>	Adaptation planning cycles started <i>SOURCE: EEA and NAS</i>	Proportion of renewable sources (+ waste) energy in electr. prod (%) <i>SOURCE: International Energy Agency (2023).</i>	Combined vulnerability and readiness score. <i>SOURCE: ND GAIN index, Univ. of Notre Dame, 2023.</i>	Complex vulnerability score. <i>SOURCE: ND Vuln. index, Univ. of Notre Dame, 2023.</i>	Climate-rel. economic losses per capita <i>SOURCE: own calculation based on EEA (2025), Statista, UKG Office for National Statistics (2024).</i>
POL	71,00	311928,00	2,00	36554,67	117,33	60,33	49118,00	30,20	33,20	0,91	78,60	3,00	4,00	1,00	28,50	61,50	0,31	472,74
PRT	59,00	92226,00	2,00	10701,64	115,00	68,42	50706,00	33,50	27,20	0,89	82,40	1,00	2,00	2,00	76,20	62,80	0,32	482,92
ROU	38,00	238398,00	3,00	19069,35	79,96	54,88	48717,00	35,80	16,10	0,85	75,90	1,00	2,00	2,00	49,70	51,40	0,41	2239,28
SCO	81,00	77925,00	1,00	5490,10	70,45	83,61	55345,04	32,00	41,00	0,93	78,80	1,00	8,00	2,00	70,30	69,70	0,29	176,93
SRB	43,00	88361,00	2,00	6587,21	77,34	57,37	31895,00	35,00	23,30	0,83	76,80	1,00	4,00	2,00	36,10	51,40	0,42	2802,07
SVK	36,00	49035,00	2,00	5422,07	110,73	54,17	46866,00	25,00	25,80	0,88	78,30	2,00	6,00	2,00	23,90	57,00	0,36	1198,78
SVN	44,00	20273,00	3,00	2126,32	104,68	56,44	56522,00	24,60	29,80	0,93	81,60	1,00	6,00	1,00	41,80	63,90	0,31	378,63
SWE	73,00	447424,00	2,00	10569,72	23,42	88,98	70017,00	30,00	41,90	0,96	83,30	2,00	8,00	2,00	70,20	69,80	0,32	581,58
TUR	68,00	774815,00	2,00	87685,43	110,12	78,00	37445,00	42,40	25,30	0,85	77,20	1,00	2,00	2,00	42,30	55,30	0,38	754,80
WAL	45,00	20735,00	1,00	3164,40	152,61	67,21	43744,45	30,00	39,00	0,91	80,10	1,00	8,00	2,00	41,50	69,70	0,29	518,94

5. Table: Categories of the connections' strength in the applied correlation analysis according to the correlation coefficients' values. Source: own editing.

 rx, y values	connections' strength
$ rx, y = 0,00$	lack of connection
$0,01 \leq rx, y \leq 0,30$	weak connection
$0,31 \leq rx, y \leq 0,49$	weaker-than-medium-level connection
$ rx, y \cong 0,50$	medium-level connection
$0,51 \leq rx, y \leq 0,80$	stronger-than-medium-level connection
$0,81 \leq rx, y \leq 0,99$	strong connection
$ rx, y = 1,00$	deterministic or functional connection

Surprisingly, the number of climate zones does not correspond with the country sizes and the spatial sensitivity of adaptation (SÜTÖ, 2025B). The main reason is that some of the biggest countries in Europe (first and foremost *Türkiye*, but partly *Poland*, *Iceland*, *Bulgaria*) have either horizontally big extension, or in spite of their greater North-South expansion they locate in a single climate zone (e.g. *Italy*, *Finland*, *Sweden*, *England*). Only countries with great North-South extensions and varied topography (*Norway*, *Germany*, *France*, *Spain*) have greater number of climatic zones.

5.4. Macro regional characteristics in the adaptation practice

Chapter 5.2.8, while summarised the main results of the aggregated spatial sensitivity composite indicator-based ranking of European countries, has already answered the question whether any macro regional determination or trend can be detected in the spatial performance of national adaptation policy planning and MRE activities. As the mentioned subchapter introduced, the already known Northwest – Southeast divide that can be observed in other topics/issues in Europe, stands out in climate adaptation policy planning instruments' spatiality, too. The traditionally pioneer climate adaptation and spatial planner states of *Western* and *Northern Europe* (parts of the *UK*, *Germany*, *Switzerland*, *France*, the *Netherlands*, *Austria* and the *Scandinavians* (minus *Iceland*)) compose the upper ranks of the final list; together with some well-performing *Easterners* (*Poland*, *Hungary*, *Lithuania*) and big and medium-sized *Southern states* (*Spain*, *Italy*, *Türkiye*, *Greece*, *Portugal*). More details about these outcomes are described by the Conclusions chapter.

6. Table: Correlation matrix of spatial sensitivity composite indicator of European national adaptation activities and the potential determinants. *Source: own editing.*

Medium blue cells: stronger-than-medium-level connection; light blue cells: weaker-than-medium-level connection; white cells with bold italic numbers: the strongest weak connections; general white cells: weak or lack of connection

	spatial sensitivity	<i>size of the country</i>	<i>nr. of climate regions</i>	<i>population</i>	<i>population density</i>	<i>degree of urbanization</i>	<i>GDP per capita</i>	<i>GINI-index</i>	<i>pop. with tertiary edu.</i>	<i>HDI</i>	<i>Life expectancy at birth</i>	<i>spatial gov. type</i>	<i>spatial planning sector's type</i>	<i>nr. of adapt. pl. cycles</i>	<i>% of renewable energy in e. prod.</i>	<i>comb. vuln. & readiness score</i>	<i>complex vuln. score</i>	<i>climate-related econ. losses</i>
spatial sensitivity	1,000																	
<i>size of the country</i>	0,460	1,000																
<i>nr. of climate regions</i>	0,174	0,458	1,000															
<i>population</i>	0,470	0,767	0,325	1,000														
<i>population density</i>	-0,163	-0,173	-0,190	0,046	1,000													
<i>degree of urbanization</i>	0,046	0,241	-0,118	0,090	0,309	1,000												
<i>GDP per capita</i>	0,154	-0,005	-0,038	-0,045	0,148	0,475	1,000											
<i>GINI-index</i>	-0,010	0,227	0,048	0,293	-0,133	-0,213	-0,224	1,000										
<i>pop. with tertiary education</i>	0,223	-0,055	-0,335	-0,107	0,042	0,212	0,399	0,126	1,000									
<i>HDI</i>	0,405	0,136	-0,092	0,144	0,197	0,561	0,652	-0,585	0,306	1,000								
<i>Life expectancy at birth</i>	0,308	0,177	0,059	0,166	0,302	0,489	0,564	-0,407	0,333	0,737	1,000							
<i>spatial gov. type</i>	0,616	0,147	0,222	0,233	0,059	0,225	0,164	-0,227	0,157	0,526	0,411	1,000						
<i>spatial planning sector's type</i>	0,285	-0,014	-0,152	-0,084	-0,140	0,195	0,352	-0,399	0,399	0,510	0,260	0,303	1,000					
<i>nr. of adapt. planning cycles</i>	0,595	0,247	-0,029	0,397	-0,021	0,030	0,182	0,001	0,114	0,259	0,104	0,308	0,426	1,000				
<i>% of renew. energy in e. prod.</i>	0,186	-0,029	0,081	-0,172	-0,247	0,256	0,361	-0,101	0,039	0,327	0,208	0,198	0,334	0,059	1,000			
<i>comb. vuln. & readiness score</i>	0,528	0,091	-0,144	0,047	0,025	0,493	0,560	-0,353	0,783	0,850	0,637	0,581	0,717	0,383	0,350	1,000		
<i>complex vulnerability score</i>	-0,465	-0,079	0,063	-0,066	-0,082	-0,386	-0,441	0,258	-0,683	-0,669	-0,652	-0,550	-0,444	-0,255	-0,102	-0,832	1,000	
<i>climate-related econ. losses</i>	0,362	0,282	0,194	0,689	0,119	0,064	0,038	0,074	-0,046	0,225	0,161	0,352	0,093	0,464	-0,090	0,198	-0,195	1,000

Although the dissertation consciously chose applying a mixed logic of classification of European states into macro regions that were based on both climatological and natural environmental characteristics AND historical development pathways and socioeconomic features, to integrate the different regional geography-, regional policy- and climate policy-related approaches into a joint classification, during discussions a valid critical remark came up among the reviewers' opinions, according to which the mixed use of climatic and political-historical macro regions could be a bit confusing. To decide, whether the purely climate impact-oriented delimitations (like that of the EUCRA) or the rather social/economic/regional geography- or regional policy-oriented classifications (like that of the TSP 2011) or perhaps a mixture of both (like that of the dissertation) show the strongest connection with the final results of the spatial sensitivity composite indicator ranking, the dissertation conducted additional analyses of variance (ANOVA) as a statistical method to determine if there are statistically significant differences between the groups of European countries according to the above mentioned groupings.

7. Table: Main outcomes of the ANOVA analyses according to 3 different classifications.

Source: own calculations.

TSP	variance's origin	Sum of Squares	degree of freedom	Mean of sum of squares	F statistic	p value	F criteria
TSP regions	Btw groups	4683,981	3	1561,33	4,33	0,0103	2,8588
	Within groups	13334,8	37	360,40			
	Altogether	18018,78	40				
EUCRA regions	Btw groups	5117,926	3	1705,98	4,89	0,0058	2,8588
	Within groups	12900,85	37	348,67			
	Altogether	18018,78	40				
Dissertation's grouping	Btw groups	4926,197	3	1642,07	4,64	0,0075	2,8588
	Within groups	13092,58	37	353,85			
	Altogether	18018,78	40				

The starting points of the analysis met the requirements of a proper ANOVA test: data points were not related to or influenced each other (independence of observations); the dependent variable was normally distributed within each group (normality) and the variance within each group was not totally different (homogeneity of variance). Altogether the results of the 3 ANOVA assessments showed that all 3 categorizations had a significant effect on the quantitative variable (in our case, the composite indicator values of the countries). The p-values are in all cases lower than 0,05; the EUCRA classification shows the most significant influence (0,0058, as the lowest p value) on the spatial differences of the composite indicator values, followed by the grouping of my dissertation (p value is 0,0075) and that of the TSP 2011 (p value is 0,0103). Similarly, the F statistics (comparing the factors of the total deviation, which is the

quotient of the variance between and within treatments) are bigger than 1 in all cases. The value is the highest in case of the EUCRA categories, a bit lower in my dissertation's classification and even a bit lower in the TSP categorization, showing that the difference between the country groups influences the variance more strongly than the differences within the individual groups (Table 7).

In all 3 categorizations the highest average composite indicator values could be registered in the Western and the Northern regions; in case of the EUCRA classification and in my dissertation the Southern region, in case of the TSP the extended Eastern region showed the weakest averages.

8. Table: Basic features of the country groups (mean, sum and deviation of the individual states' spatial sensitivity composite indicator values) in the ANOVA analyses according to 3 different classifications. Source: own calculations.

TSP	Groups	Nr. of items	Sum of the values	Mean of the values	Variance of the values
TSP regions	NORTH	5	290	58,00	420,00
	SOUTH	7	322	46,00	534,00
	EAST	17	720	42,35	226,62
	WEST	12	803	66,92	438,63
EUCRA regions	NORTH	13	743	57,15	261,81
	SOUTH	15	603	40,20	369,60
	EAST	6	290	48,33	250,67
	WEST	7	499	71,29	555,24
Dissertation's grouping	NORTH	5	290	58,00	420,00
	SOUTH	12	478	39,83	467,79
	EAST	12	564	47,00	131,09
	WEST	12	803	66,92	438,63

Summarily the outcomes only strengthen further the basic spatial picture showed by the 7 main analytical aspects of the comparative analysis: the mediocre-level Northwestern-Southeastern division in Europe, thanks to the generally better performance of the traditionally more experienced adaptation planner and spatial planner states in the majority of the main analytical aspects; while the scattered examples of outstanding performances in the situation analyses' spatiality or the spatial organization of adaptation policy activities, let alone the spatial phraseology of policy documents in some Eastern and Southern countries are not enough for their respective regions to reach the aggregated levels of the Western and Northern country groups (Table 8).

Another important idea that emerged at the internal thesis discussion was the issue of individual state performances. The question was raised whether there could be any correlation identified between certain countries (or groups of countries) regarding the results of the given main aspects of the comparative analysis, even independently from

the macro-regional classifications? Cluster analysis seemed an appropriate tool to answer to this question.

Finally, three subsequent K-means cluster analyses were run, for a dataset containing standardized values of the given countries in the 7 main analytical aspects of the comparative analysis. One analysis was conducted for 4, one for 5 and one for 6 clusters. Defining less than 4 clusters resulted in too general country groups with too numerous memberships; applying exactly 6 or more clusters resulted in too many groups, some of them with minimal number of states. Altogether the 5-cluster-version of the analysis showed the most convincing results (number of cases in each cluster is shown by Table 9; values of final cluster centres by Table 10), but the grouping of the countries only partly resembles us the results of the macroregional analysis.

9. Table: Number of cases in each cluster in the 5-cluster analysis of the county performances in the main analytical aspects. *Source: own calculations.*

Cluster	Cluster name	Number of cases in each cluster
1	Generally weak performers	11
2	Countries with stronger spatial objective systems, international aspects and spatial policy priorities	5
3	Countries with some mediocre and some weak aspects	8
4	Countries with spatially focused situation assessment	9
5	Outstanding performers in all aspects	8
Valid cases altogether		41

Out of the five groups the *first* is the most populous, showing, based on the final cluster centres, weak or low-mediocre results in all analytical aspects, only situation analyses' spatiality and consideration of spatial policy priorities registered less weak results. This group of countries shows maybe the strongest spatial connotations, with overrepresented presence of South-Eastern (Balkan, smaller Mediterranean and Eastern-Central) European countries: *Albania, Bulgaria, Cyprus, Kosovo, Malta, Montenegro, North-Macedonia, Slovakia* and *Serbia* are part of the group, complemented by *Iceland* and *Luxemburg*, two North-westerners performing consistently weak through the analysis. The *second group*, in contrast to the previous one is the less populous, containing again some Eastern and two Southern countries: *Lithuania, Slovenia, Spain, Croatia* and *Greece*. These countries show outstanding performances in the NAS objective systems' spatiality, the international aspects and consideration of spatial policy priorities.

The *third group*, consisting of the *Czech Republic, Denmark, Estonia, Ireland, Latvia, Romania, Belgium* and *Wales* is a mixed group again, dominated partly by Eastern-

European ones, showed mediocre performances in both general spatiality, spatiality of the situation analyses and spatiality of the MRE activities; the other aspects performed weakly. *The fourth group* is again a mixed one, with 4 Southern, 2-2 Northern and Western states and 1 Eastern European country; here the situation analyses' strong spatiality is the group-determining factor, but general spatiality, actions' spatiality and consideration of spatial policy priorities are also bit above the average. *Bosnia, Italy, Portugal, Türkiye, Northern Ireland, Switzerland, Hungary, Norway and Finland* got into this group, validating once again the results of the second main analytical aspect, in which a special group of countries performed the best.

10. Table: Values of final cluster centres in the 5-cluster analysis of the county performances in the main analytical aspects. *Source: own calculations*

Cluster names	Cluster				
	1	2	3	4	5
General Spatiality of Adaptation Policy	1,36	2,00	2,13	3,00	3,50
NAS Situation Analyses' Spatiality	2,36	2,40	2,63	3,33	2,50
NAS Objective Systems' Spatiality	1,64	3,40	1,50	2,33	2,63
NAP actions' Spatiality	1,73	2,40	1,50	2,67	2,50
International aspects of NASS	1,00	3,20	1,63	1,89	3,63
MRE Activities' Spatiality	1,09	1,80	2,50	2,33	3,50
Consideration of Spatial Policy Priorities	2,00	3,00	2,00	2,89	3,25

The last, *fifth group* shows again strong correlation with the overall macro regional results of the composite indicator: the group is clearly dominated by the Northwestern-European states (*Austria, Germany, Scotland, Sweden, the Netherlands, France and England*, complemented by *Poland*) and presents outstanding performance in almost all of the analytical aspects, particularly in general spatiality of adaptation policy, international aspects, MRE activities' spatiality and consideration of spatial policy priorities.

In summary, it can be said that if we look into the details of the spatial sensitivity analysis and the different country results regarding the main analytical aspects, no clear joint movement of definite country groups could be identified more than the general macro regional determinism registered by Chapter 5.2.8. and the introductory parts of Chapter 5.4.

Although Chapter 5.2 already presented the results of the analytical main and sub-aspects, it is worth describing the identified best practices by macro regions, in a more detailed way, namely the cases of those countries from each macro region that showed the best performances generally or in a given analytical aspect. Annex #4 especially

focuses on the introduction of these best country examples in the four European macro regions identified by Chapter 4.1.2.

As the dissertation has already mentioned, **Western-European countries showed summarily the best performances** in the analysis. The final ranking of spatial sensitivity of climate policy planning and MRE activities comprises Western-European states in the first 7 positions. These countries basically perform well in the *spatial MRE-related aspects*, show *very strong coherence with both European and their own national level spatial policy objectives*, and *international spatial aspects* are also strong in their adaptation policy approach. Four of them (***Austria, the Netherlands, Germany, Scotland***) are worth even for a detailed introduction. *Switzerland* shows very similar features to Austria and Germany, while *England* to Scotland; at the same time *France* is a mixture of the others, so due to limitations of the dissertation's extent, Annex #4a) concentrates only on the first four countries.

Almost all of the **Northern-European countries** (with the exclusion of Iceland) performed well in the comparative analysis, positioning themselves in the upper ranks of the final spatial sensitivity list, showing good results particularly in *international spatial perspectives* and *coherence with spatial development priorities* as well as in their *objective system's spatiality*. Annex #4b) presents the case of ***Sweden, Finland*** and ***Norway*** as the three strongest performers from the macro region.

The Mediterranean area's countries show mixed results in the analysis. The bigger ones (*Türkiye, Spain, Greece, Italy*) and *Portugal* present remarkable results in their *situation analyses' spatial approach* or in their *objective systems' spatial emphases*; while the smaller ones (*Malta, Cyprus* or countries from the *Southern Balkan*) performed rather generally weakly. Annex #4c) introduces two outstanding practices, ***Türkiye*** and ***Spain***; but we must note, that instead of Spain *Italy, Portugal* or *Greece* could also have been a proper example, but due to the strict length constraints, the dissertation includes only Spain in addition to Türkiye in the respective Annex chapter. We find most **Eastern-Central-European countries** in the second and third categories. The two best-performing states, presented by Annex #4d), ***Poland*** and ***Hungary*** stand out of the others mainly with their *situation analyses' spatial performances: space phraseology, map content* and *other spatially relevant topics* emerge relatively frequently in the evidence-seeking parts of their NAS documents. Hungary presents a particularly great example in GIS-based decision support activities, too, in the form of its NAGiS system, which could be considered as a benchmark solution even in European terms.

6. CONCLUSIONS AND DISCUSSION

This final chapter of the dissertation summarizes and structures of the outcomes. Based on the main results of the literature review and the empirical work phase, the first subchapter answers the dissertation's research questions. In the second subchapter, based on these answers, the main conclusions are drawn, even emphasizing the new scientific results as well as the limits of the research. Moreover, recommendations for further research directions are also presented.

6.1. *Answers to the research questions*

The dissertation's starting points were the one main and five sub-questions (and the one main and five sub-hypotheses) introduced by Chapter 2.2. The following pages go through these 1+5 elements, introducing those results of the dissertation that support the responses to the hypotheses and the question raised.

RSQ1: Defining the concept of spatial sensitivity in adaptation policies

The dissertation's comprehensive literature review itself brought several examples to prove the assumption that geographical space and climate adaptation are closely related to each other. Nevertheless, proportion of literature items dealing explicitly with adaptation policy's spatiality is still low. In addition to some studies either emphasising regional geography's role and its methods in the understanding of adaptation's spatiality or articles underlining the relation between adaptation policy-related and spatial planning, only a few studies concentrated on adaptation policy activities' actual spatial content. Moreover, most of these documents did that implicitly (e.g. FLEISCHHAUER ET AL., 2007; GREIVING ET AL., 2007; DOSCH ET AL., 2008; SCHUSTER in 2008; MICKWITZ ET AL, 2009; ROGGEMA, 2012; GREIVING & SCHMIDT-THOMÉ, 2013; LEITER ET AL., 2017; LEITER, 2021; TAYLOR, 2023; PAASI, 2023). Only SWART, ET AL., 2009; GREIVING&FLEISCHHAUER 2010 and 2012; and OECD, 2023 can be mentioned, as real spatially oriented analyses of climate adaptation policy activities. This dissertation plays an important role in the examination of this niche topic, namely spatial performance of adaptation policy planning and MRE.

To answer the first research question, the dissertation also overviewed the most important space-oriented disciplines' and practical fields' different space concepts and interpretations to make proper foundations for the empirical analysis of the weight of spatiality and the emergence of spatial approaches in climate adaptation policy activities. As the "*Theoretical framework and literature analysis*" chapter's 3.6. subchapter and Annex #2 describe, during the overview a wide variety of interpretations of relevant disciplines and policy domains emerged: absolute and objective space

interpretations of natural sciences and environmental geography; the relative approach of social and economic geography, regional geography and geopolitics; and partly interpretations of those disciplines that focus on internal space concepts, too (political and administrative studies, and partly even the regional studies). On top of these even some practical fields' (regional development policy, strategic spatial, urban and land use planning) spatial approaches and related concepts (territorial cohesion and its sub-concepts) were also examined. To create its own spatial sensitivity definition, the dissertation makes use both of absolutist (the container-like, 3-dimensional space) and relative interpretations (where the relation system between spatial elements is the basic regulator). The former is utilizable in the depiction of the geographical space as the place where climate change processes occur. The relativist approach can be used in the analysis of spatial dimensions as differences and structures, as climate policy monitors different spatial impacts of and adaptive capacities/vulnerabilities to climate change in given territorial units. Vulnerability assessments also use relative space interpretations. The interpretative approach is also remarkable, because adaptation policy crosscuts several sectors, harmonizing different sectoral considerations that often requires harmonizing the different interpretations of space. Relativist, constructivist spatial approaches also emphasise the relational dimension, regarding space as a direct product of society made up from societal relations. These socially constructed internal and social space interpretations can influence society's practical administrative spatial structures, too. In this regard, the research is interested in the extent to which differences in national adaptation planning and MRE system-building practices in different countries are rooted in national administrative and governmental features. Finally, as the subjects of the research, climate adaptation planning and MRE are practical issues, even applied policy-oriented space interpretations were used (e.g. regional development policy's territorial cohesion-oriented conceptual background) as well as terminologies of the related strategic and spatial planning activities.

The "*Materials and methods of the empirical research*" chapter's 4.1. subchapter summarises the usability of different space approaches and interpretations of the examined disciplines and draws the conclusion in the form of an indicative definition for spatiality / spatial approach in adaptation policy planning and the sensitivity to this spatial approach. In general, spatiality in a given activity can mean the prevalence of the spatial/territorial considerations (focus on spatial elements and geographical endowments; examination of the spatial differences of a given topic and the spatial configuration of a given phenomenon) in the examined approaches, decisions and actions: these are significantly influenced by geographic characteristics,

spatially/territorially different natural/social/economic endowments, and spatial structures.

During the research under the term spatiality in policy making, the dissertation understands the conscious, constant and consequent taking of external and internal spatial elements and their characteristics, territorial/spatial differences, and their spatial order into consideration within the absolute or relative space in planning and MRE.

Based on these, the dissertation considers an adaptation policy planning or MRE activity spatially conscious/sensitive, if it puts significant weight on the above-listed spatial dimensions, both in its evidence-seeking phase and decision-making, during the setting-up of adaptation indicator sets, conducting evaluations and establishing climate adaptation decision-supporting systems. If these aspects are at least equal with the weight of the traditional sectoral approach (i.e. separated handling of different thematic fields parallel with each other) or even dominate it, then we can talk about a spatially oriented approach, or spatial sensitivity of these activities.

All in all, hypothesis #H1: *“The ability of climate adaptation policies to recognise spatially specific (geographical) contexts and to tailor their interventions accordingly can be captured by a common concept”* has proved to be basically true. Although the related scientific and grey literature started to recognise the importance of geographical diversity, they did it mostly implicitly; examples of explicit analysis of climate adaptation’s spatiality are still rare. Consequently, to capture the essence of spatiality in climate adaptation policy planning and MRE, the dissertation has developed its own complex spatiality and spatial sensitivity concepts.

RSQ2 Assessing spatial sensitivity in climate adaptation policies

Based on the answer to RSQ1, RSQ2 searched for ways of assessing spatial sensitivity in adaptation policy planning and MRE within the dissertation. The applied solution became a comparative analysis of European national-level adaptation policy planning tools (strategic planning documents, MRE background materials and actual reports, indicator and decision support system descriptions), based on the definition of spatiality and spatial sensitivity and involving a large number of analytical aspects (7 main and 34 sub-factors). The aspects and sub-aspects derive from the different space concepts, approaches and interpretations of the earlier-introduced space-oriented disciplines and fields. The *“Material and methods of the empirical research”* chapter’s *“Measuring spatial sensitivity”* subchapter presents the logic of the comparative analysis and the disciplinary/thematic roots of its sub-aspects.

The comparisons took a critical lead, providing not just the description of the national characteristics - the use of an explicit system of analytical aspects (instead of ad-hoc considerations) serves this. The identification and selection of the final pool of aspects and sub-aspects followed a logic based on consideration of the available resource materials, the weight of the different phases within the planning cycle and complementary information. Taking into account these parameters, the majority of the analytical aspects concentrated on the characteristics of adaptation policy-related strategic planning documents. The reason for this is that within the planning cycle the actual planning itself still plays the most crucial role compared to the later phases (implementation, monitoring and evaluation) as planning is still the foundation and basis of the later phases. Moreover, NAS and NAP documents are more widely available than MRE-related materials in the majority of the analysed countries. Monitoring and evaluation are also important parts of the adaptation planning cycle, but they are so far relatively less developed activities in this field – they are represented by 1 main comprehensive analytical aspect in the empirical assessment. On top of the document analysis, the general spatial issues-related sub-aspects (consisting of the space phraseology of the documents, the emphasis on lower spatial levels' adaptation actions and planning activities) as well as the sub-aspects focusing on MRE activities and inter- and transnational dimensions were based partly on information received from questionnaires/e-mail interviews.

The composite indicator was calculated on the basis of the analytical sub-aspects: at the end of the analysis spatial sensitivity of national adaptation policies has been measured by an aggregated indicator, calculated by adding the scores corresponding to the classification for each sub-aspect of a given country together. Best categories meant 5 points; upper-middle categories 3; lower-middle categories 1; the lowest and irrelevant categories 0 points in each sub-aspects.

As for hypothesis #H2 “*Spatial sensitivity of national adaptation policy activities can be examined and measured by the analysis of their instruments*”, the dissertation in itself is the positive answer: it elaborated a complex, comprehensive analytical aspect system to conduct the comparative assessment of European countries' national adaptation policy planning activities, offering a solution to examine and measure the sensitivity of adaptation planning and MRE instruments to spatial issues.

RSQ3: The extent of spatiality emerging in European national adaptation policy instruments

The overall answer is that spatiality is emerging in European national adaptation policy instruments to a limited extent. To describe the situation in a more detailed way, basically weak results can be registered. Even the best-performing states of the analysis show only medium-level results (from the maximum available 170 points, the best-performing Austria reached 97 points, its direct followers in the ranking stand between 76-84 points) - that is around 50 (+/- 8) % performance at maximum. These outcomes verify that in European national adaptation policies the sectoral approach still prevails.

Out of the analytical aspects, general spatiality (space phraseology, general policy planning logic, active role of spatial levels and propagation of lower-level planning activities in adaptation) and coherence with European /domestic national spatial development policy objectives performed generally better. However, the spatial performance of the NAS situation analyses, objective systems and NAP actions, the international spatial/geopolitical outlooks and MRE activities' spatiality aspects showed only a few very good country examples, while the majority of the countries performed mediocre or weak.

Altogether, hypothesis #H3 “*Sensitivity to spatial dimensions emerges in national adaptation policy instruments in Europe, but to a limited extent*” proved to be true. Sensitivity to spatial dimensions emerges in national adaptation policies indeed, but in a varied degree, mostly only implicitly and with low weight.

RSQ4: The main determining factors of national adaptation policies' spatial sensitivity

The research in its 4th step also tried to identify the main determining factors of adaptation planning and MRE tools' spatial performance, by comparing the values of the elaborated spatial sensitivity composite indicator to other social/economic/geographic/spatial administration-related or spatial planning-/adaptation planning-/vulnerability-related indices to identify whether natural geographic, social or economic characteristics or spatial or adaptation policy-related issues' influence is the strongest driving force. Although the correlation analysis did not bring exclusively significant results, some basic conclusion can be drawn. The strongest influencing factors of national adaptation policy making' spatial performance are the indices of spatial governance, experiences in adaptation planning and the combined climate vulnerability-preparedness of a given country, indicating the traditions and level of development both in spatial organisation, adaptation policy-related planning and the

general climate risk-exposure of a state. But even these indices show above-than-medium-level connection with the spatial sensitivity indicator at maximum. These indices are followed by physical (population, size and complex vulnerability of the country) or social indices (HDI) showing weaker-than-medium level connections. Summarily, similarly to the results of former studies in the field (SWART, 2009; GREIVING&FLEISCHHAUER, 2010 AND 2012; LEITNER, 2021), the national level adaptation policy strategies (and, according to my results, MRE-related documents) still do not show significant national characteristics and spatially tailored approaches, rather follow a uniformed, sector-oriented logic. Spatial sensitivity/performance of national level adaptation policy planning activities seemingly depends more on individual national circumstances and environment of climate policy planning than on physical endowments, geographical characteristics or climatic trends, let alone the degree of economic or social development. The strongest determining factors could be the different approaches, attitudes of planner groups and communities; the level of institutionalization of adaptation planning; or spatial administration forms in a given country.

So, hypothesis #H4: *“Geographical characteristics of European countries fundamentally influence the spatial sensitivity of national adaptation policies of states”* has proved to be only partly (or rather barely) true: though some physical, geographical characteristics show weaker-than-medium level correlation with the spatial composite indicator of the analysis; the most decisive factors seem to be the type of spatial administration, the development level of adaptation policy planning and the combined vulnerability-preparedness of the state.

RSQ5: Macro-regional characteristics in spatial sensitivity performances of states

The last part of the empirical work phase directly dealt with the issue raised by the fifth RSQ, but actually already the earlier analytical results (the calculation of the spatial sensitivity composite indicator and the ranking of the European countries according to it) gave proper response to the question. In the comparative analysis the strongest spatial performances of national adaptation policies emerged in the traditionally outstanding spatial and adaptation policy planner *Western-European (Austria, The Netherlands, Scotland, France, Germany, Switzerland, England)* states, thanks to the great emphases they put on subnational level adaptation activities and their balanced, above-average performance throughout the entire comparative analysis. These states are also go-ahead ones with the development or operation of their adaptation MRE systems. In the second-

best group *Northern and Western-European* countries (*Sweden, Norway, Finland, Denmark, Northern Ireland*) appear, too; together with *Eastern-Central* (*Hungary, Poland, Lithuania*) and *Southern-European* (*Spain, Portugal, Greece, Türkiye, Italy, Bosnia*) states, due to their relatively well-performing NAS situation analyses (Easterners), or international spatial outlook and coherence with European/national spatial development policy objectives (Southerners, Westerners).

On the other side of the scale, the weakest performances can be experienced in the *South-eastern European* (*North-Macedonia, Montenegro, Albania, Kosovo, Bulgaria, Romania*) and smaller *Southern-European* countries (*Malta, Cyprus*), with some surprisingly weak results from other macro regions. E.g. *Iceland* emerges here, thanks to its quite basic and narrow-contented NAS – although in the recent years serious development initiatives started in the field of MRE and GIS-based decision support in the country; or the exceptionally sectoral-minded *Luxemburg*. At the same time, these are mostly smaller (*Luxemburg*) or geographically homogenous (*Iceland*) states where consideration of spatial differences within the national frameworks is not the first priority of adaptation planning.

Altogether, although the macro regional position of a given country does not directly influence the spatial performance of adaptation policy planning activities, nevertheless, some geographical pattern can be experienced in the spatial sensitivity of national adaptation policies within Europe. These results (even if we take into consideration some surprising out-of-line performances) only underline the well-known Northwest-Southeast divide in Europe in economic and social development and historical/political development pathways; no unexpected research results have come up in this case.

The three variance analyses conducted also show that there is connection between the different macro regional categorisation of the examined states and their adaptation policies' spatial performance. Altogether all 3 categorizations (EUCRA, TSP and the dissertation's own) have a significant effect on the spatial sensitivity composite indicator values of the countries, a fact shown by the p values. Similarly, the F statistics, comparing the factors of the total deviation are bigger than 1 in all cases, with the highest value shown by the EUCRA classification, followed by my dissertation's classification and the TSP categorization.

Moreover, after a remark came up in the internal thesis discussion three complementary cluster analyses were conducted, too, to analyse, whether there are any joint movement between given countries regarding the different main aspects of the comparative analysis. The cluster analyses' results finally showed that beyond the general and mediocre-level macro-regional determinations no clear groups of countries can be

clearly identified showing strong correlation in their given analytical aspect-specific performances beyond few similarly strong situation analysis- or action planning-related results from countries with totally different geographical positions and historical development pathways.

It means that, as for the feedback to hypothesis #H5 “*Some macro-regional differences can be identified in the presence of spatial sensitivity in European countries’ national adaptation policy activities due to their differences in policy culture with better performances of Western/Northern European countries*”, the dissertation’s results verified this assumption.

Main RQ: The extent of spatial sensitivity in national climate adaptation policies of European countries

According to my results, the main research question of the dissertation is basically answered positively: based on the elaborated analytical aspect system for the comparative assessment of European national climate adaptation policy planning instruments, there are some signs of sensitivity to spatial issues/dimensions in the analysed documents/activities. According to the literature review, studies and articles have started to deal with the topic, but mostly implicitly (basically through the analysis of regional geography’s role in understanding adaptation’s spatiality or via the examination of the relationship between adaptation AND spatial/urban/regional development/land use/physical planning). However, the actual emergence of spatial emphases in climate adaptation policy planning and MRE activities has not or only barely been analysed so far. The dissertation takes the first steps in this direction, showing that, according to its analysis, there are definite traces of spatial considerations in the national level adaptation planning and MRE documents.

However, these traces of spatial content are mostly weak and implicit. The vast majority of the analysed countries showed weaker-than-medium level or simply weak results in their composite indicator value. Nonetheless, there is at least one or a few states that perform well (in cases even outstandingly) in each analytical sub-aspect, which fact indicates that, according to some national planners, spatial considerations are by no means useless or pointless, futile ingredients of the strategic planning, monitoring or evaluation activities in climate adaptation. On the contrary, in such a geographical space-oriented horizontal field as climate adaptation, the adequate taking into account of spatial/geographical dimensions provides the proper basis of effective policy decisions.

Nonetheless, the general outcome of the research is that these spatial considerations and sensitivity to the use of them are basically weak. The experience of the interviews just underlined these lessons learned: the interviewees /those professionals who responded to the questions/ although theoretically recognising the importance of spatial issues, believe rather in the omnipotence of sectoral planning.

Consequently, the result regarding to the main hypothesis “*Due to the importance of geographical space and spatial differences/structures in climate adaptation, sensitivity to spatial considerations emerges in national adaptation practices across Europe*” is positive, with the slight emergence of spatial considerations in national adaptation planning and MRE in Europe, as the empirical work phase’s outcomes proved that. However, the mostly weaker-than-average or simply weak national results of the comparative analysis indicate that several further steps are needed in this field in the future.

6.2. Recommendations for the climate adaptation policy practice

Based on the best practices we became familiar with among the empirical analysis results (see Chapter 5), as well as my own professional experience and ideas, some basic recommendations can be drawn to strengthen the spatial sensitivity of the examined adaptation policy instruments. Applying some or the majority of the listed solutions consistently, and through these, strengthen the conscious spatial content/emphases of adaptation policy tools, climate adaptation policy in several countries could even partly fill the gap created by the diminishing role of regional development policy and the related spatial planning activities in the recent decade. The recommendations are grouped by work phases of strategic planning, partly reacting to the structure of the analytical aspect system applied by the empirical part of the dissertation.

6.2.1. Evidence-based work phases of planning

- Structure of an ideal NAS situation analysis is suggested to be organised according to spatial aspects: by region types, settlement types, and actual vulnerable places, dedicating given subchapters to each. The same finding is true for national climate change risk assessments;
- If the structure of the situation analysis/national climate change risk assessment is organised by sectors, then each sectoral subchapter should contain a brief summary of relevant spatial aspects;
- Within a NAS situation analysis, a special chapter could be dedicated to spatial vulnerability assessments’ results, introducing different vulnerability topics’ spatial structures and differences within a country by thematic maps;

- Use of thematic maps and regional diagrams is suggested as frequently and intensively as possible to support visualisation of the described content and help to display the spatial situation;
- Spatial results of vulnerability or climate risk assessments are especially appropriate tools to improve the explanatory force of situation analysis and make decision makers understand the most important challenges;
- SWOT analyses and narrative situation assessments can comprise dedicated sections about particularly vulnerable places or region types, spatial differences or structures related to climatic challenges, as a basis of future objectives and measures;
- It is worth mentioning in NAS situation analyses the role of spatial planning in adaptation and introducing the different levels of spatial administration where adaptation activities occur in a given country as a basis of related objectives, measures in later parts of the document;
- The position of a given country within Europe or within its wider European macro region should be taken into consideration and referred to consequently in the situation analysis, in the form of a dedicated subchapter. Beyond the mentioning of European-level climatic trends, as the majority of the examined documents did, detailed introduction of macro regional climatic challenges could enhance the understanding of the spatially determined climate impacts, making proper foundations of country-specific responses and making it possible to learn from other countries with similar problems.

6.2.2. Vision and objective system planning

- It is recommended that the vision/objective system dedicates a special vision paragraph / specific objective to spatial challenges of climate change, pointing the attention to the topic already at the beginning of the objective planning process;
- Dedicated specific/lower-level objectives could be assigned to transnational/cross-border dimensions, or to strengthening of a given country's influence on other ones through adaptation-related knowledge export or best practice-dissemination;
- Strengthening international cooperation in climate adaptation in the vision/objective system is also recommended, recognising the national border-crossing nature of climate change and its challenges.
- Subnational adaptation planning and spatial MRE-related points should get special emphasis within the objective system, making a proper basis for the improvement of these activities among the measures;

- It is worth introducing among the main horizontal principles/objectives of the given document the principles of sustainable land use and the special attention on spatial aspects, emphasising that these directions should be considered throughout the whole document and in the whole adaptation policy itself;
- It is suggested to take into consideration European-level spatial/regional development policy objectives during the objective system planning as important reference points, to secure coherence with the higher-level (European) spatial priorities;
- In the given countries, it is recommended to take into consideration their own national spatial/regional development policy objectives, too, during the objective system planning to secure coherence with the national spatial priorities and consequently harmonise the adaptation directions with the spatial frameworks;
- Vision- or objective system-related visualisation, in the form of spatially oriented infographics or planning maps (see, for example, the works of Roggema) could further enhance the explanatory force and visual soundness of the mission/objective system of the examined document.

6.2.3. Action planning

- The creation of measure groups could be structured according to vulnerable territories or according to vulnerable territories AND sectors at the same time;
- At least one measure group could be dedicated to spatial issues (vulnerable region types, actual places, settlements or general spatial differences/structures);
- In the absence of a nominated group of measures for spatial issues or at least some individual spatial measures, the description of the measures must have a standard point about spatial coverage to force the planners to consider spatial aspects of the relevant actions. This could be facilitated by elaborating spatially sensitive measure templates at the beginning of the measure planning phase;
- Spatially oriented adaptation MRE-related actions can be declared within the measure set, making the improvement of these activities possible in practice;
- Lower spatial levels' (municipality, district, county, etc.) adaptation planning activities must be urged in the form of a dedicated action or actions, securing financial resources for both the elaboration of the documents and later implementation of their actions; furthermore, providing methodological guidance for the activities.

6.2.4. Monitoring

- It is strongly recommended to set up comprehensive monitoring systems in climate adaptation at the national level in every country. These systems in climate adaptation should be ab-ovo spatial, as they should cover optimally spatial differences in both climatic trends and vulnerabilities; GHG emissions, as well as the effectiveness in policy objectives' and actions' implementation;
- Monitoring reports could be prepared regularly about spatial tendencies of vulnerability topics (e.g. in every 5 years), adopted by the national Parliaments or the governments; these reports, among other things, must concentrate beyond sectors on particularly vulnerable regions;
- Particularly regarding the impact (vulnerability) indicators, spatial data collection, processing and dissemination is strongly suggested;
- In cases of output and result indicators, they should also be produced using spatial breakdowns where it is applicable;
- GIS-based national-level adaptation decision support systems are suggested to be established, covering numerous thematic topics, based partly on the monitoring system's information, providing a map displaying system and map-based information for national and subnational decision makers, planners, as well as for higher education and the academic sphere.

6.2.5. Evaluation

- Volume of evaluation activities and actual number of evaluation products are recommended to be increased; among them, the proportion of spatially oriented items should also be on the rise;
- It is worth declaring already in the NAS/NAP the setting-up of an entire system of evaluation activities and products with special emphasis on spatial content within them or the proportion of spatially oriented products within the system;
- Regular evaluation of national adaptation planning documents (NASs or NAPs) should contain spatial aspects as well (spatial implementation of the NAS objectives/NAP measures, spatial picture of the country regarding policy activities' effectiveness, etc.). These aspects should be declared already at the beginning of the evaluation to integrate them into the evaluation tools (document analyses, interviews, indicator analyses);
- Beyond national spatial evaluations of adaptation activities, policy implementation and vulnerability situations/climate risks, subnational level (municipal, district- or county-level) evaluations' elaboration should also be urged and facilitated from the

national level with methodological guidance, financial supports, knowledge transfers;

- These newly created evaluation products should use as much visual items (especially thematic maps, regional diagrams, figures) as possible to enhance the explanatory force of spatial contents.

The listed recommendations could be interpreted only as general directions; in special national circumstances and planning environments/cultures, different emphases exist, and different solutions are available for the planners. Nevertheless, the basic lines of recommendations identified above can be assessed as good starting points; adjusting them to national circumstances (barriers and potentials) is the key to their usability.

6.3. Conclusions of the dissertation

Regarding the whole dissertation, the first and basic message of the material is unambiguous, and coherent with the works of other related authors (e.g. QURESHI, 2019; EEA, 2020; BIRCHALL & BONNET, 2021; OECD, 2023): climate change is one of the key global challenges of our era (if not the greatest; but at least we can say it is part of that system of challenges that compose the multilayered structure of global crises of the present time). The topic of climate change has been gathering more and more attention and is getting into the centre of attention within general development policy, and parallel with this process, climate adaptation has come to the fore within climate policy during recent decades. At the same time, the two main pillars of the climate policy approach (the geographical) space in significantly different ways. While, mitigation seeks international, supranational cooperation-based answers to a global problem, then adaptation requires explicitly spatially tailored responses to special local/regional challenges (climate impacts and their economic, social or physical environment-related consequences). Therefore, we presume that effective climate adaptation cannot exist without the consequent and constant taking of geographical and spatial aspects into consideration.

The strategic planning-related instruments of climate adaptation policy (actual strategic planning, monitoring, reporting, evaluation and decision support system-development) could help to find these spatially defined solutions, facilitating the implementation of actual practical place-based adaptation interventions at different spatial levels. These basic spatial levels of adaptation planning and MRE stand out clearly if we examine adaptation activities more closely: municipalities and micro regions / regions represent the subnational level; while the national level mainly coordinates and supports these

lower ones. There are also signs of adaptation-oriented cooperations and activities at the macro regional level, but the main emphasis lies on the national and subnational ones.

In the last one and a half decades, an increasing number of literature items has dealt with adaptation activities of these spatial levels in Europe, one of the leading continents of adaptation policy. However, a definite research gap takes form here: though several literature items concentrate on the challenges, methodologies or results of adaptation activities at these spatial levels, particularly at the local one, the actual examination of the presence/weight of spatial dimensions in these activities is lacking or barely appears in the scientific research activities.

My dissertation tries to be among those studies/analyses that take the first steps in this relatively new field. The foundations of my research logic come from approaches of spatially oriented disciplines and policy fields: the space concepts and interpretations of these have been examined/synthesized to compose a new analytical concept of spatial sensitivity of climate adaptation policy planning. The dissertation analysed according to this framework the spatial performance of national-level adaptation policy planning instruments in 38 European countries. To implement this task, a set of analytical criteria was set up, analysing the national adaptation policy planning activities' general spatial approach, the national adaptation strategies' spatial performance throughout their situation analyses, visions and objective systems, the emergence of inter- and transnational spatial dimensions in them and their coherence with European and national level spatial policy priorities. The analytical aspect system covers also the appearance of spatiality in national adaptation action plans' measure systems, and spatial emphases in the monitoring and evaluation methodological background documents and actual monitoring and evaluation reports of the analysed countries.

Regarding the main outcomes, as the 6.1. subchapter has already introduced, the strongest spatial performances could be observed in the Western European (*Austria, The Netherlands, Scotland, France, Germany, Switzerland, England*) countries. These states have great traditions in physical and/or development policy-oriented spatial planning and relatively great experience in adaptation planning, having already implemented 2-3 complete adaptation planning cycles, even with evaluations, and started to develop MRE systems or have already made their system operational. As for the group of followers, we can find here Eastern-Central (*Poland, Hungary, Lithuania*) and Southern-European (*Türkiye, Spain, Portugal, Greece, Italy, Bosnia*) countries, too, thanks to their relatively well-performing NAS situation analyses (Easterners), or international spatial outlook-related content and coherence with European/national spatial (regional) development policy priorities (Southerners). *Poland's* and *Bosnia's*

great performance, in addition, can be explained by their territorial administrative levels' strong role in adaptation (in *Poland*, the voivodships; in *Bosnia*, the three basic parts of the federation), and their generally balanced values in all analytical aspects, without any really outstanding results. *Lithuania* performs exceptionally well in international aspects, and *Hungary* in its situation analysis's spatiality. From the *Northern* and *Western* parts of the continent, *Finland*, *Norway*, *Sweden*, *Denmark* and *Northern Ireland* appear in this category, too. The weakest performances were experienced in the *South-Eastern European* (*North Macedonia*, *Montenegro*, *Albania*, *Kosovo*, *Bulgaria*, *Romania*) and smaller *South-European* countries (*Malta*, *Cyprus*), with some surprisingly weak results from other well-performing macro-regions (e.g. *Iceland* with its quite basic NAS and the particularly sectoral-focussed *Luxembourg*).

If we take a look at the whole analysis "from above" we see that basically weak results can be detected in the countries' spatial performance in adaptation - medium level performances are registered at best (from the maximum available 170 points the best-performing Austria reached 97 points, its followers between 76-84). These results underline that in European national adaptation policies the sectoral approach still prevails. Out of the analytical aspects, general spatiality (general spatial phraseology, basic planning logic, active role of spatial levels and propagation of lower-level adaptation planning) and NAS's coherence with spatial development policy objectives performed generally well – respectively 49,27 and 40,98% of the maximum available points were reached by the countries in average in these main aspects. Spatial performance of the NAS situation analyses, spatiality of NAS objective systems and NAP actions, international spatial outlooks and MRE activities' spatial aspects, although showing a few very good examples, the majority of the countries performed mediocre or weak in these aspects. The main lessons we can learn from here is that good performances in the general spatiality-related aspects and the coherence-seeking with spatial policies can be explained with the fact that using space-related concepts and definitions in the NAS/NAP texts, or emergence of implicit references to some spatial policy objectives can be done independently from the real spatially focused approaches; while active adaptation policy making at lower level is rather the consequence of the spatial administration of a given country and not the situation that the national level's definite logic is permeated with spatial thinking. On the other hand, situation analyses' and objective systems' spatiality showed the weakest spatial considerations in the analysis (19,09 and 21,16% of the maximum available points were reached on average, respectively), a bit overperformed by the MRE activities' spatiality, NAP actions' spatiality, and international spatial outlooks (about 30 % of the maximum available points were reached on average). It seems that when more concrete decisions must be

made (action planning), the spatial aspects somehow get a bit stronger emphasis than in the rather general development line-identifying strategic planning phases (Table 11).

The research also tries to identify the main determinants of adaptation planning and MRE tools' spatial performance, by comparing the elaborated spatial sensitivity composite indicator values of the countries to other social, economic, geographic, spatial administration-, spatial and adaptation planning-, or complex climate vulnerability-related indices to decide which one has the strongest influence. Although the correlation analysis did not close with unambiguously clear results, some basic relational trivia are recognisable. As for the strongest determining factors of national adaptation policymaking's spatial performance, the traditions and development of both adaptation planning and spatial administration show the closest connections, together with the combined vulnerability/preparedness of states; followed by such national/country characteristics as the size of the country, the number of the population or the calculated complex climate vulnerability of a state. But, once again, the strongest connections are only a bit above the medium level; there is no strong or extremely strong connection in any direction. Altogether, similarly to the results of some earlier studies mentioned by the literature review, the national level adaptation policy strategies (and, according to my results, MRE-related documents, too) still do not show numerous geographically specific national characteristics or spatially tailored approaches, but rather follow a uniform, sector-oriented logic. As in Greiving and Fleischhauer's study, where no significant correlation was detected between the speediness of national adaptation strategy development processes and the level of climate change exposure or sensitivity, I did not find a significant correlation between spatial sensitivity AND the size of a state or the consequent variability of climatic zones within a given country.

The macro regional position of a given country seems, according to the empirical analysis' outcomes, to be in connection with the spatial performance of adaptation policy planning activities. In the comparative analysis, Western and Northwestern states showed the most persuasive spatial performances, while, as we saw above, among the weakest values mostly Southern, Eastern, and South-Eastern countries appear. These results (even if we take into consideration some surprisingly outstanding performances from these latter groups) only underline the well-known Northwest-Southeast divide in Europe. No unexpected research results come up in this case. The generally better results of the Western and Northern countries could be explained by their relative longer experience in adaptation policy planning and spatial (physical and development) planning activities and their greater emphases laid on international and geopolitical aspects of climate change, showed by the respective results of the relevant main

analytical aspects of the comparative analysis. On the other side, the South-eastern and Eastern European regions' countries (in spite of few examples of spatially sensitive situation analyses, outstanding map contents or frequent use of space-related concept in the documents' texts) show general weakness in objective systems', actions', and MRE activities' spatiality (if any systemic MRE activities exist in these countries at all), not to mention the weak inter- and transnational emphases and weaker connections to spatial policy documents. These finally resulted in lower composite indicator values as well.

What has already been shown by the comparative analysis, is only further strengthened by the later conducted ANOVA analyses. Although the dissertation consciously chose applying a mixed logic of classification of European states into macro regions that were based on both climatological characteristics AND historical/socioeconomic development pathways; during discussions a valid request came up to decide, whether the purely climate impact-oriented delimitations (like that of the EUCRA) or the rather social/economic/regional geography- or regional policy-oriented classifications (like that of the TSP 2011) or perhaps a mixture of both (like that of the dissertation) show the strongest connection with the final results of the spatial sensitivity composite indicator ranking. Altogether the results of the 3 ANOVA assessments showed that all 3 categorizations had a significant effect on the quantitative variable, the EUCRA classification showing the most significant influence; closely followed by the grouping of my dissertation and that of the TSP 2011. In all 3 categorizations the highest average composite indicator values could be registered in the Western and the Northern regions; in case of the EUCRA classification and in my dissertation the Southern region, in case of the TSP the extended Eastern region showed the weakest averages. Summarily the outcomes only underline further the basic spatial picture showed by the 7 main analytical aspects of the comparative analysis.

On top of the variance analyses three complementary cluster analyses were also conducted, to examine the possible joint movement of countries regarding the different main aspects of the comparative analysis. Summarily, looking into the details of the different main analytical aspect-related country results, no clear correlation between definite countries' performances could be identified more than the general macro regional characteristics presented by Chapter 5.2.8. and 5.4.

To summarise our findings, basically we can say that the spatial sensitivity/performance of national-level climate adaptation policy planning and MRE activities depends more on individual national circumstances and climate policy planning environment than on physical endowments, geographical characteristics or climatic trends, let alone the

degree of economic or social development. The most important determinants might be the different approaches and attitudes of different planner schools, planning workshops, institutions responsible for these tasks in a given country, together with spatial administration forms and level and type of institutionalisation of adaptation policy in a given state. This is not good news, because it calls our attention to the eventuality of national spatial awareness, and the chances to improve this situation are in question, to say the least. On the other hand, if we consider the fact that spatial sensitivity of adaptation planning and related activities is almost independent from any crucial national geographic/economic/social factors, this makes the possibility theoretically to strengthen these geographical and general spatial dimensions anywhere, in any country's planning; if the political and professional willingness for such a development direction is available.

11. Table: Actual values and % of the available maximum points of the analytical main aspects in the analysed countries. *Source: own editing.*

Country	Total Spatial Sensitivity		General spatiality		Situation analyses' spatial emphases		Visions' and objective systems' spatial emphases		Actions' spatial content		Trans- and international spatial aspects		MRE activities' spatiality		Consideration of spatial development objectives	
	Points achieved	% of the available maximum	Points achieved	% of the available maximum	Points achieved	% of the available maximum	Points achieved	% of the available maximum	Points achieved	% of the available maximum	Points achieved	% of the available maximum	Points achieved	% of the available maximum	Points achieved	% of the available maximum
Albania	36	21,18	10	50,00	4	11,43	8	20,00	2	13,33	1	6,67	7	23,33	3	20,00
Austria	97	57,06	16	80,00	14	40,00	9	22,50	13	86,67	11	73,33	22	73,33	11	73,33
Belgium	46	27,06	12	60,00	8	22,86	7	17,50	3	20,00	4	26,67	4	13,33	7	46,67
Bosnia	56	32,94	12	60,00	17	48,57	5	12,50	6	40,00	3	20,00	9	30,00	3	20,00
Bulgaria	37	21,76	10	50,00	10	28,57	3	7,50	4	26,67	0	0,00	5	16,67	5	33,33
Croatia	38	22,35	5	25,00	4	11,43	13	32,50	4	26,67	0	0,00	5	16,67	7	46,67
Cyprus	12	7,06	1	5,00	4	11,43	0	0,00	1	6,67	1	6,67	2	6,67	3	20,00
Czech Republic	42	24,71	9	45,00	10	28,57	7	17,50	2	13,33	0	0,00	12	40,00	2	13,33
Denmark	51	30,00	7	35,00	10	28,57	3	7,50	5	33,33	8	53,33	12	40,00	5	33,33
England	77	45,29	14	70,00	3	8,57	10	25,00	3	20,00	15	100,00	20	66,67	11	73,33
Estonia	49	28,82	10	50,00	9	25,71	9	22,50	1	6,67	5	33,33	9	30,00	3	20,00
Finland	72	42,35	14	70,00	5	14,29	9	22,50	7	46,67	13	86,67	14	46,67	5	33,33
France	81	47,65	13	65,00	8	22,86	19	47,50	9	60,00	6	40,00	8	26,67	13	86,67
Germany	80	47,06	18	90,00	2	5,71	16	40,00	5	33,33	7	46,67	24	80,00	7	46,67
Greece	56	32,94	10	50,00	9	25,71	7	17,50	4	26,67	10	66,67	8	26,67	7	46,67
Hungary	66	38,82	16	80,00	11	31,43	9	22,50	4	26,67	1	6,67	15	50,00	7	46,67
Iceland	25	14,71	2	10,00	4	11,43	6	15,00	4	26,67	0	0,00	2	6,67	3	20,00
Ireland	46	27,06	12	60,00	3	8,57	3	7,50	3	20,00	4	26,67	15	50,00	5	33,33
Italy	51	30,00	10	50,00	9	25,71	7	17,50	7	46,67	0	0,00	10	33,33	7	46,67
Kosovo	36	21,18	8	40,00	4	11,43	6	15,00	3	20,00	0	0,00	5	16,67	5	33,33
Latvia	45	26,47	1	5,00	11	31,43	13	32,50	5	33,33	0	0,00	9	30,00	3	20,00
Lithuania	55	32,35	3	15,00	5	14,29	17	42,50	5	33,33	9	60,00	6	20,00	7	46,67

Country	Total Spatial Sensitivity		General spatiality		Situation analyses' spatial emphases		Visions' and objective systems' spatial emphases		Actions' spatial content		Trans- and international spatial aspects		MRE activities' spatiality		Consideration of spatial development objectives	
	Points achieved	% of the available maximum	Points achieved	% of the available maximum	Points achieved	% of the available maximum	Points achieved	% of the available maximum	Points achieved	% of the available maximum	Points achieved	% of the available maximum	Points achieved	% of the available maximum	Points achieved	% of the available maximum
Luxemburg	31	18,24	5	25,00	7	20,00	2	5,00	5	33,33	1	6,67	4	13,33	7	46,67
Malta	14	8,24	2	10,00	2	5,71	0	0,00	2	13,33	1	6,67	2	6,67	5	33,33
Montenegro	9	5,29	2	10,00	2	5,71	1	2,50	0	0,00	1	6,67	1	3,33	2	13,33
Northern Ireland	55	32,35	12	60,00	1	2,86	11	27,50	7	46,67	4	26,67	8	26,67	7	46,67
North-Macedonia	19	11,18	5	25,00	2	5,71	2	5,00	6	40,00	0	0,00	2	6,67	2	13,33
Norway	69	40,59	10	50,00	7	20,00	17	42,50	7	46,67	11	73,33	5	16,67	7	46,67
Poland	71	41,76	16	80,00	10	28,57	15	37,50	7	46,67	2	13,33	7	23,33	11	73,33
Portugal	59	34,71	10	50,00	8	22,86	13	32,50	6	40,00	5	33,33	9	30,00	7	46,67
Romania	38	22,35	12	60,00	5	14,29	8	20,00	2	13,33	0	0,00	5	16,67	5	33,33
Scotland	81	47,65	16	80,00	3	8,57	16	40,00	3	20,00	13	86,67	14	46,67	13	86,67
Serbia	43	25,29	9	45,00	12	34,29	6	15,00	4	26,67	0	0,00	8	26,67	3	20,00
Slovakia	36	21,18	8	40,00	4	11,43	5	12,50	3	20,00	1	6,67	8	26,67	3	20,00
Slovenia	44	25,88	6	30,00	0	0,00	12	30,00	3	20,00	8	53,33	7	23,33	3	20,00
Spain	63	37,06	12	60,00	2	5,71	11	27,50	5	33,33	10	66,67	13	43,33	9	60,00
Sweden	73	42,94	12	60,00	9	25,71	6	15,00	5	33,33	15	100,00	14	46,67	9	60,00
Switzerland	80	47,06	14	70,00	13	37,14	12	30,00	9	60,00	5	33,33	19	63,33	5	33,33
The Netherlands	84	49,41	16	80,00	9	25,71	10	25,00	8	53,33	9	60,00	20	66,67	7	46,67
Türkiye	67	39,41	14	70,00	12	34,29	9	22,50	3	20,00	6	40,00	13	43,33	9	60,00
Wales	45	26,47	10	50,00	2	5,71	5	12,50	2	13,33	5	33,33	12	40,00	9	60,00
Max.available points/values	170	100,00	20	100,00	35	100,00	40	100,00	15	100,00	15	100,00	30	100,00	15	100,00
Average values	52,07	30,63	9,85	49,27	6,68	19,09	8,46	21,16	4,56	30,41	4,76	31,71	9,61	32,03	6,15	40,98

6.3.1. New scientific results

The previous subchapter already summarised the main results of the research, and most of these, due to the fact that the dissertation deals with a relatively new and unexplored topic, can be considered as new scientific results.

As the literature review has already concluded, there have been no or barely any examples so far for analysing sensitivity to spatial issues/emphases explicitly in national climate adaptation policy planning activities of European countries. Spatial/geographical dimensions' application in national climate policy planning and MRE on the continent has not been dealt with yet, neither from a scientific point of view, nor in a comprehensive way. The few known examples of climate adaptation-oriented comparative analyses deal only with a limited number of European countries or examine some given aspects. This dissertation, with all its limits, is the first attempt to examine **almost all European countries in a single analysis** based on an extended, **comparative, pre-determined analytical aspect system**.

The innovativeness of the research and its outcomes is basically two-sided: on the one hand it tries **to conceptualise spatiality** (as the consideration of geographical emphases and spatial dimensions in climate adaptation planning and MRE activities) the **first time**. It collected space concepts and interpretations from several space-oriented disciplines and practical fields, and distilled them into a unique, **new concept: the spatial sensitivity of adaptation planning instruments**. This new concept is, to some extent, able to describe the extent of spatial considerations in national adaptation planning and MRE activities.

On the other hand, the research also tries not only to describe but **also to measure this spatial sensitivity** of policy planning activities through the elaboration of **a unique, comprehensive set of analytical aspects** (with 7 main and 34 sub-factors) being capable of **quantifying** the mentioned sensitivity **in the form of a composite indicator**. With these examinations, it became one of the first attempts to compare "spatial performances" of European countries' national level adaptation policy planning and even attribute a value to the countries in this respect **to rank them**.

Furthermore, the research even sought to **identify the main determinants of the spatial performance of national adaptation planning tools**, by **comparing** the elaborated national **spatial sensitivity composite indicators with other social/economic/geographic/spatial administration-related or spatial planning-/adaptation planning-/vulnerability-related indices** through a **correlation analysis**. Although this analysis did not bring unambiguous results with extremely strong or weak

correlations, **some basic conclusions could be drawn**, as we saw in the previous subchapters.

Finally, as another new and unique aspect, **the dissertation sought macro regional patterns**, too, in spatial sensitivity values of European national adaptation planning and MRE activities, **comparing performances of different countries from** different macro regions (**North, South, West and Eastern-Central**) of **Europe** and drew a basic picture of geographical differences in spatial performances of national adaptation policy making – the results underlines the well-known Northwest-Southeast divide within the continent even in this respect.

Naturally, as several “first attempts” this **research has its own childhood illnesses, too**, as I encountered unexpected obstacles (weak document or data availability, low willingness of the approached potential interviewees to cooperate or their low-level knowledge on /interest in the nature of spatial/geographical dimensions) and of course there are several methodological solutions in question and other constraints (described by the next subchapter in details). Despite of these, the listed results are new and the product of my own, and they serve hopefully as the first stepping stones in the future path of research activities dealing with the topic of adaptation policy’s spatiality.

6.3.2. Limits of the research and potential further directions

As the previous subchapter has already mentioned, although several new results were revealed by the empirical part of the dissertation, the research has, of course, numerous limitations and weaknesses. These, at the same time, call our attention to the potential ways of further development and future research directions – those related activities that may continue the examinations according to the aspects listed below.

The analysis, despite its uniqueness, is one-sided to some extent in its **methodological basis**. The processed information is mainly based on document analyses - although the research tried to complement these examinations with personal e-mail interviews to obtain complementary information on topics that were not revealed (or only in a blurred form) by the strategic planning or MRE documents. This attempt brought only half (or rather: partial) success. Only a few interview subjects (14, third of the total) answered, and the majority of these provided only short responses, reflecting the fact that spatial thinking is still not in the focus of interest of professionals and, consequently, is not a dominating approach or part of the planning mainstream in national climate adaptation policies, to say the least. **A potential further research direction** is to expand the circle of interview subjects (even 7-8 potential interviewees to be approached in a given country) to increase the likelihood of receiving positive, detailed answers. Moreover, the completion of the methodological background with more soft methods (e.g.

conduction of comprehensive questionnaire-based surveys or focus group interviews) is another possible solution, targeting basically the same group of countries that the current dissertation does.

Although the dissertation is based on a quite comprehensive analytical aspect system with an elaborated list of main and sub-aspects, the **vast majority of the applied sub-aspects are qualitative method-based ones**. Only space phraseology, the situation analyses' map content and the aspects measuring the proportions of lower-level objectives and actions with spatial content show some quantitative "scent". The overwhelming majority of analytical sub-aspects were measured by half-discretionary (half-arbitrary) expert estimation (nevertheless, subjectivity was tried to be diminished as much as possible with the strict definition of rules of classification in each sub-aspect in advance). **A potential further research direction** is the involvement of more quantitative indices in the system of analytical aspects instead of expert estimations/assessments. On the other hand, deepening the correlation analysis between spatial sensitivity and its potential determinants and mixing it with regression analysis could also strengthen the quantitative data basis of the findings.

Already, the geographic context subchapter within the "*Material and methods of the empirical research*" main chapter declares that **European spatial coverage is not full**: parts of the ex-USSR (excluding the Baltic states) and mini states were left out from the analysis (for reasoning, please read the mentioned chapters). Out of these left-out groups, the inclusion of the former ones should be considered for getting to a whole European picture. **A potential further research direction** in this case could be the widening of the list of countries involved, opening the research into the direction of Ukraine, Belarus and Moldova as well as the Caucasian countries in the future. Nevertheless, the recent geopolitical conflicts, as well as document/data availability and language problems, are those factors that make the involvement of these countries difficult.

Moreover, the current analysis **provides us only with a snapshot of the current situation** in (the majority of) European countries and lacks any dynamic elements. Only the most up-to-date documents (and of course the available ones) were analysed from each country; different generations of NAS documents, monitoring reports or evaluations were not compared to each other due to the time, resource and extent-wise constraints of my work. The empirical work phase's document-gathering stage was strictly closed in August 2025 to make the finalisation of the dissertation possible. As a consequence, strategic planning or MRE documents that have been adopted/published, as well as additional information that have not been made public since then, were not

taken into consideration in the empirical analysis. This decision caused some disadvantages. Just mentioning some examples: e.g. Finland has just recently published a comprehensive study on its planned MRE system and indicator development activities in adaptation; Iceland has only currently revealed that it currently works on its national adaptation-related GIS and web-based decision system tool development – these elements consequently are not part of the basis of the calculation of the countries' spatial sensitivity composite indicator. Similarly, the Hungarian National Climate Change Strategy is being revised now. Currently, there are some signs that spatiality will be strengthened even more in its objective system than the dissertation otherwise also indicates, but the empirical work phase, naturally, was not able to count with this unofficial information. **A potential further research direction** could be the widening of the research into the realms of dynamic assessments, comparing different generations of NAS/NAP documents within a given country and evaluating the strengthening or weakening of spatial performances of these as we progress in time. These results could be added to the current ones as some new dynamic indices in the analysis. At the same time, the different situations in different countries (in some states, already 2 or 3 adaptation planning cycles have been implemented and/or started, while in others, only 1) would make this kind of dynamic comparison difficult.

Last but not least, **we can naturally go down to subnational levels**, analysing regional or municipal performances, **instead of the several times too abstract national one**. Analysis of the lower spatial hierarchies could be based on a similar or almost identical analytical aspect system that was applied by my dissertation. Of course, given the enormous number of spatial items in Europe at the regional or local level, new research can concentrate on a given country's or macro regions' subregions or a given country's settlement stock instead of all European states.

The listed potential ways of further development of the current research could deepen the understanding of European adaptation policies' spatiality. As we see, the possibilities to continue the examination are almost infinite; one must only find the proper partners / methodological refinements to effectively continue and expand the research directions this dissertation has started.

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ANNEXES

Annex 1 – Overviewed and reviewed literature

Author	Year	Title	Author(s)' nationality	Publisher	Discipline	Vol, No, pages	Type	Scientific?	Source	Aim / focus	Useful content
<i>Abrahams, D., Carr, E.J.</i>	2017	Understanding the Connections Between Climate Change and Conflict: Contributions from Geography and Political Ecology	USA, USA	Springer	Geography, geopolitics	Current Climate Change Reports Climate Change and Conflicts volume 3, pages 233–242 (2017)	article	yes	primary	This literature uniquely challenges the dominant “threat multiplier” framing of climate change’s impact on climate, questioning this narrative’s unidirectional flow from climate vulnerability to conflict, exploring how climate change can create opportunities for peacebuilding as well as conflict, and identifying how climate adaptation activities can themselves become catalysts for conflict.	It offers a unique approach considering climate change from the point of geography, political ecology and geopolitics.
<i>Agnew, J.</i>	1998	Geopolitics: Re-visioning world politics. Second Edition.	USA	Routledge, Taylor & Francis	geopolitics	Routledge, London-New York. Second edition 2003 Taylor & Francis Group	book	yes	primary	The book systematically explores how Europeans in a position of global power imposed their ways and views on others through visualizing the world as a whole, defining world regions as modern or backward, seeing the world politics as the outcome of the pursuit of primacy by competing states. It explores the elements of geographical imagination and how they have come together in different historical and modern conditions. Agnew identifies and argues for an alternative, given the costs visited on the world in twentieth century by the practice of the modern geographical imagination.	Introduction of geopolitics’ main concepts and definitions as basis of its space interpretation.
<i>Agnew, J.</i>	1989	The devaluation of place in social science	USA	Routledge	social geography	In.: Agnew, J.-Duncan, J.: The Power of Place (RLE Social & Cultural Geography)	chapter	yes	primary	In this book chapter Agnew explores the merging of two interests. 1) an interest in the recent revival by geographers of a concept of place (many geographers of diverse intellectual and ideological persuasions are talking about place and the need for a revitalized regional geography). 2) an interest in why social science in general and geography in particular should have devalued place to the extent that it must be defined and refined rather than have been seen all along as a vital social science concept.	Introduction of social geography’s space concept.
<i>Amin, A.</i>	2002	Spatialities of Globalisation.	USA	SAGE Journals	regional studies, regional geography	Environment and Planning A. Volume 34. https://doi.org/10.1068/a3439	article	yes	primary	Amin focuses in this paper on the theorisation of the spatiality of globalisation, seeking shifting emphasis from the currently dominant discourse of scalar and territorial relativisation, towards relational processes and network forms of organisation that defy a linear distinction between place and space. He stresses the importance of actor networks as well as the world of practices as the central components of a topographical understanding of globalisation.	Introduction of spatial interpretation of globalisation.
<i>Araos, M.; Berrang-Ford, L.; Austin, S.; Biesbroek, R.; Lesnikowski, A.</i>	2016	CC adaptation planning in large cities: A systematic global assessment.	CAN, CAN, CAN, NRL, CAN	Elsevier Ltd.	urban planning	Environmental Science & Policy 66 (2016) pp. 375–382.	article	yes	primary	The study develops and applies a framework to track urban climate change adaptation policy using municipal adaptation reporting. It analysed 401 local governments globally in urban areas with >1. m people and found that only 61 cities (15%) report any adaptation initiatives, and 73 cities (18%) report on planning towards adaptation policy. They even classified cities based on their adaptation reporting as extensive adaptors, moderate adaptors, early-stage adaptors, and non-reporting. With few exceptions, extensive adaptors are large cities located in high-income countries in North America, Europe, and Oceania, and are adapting to a variety of expected impacts.	An example for a global comprehensive study at local level on urban adaptation. Their findings suggest that urban adaptation is in the early stages, but there are still substantive examples of governments taking leadership regardless of wealth levels and institutional barriers.
<i>Baker, I.; Peterson, A.; Brown, G.; McAlpine, C.</i>	2012	Local government response to the impacts of CC: An evaluation of local climate adaptation plans.	USA, USA, USA, USA	Elsevier Ltd.	climate adaptation planning, monitoring and evaluation	Landscape and Urban Planning 107 (2012) pp. 127– 136.	article	yes	primary	The study evaluated seven local climate adaptation plans in Southeast Queensland, Australia by developing and applying a quantitative, multi-criteria analysis framework. The results indicated that local governments were not effectively planning for climate impacts. While they were aware of expected climate change impacts, their capacity to use this information to develop geographically specific action plans was limited.	An example for a regional comprehensive study at local level on urban adaptation planning.
<i>Barnett, M.</i>	2008	Social Constructivism.	USA	Oxford University Press	IR, governance	In.: J Baylis, S. Smith, P. Owens: The Globalization of World Politics. Oxford University Press Inc., New York Oxford University Press, 2017.	book chapter	yes	primary	The book chapter examines constructivist approaches to international relations theory. It explores whether there is a possibility of moral progress in world politics, whether some cultures and countries are more (or less) inherently violent, and whether states are motivated by power or by ideas. It also discusses the rise of constructivism and some key concepts of constructivism (agent–structure problem, holism, idealism, individualism, materialism, and rational choice).	Introduction of the social constructivism school of the IR discipline. It concludes with an analysis of constructivist assumptions about global change.
<i>Baroutsis, A.; Comber, B.; Woods, A.</i>	2017	Social Geography, Space, and Place in Education.	USA, USA, USA	Oxford University Press	social geography	In.: Noblit, G. W. (Ed.) Oxford Research Encyclopaedia of Education. Oxford University Press, United States of America, pp. 1-16.	book chapter	yes	primary	The article emphasises that society is constituted by both historical and spatial elements. However, education research, policy, and practice often subordinate the spatial in preference for the temporal. In what is often referred to as the “spatial turn,” more recently education researchers have acknowledged spatial concepts to facilitate understandings and inform debates about identity, belonging, social justice, differentiation, policy, race, mobility, globalization, and even digital and new communication modes, amongst many others. Social geographers understand place as more than a dot on a map, instead focusing on the socio-cultural and socio-material aspects of spaces.	Introduction of social geography’s space concept.
<i>Baylis, J., Smith, S., Owens, P.</i>	2017	The Globalization of World Politics: An Introduction to International Relations 8 th Edition	USA, USA, USA	Oxford University Press	IR, governance	ISBN10 0198825544. Oxford, 2017.	book	yes	primary	The book is praised as “is the best-selling introduction to international relations” and offers one of the most comprehensive coverages of key theories and global issues in world politics.	Comprehensive and meticulous introduction of different IR schools.

Author	Year	Title	Author(s)' nationality	Publisher	Discipline	Vol, No, pages	Type	Scientific?	Source	Aim / focus	Useful content
<i>Benzie, M.</i>	2014	National Adaptation Plans and the indirect impacts of climate change.	SWE	Stockholm Environmental Institute.	climate adaptation planning	Stockholm Environmental Institute. Jan. 1, 2014.	Policy brief.	no	primary	A short policy brief, introducing climate impacts and possible adaptation pathways.	Introduction of climate impacts and possible adaptation pathways from a practical point of view.
<i>Benzie, M.; Persson, A.</i>	2019	Governing borderless climate risks: moving beyond the territorial framing of adaptation.	SWE, SWE	Springer	climate adaptation policy and planning, IR	International Environmental Agreements (2019) 19:369–393. https://doi.org/10.1007/s10784-019-09441-y	article	yes	primary	Nation states play key role in planning and governance. Yet, climate change impacts will not be contained within country borders. The paper demonstrates how the notion of borderless climate risks challenges the dominant territorial framing of adaptation, and why has a territorial framing and the national and sub-national scales dominated adaptation governance? How do borderless climate risks challenge this framing and what are possible governance responses? It draws on constructivist international relations theory and proposes that the epistemic community that developed to interpret climate change adaptation for decision-makers had certain features that established and subsequently reinforced the territorial framing. The authors conclude by identifying types of governance responses at three different scales—national and bilateral; transnational; international and regional.	Although there is a growing literature on the importance of borderless climate risks, the article offers distinct explanations why a territorial perspective has dominated for so long and, by doing so, pointing at what ideas and practices need to be overcome for their systematic consideration
<i>Berke, P.; Kates, J.; Malecha, M.; Masterson, J.; Shea P.; Yu, S.</i>	2021	Using a resilience scorecard to improve local planning for vulnerability to hazards and climate change: An application in two cities	USA, USA, USA, USA, USA, USA	Science Direct	climate adaptation planning	Cities. Volume 119, December 2021. https://doi.org/10.1016/j.cities.2021.103408	article	yes	primary	Communities adopt multiple plans that directly and indirectly address the effects of hazards and climate change. A major obstacle to responding to the growing threats is poor integration of individual planning efforts that govern land use and development. The article explores application of a Plan Integration of Resilience Scorecard (PIRS) in the U.S. cities of Nishua and Norfolk that involved a partnership between university experts and local government staff to assess the degree to which networks of local plans are coordinated and target hazardous areas.	The article gives additional information about adaptation planning's history, and some practical case studies from two North American cities.
<i>Birchall, S.J.; Bonnett, N.; Kehler, S.</i>	2022	The influence of governance structure on local resilience: enabling and constraining factors for climate change adaptation in practice	CAN, CAN, CAN	Elsevier Ltd.	climate adaptation planning, administrative studies	Urban Climate 47 (2023)	article	yes	primary	The article is a comparative qualitative study to analyse adaptation within two distinct regional governments; it founded that unique structural character of regional governments can enable certain climate adaptation planning and increase adaptive capacity through greater access to resources	The article gives recommendations for better utilizing strengths of regional governments and integrates interventions with broader policy frameworks
<i>Birchall, S.J.; Bonnett, N.</i>	2021	Climate change adaptation policy and practice: the role of agents, institutions and systems	CAN, CAN	Elsevier Ltd.	climate adaptation planning, urban planning	CITIES Volume 108, January 2021, 103001 doi: https://doi.org/10.1016/j.cities.2020.103001	article	yes	primary	The article investigates CC threats and the dynamic relationship btw local adaptation policy making and implementation, using stakeholder narratives and document analyses	introduction of local adaptation challenges and characteristics through case studies
<i>Birkmann, J.; Garschagen, M.; Setiadi, N.</i>	2014	New challenges for adaptive urban governance in highly dynamic environments: Revisiting planning systems and tools for adaptive and strategic planning.	GER, GER, GER	Elsevier Ltd.	urban planning, governance	Urban Climate 7 (2014) pp. 115–133.	article	yes	primary	The paper explores new challenges for adaptive urban and spatial governance in highly dynamic environments. It examines whether or not we have to rethink existing planning systems and tools in the context of climate change, natural hazards and societal transformation, focusing particularly on emerging economies in Asia.	It identifies opportunities & also constraints of existing planning tools to strengthen adaptive urban governance. At the same time, it introduces number of gaps between currently debated planning tools for adaptation and the requirements emerging from adaptive and strategic planning theory. Recommendations to further strengthen adaptive urban governance and strategic planning were also provided.
<i>Bodor, Á.; Grünhut, Z.</i>	2021	A klímaváltozás megítélésének dimenziói Európában: mintázatok és összefüggés a társadalmi bizalommal.	HUN, HUN	Central Statistical Office of Hungary	social geography	Területi Statisztika, 61(2); https://doi.org/10.15196/TS610205	article	yes	primary	Ákos Bodor and Zoltán Grünhut's research, based on secondary data, analyzed the differences in the dimensions of climate change perceptions in European countries using the database of the 18th wave of the European Social Survey (ESS).	A good example-article for spatially oriented attitude analysis in climate adaptation.
<i>Bogale, G.</i>	2015	Reviewing of Climate Vulnerability Assessment Methodologies.	NIG	Ethiopian Agricultural Transformation Agency.	climate vulnerability assessment methodology	Ethiopian Agricultural Transformation Agency. https://doi.org/10.13140/RG.2.2.20817.07524	book	yes	primary	Summary ad overview of the first to decades of CVA activities.	Most of the climate change vulnerability assessment methodologies so far developed used the additive approach to construct vulnerability index. Other methods are rarely used. To construct climate change vulnerability indices, most of the authors used historical indicators of sensitivity and adaptive capacity for future vulnerability index by assuming the continuation of the existing scenario instead of generating the future projection for each indicator.
<i>Bolliger, J.; Kienast, F.; Soliva, R.; Rutherford, G.</i>	2007	Spatial sensitivity of species habitat patterns to scenarios of land use change (Switzerland).	SWI, SWI, SWI, SWI	Springer	land use planning, ecology	Landscape Ecology, Vol. 22, pp. 773–789. https://doi.org/10.1007/s10980-007-9077-	article	yes	primary	Long-term societal trends which include decreasing population in structurally poorer regions and changes in agricultural policies have been leading to land abandonment in various regions of Europe. One of the consequences of this development includes spontaneous forest regeneration of formerly open-land habitats with likely significant effects on plant and animal diversity. The authors assess potential effects of agricultural decline in Switzerland (41,000 km ²) and potential impacts on the spatial distribution of seven open-land species (insects, reptile, birds) under land-use change scenarios	Emergence of spatial sensitive thinking in land use planning and ecology.

Author	Year	Title	Author(s)' nationality	Publisher	Discipline	Vol, No, pages	Type	Scientific?	Source	Aim / focus	Useful content
Bours, D.; McGinn, C.; Pringle, P.	2013	Monitoring and evaluation for climate change adaptation: a synthesis of tools, frameworks and approaches.	UKG, UKG, UKG	SEA Change CoP and UKCIP, Oxford	climate adaptation planning, monitoring and evaluation	SEA Change CoP and UKCIP, Oxford	guidance	no	primary	The authors have compiled a guidance provides a comprehensive collection of monitoring and evaluation tools, frameworks, and approaches, and reviews them thoughtfully. The authors have added a good number of newly published frameworks and tools and also give attention to the changing focus from adaptation towards resilience.	Introduction of European climate adaptation MRE tools, frameworks and approaches from the early 2010s.
Bours, D.; McGinn, C.; Pringle, P.	2014	Guidance notes 1: twelve reasons why climate change adaptation M&E is challenging.	UKG, UKG, UKG	SEA Change CoP and UKCIP, Oxford	climate adaptation planning, monitoring and evaluation	SEA Change CoP and UKCIP, Oxford	guidance	no	primary	In this Guidance Note, the authors identify twelve challenges that make M&E of CCA programmes difficult and highlight strategies to address each. While most challenges are not unique to CCA, together they present a distinctive package of dilemmas that need to be addressed.	Introduction of 12 CCA MRE challenges in Europe from the early 2010.
Böhme, K.; Lüer, C.; Holstein, F.	2020	From Territorial Impact Assessment to Territorial Foresight.	GER, GER, GER	Springer	regional development policy, spatial planning	In: Medeiros, E. (eds) Territorial Impact Assessment. Advances in Spatial Science. Springer, Cham. https://doi.org/10.1007/978-3-030-54502-4_9	book chapter	yes	primary	The chapter argues to adopt territorial foresight approaches instead of territorial impact assessments when long-term developments are concerned. Territorial foresight combines elements of territorial impact assessments and foresight approaches. As such the approach supports addressing the territorial impact of future trends, visions and policy objectives when designing forward-looking policies. It offers different steps that support policy makers in thinking territorially, allow them to anticipate on the future and increase ownership on possible actions shaping the future. In short, territorial foresight contributes to making policies future-wise, i.e. fit for the future.	Emergence of spatial aspects in territorial impact assessments.
Bús, B.; Tétsits, R.; Alpek, B. L.	2021	A környezettudatos magatartás településföldrajzi szempontú vizsgálata a Baranya megyei ökoiskolák végzős diákjai körében, 2020	HUN, HUN, HUN	Central Statistical Office of Hungary	social geography	Térületi Statisztika. 61(2); https://doi.org/10.15196/TS610204	article	yes	primary	Taking a broader approach to environmental awareness, Bernadett Bús and colleagues examined the environmental attitudes of students leaving eco-schools in Baranya County based on a questionnaire survey of 243 students.	A good example-article for spatially oriented attitude analysis in climate adaptation.
Cobbinah, P.; Brandful, P. Addaney, M.	2019	The Geography of Climate Change Adaptation in Urban Africa	DAF, DAF, DAF	Springer	social geography	Kwame Nkrumah University of Science and Technology	book	yes	primary	The book explores several in depth case studies in climate change adaptation response in Urban Africa; focuses on the geography of urban adaptation to climate in Africa and discusses future directions for climate change adaptation response from multiple perspectives.	Another case study and regional-oriented book on local climate adaptation
Brown, K.	2011	Sustainable adaptation: An oxymoron?	UKG	Taylor&Francis Online	sustainable development, climate adaptation policy	Climate and Development 3(1), pp. 21-31. https://doi.org/10.3763/cdev.2010.0062	article	yes	primary	The article provides critical reflection on the notion of sustainable adaptation. It discusses how the concept resonates with debates on sustainable development, and how the key elements of sustainable adaptation presented in the literature relate to sustainable development.	The article discusses three major challenges to the promotion and implementation of sustainable adaptation and achievement of its objectives: 1) many current approaches to adaptation are far from sustainable; 2) relationships between poverty reduction and adaptation to climate change are complex and highly context specific; 3) sustainable adaptation may be co-opted to support development-as-usual rather than more radical options which put social justice, equity and environmental sustainability at the core.
Brunetta, G., Caldarice, O.	2018	Putting Resilience into Practice. The Spatial Planning Response to Urban Risks	ITA, ITA	Springer	urban planning	In: Brunetta-Caldarice-Tollin-Rosas-Casals-Morató (ed): Urban resilience for Risk Adaptation Governance. Theory and Practice. Resilient Cities Series.	book chapter	yes	primary	Spatial configuration of cities has significant effects on climate change and has become central to enacting adaptive responses within a resilient framework. Starting from these remarks, the paper reports a qualitative comparison between the local climate adaptation strategies of Bologna (Italy) and London (UK). The analysis was conducted in order to understand why cities continue to engage adaptation planning, and the response of spatial planning in vision-oriented strategies and action-based plans for adaptation towards resilience. Basically, the paper discusses the gap between theory and practice of planning in achieving a resilient approach to urban risks through adaptation	The chapter gives important information about climate impacts on cities and climate adaptation's spatiality.
Bryson, J.M.	2004	Strategic Planning for Public and Non-profit Organizations: A Guide to Strengthening and Sustaining Organizational Achievement.	USA	Wiley	strategic planning	Wiley, San Francisco, 2004.	book	yes	primary	The book introduces a new and thoughtful strategic planning model. Since then, it has become the standard reference in the field. It helps today's leaders enhance organizational effectiveness.	Provides basic concepts and definitions of strategic planning in general.
Chang, Ch.-H.; Wi, A.	2018	Why the World Needs Geography Knowledge in Global Understanding: An Evaluation from a Climate Change Perspective	USA, USA	Springer	Social geography	In: Demirci-González-Bednarz (ed): Geography Education for Global Understanding	book chapter	yes	primary	The chapter examines two critical concepts of global understanding as outlined by the international year of global understanding (IYGU). How do we transform knowledge about global issues into action and how do we unpack our understanding of the connections between local action and global issues? While climate change is featured as a key theme in the IYGU discourse, global understanding transcends a concern for environmental challenges to include issues in the social, political and cultural milieu.	It provides us with information about geography's role in climate policy/climate adaptation.

Author	Year	Title	Author(s)' nationality	Publisher	Discipline	Vol, No, pages	Type	Scientific?	Source	Aim / focus	Useful content
Chen, Ch.; Noble, I.; Hellmann, J.; Coffee, J.; Murillo, M.; Chawla, N.	2024	University of Notre Dame Global Adaptation Initiative. Country Index Technical Report.	USA, USA, USA, USA, USA, USA	University of Notre Dame	environmental economics	University of Notre Dame, Indiana, 2024.	technical report	no	primary	All countries, to different extents, are facing the challenges of adaptation. Due to geographical location or socio-economic condition, some countries are more vulnerable to the impacts of climate change than others. Further, some countries are more ready to take on adaptation actions by leveraging public and private sector investments, through government action, community awareness, and the ability to facilitate private sector responses. ND-GAIN measures both of these dimensions: vulnerability and readiness.	Indices of the study have been utilized in the correlation analysis part of the empirical work phase to identify the strongest determinants of spatial sensitivity of European countries' adaptation policies.
Chevalier, R.	2017	Integrated community- and ecosystem-based approaches to climate change adaptation.	DAF	South African Institute of Inter-national Affairs	climate adaptation planning	Policy Insights Vol 49 June 2017.	article	yes	primary	The study, in response to the increasing focus on programming and policies that promote transformative and incremental adaptation and enhance resilience to climate change and emerging approaches that build the resilience of socio-economic and ecological systems, including through community-based sustainable management of natural resources, presents integrated ecosystem- and community-based solutions for African decision makers providing them with new opportunities to plan for an uncertain future, using frameworks that include the most vulnerable people and important ecosystems. The article explains how these initiatives function, introduces ways to measure their effectiveness and scale them up, and provides a stronger quantitative evidence base to demonstrate their benefits.	It introduces the role of strategic planning in CCA and the growing importance of NBSs in climate adaptation policy.
Christiansen, L.; Schaer, C.; Larsen, C.; Naswa, P.	2016	Monitoring&Evaluation for climate change adaptation: A summary of key challenges and emerging practice. Understanding discussing and exemplifying the key challenges of M&E for adaptation.	UN	UNEP	climate adaptation MRE	UNEP DTU Partnership Working Paper series: Climate Resilient Development Programme. Working Paper 1: 2016.	working paper	no	primary	The paper presents an easy-to-read overview of the key challenges and emerging practices of MRE in adaptation.	It introduces 5 fact sheets on 5 challenges: lack of standard off the shelf methodology; baseline problems; timing; proxy indicators; problem of attribution.
Cohen, S.B.	1973	Geography and Politics in a World Divided.	USA	Oxford University	geopolitics, political geography	Oxford University Press, New York, 1973.	book	yes	primary	The book describes the realities that were basic to any study of the sources and direction of the 1970s' world political power.	It introduces geopolitics' concepts and definitions.
Cohen, S.B.	2015	Geopolitics The Geography of International Relations Third Edition	USA	ROWMAN & LITTLEFIELD Lanham • Boulder • New York • London	geopolitics, political geography	ROWMAN & LITTLEFIELD Third edition (2003, 2009, 2015)	book	yes	primary	As fully revised and updated textbook, it examines the dramatic changes wrought by ideological, economic, socio-cultural and demographic changes unleashed since the end of the Cold War.	It introduces geopolitics' concepts and definitions.
Colven, E., Thomson, M.J.	2018	Bridging the divide between human and physical geography: Potential avenues for collaborative research on climate modelling	USA, USA	Wiley	Geography	Geography Compass, Volume13,Issue2 February 2019 e12418	article	yes	primary	This paper explores the possibilities for physical and human geographers to collaborate within and beyond the discipline, specifically on the topic of climate modelling. It first examines geographical research critically examining the production and circulation of climate knowledge; then outline how geographers might engage in collaborative and interdisciplinary work in order to promote more democratic practices of producing climate knowledge, enrich understandings of climate change, and more effectively serve goals of social and environmental justice.	It provides us with information about geography's role in climate policy/climate adaptation
Cresswell, T.	2008	Place: Encountering geography as philosophy	UKG	Taylor&Francis Online	social geography	Geography, 93:3, 132-139, DOI: 10.1080/00167487.2008.12094234	article	yes	primary	The article seeks to encourage an engagement with place as an idea at A-level and beyond. It asks what place is, how it has been developed over the last 40 years by geographers and others and how our ideas of place can inform our understanding of issues in contemporary society.	Introduces the development of concepts "place" and "space".
Csutora, M.; Harangozó, G.; Széchy, A.	2021	A társadalmi diszkontárta meghatározása és alkalmazási lehetőségei.	HUN, HUN, HUN	BCE	environmental economics	Ín.: Salamin Géza – Széchy Anna (szerk.): A fenntarthatósági politikák megalapozásának mérési eszközei Budapesti Corvinus Egyetem Budapest, 2021.	book chapter	yes	primary	At the same time, especially in relation to processes affecting the natural environment, providing information to support decisions is a big challenge. It also includes environmental and socio-economic aspects from the point of view of overall sustainability: in this we have to somehow compare different effects with each other in order to find the most favourable solution overall. In the volume the studies explore this issue from several different points of view. At Corvinus University in Budapest, the editor of the volume is Economic Geography, Geo-economy and the Department of Sustainable Development consider the social science-based investigation of sustainability in cooperation with the University's partner fields to be its priority mission. Their goal is to contribute professional and scientific knowledge to the policies and also for the development of their tools in this area.	The book introduces the main techniques and methods to measure climate mitigation's effectiveness and results.

Author	Year	Title	Author(s)' nationality	Publisher	Discipline	Vol, No, pages	Type	Scientific?	Source	Aim / focus	Useful content
Damsgaard O.; Doucet Ph.; Drahos Zs.; Gere L.; Illés I.; Jetmar, M.; Komornicki, T.; Lopez, I.; Péti M.; Prokai R.; Radvánszki Á.; Riez J.; Salamin G.; Schmidt-Seiwert, V.; Schön, P.; Somfai, Á.; Sütő, A.; Tomay, K.; Vanautgaerden L.; Zaucha, J.	2011	The Territorial State and Perspectives of the European Union, 2011 update: Background document for the Territorial Agenda of the European Union 2020	EU	EU	spatial planning, development policy planning	presented at the Informal Meeting of Ministers responsible for Spatial Planning and Territorial Development on 19 th May 2011 Gödöllő, Hungary.	background study	no	primary	In its updated form, the TSO 2011 offered a solid knowledge base for the renewed Territorial Agenda 2020, providing a comprehensive analysis on Europe's territorial structure and development. It highlighted the diversity of European territories, confronted us with their differences and peculiarities; strengths and potentials; weaknesses and burdens; trends and opportunities and offered a basis for a strategic guide to take territorial aspects into account when seeking responses to challenges and unleashing potentials.	delimitation of European sub-regions; subject of document analysis to examine the weight of climate adaptation in spatial planning
Davidse, B.J.; Othengrafen, M.; Deppisch, S.	2015	Spatial planning practices of adapting to climate change	NRL, NRL, NRL	Nordregio	spatial planning, land use planning, climate adaptation	European Journal of Spatial Development No 57., March 2015	article	yes	primary	Introduces spatial planning's role in climate adaptation and adaptation approaches in spatial planning. They emphasize that avoidance should get bigger weight than impact minimisation – even is spatial planning.	Introduction of spatial planning's role and function; adaptation approaches in spatial planning. It gives a detailed description of adaptation's spatiality.
Davies, A.; Hooks, G.; Knox-Hayes, J.; Liévanos, R.S.	2020	Riskscape and the socio-spatial challenges of climate change.	IRL, CAN, USA, USA	Oxford Academics	sociology, urban planning	Cambridge Journal of Regions, Economy and Society, Volume 13, Issue 2, July 2020, Pages 197–213. https://doi.org/10.1093/cjres/rsaa016	article	yes	primary	The article talks directly about riskscape (a.k.a. risk environment, as the landscape of risks). The authors state that climate change risks, and their interaction with other "riskscape", remain understudied. Riskscape in the authors' view encompasses different viewpoints on the threats across space, time, individuals and collectives. The approach through understanding of the spatial, temporal, economic and sociological dimensions of climate change and riskscape, brings together two interlinked, themes: (i) governance and institutional responses and (ii) vulnerabilities and inequalities. Riskscape encompassing different points of view in time and space on risk that highlight the "real-and-imagined geographies based on individual and collective experience. However, explicit examinations of climate change riskscape and their interaction with other riskscape remain comparatively understudied. In separate fields scholars have already documented that place matters when considering risk. Exposure to risk and its consequences varies by where a social actor lives, works and the multiplicity of other contexts in which they engage in social interaction; considering the complexities, nuances and place-specificities of riskscape and climate change is now more important than ever.	Using the concept of riskscape highlights the social, temporal and spatial texture of risk and calls attention to interactions among risks and their "cumulative impact" across several dimensions of human life and the biophysical environment. The authors illustrate how spatial, social, cultural, religious and political structures affect the experience of disaster and demonstrate the relevance of adopting a riskscape frame when considering climate change risks and their governance. It extends our understanding of riskscape with respect to territorial coverage, making explicit connections between the temporality and spatiality of riskscape. Although riskscape highlight the unique characteristics and the context of specific places, they also draw together important lessons of governance, planning and socio-ecological engagement that are critical to building resilience at the local, regional, national and global scales.
Devine-Wright, P.	2012	Think global, act local? The relevance of place attachments and place identities in a climate changed world	UKG	Science Direct	climate policy, climate adaptation planning	Global Environmental Change, Volume 23, Issue 1, February 2013, Pages 61-69. https://doi.org/10.1016/j.gloenvcha.2012.08.003	article	yes	primary	This article takes up and extends Feitelson's argument for more systematic research on place attachments and climate change. First, the paper critically reviews interdisciplinary literature on place attachment and the related concept of place identity, drawing on scholarship in human geography, environmental and social psychology.	The article concludes with five recommendations for future research: to capture place identities at global as well as local scales; to integrate qualitative and quantitative methods that capture constructions of place and identifications; to investigate links between attachments and collective actions, particular 'NIMBY' resistance to adaptation strategies; to apply greater precision when investigating spatial frames of risk communication; and to investigate links between global identities, environmental worldviews and climate change engagement.
Directorate General for Regional Policy	2009	Regions 2020 – The Climate Change Challenge for European Regions	EU	DG Regio	climate policy, climate adaptation planning	Online at: http://ec.europa.eu/regional_policy/source/s/docofitc/working/regions2020/pdf/regions2020_climat.pdf (17.9.2010) Brüssel 2009	policy paper	no	primary	Th3 paper summarizes main findings regarding changes in climate conditions in Europe, outlines some of the impacts of climate change on socio-economic conditions and identifies the regional distribution of these impacts. Preliminary conclusions are drawn in respect of the impact of climate change on regional growth potential, sustainability and quality of life.	The document provides a good xample for the use of ESPON-delimited climate change-related macro regions of Europe in decision supporting materials.
Di Gregorio, M.; Nurrochmat, D.R.; Paavola, J.; Sarib, I.M.; Fatorellia, L.; Pramovab, E.; Locatelli, B.; Brockhaus, M.; Kusumadewia, S.D.	2017	Climate policy integration in the land use sector: Mitigation, adaptation and sustainable development linkages.	INDO, INDO, UKG, INDO, INDO, INDO, INDO, UKG, INDO	Elsevier Ltd.	land use planning, urban planning	Environmental Science & Policy 67 (2017) pp. 35–43	article	yes	primary	This article re-conceptualizes Climate Policy Integration (CPI) in the land use sector to highlight the need to assess the level of integration of mitigation and adaptation objectives and policies to minimize trade-offs and to exploit synergies. It suggests that effective CPI in the land use sector requires i) internal climate policy coherence between mitigation and adaptation objectives and policies; ii) external climate policy coherence between climate change and development objectives; iii) vertical policy integration to mainstream climate change into sectoral policies and iv) horizontal policy integration by overarching governance structures for cross-sectoral coordination. This framework is used to examine CPI in the land use sector of Indonesia.	Introduces the 4 main level of climate policy mainstreaming.

Author	Year	Title	Author(s)' nationality	Publisher	Discipline	Vol, No, pages	Type	Scientific?	Source	Aim / focus	Useful content
Dosch, F., Porsche, L., Schuster, P.	2008	Anpassung an den Klimawandel aus europäischer Perspektive.	GER, GER, GER	BBSR	regional geography, regional development	Informationen zur Raumentwicklung, No 6/7. 2008, pp.381-394.	article	yes	primary	The article summarises the results of research from the time of the first generation of National Adaptation Strategies of Europe. It mentions that Strategic approach was missing in adaptation policy; no connections were analysed between spatial planning and adaptation policy and the risk governance cycle. Nevertheless, numerous adaptation- and spatial planning-related sectoral actions could be identified in the analysed countries, first of all in water and flood management, but risk management and urban planning also showed some perfect examples.	The article is an example of used methodology. The basic tool applied by the research was narrative description of national adaptation strategies, concentrating especially of the interventions identified within these or in other sectoral national strategies, in 5 special fields connected to spatial planning. No quantitative assessment of spatial performance or emergence of spatial aspects were applied, only the presence of the mentioned intervention fields was analysed in the strategies.
Dombi, M.	2021	Types of planning systems and effects on construction material volumes: An explanatory analysis in Europe.	HUN	Elsevier Ltd..	regional economics, spatial planning	Land Use Policy 109 (2021) 105682.	article	yes	primary	Based on a panel dataset of 35 European countries for 1995–2017, the article assesses the effect of governance and spatial planning factors, as well as of core socio-economic indicators (namely, GDP per capita, urbanization, and economic structure) at the national level. According to the results, the types of spatial governance and planning systems significantly shape the effects on construction material use. Such effects range from 67–215% relative to the most widespread system, i.e., the conformative system.	The article provides classification of European national spatial planning activities for the dissertation's correlation analysis.
Dunn, W.N.	2004	Public Policy Analysis. An Introduction.	USA	Taylor&Francis Online	evaluation theory, methodology	ISBN 100130976393	book	yes	primary	A problem-oriented, integrated, multidisciplinary synthesis of concepts and methods of public policy analysis.	Introduction of public policy-oriented definitions / concepts of strategic planning.
Dusek, T.	2004	A területi elemzések alapjai.	HUN	ELTE-TTK, Regionális Földrajzi Tanszék, Budapest.	regional study	Regionális tudományi tanulmányok 10.	book	yes	primary	The purpose of the Author's work is to shed light on the fundamental problems of the territorial investigation of society, taking into account the analytical possibilities and the wide range of methodological questions related to them. The first half of the book focuses on the more plausible theoretical and methodological issues, while the second half discusses specific application problems and methodological possibilities related to these and which can be interpreted as their consequences.	Introduction of space interpretation in connection with regional analyses.
Edmunds, R., Marchant, T.	2008	Official Statistics and Monitoring and Evaluation Systems in Developing Countries: Friends or Foes?	UN	UN	Evaluation theory, methodology	Partnership in Statistics for Development in the 21st Century (PARIS21). Retrieved from https://paris21.org/sites/default/files/3638.pdf	working paper	yes	primary	The paper explores the linkages between official statistics and monitoring and evaluation (M&E) processes within the context of low-income countries and donor supported poverty reduction strategies. Whilst the analysis does not specifically include middle-income countries some of the conclusions may be relevant to them	Introduction of main definitions of MRE as well as main methodological challenges.
ESPON	2011	ESPON Climate> Climate Change and Territorial Effects on Regions and Local Economies Applied Research 2013/1/4 Final Report Version 31/5/2011 Executive Summary	EU	ESPON and IRPD	spatial planning, regional study	ISBN 978-2-919777-04-4 © ESPON & IRPUD, TU Dortmund, 2011.	final research report	yes	primary	Territorial development is generally considered as very important for dealing with climate change. The EU White Paper „Adapting to climate change: Towards a European framework for action” explicitly relates to spatial planning and territorial development, respectively. In the EU Territorial Agenda, it is stipulated under Priority 5 that further work is required to develop and intensify territorial cohesion policy, particularly with respect to the consequences of territorially differentiated adaptation strategies. However, territorially differentiated adaptation strategies call for an evidence basis. This is what the ESPON Climate project is mainly about.	Introducing basic climate challenge macro regions and their spatial development implications. providing a pan-European vulnerability assessment as a basis for identifying regional typologies of climate change exposure, sensitivity, impact and vulnerability.
European Commission	2005	COMMUNICATION TO THE SPRING EUROPEAN COUNCIL. Working together for growth and jobs A new start for the Lisbon Strategy. Communication from President Barroso in agreement with Vice-President Verheugen	EU	EU	development policy	Brussels, 2.2.2005 COM (2005) 24 final (SEC (2005) 192) (SEC (2005) 193)	policy communication	no	primary	Communication from President Barroso in agreement with Vice-President Verheugen on the Spring European Council - Working together for growth and jobs - A new start for the Lisbon Strategy.	Through the analysis of the document, we can examine the degree of adaptation's presence in the strategy.
European Commission	2005	COMMUNICATION FROM THE COMMISSION TO THE COUNCIL, THE EUROPEAN PARLIAMENT, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Winning the Battle Against Global Climate Change	EU	EU	development policy	Brussels, 9.2.2005 COM (2005) 35 final (SEC (2005) 180)	policy communication	no	primary	A key European Commission communication launching the Second European Climate Change Programme (ECCP II) in February 2005, outlining strategies to meet Kyoto Protocol commitments and integrate climate action with the Lisbon Strategy for growth, focusing on cost-effective emission reductions through wider sector inclusion (aviation, maritime, forestry, non-CO2 gases), emissions trading, international cooperation, and energy efficiency, especially in transport and power generation.	The document, as an important milestone in the EU's Road to organised community-level adaptation policy climate neutrality serves as a key information source and example.

Author	Year	Title	Author(s)' nationality	Publisher	Discipline	Vol, No, pages	Type	Scientific?	Source	Aim / focus	Useful content
European Commission	2009	Adapting to climate change: towards a European framework for action. White paper	EU	EU	adaptation policy	Online at: http://eur-lex.europa.eu/LexUriServ.do?uri=COM:2009:0147:FIN:EN:PDF (17.9.2010)	European Commission: STAFF WORKING DOCUMENT	no	primary	The EU Commission's White Paper sets out a framework to reduce the EU's vulnerability to the impact of climate change. It builds on the wide-ranging consultation launched in 2007 by the Green Paper on Adapting to Climate Change in Europe and further research efforts that identified action to be taken in the short-term. The framework is designed to evolve as further evidence becomes available. It will complement action by Member States and support wider international efforts to adapt to climate change, particularly in developing countries. The EU is working with other partner countries in the UNFCCC2 towards a post-2012 climate agreement which will address adaptation as well as mitigation. The Commission's proposals in this context are set out in the Communication entitled "Towards a comprehensive climate change agreement in Copenhagen".	The document, similarly, to the one mentioned by the previous record as an important milestone in the EU's Road to organised community-level adaptation policy climate neutrality serves as a key information source and example.
EU Commission	2008	20 20 by 2020 Europe's climate change opportunity.	EU	EU	development policy	COM (2008) 30 final Brussels, 23.1.2008	policy communication	no	primary	Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions.	Through the analysis of the document, we can examine the degree of adaptation's presence in the strategy.
EU Commission	2010	EU2020 – Az intelligens, fenntartható és inkluzív növekedés stratégiája.	EU	EU	development policy	Európai Bizottság, Brüsszel, 2010.3.3. COM (2010).	development strategy	no	primary	Communication of the European Commission on the document "EUROPE 2020 - Strategy for smart, sustainable and inclusive growth".	Through the analysis of the document, we can examine the degree of adaptation's presence in the strategy.
European Commission	1999	European Spatial Development Perspective Towards Balanced and Sustainable Development of the Territory of the European Union (ESDP).	EU	EU	development policy	Agreed at the Informal Council of Ministers responsible for Spatial Planning in Potsdam, May 1999	development strategy	no	primary	The Ministers responsible for Spatial Planning in the Member States of the European Union and the member of the European Commission responsible for Regional Policy emphasized in Potsdam that the conclusion of the political debate on the European Spatial Development Perspective (ESDP) was an important step in the progress towards European integration	Through the analysis of the document, we can examine the degree of adaptation's presence in the strategy.
European Commission	2013	Communication: "An EU Strategy on Adaptation to CC",	EU	EC	climate adaptation policy	COM (2013) 216. Brüssel/Strasbourg, 2013.	policy paper	no	primary	The first EU-level adaptation strategy.	Important milestone in the EU adaptation policymaking.
EU Commission	2014	2030 Climate and Energy Policy Framework.	EU	EU	climate and energy policy	EUCO 169/14 CO EUR 13 CONCL 5. Brussels, 24 October 2014	policy framework	no	primary	The 2030 climate and energy framework includes EU-wide targets and policy objectives for the period from 2021 to 2030	Through the analysis of the framework, we can examine the degree of adaptation's presence within the development directions.
EU Commission	2021	Communication from the Commission a Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development	EU	EU	sustainable development policy	COM/2001/0264 final */	policy communication	no	primary	COMMUNICATION FROM THE COMMISSION A Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development (Commission's proposal to the Gothenburg European Council)	Through the analysis of the document, we can examine the degree of adaptation's presence in the strategy.
EU Commission	2019	REFLECTION PAPER TOWARDS A SUSTAINABLE EUROPE BY 2030.	EU	EU	sustainable development policy	European Commission COM (2019)22 of 30 January 2019, Brussels.	reflection paper	no	primary	To deliver an EU-wide, overarching, long-term Sustainable Development Strategy accompanied by a comprehensive implementation plan to achieve the SDGs by 2030	Through the analysis of the document, we can examine the degree of adaptation's presence in the strategy.
European Commission	2010	A strategy for smart, sustainable and inclusive growth: EUROPE 2020 – A European strategy for smart, sustainable and inclusive growth.	EU	EU	development policy	Brussels, 3.3.2010 COM (2010) 2020	development strategy	no	primary	Communication from the Commission on A strategy for smart, sustainable and inclusive growth: EUROPE 2020 – A European strategy for smart, sustainable and inclusive growth	Through the analysis of the document, we can examine the degree of adaptation's presence in the strategy.
European Commission	2018	Annex IX: Horizontal assessment of the adaptation preparedness country fiches.	EU	EU	adaptation policy	https://ec.europa.eu/clima/sites/clima/files/adaptation/what/docs/horizontal_assessment_en.pdf	technical report	no	primary	Horizontal assessment of the adaptation preparedness in EU member states	The assessment offers important policy-oriented information on national adaptation performances.
European Commission	2018	REGULATION (EU) 2018/1999 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 on the Governance of the Energy Union and Climate Action,	EU	EU	adaptation policy	11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663	policy communication	no	primary	Communication from the Commission to the European Parliament, the Council, about the monitoring and reporting of national adaptation measures under the EU climate policy framework, based on Regulation (EU) 1999/2018 (GovReg).	It requires Member States to regularly report on the implementation of their integrated national energy and climate plans (NECPs), including climate adaptation actions, to the Commission every two years to ensure that climate objectives are achieved.

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<i>European Commission</i>	2021	Európai Zöld Megállapodás. Célkitűzéseink megvalósítása.	EU	EU	development policy	2011. december 12-i 2011/833/EU bizottsági határozat által került végrehajtásra (HL L 330., 2011.12.14., 39. o.). Luxemburg: Az Európai Unió Kiadó Hivatala, 2021. PDF ISBN 978-92-76-39501-0	development strategy	no	primary	Developed by the European Commission in late 2019, the European Green Deal is a roadmap to realign Europe's economy with the trajectory to net zero, help implement the Paris Agreement and build a more sustainable and fairer society.	Through the analysis of the framework, we can examine the degree of adaptation's presence within the development directions.
<i>European Commission</i>	2021	'Fit for 55': delivering the EU's 2030 Climate Target on the Way to Climate Neutrality.	EU	EU	development policy	Communication from the Commission to the European Parliament, the Council, The European Economic and Social Committee and the Committee of the Regions. Brussels, 14.7.2021. COM (2021) 550 final.	development strategy	no	primary	The "Fit for 55" package is a set of proposals to revise and update EU legislation and to put in place new initiatives with the aim of ensuring that EU policies are into line with the climate goals agreed by the Council and the European Parliament.	Through the analysis of the framework, we can examine the degree of adaptation's presence within the development directions.
<i>European Commission</i>	2021	Communication from the EC to the EP, the Council; the EESC and the Committee of the Regions on Forging a climate-resilient Europe – the new EU Strategy on Adaptation to CC.	EU	EC	climate adaptation policy	COM/2021/82 final. Brussel/Strasbourg, 2021.	policy paper	no	primary	The updated, revised second version of the first EU-level adaptation strategy.	Important milestone in the EU adaptation policymaking.
<i>European Council</i>	2000	LISBON EUROPEAN COUNCIL PRESIDENCY CONCLUSIONS.	EU	EU	development policy	Lisbon, 23. and 24. March 2000	policy communication	no	primary	The European Council held a special meeting on 23-24 March 2000 in Lisbon to agree a new strategic goal for the Union in order to strengthen employment, economic reform and social cohesion as part of a knowledge-based economy.	Through the analysis of the framework, we can examine the degree of adaptation's presence within the development directions.
<i>European Environmental Agency</i>	2012	CC Impacts and Vulnerability in Europe.	EU	EEA	climate adaptation	EEA report No 12/2012 Downloaded from: http://www.eea.europa.eu/publications/climate-impacts-and-vulnerability-2012 .	technical report	no	primary	This European Environment Agency (EEA) report presents information on past and projected climate change and related impacts in Europe, based on a range of indicators. The report also assesses the vulnerability of society, human health and ecosystems in Europe and identifies those regions in Europe most at risk from climate change. Furthermore, the report discusses the principal sources of uncertainty for the indicators and notes how monitoring and scenario development can improve our understanding of climate change, its impacts and related vulnerabilities	The report gives an overview of European climate impacts and vulnerabilities.
<i>European Environmental Agency</i>	2015	National monitoring, reporting and evaluation of climate change adaptation in Europe. EEA	EU	EEA	climate adaptation planning, monitoring and evaluation	European Environment Agency, 2015 Publications Office of the European Union, 2015 ISBN 978-92-9213-705-2 ISSN 1725-2237 doi:10.2800/629559	technical report	no	primary	The report provides new insights into national MRE systems, the first attempt to consolidate emerging information across European countries.	It comprises useful practical information about 1) drivers/purposes; 2) governance and participation; 3) methodological approaches; 4) adaptation policy communication.
<i>European Environmental Agency</i>	2016	Environment and climate policy evaluation.	EU	EEA	climate adaptation planning, monitoring and evaluation	EEA Report No 18/2016. European Environmental Agency, Luxembourg.	technical report	no	primary	The publication aims to facilitate this dialogue with professional evaluators and evaluation users by 1) setting out how the EEA currently approaches a number of key issues related to environment and climate policy evaluation; 2) discussing practical approaches for environmental evaluation, in the form of an "Evaluator's toolbox" of this publication.	It provides a summary about the European national adaptation MRE situation

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<i>European Environmental Agency</i>	2020	Monitoring and evaluation of national adaptation policies throughout the policy cycle	EU	EEA	climate adaptation planning, monitoring and evaluation	EEA Report No 06/2020 European Environmental Agency, Luxembourg.	technical report	no	primary	The report provides an overview of country developments in terms of strategies and plans for climate change adaptation (CCA) and their implementation in a context of global and European policy frameworks.	The report brings together lessons learned — at the national level — on adaptation monitoring, reporting and evaluation (MRE), future directions and opportunities for mutual learning on evaluating CCA strategies and plans at national and European levels and the implications of emerging reporting requirements from relevant EU policies to improve evaluation at the EU level.
<i>European Environmental Agency</i>	2022	Advancing towards climate resilience in Europe – Status of reported national adaptation actions in 2021	EU	EEA	climate adaptation planning, monitoring and evaluation	EEA Report No11/2022 European Environmental Agency, Luxembourg.	technical report	no	primary	The report provides an overview of EU MSs and Türkiye's adaptation to CC and their reporting on adaptation actions. It concentrates on 5 main fields: CC-related hazards, vulnerabilities and risks; adaptation policies/priorities; adaptation governance; implementation and financing; MRE.	Knowledge base has improved over time through CRAs; identifies the most frequent hazards and affected sectors. EU instruments, transboundary, CBC and macro-regional cooperation can support national adaptation. Only few MSs has dedicated adaptation funds, earmarked budgets for adaptation financing. Growing number of MSs conduct adaptation MRE. M more frequently than R and E.
<i>European Environmental Agency</i>	2024	European Climate Risk Assessment Executive summary EEA Report 01/2024	EU	EEA	climate adaptation planning, monitoring and evaluation	EEA Report 01/2024. Luxembourg: Publications Office of the European Union, 2024 ISBN 978-92-9480-627-7 ISSN 1977-8449 doi:10.2800/204249	technical report	no	primary	The first European Climate Risk Assessment (EUCRA) identifies 36 climate risks that pose a threat to Europe's energy and food security, ecosystems, infrastructure, water resources, financial stability, and people's health. It shows that many of these risks have already reached critical levels and can become catastrophic without urgent and decisive action. The knowledge in this first-of-its-kind assessment is synthesised to support strategic policymaking.	Beyond the numerous important information it provides, the EUCRA even applies a macro regional classification for the European continent that was one of the bases of the dissertation's macro regional assessments.
<i>European Environmental Agency</i>	2025	Economic losses and fatalities caused by weather - and climate - related extreme events (1980-2024) - per country.	EU	EEA	climate adaptation planning, climate adaptation policy	Published 13/10/25 Modified 15/10/25. https://www.eea.europa.eu/en/analysis/indicators/economic-losses-from-climate-related/economic-losses-and-fatalities-caused-by	Chart (interactive)	no	primary	This figure shows total economic losses for all weather- and climate-related extreme events per country, per km2 and per capita. It also shows the insured losses per country and the share the insured losses are from the total. Finally, it presents the number of fatalities per country.	Source for climate-related loss & damages indicator calculation for the dissertation's chapter 5.3.
<i>Faludi, A.</i>	2006	From European spatial development to territorial cohesion policy.	NRL	Taylor & Francis	spatial planning	Regional Studies, 40(6), 667-678. https://doi.org/10.1080/00343400600868937	article	yes	primary	The European Constitution defines territorial cohesion as a competence shared between the Union and the Member States. What does this stand for, and how is territorial cohesion policy going to take shape? Answering these questions, the paper deals with the European Spatial Development Perspective's advocacy of polycentrism and how territorial cohesion has given new impetus to pursuing this agenda.	Introduction of the emergence of spatial aspects in development and spatial policy planning.
<i>Faludi, A.</i>	2013	Territorial cohesion, territorialism, territoriality and soft planning: a critical review	NRL	Sage Publications	spatial planning	Environment and Planning A, 2013, Volume 14, pp 1302-1317 doi: 10.1068a45299	article	yes	primary	The paper alert planners involved in EU spatial planning that common sense answers do not exist for the question: "what territory is?". It mentions the planning literature then relatively new feature, the articulation of soft spaces instead of hard ones.	the article adds new points to the definitions of territory, territorialism, territoriality
<i>Faludi, A.</i>	2016	The Poverty of Territorialism: Revisiting European Spatial Planning	NRL	Taylor&Francis	spatial planning	The Planning Review 52, no.3: 73-81.	article	yes	primary	Under territorialism and the crisis of the European Union the paper shows that this crisis raises questions about what the Union is and should be. Pursuing the neo-medieval alternative, the paper reports on the same author foreseeing overlapping territorial and functional arrangements, like in an empire. It discusses spatial planning in the neomedieval empire where spaces.	European space must no longer be seen through the lens of territorialism. Rather, it should be viewed as overlapping and intersecting areas, each requiring its own governance. The implication for European planning, true also for strategic planning generally, is to abandon the pursuit of spatially integrated policies. Instead, planning should produce parallel and overlapping schemes for various territorial and functional
<i>Farbotko, C.</i>	2018	Climate change and national security: an agenda for geography	AUS	Taylor&Francis	social geography	Australian Geographer Volume 49, 2018. Issue 2	article	yes	primary	The essay urges geographers, working in Australia and internationally, to make ongoing contributions to engagements about the connection of national security, climate change and geography.	Geographic data and analysis pertaining to various aspects of climate change and security are needed in order to shape policy directions and support evidence-based policy making.
<i>Faragó, L.</i>	2012	Térértelmezések – Interpretations of space	HUN	MTA	regional study	Tér és Társadalom / Space and Society 26. évf., 1. szám, 2012	article	yes	primary	The author discusses the most defining concepts of space in four chapters. It distinguishes the relational/relative space from the absolute spatial perception with an objective approach. It presents the objective material and the dual approach the concept of (subjective) social spaces. Heidegger's concept of space is described in detail. For each interpretation, he refers to their practical consequences. Then points out that the ideas of space and place do not primarily mean a difference in scale, but their meaning is different; there is a specific interaction between the abstract system/structure and the concrete place. The final chapter of the study is everyday practice, and planning discusses the use of space (concept).	The article provides a comprehensive overview of space interpretations of spatial disciplines
<i>Faragó, T.</i>	2015	Új nemzetközi éghajlatvédelmi megállapodás.	HUN	Magyar Energetikai Társaság	climate adaptation policy	Magyar Energetika, 2015/5-6, pp. 58-61.	article	yes	primary	Right before the Paris Agreement the author overviewed the expected results.	An introduction of the international climate policy yields and consequences of the Paris Agreement

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Fayol, H.	1916	General and Industrial Management.	FRA	Pitman and Sons Ltd	management studies, economics	First English Volume. Pitman and Sons Ltd., 110 pages, London, 1946.	book	yes	primary	In its seminal work, Henri Fayol, a French mining engineer and management theorist, lays out the fundamental principles of modern management.	The book provides definition for management-related concepts as planning and monitoring and evaluation.
Feldmeyer, D.; Wilden, D.; Kind, Ch.; Kaiser, Th.; Goldschmidt, R.; Diller, Ch.; Birkmann, J.	2019	Indicators for monitoring urban climate change resilience and adaptation	GER, GER, GER, GER, GER, GER, GER, GER	MDPI	urban planning, climate adaptation MRE	Sustainability, 2019, 11, 2931	article	yes	primary	The article is based on literature review, online survey, validation workshop and sectoral experts' quality control, the article provides an indicator set to measure urban climate resilience and monitor adaptation activities	It identified 24 indicators distributed over 24 action fields.
Fellmann, T.	2012	The assessment of climate change related vulnerability in the agricultural sector: Reviewing conceptual frameworks.	OECD	OECD	climate adaptation planning, monitoring and evaluation	Building resilience for adaptation to climate change in the agriculture sector, 23, 37, Proceedings of a Joint FAO/OECD Workshop 23–24 April 2012 Edited by Meybeck, Lankoski, Redfern, Azzu and Gitz	chapter	yes	primary	The article provides a review of conceptual frameworks for the assessment of climate change related vulnerability and give some examples of their application to the agricultural sector. Therefore, the paper reviews existing interpretations, concepts and frameworks of vulnerability approaches in the climate change context.	It serves as an example for studies dealing with vulnerability's particular sectoral aspects.
Fleischhauer, M., Greiving, S., Wanczura, S.	2007	Territorial planning for the management of risk in Europe	GER, GER, GER	Universität Dortmund	spatial planning	Boletín de la A.G.E. Nº 45 – 2007, pp. 383–388	article	yes	primary	This paper presents the results of an assessment made as a part of the research project «Applied Multi Risk mapping of Natural Hazards for Impact Assessment» (ARMONIA). The aim was to identify which aspects in the disaster management cycle are covered by spatial planning in planning practice in the European Union Member States Finland, France, Germany, Greece, Italy, Poland, Spain and the United Kingdom. The results have shown that spatial planning is only one of many actors in risk management that it is in general not involved in risk assessment, multi-risk assessment approaches are not used in planning practice and that risk indicators are hardly and vulnerability indicators not at all used.	The article interprets the role of spatial planning in natural risk assessment and management.
Ford, J., Berrang-Ford, L.	2015	The 4Cs of adaptation tracking: consistency, comparability, comprehensiveness, coherency.	CAN, CAN	Springer	climate adaptation policy	Mitigation Adaptation Strategies Global Change 21., 839–859 (2016). https://doi.org/10.1007/s11027-014-9627-7	article	yes	primary	The paper outlines key methodological considerations necessary for adaptation tracking research to produce systematic, rigorous, comparable, and usable insights that can capture the current state of adaptation globally, provide the basis for characterizing and evaluating adaptations taking place, facilitate examination of what conditions explain differences in adaptation action across jurisdictions, and can underpin the monitoring of change in adaptation over time.	The article argues that approaches to adaptation tracking need to (i) utilize a consistent and operational conceptualization of adaptation, (ii) focus on comparable units of analysis, (iii) use and develop comprehensive datasets on adaptation action, and (iv) be coherent with our understanding of what constitutes real adaptation. Collectively, these form the 4Cs of adaptation tracking (consistency, comparability, comprehensiveness, and coherency).
Foucault, M.	2007	Security, territory, population	FRA	St. Martin Press	philosophy	St Martin's Press, 2007.	book	yes	primary	The book, especially its fourth chapter focuses on a history of "governmentality" from the first centuries of the Christian era to the emergence of the modern nation state.	Space concepts introduced by the book is utilizable. The book, especially its fourth chapter focuses on a history of "governmentality" from the first centuries of the Christian era to the emergence of the modern nation state.
Fröhlich, C., Selby, J., Dahi, O., & Hulme, M.	2017	Climate change and the Syrian civil war revisited.	GER, UKG, UKG, UKG	Elsevier	political geography	<i>Political Geography</i> , 60, 232–244.	article	yes	primary	For proponents of the view that anthropogenic climate change will become a 'threat multiplier' for instability in the decades ahead, the Syrian civil war has become a recurring reference point, providing apparently compelling evidence that such conflict effects are already with us. According to this view, human-induced climatic change was a contributory factor in the extreme drought experienced within Syria prior to its civil war; this drought in turn led to large-scale migration; and this migration in turn exacerbated the socio-economic stresses that underpinned Syria's descent into war. This article provides a systematic interrogation of these claims and finds little merit to them.	The Syria case, the article finds, does not support 'threat multiplier' views of the impacts of climate change; to the contrary, we conclude, policymakers, commentators and scholars alike should exercise far greater caution when drawing such linkages or when securitising climate change.

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Fuldauer, L.I.; Adshead, D., Thacker, S.; Gall, S.; Hall, J.W.	2021	Evaluating the benefits of national adaptation to reduce climate risks and contribute to the Sustainable Development Goals	UKG, SWE, UKG, UKG, UKG	Elsevier	climate adaptation planning, sustainable development	Global Environmental Change 76 (2022)	article	yes	primary	The article applies a methodological process that allows national decision makers to evaluate the total SDG benefit of adapting specific assets or areas against climate change and help decision makers to develop spatially explicit adaptation strategies at national level and better evaluate sustainable development strategies.	The authors developed a methodology for better consideration of SDGs and sustainable aspects in adaptation policies
Füssel H.M.; Klein R.J.T.	2006	Climate change vulnerability assessments: an evolution of conceptual thinking.	GER, GER	Springer	climate policy monitoring, evaluation	Climatic Change 75, 301–329 (2006). https://doi.org/10.1007/s10584-006-0329-3	article	yes	primary	The paper reviews the historical development of the conceptual ideas underpinning assessments of vulnerability to climate change. We distinguish climate impact assessment, first- and second-generation vulnerability assessment, and adaptation policy assessment.	The author introduced different vulnerability assessment methods.
Geneletti, D.; Zardo, L.	2016	Ecosystem-based adaptation in cities: An analysis of European urban climate adaptation plans.	ITA, ITA	Elsevier Ltd.	land use planning, urban planning	Land Use Policy 50 (2016) pp. 38–47.	article	yes	primary	Nowadays little information is available on the combination of these two issues, i.e., the actual inclusion of EBA measures in climate adaptation plans at the urban level. This paper addresses this gap by developing a framework to analyse the treatment of EBA in urban level climate planning and apply it to a sample of climate adaptation plans in Europe.	It introduces historical development of adaptation policy and especially the evolution of the so-called ecosystem-, or nature-based adaptation measures.
Geoghegan, J.; Gray, W.	2005	Spatial aspects of environmental policy.	USA, USA	Clark University	environmental economics	Economics. Issue 72. https://commons.clar.ku.edu/faculty_economics/72	article	yes	primary	The article collected 24 key publications considering the reasons for spatial variation in policies, due to either efficiency or equity considerations, and the consequences of that spatial variation for both environmental and economic outcomes.	Analysis of spatial aspects in environmental policy
Gilbert, J.M.; Jefferson, J.L.; Constantine, P.G.; Maxwell, R.M.	2016	Global spatial sensitivity of runoff to subsurface permeability using the active subspace method.	USA, USA, USA, USA	Science Direct	hydro-meteorology, geology	Advances in Water Resources, Vol. 92, 2016, ISSN 0309-1708, https://doi.org/10.1016/j.advwatres.2016.05.020 .	article	yes	primary	Hillslope scale runoff is generated as a result of interacting factors that include water influx rate, surface and subsurface properties, and antecedent saturation. Heterogeneity of these factors affects the existence and characteristics of runoff. This heterogeneity becomes an increasingly relevant consideration as hydrologic models are extended and employed to capture greater detail in runoff generating processes. The authors investigated the impact of one type of heterogeneity – subsurface permeability – on runoff using the integrated hydrologic model ParFlow.	Use of the concept of spatial sensitivity in subsurface permeability assessments.
GIZ	2013	Recommendation for Adaptation M&E in Practice	GER	GIZ	climate adaptation MRE	Experiences from the project 'Inventory of Methods for Adaptation to Climate Change (IMACC)' on behalf of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), the project 'Effective Adaptation Finance (M+E Adapt)' as well as the 'Climate protection programme for developing countries	discussion paper	no	primary	The paper provides a synthesis of the experiences made so far with adaptation monitoring and evaluation to provide key messages for adaptation practitioners and decision makers	The paper provides practical recommendations for MRE system development at national level, in 5 steps: analysis and description of the context; identifying levels and methodologies, indicator definitions with baselines and data sources; setting up the concrete system; utilization of MRE results.
Golobic, M.; Marot, N.	2011	Territorial impact assessment: Integrating territorial aspects in sectoral policies.	SLN, SLN	Science Direct	regional development policy, spatial policy and planning	Evaluation and Program Planning, Vol. 34, Issue 3, 2011, ISSN 0149-7189. https://doi.org/10.1016/j.evalprogplan.2011.02.009	article	yes	primary	Territorial impact assessment has recently gained attention as a tool to improve the coherence of sector policies with territorial cohesion objectives. The paper presents a method for territorial impact assessment and the results of applying this method on Slovenian energy policy.	Introduction of the possibilities of integrating territorial aspects in Slovenian energy policy.
Gooneseckera, S.M.; Olazabal, M.	2022	Climate Adaptation Indicators and Metrics: State of Local Policy Practice	NRL, ESP	Elsevier Ltd.	climate adaptation MRE, urban planning	Ecological Indicators 145 (2022)	article	yes	primary	Surveying the 136 largest coastal cities worldwide to examine their used indicators and metrics to track climate adaptation.	The authors compiled and coded 1971 indicators of which 1841 focus fully or partially on adaptation related aspects.
Greiving, S.; Fleischhauer, M.; Wanczura, S.	2007	Management of natural hazards in Europe: The role of spatial planning in selected EU member states	GER, GER, GER	Taylor&Francis	spatial planning	Journal of Environmental Planning and Management Vol. 49, Issue 5	article	yes	primary	Guiding question of the study is which role spatial planning (at the regional and local level) can play in dealing with natural hazards.	Limits of formal spatial planning instruments; spatial planning as one of many actors.

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<i>Greiving, S. – Fleischhauer, M.</i>	2010	National strategies of European countries for climate change adaptation: A review from a spatial planning and territorial development perspective	GER, GER	German Federal Ministry of Transport, Building and Urban Development (BMVBS) Scientific Support	territorial/spatial planning, climate adaptation	BMVBS-Online-Publikation, No. 21/2010	technical report	yes	primary	The study provides an overview and systematic characterisation of different national approaches for climate policy strategic planning from spatial planning/regional development perspective, examine how regionally different climate impacts and admin/political systems influence national adaptation strategies. It grouped adaptation strategies according to spatial planning aspects	Spatial planning is only given minor attention in the assessed analyses, and its role is one among the sectors. Exposures and planning systems differ strongly. It gives also set of recommendations about the improvement of spatiality in adaptation planning. The territorially specific focuses, geographical scopes, spatial aspects in adaptation got lesser emphasis. Although some special objectives/foci can be identified in national adaptation strategies in the late 2000s – early 2010s, their addressed sectors and development lines are quite similar. No geographical specificities are reflected in the character and objective system of given national strategies
<i>Greiving, S. – Schmidt-Thome, P.</i>	2013	European climate vulnerabilities and adaptation: a spatial planning perspective	GER, FIN	Taylor&Francis Online	territorial/spatial planning, climate adaptation	European Planning Studies Volume 20, 2012 – Issue 1: Climate Change and Sustainable Cities Pages 27-48 Published online: 24 Jan 2012 https://doi.org/10.1080/09654313.2011.638493	article	yes	primary	The study analyses the impacts climate change might have on regions and their local economies. Regions clearly differ in view of the complex patterns of climate change impact, but also regarding the given vulnerability and coping capacity. Impacts of climate change can have a marked effect on the functioning of regions and sectors of the society, if not properly addressed. Readiness to adapt to the impacts and lasting changes counts towards vulnerability of the regions. The book builds upon the findings of a project conducted under the European observation network for territorial development and cohesion (ESPON), The ESPON Climate project.	It examines spatial planning's role to undertake a coordinative role conducting multi risk assessments considering all relevant hazards for given regions.
<i>Greiving, S., Fleischhauer, M.</i>	2012	National Climate Change Adaptation Strategies of European States from a Spatial Planning and Development Perspective	GER, GER	Taylor&Francis Online	territorial/spatial planning, climate adaptation	European Planning Studies Climate Change and Sustainable Cities Volume 20, 2012 – Issue 1 pp 27-48	article	yes	primary	The aim of this article is to give an overview and systematic characterization of different national approaches to developing strategies of climate change adaptation from a spatial planning or regional development perspective, respectively. Based on this analysis, recommendations are made for the implementation of the Territorial Agenda of the European Union.	Exposures and planning systems differs strongly. It gives also set of recommendations about the improvement of spatiality in adaptation planning. The territorially specific focuses, geographical scopes, spatial aspects in adaptation got lesser emphasis. Although some special objectives/foci can be identified in national adaptation strategies in the late 2000s – early 2010s, their addressed sectors and development lines are quite similar.
<i>Guskey, T. R.</i>	2000	Evaluating professional development.	CAN	Thousand Oaks, CA	Evaluation theory, methodology	Corwin Press.	book	yes	primary	As a practical guide, the book gives a framework to evaluating professional development programs at five increasing levels of sophistication: participants' reaction to professional development; how much participants learned; evaluating organizational support and change; how participants use their new knowledge and skills; and improvements in student learning	The book introduces us the concepts and definitions of strategic evaluations.
<i>Gustavsson, E.; Elander, I.; Lundmark, M.</i>	2009	Multilevel Governance, Networking Cities, and the Geography of Climate-Change Mitigation: Two Swedish Examples	SWE, SWE, SWE	Sage Journals	social geography, spatial planning	Environment and Planning C: Politics and Space Volume 27, Issue 1 https://doi.org/10.1068/c07109j	article	yes	primary	The article tries to answer the question "What geographical and institutional conditions are important for initiating and sustaining climate-change mitigation at the local level?" It analyses local climate mitigation as a case of multilevel network governance. It illustrates the results by the case of two Swedish cities, which are both involved in city networking in favour of climate-change mitigation.	Different business structures and other local conditions in significant ways influence both the level of ambition and the climate-policy strategies of cities. The sheer size and intensity of the networking activities clearly illustrate the fact that cities are increasingly becoming arenas of globalization, rather than passive victims of global forces, thus confirming the call for a multilevel network-governance approach in policy and politics as well as in research.
<i>Hallegatte S.</i>	2009	Strategies to adapt to an uncertain climate change.	FRA	Elsevier Ltd.	climate adaptation planning	Global Environmental Change 19(2): 240–247.	article	yes	primary	Many decisions concerning long-lived investments already need to take into account climate change. But doing so is not easy for at least two reasons. Five methods are examined by the article: (i) selecting "no-regret" strategies that yield benefits even in absence of climate change; (ii) favouring reversible and flexible options; (iii) buying "safety margins" in new investments; (iv) promoting soft adaptation strategies, including long-term perspective; and (v) reducing decision time horizons.	It calls our attention to the trend that cities globally face significant risks from climate change and are taking an active role in formulating and implementing climate adaptation.
<i>Hague, R.; Harrop, M.; McCormick, J. (ed).</i>	2019	Comparative Government and Politics. An Introduction. 11th edition.	UKG, UKG, UKG	Red Globe Press	political studies	London, Red Globe Press	book	yes	primary	The revised and updated edition of a core higher education textbook (which is one of the most well-established texts in the field of comparative politics) offers a comprehensive introduction to the comparison of governments and political systems, helping to understand not just the institutions and political cultures of their own countries but also those of a wide range of democracies and authoritarian regimes from around the world.	The content of the book was used for the classification of European countries according to their spatial governance type, during the dissertation's correlation analysis.
<i>Haggard, S. – Simmons B.A.</i>	1987	Theories of International regimes	USA, USA	MIT Press	IR, regime theory, governance	International Organization, Vol. 41, No 3: 491-517	article	yes	primary	Over the 1970-80 decades, international regimes have become a major focus of empirical research and theoretical debate within international relations. This article provides a critical review of this literature.	Introduces main schools of IR theory.
<i>Haggett, P.</i>	2001	Geography. Global synthesis.	UKG	Pearson College	social and economic geography	Typotex, Budapest	book	yes	primary	A synthesizing book of natural, social and regional geography knowledge, one of the best known and appraised in the genre.	The book comprises description of space and place definitions and a glossary as well.
<i>Hajduga, P.</i>	2014	Territorial aspect of regional development in the new cohesion policy.	POL	Wroclaw University	regional development	Biblioteka Regionalisty.	article	yes	primary	The paper aims at attracting attention to the evolution of the European cohesion policy model towards a place-based policy.	Introduction of some territorial, spatial aspects of the then-new cohesion policy.

Author	Year	Title	Author(s)' nationality	Publisher	Discipline	Vol, No, pages	Type	Scientific?	Source	Aim / focus	Useful content
					policy, spatial planning	https://doi.org/10.15611/br.2014.1.04					
Hansen, L.	2017	Poststructuralism.	USA	Oxford University Press	IR, governance	In: J Baylis, S. Smith, P. Owens: The Globalization of World Politics. Oxford University Press Inc., New York Oxford University Press, 2017. ISBN 978-0-19-882554-8.	chapter	yes	primary	Introduction of the main characteristics of the post-structuralism school and its evaluation.	Introduction of the post-structuralism school of the IR discipline.
Harley M.; van Minnen J.	2009	Development of adaptation indicators.	UKG, NRL	EEA	climate adaptation planning, monitoring and evaluation	Climate and Development 3(1), pp. 21-31. https://doi.org/10.3763/cdev.2010.0062	technical report	no	primary	The purpose of this Technical Paper is to present a theoretical and practical framework for the development of adaptation indicators. The paper also aims to apply the framework in the development of indicators for the biodiversity sector and (i) the vulnerability of European biodiversity to climate change and (ii) regions being the interface between high-level national/European policy and local implementation.	The paper introduces the necessary prerequisites of adaptation indicator development as well as considerations important in their development.
Haug, C., Rayner, T., Jordan, A., Hildingsson, R., Stripple, J., Monni, S., Huitema, D., Massey, E., van Asselt, H., Berkhout, F.	2010	Navigating the dilemmas of climate policy in Europe: evidence from policy evaluation studies.	NRL, UKG, UKG, SWE, SWE, ITA, NRL, NRL, NRL, NRL	Springer	climate adaptation planning, monitoring and evaluation	Climatic Change 101(3-4), 427-445.	article	yes	primary	One obvious source of evidence is the evaluations of the performance of existing policies. But to what extent do these evaluations provide insights into the difficult dilemmas that governors typically encounter? The article addresses this question by reviewing the content of 262 evaluation studies of European climate policies in the light of six kinds of dilemma found in the governance literature.	Common findings: that climate change is framed as a problem of market and/or state failure; that voluntary measures tend to be ineffective; that market-based instruments tend to be regressive; that EU-level policies have driven climate policies in the latecomer EU Member States; and that lack of monitoring and weak enforcement are major obstacles to effective policy implementation. However, there is too little systematic climate policy evaluation work in the EU to support systematic evidence-based policy making.
Haughton, G.; Allmendinger, Ph.	2008	The Soft Spaces of Local Economic Development	UKG, UKG	Sage Journals	social geography	May 2008Local Economy 23(2):138-148 DOI:10.1080/02690940801976216	article	yes	primary	The article examines soft spaces, soft outcomes and soft infrastructure, trying to make some connections between them. The authors argue that soft spaces of governance constitute one of the most important but little understood components of contemporary sub-national economic development policy.	The article talks about soft places as special type of functional places.
Havlík, V.	2023	The Europeanization of territoriality and its limits: the territorial dimension of EU cohesion policy and its varying implementation.	CZH	Taylor & Francis	regional policy, spatial planning and policy	European Planning Studies, 31(4), 802-821. https://doi.org/10.1080/09654313.2022.2091407	article	yes	primary	In the framework of the territorial dimension of EU cohesion policy, the European Commission has been offering the establishment of functional regions. The response at the member state level has been very diverse, though. Whereas some states have established 'new regions', others have been reluctant to do so. The article argues that states and/or regions may veto the Europeanization process on the grounds of protecting their territoriality.	Analysis of the "territoriality" concept from an Europeanization point of view.
Haynes, P.A.	1974	Towards a Concept of Monitoring	UKG	Liverpool University Press	strategic planning	The Town Planning Review Vol. 45, No. 1 (Jan., 4), pp. 5-29 (25 pages)	article	yes	primary	The article analyses the concept and potential role of monitoring in planning.	Provides definition for monitoring activities.
Hogan, R.L.	2007	The Historical Development of Program Evaluation: Exploring the Past and Present	USA	Eastern Illinois University	strategic planning	Online Journal of Workforce Education and Development Volume II, Issue 4 – Fall 2007	article	yes	primary	The purpose of this article is to present the historical development and significant contributions leading to the current status of the program evaluation field.	Provides definition for evaluation activities.
Healy, P.	2004	The Treatment of Space and Place in the new Strategic Spatial Planning in Europe	UKG	Wiley	spatial planning, urban planning	International Journal of Urban and Regional research. Volume28, Issue 1. March 2004. Pp 45-67. https://doi.org/10.1111/j.0309-1317.2004.00502.x	article	yes	primary	This paper examines the way concepts of place and space are being used in the new wave of strategic spatial plans in Europe, in relation to the intellectual debates in the social sciences and humanities on these concepts.	The article emphasises spatial planning's important role and history from urban planning point of view.
Heidrich, O.; Reckien, D.; Olazabal, M.; Foley, A.; Salvia, M.; De Gregorio Hurtado, S.; Orru, H.; Flacke, J.; Geneletti, D.; Pietrapertosa, F.; Hamann, J.-J.P.; Tiwary, A.; Feliu, E.; Dawson, R.J.	2016	National climate policies across Europe and their impacts on cities strategies	UKG, NRL, ESP, UKG, ITA, ESP, FIN, NRL, ITA, ITA, FRA, UKG, ESP, UKG	Elsevier Ltd.	climate adaptation policy and planning	Journal of Environmental Management Volume 168, 1 March 2016, Pages 36-45 https://doi.org/10.1016/j.jenvman.2015.11.043 Get rights and content	article	yes	primary	The article facilitates the understanding of relationship between city strategies on mitigation/adaptation and relevant national strategies. It analyses how climate policy is integrated into national as urban policies and what implications can be drawn from EU and national policies.	An example for a comparative evaluation of 200 European cities' climate change strategies from ÖST, BEL, EST, FIN, FRA, GER, ITA, IRL, NRL, ESP, UKG.

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Huitema, D.; Jordan, A.; Massey, E.; Rayner, T.; van Asselt, H.; Haug, C.; Hildingsson, R.; Monni, S. – Strippel, J.	2011	The evaluation of climate policy: theory and emerging practice in Europe.	NRL, UKG, NRL, UKG, NRL, NRL, SWE, ITA, SWE	Policy Science	climate adaptation planning, monitoring and evaluation	Policy Science (2011) 44: 179. doi:10.1007/s11077-011-9125-7	article	yes	primary	This article attempts to provide the first systematic cataloguing of the emerging patterns of policy evaluation undertaken in different parts of the European Union. Theories of policy evaluation suggest that these evaluation practices should acknowledge the inherent complexity of climate policy making, be reflexive by questioning official policy goals, and be participatory. The article concludes by analysing the implications of this finding for those in the academic and practitioner community.	A meta-analysis of 259 climate policy evaluations suggests that current practice engages with some but not all of the mentioned issues. The authors consider planning, monitoring, evaluation and feedback provision as the 4 most important steps of the planning cycle
Hurlimann, A.C., March, A.P.	2012	The role of spatial planning in adapting to climate change	AUS AUS	Wiley Interdisciplinary Reviews of Climate Change	territorial / spatial planning	Interdisciplinary Reviews of Climate Change Published in 2012, 3(5) 477-488.	article	yes	primary	According to the authors spatial planning has been identified as a critical mechanism through which climate change adaptation can be facilitated. The authors reviewed the role of spatial planning as a tool for adaptation to climate change. In doing so, they described common planning processes and tools. Six capacities of spatial planning that have the potential ability to facilitate climate change adaptation are identified and discussed. These principally relate to spatial planning's ability to: act on matters of collective concern; manage competing interests; cut across scales; reduce and act on uncertainty; act as a knowledge repository; and be oriented to the future while integrating a range of diverse systems. Methods (tools) for planning which have the capacity to address climate change adaptation were also presented and discussed.	The article analysed the role of spatial planning in adapting to climate change.
Illés I.	2002	Közép- és Délkelet-Európa az ezredfordulón. Átalakulás, integráció, régiók	HUN	Dialog Campus	regional geography, regional economics	Dialóg Campus szakkönyvek. Studia Regionum. Területi és Települési Kutatások. 19. kötet.	book	yes	primary	The book offers a regional development-oriented situation analysis of the CADSES region, identifying its challenges and perspectives, transnational and cross-border initiatives	The book is a collection of different history-, ethnography-, politics- and economics-oriented Eastern and Central-European definitions; the author especially emphasises the role of politics in the creation of these delimitations
IPCC 2007 [ed: Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. & Hanson, C.E.].	2007	Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change	UN	IPCC	climate adaptation policy	Cambridge University Press, Cambridge, UK. 976 pp. https://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4_wg2_full_report.pdf	technical report	yes	primary	An IPCC overview of CC trends, impacts and vulnerability information from 2007.	Information about global and macro-regional CC-related trends of impacts, adaptability and vulnerability.
IPCC 2012. [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)].	2012	Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change	UN	IPCC	climate adaptation policy	Cambridge University Press, Cambridge, UK, and New York, NY, USA, 582 pp.	technical report	yes	primary	An IPCC overview of CC related risks and extreme events information from 2012.	Information about global and macro-regional CC-related risk- and disaster management situation.
IPCC 2014. [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)].	2014	Climate Change – Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change	UN	IPCC	climate adaptation policy	Cambridge University Press, Cambridge, United Kingdom, and New York, NY, USA, 1132 pp.	technical report	yes	primary	An IPCC overview of CC trends, impacts and vulnerability information from 2014.	Information about global and macro-regional CC-related trends of impacts, adaptability and vulnerability.
IPCC AR5 2013. [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)].	2013	IPCC – Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change	UN	IPCC	climate adaptation policy	Cambridge University Press, Cambridge, United Kingdom, and New York, NY, USA; 2013.	technical report	yes	primary	An IPCC overview of CC trends, impacts and vulnerability information from 2013.	Information about global and macro-regional CC-related trends of impacts, adaptability and vulnerability.
IPCC 2022. [H.-O. Pörtner, D.C. Roberts, E.S. Poloczanska, K. Mintenbeck, M. Tignor, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem (eds.)].	2022	Summary for Policymakers In: Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of WG II to the AR6 of the IPCC.	UN	IPCC	climate adaptation policy	Cambridge University Press. In Press.	technical report	yes	primary	An IPCC overview of CC trends, impacts and vulnerability information from 2022.	Information about global and macro-regional CC-related trends of impacts, adaptability and vulnerability.

Author	Year	Title	Author(s)' nationality	Publisher	Discipline	Vol, No, pages	Type	Scientific?	Source	Aim / focus	Useful content
Isthiaque, A.; Estoque, R.C.; Eakin, H.; Parajuli, J.; Rabby, Y.W.	2022	IPCC's current conceptualization of 'vulnerability' needs more clarification for climate change vulnerability assessments.	USA, JPN, USA, USA, USA	Elsevier	climate adaptation policy, environmental management	Journal of Environmental Management, 303 (2022). https://doi.org/10.1016/j.jenvman.2021.114246	article	yes	primary	The article raises the concern that the existing conceptualization of 'vulnerability', introduced in the IPCC Fifth Assessment Report (AR5), is not facilitative for standalone vulnerability assessments and that this conceptualization has not been well accepted by the vulnerability researchers. The authors identify three key reasons for low adoption of the AR5 conceptualization in climate change vulnerability assessments and urge the clarification of how the current conceptualization of 'vulnerability' can facilitate standalone climate change vulnerability assessments.	Information about spatial implications of consecutive IPCC CVA methodologies. The authors propose treating 'exposure' not only as a precondition for vulnerability but also as a secondary element of it.
Jackson, B.; Sørensen, G.; Möller, J. (ed)	2019	Introduction to International Relations: Theories and Approaches	USA-USA-USA	Oxford University Press	IR, governance	7 th Edition Oxford University Press	book	yes	primary	An accessible introduction to international relations, which demystifies the key theories, debates, and issues.	Comprehensive and meticulous introduction of different IR schools.
Jensen, A.; Van Bommel, S.; Pedersen, A.B.; Nielsen, H.O., Kuindersma, W.	2013	Framing climate change: new directions in Dutch and Danish Planning Strategies.	DEN, NRL, DEN, DEN, NRL	Taylor&Francis	Spatial planning	Planning Theory&Practice, Volume 4, Issue 2, 2013.	article	yes	primary	Through studies of change in particular framings of planning, induced by the integration of climate change policy issues in the strategic planning of Copenhagen (Denmark) and the Zuidplaspolder (the Netherlands), this paper analyses how climate policies push reframing the basic perceptions and spatial imaginaries of strategic planning, and how this affects planning as a politicised activity.	The study shows that reframing socio-spatial imaginaries influences the spatiality of the city/the polder, including a spatial identity, advocates certain solutions, and further enables institutional actors to reframe climate issues strategically to benefit other planning objectives as well as weaving together environmental agendas with economic agendas. However, new framings are challenged by some citizens/actors. At an institutional level, framing of planning may hence serve to relocate tensions and engage citizens and stakeholders in hard transitions, thus revealing implications beyond the discursive.
Jones, H. P.; D. G. Hole; E. S. Zavaleta	2012	Harnessing nature to help people adapt to climate change.	USA, USA, USA	Nature Publishing Group	nature conservation/ climate adaptation policy	Nature Climate Change 2; pp. 504-509.	article	yes	primary	According to the authors, "an overwhelming focus of adaptation strategies to reduce climate change-related hazards has been on hard-engineering structures such as sea walls, irrigation infrastructure and dams. Closer attention to a broader spectrum of adaptation options is urgently needed. In particular, ecosystem-based adaptation approaches provide flexible, cost-effective and broadly applicable alternatives for buffering the impacts of climate change, while overcoming many drawbacks of hard infrastructure".	Introduction of the importance of NBSs in climate adaptation.
Kabeyi, M.J.B.	2019	Evolution of Project Management, Monitoring and Evaluation, with Historical Events and Projects that Have Shaped the Development of Project Management as a Profession	DAF	International Journal of Science and Research	management theories, strategic planning (evaluation theory, methodology)	International Journal of Science and Research (IJSR) · December 2019	article	yes	primary	The article introduces the evaluation project management and its main pillars.	The article introduces several concepts, definitions of monitoring, evaluation and reporting.
Kajner, P.; Czira, T.; Selmeczi, P.; Sütő, A.	2017	National Adaptation Geo-Information System in climate adaptation planning.	HUN, HUN, HUN, HUN	Hungarian Meteorological Service	sustainable development, climate adaptation policy	Időjárás, Quarterly Journal of the Hungarian Meteorological Service. Vol. 121, No. 4, October-December 2017, pp. 345–370.	article	yes	primary	The article describes the establishment and the main characteristics of the holistic, horizontal national climate adaptation-oriented GIS-based DS system of Hungary.	Introduction of the NAGIS system as a European-level good practice.
Karanika, M.; Kallioras, D.	2018	EU spatiality under question – territorial cohesion in danger	GRE, GRE	UC Santa Barbara	regional study, spatial development policy	Territories: A Trans-Cultural Journal of regional Studies, 1(1) https://doi.org/10.5070/T21141511 https://escholarship.org/uc/item/6sg0n7gg	article	yes	primary	The paper highlights the importance of spatial transformations with respect to the EU integration undertaking and the fact that the insufficient knowledge of the inherent characteristics of territory poses a threat to the achievement of the territorial cohesion objective.	Useful and detailed introduction of space, place and territory – related concepts. It highlights the importance of spatial formations in human pursuits and points out their importance in the European Masterplan through decoding the concepts of space, place and territory
Kelly, Ph.	2016	Classical Geopolitics: A New Analytical Model.	USA	Stanford University	geopolitics	Stanford University Press, 2016. ISBN: 9780804799508. http://www.sup.org/books/title?id=25589	book	yes	primary	In Classical Geopolitics, Phil Kelly attempts to build a common theoretical model, incorporating a host of variables that reflect the complexity of the modern geopolitical stage. He then analyses thirteen pivotal but widely differing historical events stretching from the Peloponnesian War to World War II, from the fall of the British and Soviet empires to the contemporary diplomacy of South America.	The book comprises among other things concepts / definitions of geopolitics.

Author	Year	Title	Author(s)' nationality	Publisher	Discipline	Vol, No, pages	Type	Scientific?	Source	Aim / focus	Useful content
Kerbler, B.	2016	Revitalisation of open spaces, changing centralities and neighbourhoods, and the importance of spatial planning for climate change adaptation.	SLN	Urbanistični inštitut Republike Slovenije	sociology, spatial planning	Urbani Izživ. Vol. 27, No. 1 (June 2016), pp. 89-94.	article	yes	primary	The article further developed selected findings from the previous issues of the journal. A critical comparative analysis of these earlier articles is presented by the study in order to provide added value to the articles and research findings published earlier in this journal, and hence further enhance their research profile.	It describes the importance of spatial planning for climate change adaptation and the possible ways to utilize risk assessments' results, climate models and scenarios for better prediction of climate change impacts.
Kerekes, S.	2021	Chasing the Impossible. Sustainable Development Is a Wicked Problem, but It Can Be and Should Be Tamed!"	HUN	Taylor&Francis Online	environmental economics, sustainable development, climate adaptation policy	World Futures-12.	article	yes	primary	To make use of the results of wicked problems in planning sustainable development, the author is trying to make the connection in the article.	Describes the way to tackle wicked and non-ergodic problems and their usefulness in handling CC impacts.
Kern, K.	2023	Cities in EU multilevel climate policy: governance capacities, spatial approaches and upscaling of local experiments.	GER	Elgar	urban planning	In.: Rayner, T.; Szulecki, K.; Jordan, A.J.; Oberthür, S. (Ed.): Handbook on European Union Climate Change Policy and Politics. Elgar Handbooks in Energy, the Environment and Climate Change.;	book chapter	yes	primary	The paper discusses, first, the changes of local climate governance in the EU multilevel system because different instruments are needed for specific types of cities. Second, the paper provides an overview on the phases of EU-city relations from the emergence of transnational city networks to the establishment of the EU Covenant of Mayors and the development of the European Green Deal. Third, the paper focuses on the dynamics between leading and lagging cities in Europe.	A good example of city- and city-differences oriented approach in climate change -related literature.
Khajuria, A. and Ravindranath, N.H.	2012	Climate Change Vulnerability Assessment: Approaches DPSIR Framework and Vulnerability Index.	IND, IND	OMICS International	climate adaptation planning, monitoring and evaluation	Journal of Earth Science & Climatic Change, Vol 3, 2012, pp 1-6.	article	yes	primary	The paper shows two different vulnerability assessment indexes: the Livelihood Vulnerability Index (LVI) and the Livelihood Effect Index (LEI). Both indices exist in the framework of the Drivers-Pressures-State-Impact-Response (DPSIR) framework that has evolved into an interdisciplinary tool for environmental analyses and assumes cause-effect relationship between interacting component of social, economic, and environmental systems. The DPSIR framework helps in identifying the indicators of (LVI) and (LEI) vulnerability index as cause-effect relationship.	Introduction of vulnerability assessment methodologies.
Kind, Christian; Kaiser, Theresa; Gaus, Hansjörg	2019	Methodology for the evaluation of the German adaptation strategy. Environmental Research Plan Report.	GER, GER, GER	Umweltbundesamt [German Environment Agency] Dessau-Roßlau, Germany.	climate adaptation planning, monitoring and evaluation	ENVIRONMENTAL RESEARCH PLAN Project number 3715 41 106 0	policy study (research plan report)	no	primary	Within the UFOPLAN-project „Evaluation and further development of the DAS“ Adelphi and CEval have prepared a concept for the evaluation of the national German adaptation strategy (DAS). The concept will be used to continuously review the evaluation process in Germany. In the long term, the evaluation concept shall be used to check whether the activities and instruments of the adaptation process are suitable to achieve the main goal of the DAS: "To reduce vulnerability and improve the adaptive capacity of ecologic, social and economic systems towards the unavoidable impacts of climate change."	Interesting practical material, describing the evaluation method of the German NAS evaluation.
Kiss, E.; Fazekas, I.; Balla, D.	2021	A klímaváltozással kapcsolatos fogalmi hálók feltárása a kiválasztott Hajdú-Bihar megyei településcsoportokban	HUN, HUN, HUN	Central Statistical Office of Hungary	social geography	Területi Statisztika, 61(5); https://doi.org/10.15196/TS610503	article	yes	primary	The authors applied a word association study in two groups of settlements in Hajdú-Bihar County to explore the conceptual networks related to climate change in settlements that have developed a sustainable Climate and Energy Action Plan or that have not yet done so.	A good example-article for spatially oriented attitude analysis in climate adaptation.
Kiss, E.; Balla, D.; Poszet, SZ.; Kovács, A. D.	2022	A klímaaggodalmak jellemzői és helyi szintű sajátosságai: Esettanulmány Hajdú-Bihar megye választott településeiről, 2020.	HUN, HUN, HUN, HUN	Central Statistical Office of Hungary	social geography	Területi Statisztika, 62 (5); https://doi.org/10.15196/TS620505	article	yes	primary	Kiss et al. conducted a questionnaire survey on a sample of 512 people in Debrecen regarding attitudes and personal risk assessments related to climate change	A good example-article for spatially oriented attitude analysis in climate adaptation.
Klostermann, J., van de Sandt, K., Harley, M., Hildén, M., Leiter, T. van Minnen, J., Pieterse, N., van Bree, L.	2018	Towards a framework to assess, compare and develop monitoring and evaluation of climate change adaptation in Europe	NRL, NRL, UKG, FIN, FIN, NRL, NRL, NRL	Springer	climate adaptation planning, monitoring and evaluation	Mitigation and Adaptation Strategies for Global Change volume 23, pages187–209 (2018) Feb2018, Vol. 23 Issue 2, p187-209. 23p.	article	yes	primary	The aim of the article was to support joint learning about adaptation monitoring in Europe on how adaptation can be monitored at the national level to detect possible mismatch between policy and implementation, on the general requirements of adaptation monitoring and on recommendations for a possible monitoring framework for adaptation.	Based on literature review the article created an outline of a framework with building blocks and assess 3 NASs (FIN, UKG, GER). It gave recommendations for the proposed framework in terms of system of interest; indicators; responsible organisations; procedures.
Koch, J.; Mendiguren, G.; Mariethoz, G.; Stisen, S	2017	Spatial Sensitivity Analysis of Simulated Land Surface Patterns in a Catchment Model Using a Set of Innovative Spatial Performance Metrics.	DEN, DEN, SWI, DEN	American Meteorology Society	hydro-meteorology	Journal of Hydrometeorology. Vol. 18, Issue 4, 2017. https://doi.org/10.1175/JHM-D-16-0148.1	article	yes	primary	Hydrological models simulate states and fluxes of water and energy in the terrestrial hydrosphere at each cell. The predicted spatial patterns result from complex nonlinear relationships and feedback. Spatial patterns are often neglected during the modelling process, and therefore a spatial sensitivity analysis framework that highlights their importance is proposed. This study features a comprehensive analysis of spatial patterns of actual evapotranspiration (ET) and land surface temperature (LST), with the aim of quantifying the extent to which forcing data and model parameters drive these patterns.	Using the concept of spatial sensitivity in land surface analysis within water catchment area modelling.

Author	Year	Title	Author(s)' nationality	Publisher	Discipline	Vol, No, pages	Type	Scientific?	Source	Aim / focus	Useful content
Korompai, A.	1995	Regionális stratégiák jövőképzési megvalósítása.	HUN	ELTE-TTK, Regionális Földrajzi Tanszék, Budapest	regional study	Regionális tudományi tanulmányok 1.	book	yes	primary	The study introduces the role of regional strategy building in future research.	The study was used in this research to identify space interpretations and types.
Koks, E. E., Moel, H.; Aerts, J. C. J. H. & Bouwer L. M.	2014	Effect of spatial adaptation measures on flood risk: study of coastal floods in Belgium	BEL, BEL, BEL, BEL	Springer	adaptation planning, spatial planning	Regional Environmental Change, 14(1), 413–425, doi: 10.1007/s10113-013-0514-7	article	yes	secondary	The main goal of the study is to assess future changes in flood risk and the effectiveness of flood risk adaptation measures for the coastal zone in Flanders, Belgium. In order to achieve this, they set up a modelling framework to assess the future flood risk of the Belgian coast including climatic and socioeconomic projections and used this model to assess the effectiveness of two spatial adaptation measures: compartmentalization and land-use zoning.	Providing detailed additional information on adaptation planning's spatiality.
Krasner, S. (ed)	1983	International regimes	USA	Cornel University Press Ithaca	IR, regime theory, governance	Cornel University Press Ithaca	book	yes	primary	A thorough exploration of the concept of international regimes by fourteen distinguished specialists in international political economy.	The book was used in this research to identify regime concepts.
Lamhauge, N.; Lanzi, E.; Agrawala, S.	2012	Monitoring and evaluation for adaptation: lessons from development operation agencies.	OECD, OECD, OECD	OECD	adaptation MRE	OECD Environment Working Papers No3.	working paper	no	primary	The article conducts an examination of development organisations' documents on adaptation evaluation.	The article concentrated mostly on methodological issues (use of Logical Framework and Result based Management approaches and Theory of Change methods).
Lange, B.; Hülz, M.; Schmid, B.; Schütz, Ch. (ed.)	2021	Post-Growth Geographies: Spatial Relations of Diverse and Alternative Economies (Social and Cultural Geography).	GER, GER, GER, GER	Transcript Publishing	geopolitics, regional geography	2021. ISBN-10 3837657337	article	yes	primary	The book was elaborated by the collaboration of the editors and a number of the contributors in the working group 'Post-Growth Economies' of the Academy for Territorial Development in the Leibniz. The working group involved more than a dozen geographers, economists and spatial and landscape planners from Germany, Switzerland and Luxembourg. From mid2017 to mid-2020, the group members met every six months at workshops in different locations and systematically tackled the topic of post-growth economies from the perspective of the spatial and planning sciences.	The book was used during identification of different space interpretation of this research, concentration on post-growth trends.
Laudien, R., Goosen, H., van Nieuwaaal, K., Boon, Eva	2019	The Dutch adaptation web portal: seven lessons learnt from a co-production point of view	NRL, NRL, NRL, NRL	Springer	climate adaptation planning, monitoring and evaluation	Climatic Change Apr2019, Vol. 153 Issue 4, p509-521. 13p	article	yes	primary	Since its release in 2014, the Knowledge Portal for Spatial Adaptation has evolved into the central web portal for climate adaptation in the Netherlands, supporting regional and local adaptation efforts. This paper reflects on how co-production shaped the development of the portal and evaluates its use and the usability of the most frequently accessed tool, the 'Climate Adaptation Atlas'.	Introduction of a practical GIS-based DS tool.
Leiter, T.	2013	Recommendations for adaptation M&E in practice. Experiences with establishing national adaptation M&E systems.	GER	GIZ	climate adaptation planning, monitoring and evaluation	Deutsche Gesellschaft für Internationale Zusammenarbeit GIZ	working paper	no	primary	Leiter overviewed good practice examples of 10 adaptation MRE pioneering countries: the context of their systems; the institutional arrangements and their development; and the systems' content.	The analysis underlined the complexity of the national systems and the importance of learning from each other.
Ledda A., Di Cesare E.A., Satta G., Cocco G., Calia G., Arras F., Congiu A., Manca E., De Montis A.	2015	Adaptation to Climate Change and Regional Planning: A Scrutiny of Sectoral Instruments	ITA, ITA, ITA, ITA, ITA, ITA, ITA, ITA	MDPI, Basel, Switzerland	territorial/spatial planning / climate adaptation policy	Sustainability 2020, 12, 3804; doi:10.3390/su12093804	article	yes	primary	The study focuses on the regional plans adopted by the Autonomous Region of Sardinia (Italy), south European Mediterranean region, an area that will be negatively affected by climate change in the coming decades. The study aims at proposing a method for scrutinizing regional plans related to spatial planning issues, by using criteria rooted in the scientific literature and adaptation strategies.	The article examines adaptation's role and weight in regional planning.
Leiter, T.	2021	Do governments track the implementation of national climate change adaptation plans? An evidence-based global stocktake of monitoring and evaluation systems	GER	Elsevier Ltd.	climate adaptation MRE	Environmental Science and Policy 125 (2021)	article	yes	primary	The article is a comprehensive inventory of NAP MRE systems, documenting governmental practices from over 60 countries It gives an overview of good practice examples of 10 adaptation MRE pioneering countries.	It examines the context of systems; the institutional arrangements and development; the systems' content. The analysis underlined the complexity of the national systems and the importance of learning from each other. It is a quasi-global stocktake on adaptation MRE system building.
Leiter, T.	2015	Linking Monitoring and Evaluation of Adaptation to Climate Change Across Scales. Avenues and Practical Approaches.	GER	Wiley Online Library	climate adaptation planning, monitoring and evaluation	New Directions for Evaluation: Volume 2015, Issue 147, Fall 2015. Monitoring and Evaluation of Climate Adaptation: A Review of the Landscape. Wiley Online Library. Pp. 117-127 doi.org/10.1002/ev.20135	article	yes	primary	Monitoring and evaluation activities prepare for and reduce the impacts of climate change can help to understand the results of adaptation interventions and better account for progress over time. Information on adaptation is so far typically gathered through either project and program, or national-level climate change adaptation MRE systems with limited connection between them. However, given that adaptation takes place at multiple scales, a complete picture of the adaptation progress can only be established if information from national and subnational levels is combined. Leiter's article outlines three avenues illustrated by examples from practice on how information on adaptation interventions and evaluation results can be connected across scales in order to improve the evidence base for adaptation planning and decision making.	The analysis underlined the complexity of the spatial scales of adaptation MRE.

Author	Year	Title	Author(s)' nationality	Publisher	Discipline	Vol, No, pages	Type	Scientific?	Source	Aim / focus	Useful content
<i>Leiter, T., Buitrago, M.F., Druta, A., Guitierrez, J.E., Harley, M., Makholela, T., Ponlok, T., Ramarou, T., Vargas, C.R., & Wallin, E.</i>	2017.	Country-specific assessments of adaptation progress.	UN	UNEP	climate adaptation planning, monitoring and evaluation	In: UNEP: The Adaptation Gap Report 2017: Towards Global Assessment (pp. 23–33).	technical report	no	primary	Leiter and colleagues found that very few national adaptation M&E systems have advanced beyond initial steps, i.e., concluding the opposite of what Morgan et al. claim	A comprehensive overview of national adaptation MRE systems.
<i>Leitner M.; Johnson K.; Lexer W.; Munck af Rosenschöld J.; Dworak T.; Tamásóvá A.; Nikolova A.; Vanneuville W.</i>	2024	Characteristics and conditions of adaptation policy in European Environment Agency member and cooperating countries.	EU	EEA	climate adaptation policy & MRE	ETC CA. Report published 2024 via European Topic Centre on Climate change adaptation and LULUCF, (ETC CA). doi.org/10.25424/cmcc	technical report	no	primary	This European Topic Centre on Climate change Adaptation and LULUCF (ETC CA) report aims to provide a deeper understanding of the diverse landscape of adaptation policy frameworks and instruments utilized across the 38 European Environment Agency member and cooperating countries, exploring their defining characteristics and how they operate within national contexts. Particular attention is given to countries with national climate laws governing climate change adaptation. The report provides an assessment of adaptation policy documents and reports published through July 2024. It also identifies challenges in integrating monitoring and evaluation systems, ensuring that adaptation actions lead to meaningful risk reduction and increased resilience.	The report takes stock of the progress made in establishing legal frameworks and policies for climate adaptation across Europe. However, it also identifies challenges in integrating monitoring and evaluation systems, ensuring that adaptation actions lead to meaningful risk reduction and increased resilience. The findings suggest a need for continued efforts to enhance the coherence and effectiveness of adaptation policies through robust legal mandates and improved governance structures
<i>Lengyel I.</i>	2010	A regionális tudomány „tényező”: realis esélyek avagy csalfa délibábok.	HUN	MTA	regional study	Tér és Társadalom, 3, 11–40.	article	yes	primary	The study deals with the most important challenges facing regional science and the possible answers. He considers the drastic reduction of transport and communication costs to be essential, partly as a result of this, the reorganization of spatial relations and the promotion of agglomeration economies. These processes form a new social space according to the needs of the globalized economy, which is largely separated from the geographical space. According to the author, an integrated management of the geographical space and the new social space can greatly contribute to the renewal of regional science.	It provides an example for regional study's space approach.
<i>Lennox, V.</i>	2008	Conceptualizing Global Governance in International Relations.	CAN	Oxford University Press	IR, governance	University of Ottawa, 2008.	working paper	yes	primary	The author deals with questions of how the concept of global governance can be used to describe the prevailing global order and what is the most appropriate way of formulating the concept of global governance.	Concepts and approaches of IR, to be utilized in the research, are examined by the paper.
<i>Ligtvoet, W.; Franken, R.; Kunseler, E.</i>	2016	Keeping track of adaptation in the Dutch Delta. Design of a reflexive monitoring and evaluation framework for the Delta Programme.	NRL, NRL, NRL	PBL Netherlands Environmental Assessment Agency the Hague	climate adaptation planning, monitoring and evaluation	PBL Netherlands Environmental Assessment Agency the Hague, 2016 PBL publication number: 2557	policy study	no	primary	The Delta Commissioner's Office requested PBL, Netherlands Environmental Assessment Agency to formulate a proposal for a monitoring and evaluation framework for the Delta Programme. PBL was asked, in collaboration with the University of Amsterdam and the Delft University of Technology, to combine three perspectives in the framework design: 1) learning through collaboration; 2) adaptive management for a timely response; and 3) shared accountability.	A practical example of MRE system building.
<i>Lilburne, L.; Tarantola, S.</i>	2009	Sensitivity analysis of spatial models.	NZL, ITA	Taylor & Francis	geography	International Journal of Geographical Information Science, 23(2), 151–168. https://doi.org/10.1080/13658810802094995	article	yes	primary	Sensitivity analysis is the study of how uncertainty in model predictions is determined by uncertainty in model inputs. A global sensitivity analysis considers the potential effects from the simultaneous variation of model inputs over their finite range of uncertainty. A number of techniques are available to carry out global sensitivity analysis. A novel approach for undertaking a spatial sensitivity analysis (based on the method of Sobol' and its related improvements) is proposed and tested. This method makes no assumptions about the model and enables the analysis of spatially distributed, uncertain inputs. The proposed approach is illustrated with a simple test model and a groundwater contaminant model.	A use of sensitivity analysis of spatial models.
<i>Lombardi, D. R.; Caserio, M.; Donovan, R.; Hale; J., Hunt; D. V. L., Weingaertner; C.</i>	2011	Elucidating sustainability sequencing, tensions, and trade-offs in development decision making.	UKG, UKG, UKG, UKG, UKG, UKG	SAGE Publications Ltd	sustainable development	Environment and Planning B: Planning and Design, 38(6), pp. 1105–1121. http://dx.doi.org/10.1068/b36161 .	article	yes	primary	The article introduces the MODESTT mapping approach was developed to elucidate the interdependencies, tensions, and trade-offs between different sustainability objectives for a given development, and to make explicit the points at which a single design decision may 'lock-in' or 'lock-out' various possible outcomes. The authors review and analyse existing models of the development process, illustrate the decisions and activities inherent in delivering a single element of a development (illustrated in this paper with the example of a roof); then apply the MODESTT analysis to three sustainability objectives.	Presentation of an example for changes in strategic planning approaches.
<i>Malekpour, S.; Brown, R.R.; de Haan, F.J.</i>	2015	Strategic planning of urban infrastructure for environmental sustainability: Understanding the past to intervene for the future.	AUS AUS AUS	Elsevier Ltd.	strategic planning / urban planning	Cities 46 (2015) pp. 67–75.	article	yes	primary	The study identifies the cognitive framings that underpin the evolution of strategic planning over the last century, to reveal the path-dependent attributes of strategic planning thinking that undermine alternative solutions. To do that, a scoping study of the literature on strategic planning of public infrastructure, from 1900 through 2013, was conducted.	Presentation of an example for changes in strategic planning approaches.
<i>Magni-Berton, R.</i>	2024	Territorial Countervailing Powers Under the Pandemic	FRA	Palgrave MacMillan	political sciences, sociology, regional economics	In: Egger, C.; Magni-Berton, R.; de Saint-Phalle, E.(ed): Covid-19 Containment Policies in Europe. International Series on Public Policy. ISSN 2524-7301	book chapter	yes	primary	Collection of studies about the social, economic and crisis-management -related impacts of Covid-19 in Europe, from the political sciences, sociology, regional economics point of view.	The book provides classification of European national spatial governance types for the dissertation's correlation analysis.

Author	Year	Title	Author(s)' nationality	Publisher	Discipline	Vol, No, pages	Type	Scientific?	Source	Aim / focus	Useful content
<i>Medeiros, E.</i>	2017	The territorial dimension of European Union policies. A conceptual approach.	POR	Routledge	regional policy, spatial planning	In.: Medeiros (ed) Uncovering the Territorial Dimension of European Union Cohesion Policy. 1st Edition. Routledge, 2017.	book chapter	yes	primary	The book chapter contribute to the academic debate on territorial cohesion by first discussing the territorialisation of policies. It then examines the main dimensions and components of the notion of 'territorial dimension of policies' to facilitate its analysis. The chapter focuses on the territorial dimension of European Union (EU) Cohesion Policy, as that most financed by the EU. EU Cohesion Policy has produced significant territorial impacts in the EU territory as clearly expressed by EC official documents and in independent analysis.	Analysis the territorialisation of policies and the main dimensions and components territorial dimensions of policies.
<i>Member States' Ministers responsible for Urban Development</i>	2007	LEIPZIG CHARTER on Sustainable European Cities.	EU	EU	urban planning	Final Draft. Leipzig, 02 May 2007.	strategy	no	primary	In 2007, the European Ministers for Urban Development and Regional Planning adopted the Leipzig Charter for a Sustainable European Cities (PDF) in Leipzig. The aim of the Leipzig Charter 2007 was to establish city-wide Integrated Urban Development in order to strengthen and further develop European cities. A special focus was to be placed on districts with special requirements for development.	subject of document analysis to examine the weight of climate adaptation in urban planning
<i>Member States' Ministers responsible for Urban Development and Territorial Cohesion</i>	2007	Territorial Agenda of the European Union. Towards a More Competitive and Sustainable Europe of Diverse Regions.	EU	EU	spatial planning	Agreed on the occasion of the Informal Ministerial Meeting on Urban Development and Territorial Cohesion in Leipzig on 24 / 25 May 2007.	strategy	no	primary	The first action-oriented policy framework of the Ministers responsible for spatial planning and territorial development to support territorial cohesion in Europe as a new goal of the European Union.	subject of document analysis to examine the weight of climate adaptation in spatial planning
<i>Member States' Ministers responsible for Spatial Planning and Territorial Development</i>	2011	Territorial Agenda of the European Union 2020 Towards an Inclusive, Smart and Sustainable Europe of Diverse Regions	EU	EU	spatial planning	agreed at the Informal Ministerial Meeting of Ministers responsible for Spatial Planning and Territorial Development on 19 th May 2011 Gödöllő, Hungary.	strategy	no	primary	TA2020 is the action-oriented policy framework of the Ministers responsible for spatial planning and territorial development to support territorial cohesion in Europe as a new goal of the European Union (EU) introduced by the Treaty of Lisbon (Art 3.TEU). It outlines objectives in accordance with the time horizon of major policy documents until 2020.	subject of document analysis to examine the weight of climate adaptation in spatial planning
<i>Member States' Ministers responsible for Urban Matters</i>	2020	THE NEW LEIPZIG CHARTER. The transformative power of cities for the common good.	EU	EU	urban planning	Adopted at the Informal Ministerial Meeting on Urban Matters on 30 November 2020. www.bmi.bund.de	strategy	no	primary	The EU Ministers responsible for urban matters, agree upon the New Leipzig Charter that emphasises the pursuit of the common good using the transformative power of cities. This includes general welfare, reliable public services of general interest as well as reducing and preventing new forms of social, economic, environmental and territorial inequalities. The common goal is to safeguard and enhance the quality of life in all European towns and cities and their functional areas.	subject of document analysis to examine the weight of climate adaptation in urban planning
<i>Member States' Ministers responsible for Spatial Planning and Territorial Development and/or Territorial Cohesion</i>	2020	Territorial Agenda 2030. A future for all places.	EU	EU	spatial planning	Informal meeting of Ministers responsible for Spatial Planning and Territorial Development and/or Territorial Cohesion. 1 December 2020, Germany	strategy	no	primary	On 1 December 2020, the EU Ministers responsible for spatial planning, territorial development and/or territorial cohesion have agreed on the Territorial Agenda 2030 of the European Union. The new Agenda provides an action-oriented framework to promote territorial cohesion in Europe: a future for all places, involving countries at national, regional and local levels, and promoting cooperation with other countries.	subject of document analysis to examine the weight of climate adaptation in spatial planning
<i>Ministry for Technology and Innovation & National Adaptation Centre</i>	2018	2 nd National Climate Change Strategy	HUN	Hungarian Parliament	strategic document	-	strategy	no	primary	To define the medium and long-term objective system of Hungarian climate (and within its adaptation-) policy and short-term sectoral action lines in mitigation, adaptation and awareness raising	Adaptation definition, context, content in Hungary

Author	Year	Title	Author(s)' nationality	Publisher	Discipline	Vol, No, pages	Type	Scientific?	Source	Aim / focus	Useful content
<i>Mickwitz, P.; Aix, F.; Beck, S.; Carss, D.; Ferrand, N.; Görg, Ch.; Jensen, A.; Kivimaa, P.; Kuhlicke, Ch.; Kuindersma, W.; Manez Costa, M.; Melanen, M.; Monni, S.; Pedersen, A.; Reinert, H.; Bommel, S.</i>	2009	Climate Policy Integration, Coherence and Governance	EU	PEER (Partnership for European Environmental Research)	climate adaptation policy & planning	PEER Report No. 2. Helsinki 2009 ISBN: 978-952-11-3379-4	technical report	no	primary	The study was carried out by the non-governmental PEER network in order to reflect upon the political implementation of adaptation strategies.	Analysis of policy integration for mitigation and adaptation efforts in more detail for selected case studies from six European countries
<i>Morgado, N.</i>	2020	Neoclassical geopolitics: Preliminary theoretical principles and methodological guidelines	POR	Charles University, Prague	geopolitics	Medunarodni Problemi 72: 1. pp. 129-157. (2020)	article	yes	primary	Introduction of directions of neoclassical geopolitics through the author's preliminary theoretical principles and methodological guidelines.	It introduces among other things 'geopolitics' definition and space concepts.
<i>Morgan, E.A.; Nalan, J.; Mackey, B.</i>	2019	Assessing the alignment of national-level adaptation plans in the Paris Agreement.	AUS, AUS, AUS	Elsevier Ltd.	climate adaptation planning	Environment Science Policy 93 (3) pp. 208-220	article	yes	primary	The authors analysed 54 national documents and their alignment with the Paris Agreement.	The authors drew the conclusion that significant proportion of the analysed documents put serious effort into MRE activities during planning
<i>Nawratek, K.</i>	2018	Territory, space, Place and Beyond	UKG	Palgrave Pivot	architecture	In.: Nawratek, K.: Total urban mobilisation. Ernst Jünger and the post-capitalist city	book chapter	yes	primary	The chapter discusses the tension between notions of space, place, and territory. Architects and urban designers often discuss and conceptualise place as a subjective, phenomenology-based idea; however, in practice, they would rather refer to Cartesian, neutral, and geometrical, space, and to a territory. In this chapter, the author argues that the tension between these notions should be a starting point to rethink a post-capitalist project.	The chapter add further layers to the space, place and territory concept.
<i>Nemes-Nagy, J.</i>	1998	A tér a társadalomkutatásban.	HUN	Hilscher Rezső Szociálpolitikai Egyesület	regional study	Hilscher Rezső Szociálpolitikai Egyesület. Budapest, 1998.	book	yes	primary	Some kind of synthesis about the concepts, methods and approaches of the regional study.	The book introduces –among other things- the main space concepts of the regional study and different space interpretations.
<i>Nemes-Nagy, J. (ed).</i>	2005	Regionális elemzési módszerek. Kézikönyv.	HUN	ELTE TTK Regionális Földrajzi Tanszék, MTA-ELTE Regionális Tudományi Kutatócsoport	regional study	Regionális Tudományok 1585-1419, 11. Budapest, Magyarország, 284 p. 2005.	book	yes	primary	Handbook on regional analytical methods, basic work in applied regional study.	Valuable information about spatial analyses.
<i>Nemes Nagy, J.</i>	2007	Kvantitatív társadalmi térértelemezési eszközök a mai regionális tudományban – Elements of Quantitative Spatial Analysis in the Recent Regional Science	HUN	MTA	regional study	Tér és Társadalom 21. évf. 2007/1. 1-19. p	article	yes	primary	The article examines the relationship between space and society and the main analytical tool of this relationship: the quantitative methods, concentrating on spatial inequalities.	The article introduces –among other things- the main space concepts of the regional study and different space interpretations.

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<i>Nemes Nagy J.</i>	2009	Terek, helyek, régiók. A regionális tudomány alapjai.	HUN	MTA	regional study	Akadémiai Kiadó, Budapest	book	yes	primary	An improved version of the 1998 book of the author.	The book mentions space concepts of the regional study and different space interpretations.
<i>Oberthür, S.; Roche Kelly, C.</i>	2008	EU Leadership in International Climate Policy: Achievements and Challenges	GER, BEL	Taylor&Francis	climate policy	The International Spectator, Italian Journal of International Affairs. Vol 43, Issue 3, pp 35-50 https://doi.org/10.1080/03932720802280594	article	yes	primary	The article says that climate change had taken centre stage in European and international politics. Since the second half of the 1980s, the EU had established itself as an international leader on climate change and has considerably improved its leadership record. However, implementation and policy coherence, coordination of EU environmental diplomacy, an evolving international agenda, EU enlargement, and a still precarious EU unity remained major challenges. The article urges shifts in underlying driving forces and advances of EU domestic climate and energy policies to support the expectation that the EU will remain a progressive force in international climate policy for some time.	Describes the EU's pioneering role in adaptation policy
<i>O'Donnell, T.</i>	2019	Contrasting land use policies for climate change adaptation: A case study of political and geo-legal realities for Australian coastal locations	AUS	ScienceDirect	land use planning	Land Use Policy, Volume 88, November 2019, https://doi.org/10.1016/j.landusepol.2019.104145	article	yes	primary	Using a legal geography lens, the article critically examines how local governments use law and land use policy to respond to climate change adaptation in three coastal localities in New South Wales, Australia. It also explores how relations between key coastal actors and dynamic material environments influence climate change adaptation trajectories.	The article shed light on spatial planning's and land use planning's importance in climate adaptation.
<i>OECD</i>	2023	A Territorial Approach to Climate Action and Resilience.	OECD	OECD Publishing, Paris.	climate policy, regional policy	OECD Regional Development Studies, doi.org/10.1787/1ec42b0a-en . ISBN 978-92-64-71907-1.	study	no	primary	The report proposes a policy framework to help decision makers develop more effective climate and resilience policies through a "territorial approach". Adopting a territorial approach is critical for national and subnational governments to tap into the full potential to reduce greenhouse gas (GHG) emissions across all places and better address locally specific climate impacts, which often hit the most vulnerable communities the hardest. -	The report proposes a policy framework to help decision makers develop more effective climate and resilience policies through a "territorial approach". Drawing on an analysis of 36 leading practices from countries, regions and cities mainly in the OECD area, three types of actions are recommended. Integrate a place-based perspective into climate policy; climate-proof regional, and enable and scale-up local climate action and resilience.
<i>Ottaviani Aalmo, G.O.; Gioli, B.; Rodriguez, D.G.P.; Tuomasjukka, D.; Liu, H.; Pastore, M.C.; Salbitano, F.; Bogetoft, P.; Saebo, A.; Konijnendijk, C.</i>	2022	Development of a Novel Framework for the Assessment and Improvement of Climate Adaptation and Mitigation Actions in Europe	NOR, ITA, NOR, FIN, NOR, ITA, ITA, DEN, ESP	Frontiers	adaptation planning, adaptation governance	Frontiers in Sustainable Cities (4), doi: 10.3389/frsc.2022.833098	article	yes	primary	The article gives recommendation for a new framework for improvement and assessment of climate adaptation and mitigation actions in Europe and strengthen the role of regions	It provides us with a conceptual framework for enabling rapid and far-reaching climate actions through multi-sectoral adaptation pathways targeting regional policy makers and scientific actors.
<i>O'Tuathail, G., Dalby, S., Routledge, P.</i>	1998	The Geopolitics Reader.	UKG, UKG, UKG	Routledge	geopolitics	London, Routledge, 1998.	book	yes	primary	The book is the extensively revised second edition of The Geopolitics Reader and draws together the most influential and significant geopolitical readings from the last hundred years.	It introduces among other things geopolitics' definition and space concepts.
<i>Paasi, A.</i>	2023	Regional geographies of climate change	FIN	Wiley	human geography, regional geography	Tijdschrift for Economische and Soziale Geographie. Volume 114, Issue2. April 2023. Pp 71-78.	article	yes	primary	This essay is a commentary on Peter Taylor's article 'The geographical ontology challenge in attending to anthropogenic climate change: regional geography revisited. It focuses particularly on the contested (discursive) regional, regional geographical and state-centric frames critically examined in Taylor's paper. At first, it contextualizes Taylor's text, consider why it is topical, and how it echoes his earlier studies in geography. Next, it looks briefly at traditional regional geographic viewpoints on climate and regions and the related modalities of regionality. Finally, it elaborates Taylor's ontological interventions.	The commentary focuses on the framework in the context of regional geography. Since regional/territorial, particularly state-centric frames are frequently taken for granted, it focuses mainly on the regional (geographic) aspects of Taylor's article, and it is organized as follows.
<i>Painter, J.</i>	2010	Rethinking Territory	UKG	Antipode Foundation Ltd	Geography	Antipode: A radical journal of Geography, Volume 42, Issue 5, November 2010 Pp 1090-1118	article	yes	primary	Drawing on an empirical case study of the monitoring of regional economic performance through the measurement of gross value added (GVA), the article shows that "territory" and "network" are not, as is often assumed, incommensurable and rival principles of spatial organisation, but are intimately connected.	The article provides additional layers to the concept of territory.
<i>Pálvölgyi, T.; Czira, T.; Dobozi, E.; Rídeg, A.; Schneller, K.</i>	2010	A kistérségi szintű éghajlat-változási sérülékenység-vizsgálat módszere és eredményei.	HUN, HUN, HUN, HUN, HUN	MTA KSZI Klíma-védelmi Kutatások Koordinációs Iroda	regional geography, climatology	Klíma-21" Füzetek: Klimaváltozás—Hatások —Válaszok, 2010/62, 88–102.	article	yes	primary	The aim of the article is to develop an objective-based impact assessment methodology that can quantitatively characterize and compare the complex natural, social and economic vulnerability of a region to climate change. During the domestic adaptation of the regional exposure, sensitivity and adaptability-based climate change vulnerability assessment method (CIVAS model) at the regional level, several regional complex indicators were developed. The research work laid the foundation for a four-year professional program on climate change mitigation in regional development policy and can offer sustainable development based on the specific characteristics of our regions for the development of climate and regional strategies.	Detailed description of the CIVAS model, one of the first complex and spatially oriented impact-chain-based CVA method based on IPCC AR4.
<i>Peltonen, L.; Haanpää, S.; Lehtonen, S.</i>	2005	The challenge of climate change adaptation in urban planning.	FIN, FIN, FIN	Finnish Environment Institute	strategic planning / urban planning / climate adaptation	FinAddAPT Working Paper 13, 343, Helsinki, 44 p.	working paper	yes	secondary	Based on a literature review and a series of round-table discussions with actors engaged in urban planning, the article addresses adaptation issues relevant in urban planning. Different adaptation challenges are discussed, together with aspects of vulnerability such as awareness, geographical context, institutional frames and organisational capacities.	The report stresses the spatial dimensions of vulnerability and adaptation. Plans at different levels should identify areas affected by climate related hazards and risks. This requires developing regional climate change assessments.

Author	Year	Title	Author(s)' nationality	Pub- lisher	Dis- cipline	Vol, No, pages	Type	Scien- tific?	Sour- ce	Aim / focus	Useful content
<i>Péti, M.</i>	2011	A területi tervezés és fejlesztés a fenntarthatóság jegyében & Stratégiai környezeti vizsgálatok földrajzi szemlélettel.	HUN	Szeged University	regional planning	Szeged, JATEPress.	book	yes	primary	Introduction of the connections between spatial planning, environmental impact assessment and sustainable development.	The book shows good examples for the connections between spatial and adaptation policies.
<i>Péti, M.</i>	2012	A territorial understanding of sustainability in public development.	HUN	ScienceDirect	regional planning	Environmental Impact Assessment Review 32: 1 pp. 61-73., 13 p. (2012)	article	yes	primary	Introduction of the territorial understanding of sustainability in public development.	The article shows good examples for the connections between spatial and adaptation policies.
<i>Péti, M.; Botka, M.; Szilágyi, G.; Salamin, G.; Radvánszki, Á.</i>	2009	Kézikönyv a területi kohézióról: Területi megközelítés alkalmazása a közszféra által támogatott fejlesztésekben.	HUN, HUN, HUN, HUN, HUN	VÁTI	regional policy, strategic planning	VÁTI, Nemzeti Fejlesztési és Gazdasági Minisztérium, Budapest	handbook	no	primary	Introduction of the concept of territorial cohesion in a manual format. A depiction of the application possibilities of the territorial approach in developments supported by the public sector.	Description of the concept of territorial cohesion and its sub concepts; and their practical use.
<i>Phadke, R.; Manning Ch.; Burlager S.</i>	2015	Making it personal: Diversity and deliberation in climate adaptation planning.	USA, USA, USA	Elsevier Ltd.	climate adaptation planning, monitoring and evaluation	Climate Risk Management 9 (2015) pp. 62–76.	article	yes	primary	The article introduces the authors' project aimed to engage underrepresented communities in climate change adaptation decision-making using a neighbourhood consensus conference model developed and tested in several diverse districts of Saint Paul, Minnesota.	The article, among other things, identifies barriers to effective local climate adaptation planning.
<i>Picketts, I.M.; Déry, S.J.; Curry, J.A.</i>	2013	Incorporating Climate Change adaptation into local plans.	USA, USA, USA	Taylor&Francis Online	strategic planning / urban planning / climate adaptation	Journal of Environmental Planning and Management 57(7). DOI:10.1080/09640568.2013.776951	article	yes	primary	The authors undertook action-oriented, case study research by participating (as adaptation experts) in the process to create a sustainability and land use policy plan for the City of Prince George, Canada.	The "well-suitedness" of climate adaptation to local planning is emphasised.
<i>Pieterse, A.; van Niekerk; W.; du Toit, J.,</i>	2018	Creating resilient settlements through climate change adaptation planning	DAF, DAF, DAF	South African Planning Institute	strategic planning / urban planning / climate adaptation	Conference Study, Planning Africa Conference 2018, South African Planning Institute. 15 – 17 October 2018, Cape Town	conference study	yes	primary	The paper explores the conceptual relationship between climate change adaptation and spatial planning, specific to the local level, and identifies areas of overlap and opportunity to facilitate the development of resilient settlements. By highlighting barriers and enabling factors to implementation through existing local government planning instruments and processes, the paper aims to unlock discourse on the methods and mechanisms used for resilience planning.	Introduction of spatial planning's and adaptation's relation with each other and gives some important hints on adaptation's spatiality
<i>Pietta, A.</i>	2023	Climate Change and Geography	ITA	Springer	Geography	In.: Pellegrino Gianfranco & Marcello Di Paola (ed.) Handbook of Philosophy of Climate Change. Springer Nature. pp. 205-225 (2023)	book chapter	yes	primary	The chapter considers the contribution of the geographical literature to change the perspective of the IPCC on topics like vulnerability, resilience, mitigation, and adaptation policies and to introduce transformation, between the fourth and fifth assessment reports. In particular, the geographical research allowed the IPCC to situate these topics within sociopolitical and socioenvironmental processes	It provides us with information about geography's role in climate policy/climate adaptation.
<i>Pringle, P.</i>	2011	Adapt ME: Adaptation monitoring and evaluation.	UKG	UKCIP	climate adaptation planning, monitoring and evaluation	UKCIP, Oxford, UK. School of Geography and the Environment, www.ukcip.org.uk	working paper	no	primary	The paper offers a toolkit responding to a growing demand for practical support in evaluating adaptation progress and performance and enhances Step 5 of the UKCIP Adaptation Wizard (Monitor and Review). It helps users to think through some of the factors that can make an evaluation of adaptation activities inherently challenging and equip you to design a robust evaluation.	The article, among other things, identifies barriers to climate adaptation MRE.
<i>Pringle, P.; Prutsch, A.; Mäkinen, K.; Karali, E.</i>	2017	Monitoring, reporting and evaluation of national level adaptation in Europe: Lessons and experiences from other policy domains.	UKG, AUT, FIN, GRE	EEA	climate adaptation planning, monitoring and evaluation	European Environmental Agency, European Topic Centre on Climate Change Impacts, Vulnerability and Adaptation. Luxembourg, 2017.	technical report	no	secondary	The paper highlights transferable lessons learned that may inform MRE practice for climate change adaptation from evaluation communities working in the sectors of biodiversity, adaptation and international development, and sustainability.	Introduction of insightful, inspirational and relevant perspectives for those working on MRE for adaptation in Europe, in particular at national level.
<i>Probáld F. et al.</i>	2000	Európa regionális földrajza	HUN	ELTE Eötvös Kiadó	regional geography	ISBN 963 463 319 6	book	yes	primary	As a university schoolbook it provides a regional geography overview of European countries' ecologic, economic and demographic situation, grouping the countries into bigger regions.	The book helps the delimitation of European subregions.

Author	Year	Title	Author(s)' nationality	Publisher	Discipline	Vol, No, pages	Type	Scientific?	Source	Aim / focus	Useful content
<i>Qureshi, S.</i>	2019	Climate change adaptation for sustainable development: the information and communication technology (ICT) paradox	USA	Taylor&Francis Online	sustainable development, climate adaptation policy	Information Technology for Development, 25:4, pp. 625-629, DOI: 10.1080/02681102.2019.1680164	article	yes	primary	The article focuses on the role of ICTs in climate change and how they may be used to create positive adaptations to climate change.	The article calls our attention to the growing importance of adaptation.
<i>Randalls, S.</i>	2017	Contributions and perspectives from geography to the study of climate	UKG	Royal Geographical Society	social geography	WIRE's Climate Change, Volume 8, Issue 4, July/August 2017 https://doi.org/10.1002/wcc.466	article	yes	primary	Geographers have played an important and sometimes controversial role in the study of climate during the 20th century, says the review that traces the historical contributions of geographical scholarship to the study of climate in two primary areas: statistical, descriptive climatology and research in climate and society.	The article draws out the specifically geographical nature of climatological work in the 20th century, looking at the role of maps, classifications, and historical statistics in describing and potentially explaining climatic cycles, patterns, and processes. Geographers were keen to demonstrate the broader linkages between climate and the physical environment and humankind, such that applications of climatological expertise were crucial to economic development, imperialism and local scales, particularly the urban scale
<i>Rannow, S.; Loibl, W.; Greiving, S.; Gruehn, D.; Meyer, B.C.</i>	2010	Potential impacts of climate change in Germany – Identifying regional priorities for adaptation activities in spatial planning	GER, GER, GER, GER, GER	ScienceDirect	landscape planning, spatial planning	Landscape and Urban Planning, Vol 98, Issues 3-4, December 2010, pp 160-171	article	yes	primary	Presentation of an assessment framework from exploring the impacts of climate change the context of spatial planning. The framework employs exposure, sensitivity and impact indicators, assessing 11 potential impacts with relevance for the German spatial planning system.	The assessment provides information of the spatial distribution of potential climate impacts in Germany; the suggested framework says important information about climate adaptation's spatial logic.
<i>Ricci, L.; Mariano, C.</i>	2023	Territorial governance and climate adaptation. Towards an environmental perspective of urban regeneration.	ITA, ITA	Gangemi Editore International	urban planning	In.: WORLD HERITAGE and DWELLING ON EARTH pp. 439-449.02 Pubblicazione su volume:02a Capitolo o Articolo. ISBN 978-88-492-4647-6	article	yes	primary	The article introduces urban regeneration and governance of the contemporary city from the ecological-environmental perspective.	Ricci and Mariano analyse territorial governance's role in climate adaptation, from the perspective of urban regeneration-related planning and development.
<i>Rittel, H.; Melvin, W.</i>	1973	Dilemmas in a general theory of planning	USA, USA	Springer	strategic planning	Policy sciences 4(2); pp.155-69.	article	yes	primary	The article searches for scientific bases for special social problems called wicked problems.	The article introduces the problem of non-ergodic and wicked issues.
<i>Roggema R.</i>	2012	Adaptation to climate change: does spatial planning help? Swarm planning does!	NRL	WIT	spatial planning, climate adaptation planning	WIT Transactions on Ecology and the Environment, Vol 127, © 2009 WIT Press doi:10.2495/RAV090141	article	yes	primary	According to the author, planning for the longer term is not yet common in spatial planning practice and as climate change appears as a long-term problem, the adaptation of society to climate change is not really facilitated by current spatial planning. The article focuses on the so-called hotspot climate proof Groningen. The content of climate proofing a region is investigated, and this resulted in the development of a new planning paradigm which enables planning for the longer term: swarm planning.	Introduction of a new paradigm in spatial planning that could resonate with growing emphases on adaptation.
<i>Roggema R.; Vermeend T.; van den Dobbelsteen, A.</i>	2012	Incremental Change, Transition or Transformation? Optimising Change Pathways for Climate Adaptation in Spatial Planning	NRL, NRL, NRL	MDPI, Basel, Switzerland	spatial planning, climate adaptation planning	Sustainability 2012, 4, 2525-2549; doi:10.3390/su4102525 sustainability ISSN 2071-1050 www.mdpi.com/journal/sustainability	article	yes	primary	In order to incorporate climate adaptation in spatial planning change is required, because climate change impacts the way we live. This implies that spatial planning, as the arranger of the spatial organisation and layout needs to be able to support this change. Current spatial planning is not yet well equipped to play this role. In this research article three possible routes to navigate change are explored. Incremental change is seen as a slow process, which modifies the landscape only slightly. Transition is seen as a fluent change towards a new future, which is an improved version of the existing; and transformation is seen as a change towards a future that is fundamentally different from the existing.	Introduction of new directions in spatial planning that could resonate with growing emphases on adaptation.
<i>Roggema, R.</i>	2009	Adaptation to Climate Change: A Spatial Challenge.	NRL	Springer Dordrecht Heidelberg London New York	spatial planning, climate adaptation planning	ISBN 978-1-4020-9358-6 e-ISBN 978-1-4020-9359-3 DOI 10.1007/978-1-4020-9359-3 Library of Congress Control Number: 2009929308 © Springer Science+Business Media B.V. 2009	book	yes	primary	The book examines the role of design in dealing with climate change adaptation and overviews plans and designs regarding diverse sections of policy. It offers an insight into the required integrated (design) approach and illuminates the first contours of a new spatial planning paradigm: swarm planning	Introduction of a new paradigm in spatial planning that could resonate with growing emphases on adaptation.

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Roggema, R. (ed)	2012	Swarming Landscapes – The Art of Designing for Climate adaptation	NRL	Springer	spatial planning, land use planning, climate adaptation, planning	Advances in Global change Research Vol 48	book	yes	primary	The book is an essential analysis of planning systems in genuine need of reform, featuring practical examples of 'swarm' planning. It is supported by examples from various European countries, four different planning strategies (planning for mitigation, sectorized adaptation, integrated adaptation and flexible adaptation) are positioned within the framework.	Introduction of spatial planning role in climate adaptation activities. It concludes that each of these strategies fills its own niche in the framework, that all strategies together describe the behaviour of a complex system and that flexible adaptation planning is most likely to facilitate a system change. When this reasoning is reversed and the question concerns which planning strategy fits in best with the demands imposed by climatic change (e.g. for a system change), flexible adaptation planning is seen as the most suitable option
Romero Lankao, P.; Dodman D.	2011	Cities in transition: transforming urban centres from hotbeds of GHG emission and vulnerability to seedbeds of sustainability and resilience.	USA UKG	Elsevier Ltd.	urban planning, sustainable development, environmental economics, climate adaptation	Current Opinion in Environmental Sustainability Vol 3 Issue 3: 113–120.	article	yes	primary	This overview paper draws on the papers in this issue (as well as a wider array of literature) to provide an analytical review of the carbon and climate relevance of urbanization and of some of the interactions between urbanization and global environmental change. The authors' insights are used to inform a more general set of reflections on the nature of urban and environmental change, and the linkages between the two. Three over-arching themes are identified: the centrality of vulnerability and resilience as concepts shaping urban responses to climate change; the growing recognition of the role of specific governance mechanisms and systems at different scales in shaping the design and implementation of responses; and the particularities, cross-cutting issues and connections between cities from different regions (e.g., Europe, East Africa) in addressing this challenge.	The article underlines that cities globally face significant risks from climate change and are taking an active role in formulating and implementing climate adaptation policies.
Rosenau, J.N.	1995	Governance in the Twenty-first century.	USA	Brill	IR, governance	Global Governance Vol. 1, No. 1 (Winter 1995), pp. 13-43 (31 pages)	article	yes	primary	The article describes the expected prospects of global governance in the coming decades at the beginning of the 1990s.	The articles offer useful definitions for governance and introduce global trends in world politics and changing role of territorial levels.
Rosenau, J.N.	1992	Governance, Order and change in World Politics.	USA	Cambridge University Press	IR, governance	In.: James N. Rosenau and Ernst-Otto Czeimpe: Governance without Government Order and Change in World Politics, pp. 1 – 29.	article	yes	primary	The article examined the prospects for global order and governance at a time when former hegemony were declining, when boundaries were disappearing, when military alliances seemed to be losing their viability – in one word: in an era of transforming world politics.	The articles offer useful definitions for governance and introduce global trends in world politics and changing role of territorial levels.
Sack, R.D.	1986	Human Territoriality Its Theory and History	UKG	Cambridge University Press	IR, governance	ISBN: 9780521311809	article	yes	primary	The book (by analysing the possible advantages and disadvantages that territoriality can provide) demonstrates that territoriality for humans is not an instinct, but a powerful and often indispensable geographical strategy used to control people and things by controlling area. Specific analyses of the pre-modern uses of territoriality are provided through the introduction of the history of the Catholic Church, and North American political territorial organization and the organization of factories, offices, and homes.	The book adds important hints to the definition of territory and territoriality.
Sapountzaki, K.; Wanczura, S.; Casertano, G.; Greiving, S.; Xanthopoulos, G.; Ferrara, F.F.	2010	Disconnected policies and actors and the missing role of spatial planning throughout the risk management cycle	GRE, GER, ITA, GER, GRE, ITA	Springer	spatial planning	Natural Hazards (2011) 59:1445–1474 DOI 10.1007/s11069-011-9843	article	yes	primary	The article addresses the problem of lack of coordination between policies and actors with joint competence for risk management, i.e., civil protection, spatial planning, and sectoral planning (e.g., forest policy in the case of forest fire risk). It examines three cases of European risk management systems when confronting with natural hazards.	It concludes that spatial planning in particular is assigned a minor or no role at all though it might perfectly operate as the coordinating policy platform; the reason is that spatially relevant analysis and policy guidance is an omnipresent component of the risk management cycle. It reveals the problems of fragmentation of risk management policies, marginalization of spatial planning, and related repercussions.
Salamon G.	2018	A földrajzi tér alakításának Európaizálódása: Az Európai Unió térbeli stratégiáinak, tervezésének és kohéziós politikájának hatása az európai országok térbeli tervezési rendszereinek transzformációjában	HUN	Enyedi György Regionális Tudományok Doktori Iskola	territorial/spatial planning	SZIE, 10.14751/SZIE.2018.010	doctoral dissertation	yes	primary	The author examined the growing emphasis of European issues within spatial planning; the impact of the spatial strategies, planning and cohesion policy of the European Union on the transformation of the spatial planning systems of European countries.	The dissertation applies several utilizable qualitative methodologies that can be used in my research, too.

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Salamin, G.; Riez J.; Drahos, Zs.; Radvánszki, Á.; Hoffmann, Cs.; Péti, M.	2010	Kézikönyv az Európai Unió Területi Agendájának hazai érvényesítéséhez.	HUN, HUN, HUN, HUN, HUN, HUN	VÁTI	regional policy, strategic planning	VÁTI, Nemzeti Fejlesztési és Gazdasági Minisztérium, Budapest	guidance, handbook	no	primary	On the one hand, this volume aims to raise awareness of the Territorial Agenda in Hungary and to contribute, through concrete, practical recommendations, to the interpretation and implementation of the document's objectives in the domestic context. On the other hand, in the spirit of the Agenda, it seeks to promote the general and widespread application of the territorial approach, primarily at the level of shaping domestic policies, program-based development, and planning. Beyond presenting the document, it attempts to identify and adapt the challenges and priorities formulated at the European level to Hungary's specific context, and its recommendations are explicitly tailored to domestic practice.	Consideration of territorial / spatial dimensions in sectoral policies and European spatial priorities in domestic policy making.
Salamin, G.; Sütő, A.	2010	Territorial Structures and the Territorial Agenda of the European Union. Regional Responses and Global Shifts: Actors, Institutions and Organisations.	HUN, HUN	RSA Annual International Conference	spatial planning	Conference article, RSA Annual International Conference, Pécs, 2010. május 26.	conference article	no	primary	A conference article describing the territorial approach and emphasis in the then current Territorial Agenda of the EU	The article presents good examples for spatial approaches in development policy planning and describes dimensions, interpretations and sub concepts of territorial cohesion
Salamin G.; Kohán Z.; Dobozi E.; Péti, M. (ed.)	2011	Climate-Friendly Cities: A Handbook on the Tasks and Possibilities of European Cities in Relation to Climate Change	HUN, HUN, HUN, HUN	VÁTI/Ministry of Interior	urban planning	Budapest, Magyarország: Várostervezési Tudományos és Tervező Intézet (VÁTI), Ministry of Interior, Hungary (2011), 268 p.	handbook	no	primary	A Handbook elaborated as part of the HUN EU Presidency 2011, introducing the main tasks and possibilities of European Cities in relation to climate change	Describing interesting examples of connections between urban and adaptation policies and planning
Schuster, P.	2008	Klimaanpassungsstrategien in europäischen Nachbarländern – ein Werkstattbericht.	GER	BBR	climate adaptation planning, spatial planning	Anpassungsstrategien an den Klimawandel in EU 27 und ihre potentielle Bedeutung für die Raumentwicklung in Deutschland. BBR, 2008.	technical report	no	primary	The study identifies adaptation measures with spatial planning relevance from Germany's neighbours.	The author identifies concrete spatial planning-oriented adaptation measures to decrease vulnerability.
Schmidt, Ch.W.	2009	Beyond Mitigation: Planning for Climate Change Adaptation.	USA	PMC	climate adaptation planning, biology	Environmental Health Perspectives. Vol. 117, No. 7 (July 2009), pp. A306-A309	article	yes	primary	The article is contemplating about the growing importance of climate adaptation within climate policy.	The article points it out that adaptation has become the centre of attention worldwide.
Schmidt-Thomé, Ph.	2007	Integration of natural hazards, risk, and climate change into spatial planning practices.	FIN	Estonian Academy of Sciences	territorial/spatial planning, climate adaptation	Estonian Journal of Earth Sciences 56(3):183-183. DOI:10.3176/earth.2007.22	article	yes	primary	The article presents information on techniques to reduce the risk and the impact of natural disasters and climate change and integrating these factors into spatial planning practices. It analyses the application of risks concepts into spatial planning. It reports that linking of natural disasters and climate change with spatial planning is not complete, but its importance is growing.	It emphasises the growing importance of risk assessments and hazard assessments in spatial planning.
Schmidt-Thomé, Ph.; Klein, J.	2011	Applying Climate Change Adaptation in Spatial Planning Processes.	FIN, FIN	Springer	territorial/spatial planning, climate adaptation	In.: Schernewski, G., Hofstede, J., Neumann, T. (eds) Global Change and Baltic Coastal Zones. Coastal Research Library, vol 1. Springer, Dordrecht. https://doi.org/10.1007/978-94-007-0400-8_11 .	book chapter	yes	primary	Introduction spatial planning as a useful tool to protect settlements from hazard impacts through case studies. However, the tool's full range of potential is seldom applied or overruled by other priorities.	Spatial planning's importance in climate adaptation, as well as the EU's leading role are introduced in a detailed way.
Shi, L.; Chu, E.; Debats, J.	2015	Explaining Progress in Climate Adaptation Planning Across 156 U.S. Municipalities	USA, NRL, USA	American Planning Association	urban planning, climate adaptation planning, monitoring and evaluation	Journal of the American Planning Association 81(3), pp. 1-12. DOI:10.1080/01944363.2015.1074526	article	yes	primary	This survey of climate change adaptation in U.S. cities illustrates that the more dispersed nature of U.S. governance (vis-à-vis planning) creates a more heterogeneous response, whereby individual cities are "leading the way" when it comes to climate change planning. However, this heterogeneity creates an uneven response when taken at a national scale. The study also points to the challenges for less wealthy cities and those where climate change effects are still not recognized as having impacts.	An example for comprehensive analysis of local adaptation planning activities.

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<i>Schönthaler, K.; von Andrian-Werburg, S.</i>	2015	Evaluation of the German Strategy for Adaption to Climate Change (DAS) – Reporting and Closing Indicator Gaps.	GER, GER	Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety. Umweltbundesamt (German Environment Agency) Dessau-Roßlau, Germany.	climate adaptation planning, monitoring and evaluation	CLIMATE CHANGE 16/2015 Environmental Research of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety Project No. (FKZ) 3711 41 106 Report No. (UBA-FB) 002105/E	policy study (MRE report)	no	primary	The Indicator System underlying the German Monitoring Report and the overall report itself were created and agreed politically in an inter-departmental process with the participation of numerous experts from the competent sectors of agencies at Federal and Länder level and from scientific and private institutions. The Indicator System comprises 102 indicators; the Monitoring Report runs to some 256 pages. The documentation system was designed in a way to ensure the complete repeatability of calculations.	A practical example of strategic evaluation and indicator system building from Germany's adaptation policy.
<i>Sharma, J.; Ravindranath, N. 2019.</i>	2019	Applying IPCC 2014 framework for hazard-specific vulnerability assessment under climate change.	IND, IND	IOP Science	climate adaptation planning, monitoring and evaluation	Environmental Research Communication. 1 051004	article	yes	primary	The IPCC Working Group II Report (2014) presented vulnerability as a pre-existing characteristic property of a system. Accordingly, indicators for 'sensitivity' and 'adaptive capacity', which are internal properties of a system, are employed to assess it. Comparatively, the IPCC 2007 report includes 'exposure', an external factor, as the third component of vulnerability. The authors compared the construct of vulnerability presented in IPCC 2007 and 2014 reports.	Introduction of current vulnerability assessment frameworks and methods of IPCC. It is argued that the results of vulnerability assessment obtained by adopting IPCC 2014 framework are practically more useful for reducing current vulnerability in preparedness to deal with an uncertain future. In the process, the authors articulated the novel concepts of 'selecting hazard-relevant vulnerability indicators' and 'assessing hazard-specific vulnerability'.
<i>Skryzhevskaya, Y.; Tynkkynen, V-P.; Leppänen, S.</i>	2015	Russia's climate policies and local reality	RUS, FIN, FIN	Taylor& Francis	social geography	Polar Geography Volume 38, 2015 - Issue 2, Pp 146-170 https://doi.org/10.1080/1088937X.2015.1052031	article	yes	primary	In this paper, the authors attempt to utilize unique interview data from 14 Russian localities about adaptation responses, the results of which revealed three key findings.	First, the federal government of Russia recognizes the problem of CC, but due to budget constraints local authorities cannot implement adaptation actions in their regional planning. Second, only 2 of the 14 surveyed regions have a CC adaptation plan, while a few others incorporate some adaptation measures in their socio-economic development plans. Third, regions with notable agricultural, forestry and fishing sectors have experienced a more significant impact from CC on their economies, and most of the interviewed regional authorities perceived these effects as negative.
<i>Soja, E.</i>	1971	The political organization of space	USA	Association of American Geographers, Commission on College Geography	social geography, administration studies	Association of American Geographers, Commission on College Geography Resource Paper 8: Washington DC.	resource paper (book)	yes	primary	A resource overview about political space concepts.	The article contributed to the research with descriptions of the concept of "territory".
<i>Somlyódiné Pfeil, E.</i>	2019	The Adaptation of Territorial Governance from Unitary State Perspective: About the Framework of Functional Space Construction.	HUN	BCE	social geography, administration studies	Corvinus Regional Studies 4. (1–2.): pp. 41–60	article	yes	primary	The paper reveals different characteristics of territorial governance efforts in CEE, especially in Hungary compared to highly developed countries. The analysis based on the institutional and regulatory environment proves the lack of desired authorisation of the local and subnational levels for network-building and taking part in the national planning scheme.	The article contributed to the research with descriptions of concepts "constructivist space theories" and "functional territories".
<i>Stepniak, M.; Rosik, P.</i>	2016	From improvements in accessibility to the impact on territorial cohesion: the spatial approach.	POL, POL	World Society for Transport and Land Use (WSTLUR).	spatial policy, regional economic	The Journal of Transport and Land Use. Vol.9, No.3. (2016). pp 1-13.	article	yes	primary	The paper aims at introducing the consequences in developing accessibility to territorial cohesion in Poland as a result of road network developments.	Analysis of territorial investments' and infrastructure developments' impacts of territorial cohesion in Poland, as spatial aspects of transport development policies.

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<i>Stern, M.:</i>	2006	The Economics of Climate Change - The Stern Review. -	UKG	Cambridge University	regional economics, environmental economics	Cambridge 2006	review (policy study)	no	primary	The Review has assessed a wide range of evidence on the impacts of climate change and on the economic costs and has used a number of different techniques to assess costs and risks. From all of these perspectives, the evidence gathered by the Review leads to a simple conclusion: the benefits of strong and early action far outweigh the economic costs of not acting.	The report emphasises that planning and planners play key role in reducing vulnerability
<i>Störbjork, S.; Uggla, Y.</i>	2014	The practice of settling and enacting strategic guidelines for climate adaptation in spatial planning: lessons from ten Swedish municipalities.	SWE, SWE	Springer	spatial planning	Regional Environmental Change 15 (2015) DOI: 1.1007/s10013-014-0690-0	article	yes	primary	The aim of the paper is to analyse how frontline planners approach climate change adaptation in an urban context, emphasizing the process of settling and enacting strategic guidelines in spatial planning.	The article provides us with important information on spatial planning role and function, the role of locality in adaptation planning and introduces the difference between reactive and proactive strategies.
<i>Sütő A.; Fejes L.</i>	2019	A turizmus ágazat jelenlegi és potenciális éghajlati sérülékenységének területi különbségei Magyarországon.	HUN, HUN	MTA	climate adaptation planning, monitoring and evaluation	Tér és Társadalom 3/2019.	article	yes	primary	Since 2017, under the coordination of the Department of the National Adaptation Centre of the Hungarian Mining and Geological Service, the further development of the National Adaptation Spatial Information System project has been taking place, the C3 module of which researched the climate vulnerability of tourism. The aim of the article is to present the methodology developed during the research on climate vulnerability of the tourism sector in Hungary and its dimensions of exposure, sensitivity and adaptability.	The article introduces the practical application of the NAGIS's CIVAS model in a sectoral vulnerability assessment at national level.
<i>Sütő, A</i>	2017	Értékelési rendszerek és hazai alkalmazhatóságuk a klímapolitikában.	HUN	BCE	climate adaptation planning, monitoring and evaluation	Diplomamunka. Budapesti Corvinus Egyetem, Társadalomtudományi és Nemzetközi Kapcsolatok Kar, Gazdaságföldrajz, Geökonómia és Fenntartható Fejlődés Intézet. Budapest, 2017.	MSc thesis	yes	primary	The thesis is practically a monography on the history and characteristics of the Hungarian development policy-related and climate-policy oriented planning, monitoring and evaluation activities.	Introduction of the development of general development policy oriented and climate policy related MRE activities in Hungary and Europe in the mid-2010s.
<i>Sütő, A.; Salamin, G.; Szabó, P.</i>	2010	Issues of Territoriality and Territorial Cohesion in the Revision of the TSP and the Territorial Agenda – a Sort of Connection between Geography and Regional Policy.	HUN, HUN, HUN	Universitaria Craiova	regional geography,	Forum geografic. Studii și cercetări de geografie și protecția mediului, 9 (9). pp. 145-154.	article	yes	primary	After Hungary was asked according to the Territorial Agenda (TA), agreed in the informal ministerial meeting under the German Presidency in May 2007, it undertook the responsibility to evaluate and review the TA and update the closely related Territorial States and Perspectives of the European Union (TSP). The paper is aiming to introduce some of the main findings of the TSP/ TA revision process with special reference to the new aspects and trends related to the territorial structures of the Union and the spatial structure of Europe. Finally, some solutions will be introduced which could help to enhance the currently not enough strong territorial approach within TSP and TA.	Describes briefly the spatial dimensions of sectoral thematic in the EU through introducing the main situation analysis chapters of the TSP then under elaboration.
<i>Sütő, A. (ed.)</i>	2020	A magyarországi klímapolitikai monitoring, jelentéstételi és értékelési rendszer (KIMÉR) felállítását és működésének elindítását közvetlenül megalapozó rendszerkonceptió javaslat.	HUN	HMGS	climate adaptation planning, monitoring and evaluation	Magyar Bányászati és Földtani Szolgálat, Nemzeti Alkalmazkodási Központ. Budapest, 2020.	working paper	no	secondary	This system concept proposal directly makes the foundations of the establishment and the setting up of operation of the Hungarian climate policy monitoring, reporting and evaluation system (CiMES).	The working paper summarizes the European and Hungarian good practices and experience of MRE in climate adaptation.
<i>Sütő, A. (ed.)</i>	2016	Climate Change and Adaptation – Establishing the National Adaptation Geo-Information System (NAGIS). An effective tool to provide the right answers.	HUN	HMGS	climate adaptation planning, monitoring and evaluation	HU04 – Programme for adaptation and climate change. EEA-C11-1 project. Hungarian Mining and Geological institute. Budapest, 2016.	technical report	no	secondary	The report introduces the history, development, main vulnerability thematic fields and main pillars (GeoDat database, meta-database, mapping system, document inventory) of the National Adaptation Geo-Information System (NAGIS).	The report introduces the European and Hungarian good practice DS system, the NAGIS.
<i>Sütő, A. (ed.)</i>	2023	The role of strategic planning and territorial aspects of sustainability and climate adaptation activities.	HUN	University of Sopron	climate adaptation planning, monitoring and evaluation	Under publication in E-Econ. Sopron, 2023.HU04 – Programme for ado	article	yes	primary	The article summarizes the main challenges gaps and results of adaptation policy and planning related literature. The report introduces the history, development, main vulnerability thematic fields and main pillars (GeoDat database, meta-database, mapping system, document inventory) of the National Adaptation Geo-Information System (NAGIS).	The article introduces the actual trend of climate adaptation planning in Europe, the main territorial levels of activities, and the current challenges and approaches in climate policy. The report introduces the European and Hungarian good practice DS system, the NAGIS.

Author	Year	Title	Author(s)' nationality	Publisher	Discipline	Vol, No, pages	Type	Scientific?	Source	Aim / focus	Useful content
Sütő, A.; Selmeczi, P.; Lovász, Cs.	2023	Decision support activities and sectoral vulnerability assessment tools and their potential applicability in the Western Balkan countries. The role of strategic planning and territorial aspects of sustainability and climate adaptation activities.	HUN, HUN, HUNHUN	KNE Publishing University of Sopron	climate adaptation planning, monitoring and evaluation climate adaptation planning, monitoring and evaluation	in Economies of the Balkan and Eastern European Countries, KnE Social Sciences, pages 505–535. DOI 10.18502/kss.v8i1.12673Under publication in E-Econ. Sopron, 2023.	article	yes	primary	The article introduces main CC-related challenges in the Balkan region and different CC-related strategic planning and GIS-based developments of activities in the different countries, even introducing the results of two vulnerability topic. -related case studies, one for Montenegro, one for Albania. The article summarizes the main challenges gaps and results of adaptation policy and planning related literature.	The article gives useful information about adaptation planning's and decision support activities' role at different territorial levels. The article introduces the actual trend of climate adaptation planning in Europe, the main territorial levels of activities, and the current challenges and approaches in climate policy.
Sütő, A.	2025a	A hazai klímakalkulációkódási politika 2022-23. évi felülvizsgálatának szempontjai és területi jellemzői.	HUN	Central Statistical Office of Hungary	climate adaptation planning, monitoring and evaluation	Területi Statisztika, 2025, 65 (1): 3-40. https://doi.org/10.15196/TS650101	article	yes	primary	The climate change-related increase of intensity and frequency of weather extremities (especially considering the weather events of recent years) and their consequences, both globally and in Hungary, are increasingly becoming the focus of public policy debates. The floods, flash floods and the extreme droughts of recent years brought attention to the issue also in Hungary - especially to the need for regional and local response measures. As the Parliamentary Decree on the adoption of the second National Climate Change Strategy (NCCS-2) declares, the first revision of the document would take place 5 years after the adoption of the strategy. The HungaroMet National Adaptation Centre carried this evaluation out during 2022-23, to assess the implementation of NCCS-2 and its Action Plans, based on extensive document analysis, and interviews involving governmental bodies and experts. The main goal of this article is to present this revision process, introducing its main conclusions and potential directions of the future NCCS update, focusing among them especially on the spatial emphases of climate policy and the affected sectors as the first (partially spatial) outputs of the process.	Description of the methodology and outcomes of the current NAS evaluation in Hungary, touching even spatial emphases.
Sütő, A.	2025b	Climate sensitivity of national adaptation policies in Eastern-Central Europe - first results of national comparative studies.	HUN	University of Sopron	climate adaptation planning, monitoring and evaluation	E-conom, 14. évf. 1 szám. pp. 33-70. Sopron, 2025.in Economies of the Balkan and Eastern European Countries,	article	yes	primary	The aim of the paper is to provide a brief overview of the research results to date, including the methodological background. The paper concludes with the first empirical results of the analysis for the Eastern-Central European region: that adaptation policy and planning are growing in importance in many countries, but the related monitoring/assessment activities and the emergence of spatial considerations in these and in planning itself are still in their early stages	The first introduction and publishing of the research methodological background and its first results.
Swart, R.; Biesbroek, R., Binnerup, S. Carter, T.R.; Cowan, C.; Heinrichs T.; Loquen S.; Mela, H.; Morecroft, M.; Reese, M.; Rey, D.	2009	Europe adapts to climate change: Comparing National Adaptation Strategies	EU	PEER (Partnership for European Environmental Research)	climate adaptation planning	PEER Report 01. Helsinki, 2009.	technical report	no	primary	The report presents a comparative analysis of national adaptation strategies from given European countries, identify policy-relevant findings and recommendations for the future.	Along six themes (facilitating strategic development; science-policy interaction; communication; multilevel governance; sectoral mainstreaming; role of policy monitoring) the report examined the different countries' approach and progresses.
Taylor, P.J.; O'Keefe, Ph.	2021	In praise of Geography as a field of study for the climate emergency	UKG, USA	The Royal Geographical Society	Geography	The Geographical journal. Volume187, Issue 4 December 2021 Pp 394-401 https://doi.org/10.1111/geoj.12404	article	yes	primary	The article argues that Geography should be centre stage for understanding today's climate emergency. This position is because as a field of study it uniquely straddles physical/environmental and human/social scholarships. In the wider academic world, bringing together scholars across this "cultural" divide has traditionally been difficult, and continues to be so in current responses to human-induced climate change.	It provides us with information about geography's role in climate policy/climate adaptation.
Taylor, P.J.	2023	The geographical ontology challenge in attending to anthropogenic climate change: regional geography revisited	UKG	Wiley	regional geography	Journal of Economic and Human Geography, https://doi.org/10.1111/tesg.12540	article	yes	primary	The article is experimenting with geographical regions encompassing human-environmental interactions as alternative spatial policy framings to the world political map. Three examples are presented: intergovernmental resilient regions for mitigation; localization through urban sustainable regions; and regions for planetary stewardship of humans-in-nature. None of these are 'solutions', rather they are illustrations of possible future regional geographies intended to stimulate current cohorts of geographers to contribute necessary regional thinking to the scholarship unpinning climate change policymaking	Additional information to understand adaptation's spatiality and the role of regional geography in this understanding process.
Termeer, C.; Biesbroek, R.; van den Brink, M.	2011	Institutions for adaptation to climate change: comparing national adaptation strategies in Europe.	NRL, NRL, NRL	Wageningen University	climate adaptation planning, administrative studies	Symposium. Wageningen University, Netherlands. Published online 24 June 2011. doi.: 10.1057/eps.2011.7.	research report	no	primary	The report examined historically grown institutions' ability to cope with new challenges of climate adaptation.	Introduction of aspects of successful adaptation governance in six qualities of governance institutions (variety, learning, room for autonomous processes, resources, leadership, fair governance).
Tompkins, E.L.; Amundsen, H.	2008	Perceptions of the effectiveness of the UNFCCC in advancing natural action on climate change.	UK, NOR	Elsevier Ltd.	climate adaptation policy	Environmental Science and Policy, 11 (1) pp 1-13.	article	yes	primary	The article characterises the ways in which the UNFCCC is trickling down to affect national level action on climate change. State and non-state actors were interviewed at the 8th UNFCCC Conference of Parties (COP8) during October and November 2002.	Among interviewees, climate change was already perceived to be or was becoming a priority issue. In a number of countries substantial legislation is already in place to facilitate CC preparedness (both adaptation and mitigation). While all respondents saw change occurring at the national level, mostly through planning and research, few saw climate change response actions at the local level.

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Tuan, Y.F.	1979	Space and Place: Humanistic Perspective.	USA	Springer	social geography	In: Gale, S., Olsson, G. (eds) Philosophy in Geography. Theory and Decision Library, vol 20. Springer, Dordrecht.	chapter	yes	primary	According to Tuan, space and place together define the nature of geography. Spatial analysis or the explanation of spatial organisation is at the forefront of geographical research. The author says that geographers appear to be confident of both the meaning of space and the methods suited to its analysis. Their interpretation of spatial elements requires an abstract and objective frame of thought, quantifiable data, and ideally the language of mathematics. Place, like space, lies at the core of geographical discipline. The article examines the different concepts of place and space.	It offers space- and place-definitions.
UBA	2025	Towards a climate resilient Europe. Recommendations for the European Climate Resilience and Risk Management Framework.	GER	UBA	climate adaptation policy	Umweltbundesamt Deutschland, KomPass Competence Centre for Climate Impacts and Adaptation. August 2025. Dessau-Rosslau	Scientific Opinion Paper	n	primary	Scientific opinion paper of the German climate adaptation background institute of the federal government about the then-drafted ECAP document.	It offers important information about the recently planned ECAP document (being under elaboration).
Uittenbroek, C.J.; Janssen-Jansen, L.B.; Runhaar, H.A.C.	2013	Mainstreaming climate adaptation into urban planning: overcoming barriers, seizing opportunities and evaluating the results in two Dutch case studies	NRL, NRL, NRL	Springer	urban planning, climate adaptation planning, monitoring and evaluation	Regional Environmental Change volume 13, pages399–411 (2013)	article.	yes	primary	The article introduces a conceptual model for mainstreaming climate adaptation to enhance our understanding of the concept as well as the barriers and opportunities that influence these integration processes and to explore strategies for overcoming barriers and creating opportunities. Two Dutch case studies—related to urban planning—are used to illustrate the value of the model.	The authors emphasise the importance of mainstreaming of adaptation objectives into existing policy domains (especially urban planning).
UNFCCC	2015	Paris Agreement. United Nations Framework Convention on Climate Change.	UN	UNFCCC	climate adaptation	United Nations, 2015	policy paper	no	secondary	A legally binding international treaty on climate change. It was adopted by 196 Parties at the UN Climate Change Conference (COP21) in Paris, France, on 12 December 2015. It entered into force on 4 November 2016. Its overarching goal is to hold "the increase in the global average temperature to well below 2°C above pre-industrial levels" and pursue efforts "to limit the temperature increase to 1.5°C above pre-industrial levels." However, in recent years, world leaders have stressed the need to limit global warming to 1.5°C by the end of this century.	An important milestone in international climate policy as well as in the evolution of adaptation policy.
UNFCCC	2021	National Adaptation Plans 2020 – Progress in the Formulation and Implementation of NAPs	UN	UNFCCC	climate adaptation	United Nations Climate Change Secretariat UN Campus Platz der Vereinten Nationen 1 53113 Bonn Germany	technical report	no	primary	The Least Developed Countries Expert Group (LEG) was established in 2001 as one of the primary pillars under the UNFCCC to support the least developed countries (LDCs) in addressing the adverse impacts of climate change. The LEG produces the annual progress report on the process to formulate and implement NAPs. The topics covered in the report include the progress made under the four elements and related steps of the process to formulate and implement NAPs; progress in achieving the objectives of the process; support provided and received in the process; and gaps and needs and challenges faced by developing countries in the process.	It gives information about the proportion of the 154 developing countries that had undertaken activities related to the process to formulate and implement NAPs.
UNFCCC	2023	COP28 Agreement Signals "Beginning of the End" of the Fossil Fuel Era.	UN	UNFCCC	climate adaptation	UN Climate Press, 13 December 2023. https://unfccc.int/news/cop28-agreement-signals-beginning-of-the-end-of-the-fossil-fuel-era	web article	no	primary	Brief overview about the outcomes of the COP 28. The article reports that the United Nations Climate Change Conference (COP28) closed with an agreement that signals the "beginning of the end" of the fossil fuel era by laying the ground for a swift, just and equitable transition, underpinned by deep emissions cuts and scaled-up finance.	It offers important implications for the adaptation policy contexts chapter of the dissertation.
UN General Assembly	2015	Transforming our world: The 2030 Agenda for Sustainable Development.	UN	UN	sustainable development	Adopted by the General Assembly on 25 September 2015 [without reference to a Main Committee (A/70/L.1)] 70/1.	strategy	no	primary	The UN's Agenda is a plan of action for people, planet and prosperity. It also seeks to strengthen universal peace in larger freedom. It recognises that eradicating poverty in all its forms and dimensions, including extreme poverty, is the greatest global challenge and an indispensable requirement for sustainable development. All countries and all stakeholders, acting in collaborative partnership, will implement this plan. The 17 Sustainable Development Goals and 169 targets which were announced demonstrate the scale and ambition of this new universal Agenda.	subject of document analysis to examine the weight of climate adaptation in UN's sustainable development planning
UNISDR	2015	Sendai Framework for Disaster Risk Reduction 2015-2030.	UN	UN	disaster risk management, sustainable development	Geneva Switzerland. www.unisdr.org	policy framework	no	primary	The Framework was adopted at the Third UN World Conference on Disaster Risk Reduction in Sendai, Japan, on March 18, 2015. It outlines seven clear targets and four priorities for action to prevent new and reduce existing disaster risks: (i) Understanding disaster risk; (ii) Strengthening disaster risk governance to manage disaster risk; (iii) Investing in disaster reduction for resilience and (iv) Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction. It aims to achieve the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries by 2030.	subject of document analysis to examine the weight of climate adaptation in UN's disaster risk management
Vallejo, L. (ed)	2017	Insights from national adaptation monitoring and evaluation systems	OECD	OECD	climate adaptation MRE	Climate Change Expert Group Paper No. 2017(3)	technical report	no	primary	The report draws on insights into national approaches of adaptation MRE, overviewing these approaches' development and present good examples showing the diversity of purposes, indicators and geographical aggregation.	It describes worldwide situation of national adaptation MRE activities and its challenges

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<i>van Minnen, J.; Harley, M.; van de Sandt, K.; Ligtoet, W.</i>	2014	Adaptation indicators: a basis for monitoring implementation and effectiveness.	NRL, UKG, NRL, NRL	Routledge, New York	adaptation monitoring and evaluation	In: Prutsch A, Grothmann T, McCallum S, Schauser I, Swart R (ed) (2014) Climate Change Adaptation Manual, Lessons learned from European and other industrialised countries, Chapter 14, Climate Change Expert Group Paper No. 2017(3)	chapter	yes	primary	An examination of predominantly European policy and inter-disciplinary insight into cutting edge knowledge and lessons learnt in a relatively new field of implementation.	The chapter emphasises adaptation indicators' importance as basic tools for monitoring implementation and effectiveness.
<i>Van Minnen, J.G.; Harley, M.; Franken, R.; Ligtoet, W.</i>	2018	Developments in Monitoring Climate Change Adaptation in Urban Areas. Quick scan of experiences outside the Netherlands.	NRL, UKG, NRL, NRL	PBL Netherlands Environmental Assessment Agency, The Hague	climate policy monitoring, evaluation	PBL Netherlands Environmental Assessment Agency the Hague, 2018 PBL publication number: 3018	working paper (policy note)	no	primary	The Delta Programme on Spatial Adaptation is building a system for the monitoring and evaluation (M&E) of climate change adaptation in the Dutch urban environment. In this context, PBL has been asked to develop an indicator framework for the urban environment, and to update knowledge of M&E systems through a quick scan of developments in a selected number of countries and cities outside the Netherlands.	The report presents developments in the monitoring and evaluation (M&E) of climate change adaptation in various countries and cities [6 European countries – GER, UKG, SWI in detail; FIN, FRA, POL in general; and South Africa] were selected for this quick scan], in particular with respect to monitoring outputs, outcomes and the effectiveness of adaptation measures.
<i>van R��th, P.; Sch��nthal, K.; von Andrian-Werburg, S.; Buth, M.</i>	2019	Monitoringbericht 2019 zur Deutschen Anpassungsstrategie an den Klimawandel. Bericht der Interministeriellen Arbeitsgruppe Anpassungsstrategie der Bundesregierung.	GER, GER, GER, GER	Umwelt-Bundesamt, Dessau-Ro��lau, Germany.	climate policy monitoring, evaluation	Publikation as pdf: www.umweltbundesamt.de/publikationen / monitoringbericht-2019 (downloaded: 2021. 09. 23.) www.klivoportal.de/monitoringbericht2019	policy study (MRE report)	no	primary	The German NAS's first monitoring report.	A practical example for a monitoring report from the national level.
<i>von Lucke, F.</i>	2021	Principled pragmatism in climate policy? The EU and changing practices of climate justice	GER	Science Direct	climate policy, political geography	Political geography, Volume 166, April 2021, 102355 https://doi.org/10.1016/j.polgeo.2021.102355	article	yes	primary	This paper critically assesses the EU's role concerning climate change from a perspective of global political justice, which builds on a tripartite theoretical conception, consisting of 'non-domination', 'impartiality' and 'mutual recognition'. It inquires to which conceptions of justice the EU's climate strategy and approach to the international negotiations have corresponded, how and why changes have come about, and whether the EU was able to influence the international regime.	The paper finds that while the EU started out from a focus on political measures linked to impartiality, after the failed negotiations in Copenhagen in 2009 it has become more open towards policies and instruments in line with mutual recognition and non-domination. Thus, the emphasis moved away from top-down, legally binding measures, towards voluntary bottom-up procedures, a recognition of difference and diplomatic outreach activities. While this shift was necessary to reinstate the EU's influence and secure the Paris Agreement, it could hamper the quest for robust climate abatement measures and global climate justice.
<i>Vedung, E.</i>	1997	Public Policy and Program Evaluation	USA	Routledge, New York	evaluation theory, methodology	ISBN 9780765806871	book	yes	primary	Written from a political science perspective, the book provides an overview of the possibilities and limits of public sector evaluation. Vedung examines evaluation as a mechanism for monitoring, systematizing, and grading government activities and their results so that public officials, in their future-oriented work, will be able to act efficiently.	Concepts/definitions of evaluation are provided by the book.
<i>Velazquez, D. R.</i>	2012	Territorial Risks and Climate Change.	MEX	UNAM	climate policy, public administration	Voices of Mexico. No 95., 2012.	article	no	ye	This article sets out to reflect on the social and human implication of climate change. Such a complex subject cannot be understood solely through the prism of technology and science; analysing it is difficult when using the time-based, measurable reference points that conform to short-term-oriented business and government interests, given their overriding concern with investment performance and immediate electoral results.	Gives some important aspects to territoriality of climate change, but not exclusively from adaptation point of view.
<i>Villanueva, P.S.</i>	2012	Learning to ADAPT: monitoring and evaluation approaches in climate change adaptation and disaster risk reduction – challenges, gaps and ways forward	ESP	Strengthening Climate Resilience, www.csdrm.org	climate adaptation planning, monitoring and evaluation	SCR Discussion Paper (technical report)	discussion paper	no	primary	The paper is a methodological contribution to the emerging debate on monitoring and evaluation (M&E) in the context of climate change adaptation and disaster risk reduction.	It concludes that effective management of disaster risk is critical for adapting to the impacts of climate change, however disasters risk reduction MRE practice may be limited in capturing progress towards adaptation. The unique nature of adaptation to climate change calls for experience-based learning MRE processes for discovering the key insights into adaptive capacity and its links to adaptation processes, and to risk and vulnerability reduction at large. The ADAPT guiding principles and indicators set the foundations towards this end.

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<i>Vogler, J.</i>	2017	Environmental issues	USA	Oxford University Press	IR, governance	In.: J Baylis, S. Smith, P. Owens: The Globalization of World Politics. Published in the United States by Oxford University Press Inc., New York Oxford University Press, 2017.	chapter	yes	primary	This chapter examines how environmental issues have become increasingly prominent on the international agenda over the last five decades. It considers whether globalization and development must come at the expense of the physical environment, whether state governments can cooperate to protect the planet, and whether climate justice is possible.	The chapter first provides a brief history of the development of an international environmental agenda before discussing the functions of international environmental cooperation. It then explores efforts to address the problem of climate change through the establishment of an international climate regime and highlights the neglect of environmental issues in traditional and realist international relations theory.
<i>Waterman, R.W.; Wood, B.D.</i>	1993	Policy Monitoring and Policy Analysis.	USA, USA	Wiley-Blackwell	strategic planning	Journal of Policy Analysis and Management. Vol. 12, No. 4 (Autumn, 1993), pp. 685-699.	article	yes	primary	The article introduces a policy analytic technique called "policy monitoring." The authors demonstrate how the technique can be employed in actual practice. In addition to demonstrating how policy monitoring can be employed, the authors also discussed how it can be used in other policy analytic situations.	The article offers definition for monitoring activities.
<i>Weckroth, M.; Alamaantila, S.</i>	2022	Socioeconomic geography of climate change views in Europe	FIN, FIN	Elsevier	social geography	Global Environmental Change 72 (2022) 102453	article	yes	primary	The article's aim is to better understand the spatially bounded human agency associated with climate change views. More specifically, using nationally representative survey data from 23 European countries it examines urban-rural differences and regional level contextual effects in four explicit concepts discussed in environmental psychology, each of which focus on individual-level perceptions of climate change: 1) climate change scepticism, 2) climate change concern, 3) foundations of pro-environmental personal norms and 4) a willingness to engage in low-carbon behaviour. The authors argue that the geography of these concepts is an especially timely subject for empirical evaluation, since recent decades have witnessed increasing interregional inequality and deepening urban-rural divisions within the EU.	The study finds that climate change scepticism and concern do exhibit urban-rural differences, where living in a country village is associated with greater climate scepticism and lower concern compared to living in a big city. Also, higher climate change concern and pro-environmental norms are associated with living in a region with constant population growth. These geographical differences are independent of individual-level socioeconomic attributes as well as one's political orientation.
<i>Weinger, B.K.</i>	2021	Scripting climate futures: The geographical assumptions of climate planning	USA	Elsevier	political geography	Political Geography 88 (2021) 102409	article	yes	primary	Through discourse analysis and the multi-scalar institutional and political history of climate planning, this article examines how normative discursive parameters enact prevailing political dynamics that script material futures. Drawing on recent climate planning reports of Palestine and Israel, this article investigates how state discourses operate within an asymmetric geopolitical context where issues of territoriality, sovereignty, and statecraft remain fractured and contested.	The author positions climate reports as discursive formations embedded in and productive of wider national strategies. To build a comparative analysis. The article very well shows the geopolitical importance of the climate adaptation issue.
<i>Wheeler, S.; Weinger, B.K.</i>	2013	Planning for Sustainability. Creating Liveable, Equitable and Ecological Communities.	USA	Routledge. London	sustainable development	Routledge. London, 2013.	book	yes	primary	The book is a well-grounded and accessible introduction to the concept of planning for more sustainable and liveable communities. The text explores topics such as how more compact and walkable cities and towns might be created, how local ecosystems can be restored, how social inequalities might be reduced, how greenhouse gas emissions might be lowered, and how more sustainable forms of economic development can be brought about.	It introduces proactive ways of sustainable urban planning strategies and introduces some new tools that have also been developed in consideration with sustainable development aspects.
<i>Wiechmann, T.</i>	2008	Errors Expected – Aligning Urban Strategy with Demographic Uncertainty in Shrinking Cities	GER	Taylor&Francis Online	urban planning	International Planning Studies Volume 13, 2008 – Issue 4 Demographic Changes and the New Landscape for Planning. Special Issue; pp. 431-446	article	yes	primary	According to the author, at the beginning of the 21st century, the majority of Europe's cities experienced a population decrease. Dealing with the results of demographic, economic and physical contraction processes and planning for the future of considerably smaller but nevertheless liveable cities presents some of the most challenging tasks for urban Europe in the near future. The article highlights the example of Dresden in Eastern Germany, where the breakdown of the state-directed economy caused economic decline, industrial regression, and high unemployment rates.	Slightly touches the issue of sustainable and adaptive solutions in urban planning.
<i>Wilson, E.; Piper, J.</i>	2010	Spatial Planning and Climate Change	USA, USA	Routledge, New York	spatial planning, climate adaptation planning, monitoring and evaluation	ISBN 9780415495912 Published August 16, 2010, by Routledge 480 Pages	book	yes	primary	The 2 authors explore a wide range of issues in their comprehensive book on the relationship between the changing climate and spatial planning. Moreover, they suggest ways of addressing the challenges by taking a longer-sighted approach to our preparation for the future.	The book emphasises the relationship between changing climatic factors and spatial planning, seeking for theoretical/political explanations of the challenges planning facing with.
<i>Wright, J.; Flacke, J.; Schmitt, J.P.; Schultze, J.; Greiving, S.</i>	2021	Comparing Climate Impact Assessments for Rural Adaptation Planning in Germany and the Netherlands	GER, GER, GER, GER, GER	COGITATIO	climate adaptation planning, physical (land use) planning, rural development	Urban Planning 2021 Vol 6 Issue 3, pp. 306-320.	article	yes	primary	The article offers a comparison of climate impact assessments done in two regional climate adaptation processes, in a Dutch and a German region.	It introduces two different analytical approaches and gives recommendations for strengthening communication and visualization of CRA's results to enhance decision makers' knowledge base and stakeholders' involvement.
<i>Woodruff, S.C.; Regan P.</i>	2018	Quality of national adaptation plans and opportunities for improvement.	USA, USA	Springer	urban planning, climate adaptation planning, monitoring and evaluation	Mitigation and Adaptation Strategies for Global Change, Springer, vol. 24(1), pages 53-71, January.	article	yes	primary	In order to identify how NAPs could be improved, this paper analyses 38 national adaptation plans using plan quality evaluation methods and explores national characteristics that are associated with high-quality plans.	According to the authors NAPs typically include multiple data sources, explore current impacts and future vulnerabilities, establish goals, and identify potential adaptation strategies. Plans are weaker in the articulation of implementation and monitoring measures. In addition, plans generally do not include a broad range of stakeholders in the planning process. Plans written by multi-agency committees are significantly higher quality than those written by single agencies, especially on engagement of stakeholders.

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Yang H.; Lee, T.; Juhola, S.	2021	The old and the climate adaptation: Climate justice, risks, and urban adaptation plan.	USA, KOR, FIN	Elsevier Ltd.	urban planning, climate adaptation planning, monitoring and evaluation	Sustainable Cities and Society 67 (2021). https://doi.org/10.1016/j.scs.2021.102755	article	yes	primary	Accounting for local climate risks and the presence of national adaptation schemes, this study examines whether the implementation of adaptation policies in the 902 European cities is influenced by the proportion of these vulnerable groups.	The results show a positive and significant association between the proportion of elderly citizens and adaptation policies among these European cities, offering local level empirical evidence to the climate justice discussion and suggests that the adaptation policies adopted by these European cities are working to ameliorate environmental injustice faced by the older and weaker social groups.
Yarmal, B.	2010	Special Issue: Climate change and applied geography - place, policy, and practice	USA	Science Direct	social geography	Applied Geography 30(4):461-463, December 2010. DOI:10.1016/j.apgeo.2010.05.008	article	yes	primary	This special issue contains 6 papers covering topics on: the need for more societally relevant research on vulnerability and adaptation to climate change; greenhouse gas inventories at US national parks and its implications to the public society; rainfall variability and trends in semiarid Botswana; the influence of potential sea level on societal vulnerability to hurricanes; stakeholders perspectives on land use strategies for adapting to climate change-enhanced coastal hazards; and reduction of emissions in a suburban landscape.	Introduces case studies.
Ye, B.; Jiang J.; Liu J.; Zheng, Y.; Zhou, N.	2020	Research on quantitative assessment of climate change risk at an urban scale: review of recent progress and outlook of future direction	CHI, CHI, CHI, CHI, CHI	Elsevier Ltd.	urban planning, climate adaptation planning	Renewable and Sustainable Energy Reviews 135 (2021)	article	yes	primary	The article summarizes the updated research progresses and literature results and discusses the major challenges to be overcome; identifies future directions to advance quantitative assessment of urban -scale climate risks and improves related methodology.	The main topics in which the article summarizes literature results: possibilities of downscaling climate change to a local scale; couple regional and local climate to project urban microclimate; assessment of urban climate vulnerability; integrated risk assessments for cities.
Zaucha, J.	2017	The territorial keys of policies.	POL	Routledge	regional policy, spatial planning	In.: Medeiros (ed) Uncovering the Territorial Dimension of European Union Cohesion Policy. on1st Edition.	book chapter	yes	primary	The chapter analyses the territorialisation of policies as a vehicle of integration regarding spatial and socio-economic approaches. It identifies precisely the meeting points created in recent years by economists and spatial researchers. The chapter examines the perspective of performing the function of boundary objects integrating spatial and socio-economic dimensions of the policies and, as a result, also policies among themselves – that is policies affecting a given territory.	The concept of territorial keys was developed in order to provide a better link between the strategy of Europe 2020 and the EU Territorial Agenda.
Zaucha, J.; Komornicki, T.; Böhme, K.; Świątek, D.; Żuber, P.	2014	Territorial Keys for Bringing Closer the Territorial Agenda of the EU and Europe 2020.	POL, POL, GER, POL, POL	Taylor & Francis	regional policy, spatial planning	European Planning Studies, 22(2), 246–267. https://doi.org/10.1080/09654313.2012.722976	article	yes	primary	The paper analyses the concept of policy territorialization and proposes policy tools for that purpose. The relevant theoretical models are used, mainly evolutionary economics and new economic geography. Also, some plausible ways of making use of those keys are proposed and then tested using Polish territory as a case study.	Contemplating territorial aspects of sectoral policies from territorial cohesion point of view, and analyses the concept of policy territorialization and proposes policy tools for that purpose. The key outcome is a set of territorial keys supposed to enhance territorial approach in developmental policies.

Annex 2 – Concepts and interpretations of space in different disciplines and practical fields

The following two annex subchapters (Annex 2a and 2b) are strongly based on my conference article about the topic (SÜTÖ, 2024), but both of them have been revised and updated since then.

Annex 2a) Concepts of space, region, territory and place

During the overview of works of different authors looking for a proper definition of space, as Dusek warns us, usually we meet either blurred concepts or too narrow definitions valid only for given situations (DUSEK, 2004). Several studies that deal with spatial analyses' methodological background generally start with philosophical space definitions. These differentiate usually 3 main approaches: absolutist and relativist interpretations and the interpretation of Kant¹⁰⁷. However, regarding the complexity of the notion of space, none of the above can be regarded as exclusively applicable (NEMES-NAGY, 1998 and 2009; DUSEK, 2004, KARANIKA&KALLIORAS, 2018; NAWRATEK, 2018; TAYLOR, 2023).

Regarding the related concepts (space, territory, place, region), the definitions of Haggett reflect the absolutist approach. In his synthesizing work he refers to space as a large area without boundaries, "*ranging in size from local areas to the global*" while territory is usually "*the terrestrial space that is used to denote its geometric part*". The author also defines the concepts of **region and place**¹⁰⁸ as delimited, lower-level units of space (HAGGETT 2006, P. 787, 803).

Classical geography regards space, region, territory, area and place as strongly connected concepts, referring mostly to given parts of the globus' surface. CRESSWELL calls **space** as a location or a geographical point on the Earth's surface with exact identities (defined by longitude and latitude). As opposed to the meaningful places, CRESSWELL thinks, it does not have a concrete meaning (CRESSWELL 2008). MASSEY disagreed with the idea that space is meaningless and sees both the concrete places and space as "*inextricably intertwined*" entities. The one informs the other, so they cannot be handled separately (as space and time are also inseparable from each other, supporting the existence of the world) (MASSEY, 1994, 2005). Agnew also underlines that space is a more abstract concept, and he continues that it is something that is more conceptual than real as opposed to places. (AGNEW, 1989). TUAN argued that space and place together are the essence of geography that uses spatial analysis and explain spatial organisations. He also emphasises space's several meanings: location with linkages to other units; a unique entity, depiction of experiences and aspirations of people (TUAN, 1979). Karanika and Kallioras emphasise a social factor in their definition: within space, *spatial formations* provide the shelter that normalizes people within a society, assists them in the creation of individual identity and delimits the insiders and the outsiders¹⁰⁹

¹⁰⁷ The latter attempted to reconcile Newtonian's absolute space and Leibniz's conception of space as relational and, by accepting the relational view, accepted that spatial relations constitute mutual influences and possible interactions, recognizing that causal interdependence is a divine product, argued that space can be an independent existence of absolute reality. He asserts that space and time are not objective, self-subsisting realities, but subjective requirements of human sensory-cognitive faculties to which all things must conform. Space and time serve as indispensable tools that arrange and systemize the images of the objects imported by our sensory organs (KARANIKA&KALLIORAS, 2018).

¹⁰⁸ The region is "*a part of the earth's surface with defined boundaries and characteristics*". Place is "*also a certain part of the earth's surface applies, (...) we do not use it in an abstract sense, only one can be identified location-related*" (HAGGETT 2006, 5).

¹⁰⁹ Such spatial formations include spaces that are constructed and produced individually or socially, as reference points, showing the primitive process of nesting to defend the place where they reproduce, feed and roam. In accordance, the range of residence is the place where humans realize security, warmth and intimacy, mostly through guaranteed ownership, which gives the control, within a delimited space. Space focuses on the perception that puts human at the centre of social practice and thought, but it is surrounded by meanings and feelings (place), and political constructions (territory) (KARANIKA&KALLIORAS, 2018).

(KARANIKA & KALLIORAS, 2018). According to Faragó, *in the postmodern approach, interpretations space and place* are especially distinguished. The first one, as Agnew already had pointed out, is a general, abstract concept, to a lesser extent a „*larger physical unit*“, but much more a system of places (FARAGÓ L., 2012). Space is a conceptual base for „*spatial structures*“ where space is the „*relational system of the multitude of occupied positions*“, while place is a „*specific experience*“ which depicts the relational system locally (FARAGÓ L., 2012). This approach leads us further from absolutist interpretations to the relativist approaches.

The above mentioned two Greek authors say that **place** is a cultural concept, a source of understanding and belonging, manifested in everyday experience and human consciousness. Places are diverse as the meaning attributed to them, containing several (cultural, symbolic, etc.) layers. As opposed to Haggett, they consider place without size constraints. The attribution of a meaning to places is indicated by place naming. Existence is always a being in place. Consequently, the notion of place is always holistic that rather includes than excludes, it emphasizes relations and attributed a privileged role to difference and uniqueness (KARANIKA & KALLIORAS, 2018).

Karanika&Kallioras also underline that perception and conception of **territoriality**, which is an inherent characteristic of the **territory**, contributes to the emergence of issues related to the exercise and limitation of power in a given space. The concept of territory is adjacent to the concept of land and terrain, rooted back to the period of the Middle Ages up to the 17th century when territorium and jurisdiction went hand in hand¹¹⁰ (KARANIKA & KALLIORAS, 2018). Foucault's territory concept has similar geographical, legal, political and jurisdictional implications; an area that is controlled through the exercise of power (FOUCAULT, 2007). Elden considers the combination of economy, strategy, law and technique to be decisive for the definition of the territory, which is, also, a political development. Territoriality, consequently, is a phenomenal behaviour, linking space organization with spheres of influence and delimited areas and transformed them into units of influence (ELDEN, 2013). Soja also emphasised that territory is the political organization of the area, with the main objective of creating and maintaining solidarity within society (SOJA, 1971); and similarly, Painter considers territory as the quintessential, but under-theorised state space, which can be interpreted as an outcome of social-technical practices, a product of relational networks (PAINTER, 2010). Faludi added that territorialism is a fundamental principle of spatial organization, and territoriality is the control over territories (FALUDI, 2012, 2016).

In the above introduced framework space is a limitless surface yet, while **regions** have boundaries. The surface can be regarded as the sum of the regions and to analyse the spatiality of society is therefore focuses on the examination of the surface and its regions (DUSEK, 2004). Taylor pays attention for two basic types of regions: *formal and functional* ones. One formal region differs from other formal regions because it contains unique content across its areal extent; while functional regions are defined by connections, typically linking together different contents in areal terms. Initially the formal regions dominated thinking and policy making but regional geography designated *geographical regions*. This elevation of synthesis over analysis made geography an unusual academic discipline, able to concentrate on both types of regional units (TAYLOR, 2023). As a consequence, regional analysis gained momentum as tools focusing on regional systems and human functional relations in place, for example, providing basis for understanding how certain regions are affected by climate change processes. The role of regions and regional approach is unavoidable if one examines climate policy's spatiality as we saw in the previous chapters.

¹¹⁰ Territory of a kingdom was a delimited and described place, in which the King's Laws are implemented. The issue of the King' domination and power derive from territory. The link between sovereignty and territory is clear: sovereign or potentate is that Lord or State who is master of a territory (KARANIKA & KALLIORAS, 2018).

Annex 2b) Space interpretations

The following paragraphs go through the main space concepts and interpretations of those disciplines / fields of profession that I build my research on exploring spatiality's presence in adaptation planning and MRE activities.

Geography is one of the most significant space-oriented disciplines; its space interpretation creates the foundations of many others, as a discipline that studies the characteristics and patterns of the natural and anthropogenic environment's interactions (COHEN, 2015). The mainstream practice of contemporary geography became bi-disciplinary – half in environmental science, half in social science – says Taylor – and the two branches of geography [natural and human (social/economic)] exist quasi independently from each other, departing from the long-term tradition of focusing on relations between people and environment. With anthropogenic climate change gaining momentum globally, according to the author, the time has come for revitalization of the dual focus on human and environmental factors in geography, says the author (TAYLOR, 2023).

The basis of the discipline's approach derives basically **from environmental (natural) geography** that *interprets space with empirical tools based on natural sciences' positivism/realism, regarding space as an external endowment, providing the roots of the generally known absolutist space concept* (the well-known three-dimensional space without preferred points, an „empty form that can be freely filled in”) (FARAGÓ L., 2012, p. 8-9; NEMES-NAGY, 1998; DUSEK, 2004). Additionally, there is an ordering force in space deriving from its substance as an independent variable that affects its elements. Korompai calls our attention to the character of space as an objective entity with its own structure, based on the special dualism of continuity of space and division of the things in the “container” (KOROMPAI, 1995). The described features, e.g. the container-like space, are the essence of the absolutist space interpretation.¹¹¹ In this approach it is not difficult to recognize similarities with the geographical space of climate change as frameworks of climatic processes (“the container” in which these processes are taking place) and at the same time the space is also affected by those processes.

Environmental geography's mostly absolute space interpretation and geography's earlier mentioned space, place and territory concepts (delimited/limitless geographical areas with abstract or concrete meaning) have basically still the biggest impact on human space interpretation (FARAGÓ L., 2012) and as such, will form one basis of the spatial approach of the current research. However, the earlier mentioned remarks of FARAGÓ, namely the postmodern interpretations of space as a conceptual base for „spatial structures” where space is the „relational system”, lead us further from absolutist interpretations to the relativist approaches.

Going further into the sub-branches of geography, the also geographical space-oriented **economic and social geography** use a similar interpretation than environmental geography but with a special focus: it *examines the natural spatiality of society and economy*. Here the other main approach, the relativist space interpretation comes into our attention that interprets space as a system of relations between objects (objective beings), as the order of coexistence, the division of spatial elements and their relations create the continuity of space (KOROMPAI, 1995; NEMES-NAGY, 1998 AND 2009; DUSEK, 2004). Consequently, the main focus of social and economic geography is on places, positions and regions (NEMES-NAGY, 1998). Others also define the relational concept that emphasises space's nature as a social construction resulting inherent spatiality in all relations (AMIN, 2002; HEALY, 2004).

¹¹¹ One of the main absolutist space interpretation-oriented subjects of geographical analyses is the natural space, which exist independently from anthropogenic activities but at the same time is formed by those. Dusek even use the notion of natural geographic space, as that part of natural space that can be perceived by humans in terrestrial scale (DUSEK, 2004).

Social and economic geography regard space as a system of relations between objects, putting spatio-temporal existence in the centre where non-identity with both each other and themselves is the main ordering force. In this approach space does not derive from the nature but from the society (more exactly: from *the mutual connections between the two spheres*), (FARAGÓ L., 2012). This approach is essential in the examination of spatiality in adaptation, which deals basically with differences of spatial impacts of climate change and different adaptive capacities / vulnerabilities of given regions, countries, micro or macro regions.

Dusek also considers social space as the external spatial framework and subject of human activities that can be identified by geographical coordinates and described by humans' and their communities' features. Its materialized results exist in the natural space which fact explains the even nowadays significant weight of absolutist approach in spatial studies. Dusek also mentioned the temporality of social spaces¹¹². Social space's materialized elements such as movements, points and formations of points, hierarchies, networks and surfaces have outstanding role in territorial/spatial analyses: these are based on the examination aspects of the geometric space (e.g., distribution of points, features of plane figures) and use related notions (distance, point, line, etc.). (DUSEK, 2004). We can see clearly here the evolution from and further development of natural geography's space concepts.

The main focus of social geography on places, positions and regions as socially constructed entities (BAROUTSIS ET AL., 2017) are central aspects in the analysis of national adaptation activities, too. Furthermore, considerations of space's materialized elements such as climate impact-induced movements of people, particularly vulnerable points (settlements), point formations (settlement groups), hierarchies (urban networks), networks (vulnerable infrastructure elements) and surfaces (vulnerable regions) are also essential in adaptation-oriented planning as subjects of targeted interventions. In addition to the spatially uneven impacts of climate change, significant spatial differences also exist in terms of people's climate change views, and thus, their support for pro-environmental and climate change policies (WECKROTH&ALA-MANTILA, 2022). The analysis of these factors requires the relativist spatial approach.

But the evolution of space interpretations does not stop here. The special space manifestations of different disciplines using this relativist approach and mathematical methods get us to the space interpretations of the even more economic and social space-oriented studies. *Space has several layers*. This multi-layered nature is reflected well in the *interpretative approach* mentioned by FARAGÓ: different manifestations of space require different interpretations, due to the nature of space (as very complex systems' spatiality)¹¹³. *As a distinguished advocate of the interpretative approach, regional studies* (together with **regional geography, regional economics and location theories**) developed further the earlier mentioned approaches in their space interpretations. While social and economic geography, as we saw earlier, concentrate on the relation system of society's external spatial elements, regional studies bring "internal spaces" into the analysis, as new elements (NEMES-NAGY, 1998 AND 2009; FARAGÓ, 2012).

Under existence in space and time NEMES-NAGY understands inequalities and some forms of order and nominates the two main components of the spatial dimension: spatial/territorial inequalities (internal differences within the functioning system, examined by quantitative analyses) and spatial/territorial order/configuration (the

¹¹² The state of the space known today has always evolved from a state that already existed before, says Dusek.

¹¹³ In this approach, says the author, „*the substance of space manifests in the variety of its appearances and aspects*“, because different disciplines use different concepts to describe space, based on unique objects and interpretations (FARAGÓ L., 2012, p. 10-11). Adaptation policy, as integrator of several sectors, harmonizes different manifestations of space, too, to identify how the society and the different sectors affected by adaptation policy planning itself interpret the "subject-spaces" of their activities.

functioning systems' spatial structure depicted by thematic maps)¹¹⁴. The author introduces in his important summarizing book the general elements of space as spatial categories of regional study with which one can describe spatial inequalities, configurations and processes. These are different classes of space, the concept of place, movements and social activities. If in the analysis a social sphere's localization / connection to geographical space plays a crucial role, we talk about external space (the existence of a given sphere in the geographical space)¹¹⁵. The pair of external space is the internal space. Those "spatial" aspects, inequalities and order that exist in the social sphere themselves, separated from (or not attributed to) the geographical space constitute the internal spaces. These are abstract spaces of a given sphere, which can be examined through basic relations of dual values (NEMES-NAGY, 1998 and 2009). Due to the string of interconnectedness, separation of different spaces is not an easy task. According to NEMES-NAGY, the basis of regional study' approach is the distinction between the localized outer space of society attributed to the geographical ("terrestrial") space and the inner space of given social spheres. The outer space is in this view the depiction and mapping of social processes (NEMES-NAGY, 2007; LENGYEL I., 2010; FARAGÓ, 2012)¹¹⁶.

Some social spheres show spatial characteristics or inequalities even independently from the geographical space; however, it is not the territorial analyses' task to analyse the social and economic spheres' structural features independently from the geographical location (DUSEK, 2004). We do not follow this road in this research, either: mostly external spaces constitute the basis of our applied interpretations.

Regarding spatial aspects, all branches of economics deal mainly with internal spaces; the analysis of whom are usually not part of traditional empirical spatial analyses. The main scope of **regional economics** is the external space of economic activities, especially the position, the distance and the perception (NEMES-NAGY, 1998). DUSEK draws similar consequences but from the opposite direction: as opposed to social or economic geography, regional economics concentrate on society/economy and its territorial features instead of space; and examine the relation between society/economy and external conditions (among them the natural and social space) in general (DUSEK, 2004). Out of the introduced space concepts of the related disciplines, mostly external spaces and spatial analyses of social/economic spheres are relevant aspects here.

Successful and effective policy decisions always require high-quality and preferably quantified information base, and in case of space-oriented fields (like climate adaptation), even more spatial information. These, together with the recently growing importance of environmental sustainability considerations and growth-critical approaches in public and professional discourses also call the attention for regional economic and environmental data utilization. Climate policy, especially adaptation, is inseparable from the natural environment/geographical space, so the domain is particularly can be supported by spatial/environmental analyses and assessments of sustainability. Environmental and adaptation processes are especially complex; the

¹¹⁴ Spatial research prefers quantitative analyses of regional inequalities disaggregating upper territorial levels into lower territorial units to explore internal divisions. At the same time, configuration is analysed by elaboration of thematic maps (NEMES-NAGY, 1998, 2009).

¹¹⁵ In this case identifying the immaterial social elements' connections to geographical locations are not an easy task usually, the localization is frequently indirect (NEMES-NAGY, 1998). External space could be analysed in two main ways. Regional research describes or compares different territorial entities/spatial units, their characteristics and structures, focusing on society's spatiality by quantitative spatial parameters, where the main analytical units are the spatial/territorial entities. The other way, sectoral analyses focus on a relatively homogeneous social sphere's spatially determined institutions, processes and actors to introduce the spatial division in its functioning (NEMES-NAGY (ED), 2005).

¹¹⁶ LENGYEL thinks that amalgamation of physical (geographical) and social space-interpretations is one of the breakout points of regional science (LENGYEL I., 2010;). This duality of physical and social spaces is reflected also in the approaches of neo-Marxism or the so-called new regionalism of the 2000's European spatial development, with parallel acknowledgement of both objective spaces and social/economic structures, focusing on the mutual impacts of these on each other (FARAGÓ, 2012) by the regional analysis.

effects are frequently far from decisions in space and time (EEA, 2016; CSUTORA ET AL., 2021). Due to its complex and multi-sectoral nature and difficult quantification, adaptation policy's monitoring is still problematic. Even the empirical part of the research puts the main emphasis on qualitative analysis of European national level adaptation planning and MRE activities.

Regional study's approach brings new aspects into the concept of spatiality: it incorporates "internal spaces" into the analysis; focusing on localized outer spaces of social/economic spheres with geographic space-attributions and internal structures and concepts of given spheres simultaneously. Its central method is the regional analysis instead of sectoral approach; it applies different space categories parallel with each other (objective and real spaces, external and internal spaces, etc.), implementing given social spheres' localization and connection to geographical space. It concentrates on elements (spatial categories) of the space concept to describe spatial inequalities and configurations. Economic, social, cultural and geographical spaces often can be considered as different layers upon each other. Differences within a given thematic space can be transformed into spatial/territorial inequalities. When one turns to such a complex and multi-sectoral topic as climate adaptation, or climate vulnerability with its impact chain-based elements; the application of this multi-layered approach considering external and partly internal spaces and different spatial elements/aspects can be an asset to be utilized in the research. The interpretative approach is also remarkable, because the adaptation policy harmonizes different sectors with different manifestations of space that requires different interpretations to identify how the given planning scene interprets the "subject-spaces" of their policy activities.

The administrative/political structures of countries influence among other things the (spatial) organisation of public administration, functioning of policies, practical implementation of planning and evaluation activities, and monitoring tasks in different sectors. The connection with space, regions and territories is clear: administration, planning and MRE are realized in spatial units (in states, regions, microregions, functional urban areas, municipalities). **Political/administrational studies, international relations**, concentrate among other things on different governance and regime types, the related global processes and their spatial consequences. These factors might also seriously influence the establishment, structure and functioning of national planning and MRE activities and system-building practices in climate (adaptation) policy (GREIVING&FLEISCHHAUER, 2010)¹¹⁷.

The already introduced relativist approach partly examines the way how humans conceptualize/constitute space in their everyday life (FARAGÓ, 2012). For instance, in constructivist theory space is a relational dimension, a direct product of society made up from societal relations (SOMLYÓDINÉ, 2019). This interpretation is close to that of Kant and is based on sensual perceptions as the foundation of experimental learning (DUSEK, 2004). Since the 1980s regions have been considered more and more as relational/social constructions and results of governance-, economy-, culture- related and political struggles as well as of environmental relations (PAASI, 2023).

Looking through the different political science- and IR-theories, it seems that some social theory-based schools, like constructivism or post-structuralism are adequate also for depicting national administrative and MRE system construction-related "behavioural" differences¹¹⁸ and particular space interpretations. Constructivism thinks

¹¹⁷ The authors even examined whether at which administrative level of the case study countries spatial planning is organised and if there is a binding effect for the planning process(es) at the subordinated level(s) (GREIVING&FLEISCHHAUER, 2010).

¹¹⁸ These differences can be detected, for example, in the different Hungarian settlement network-related development objectives of different periods' domestic territorial policies. While the second National Spatial Development Concept (2005), in the era of European regionalisation, had emphasised the role of development poles (regional centres) in the Hungarian settlement network; then the next National Development and Regional Development Concept in 2014 already focused on different tiers of the urban system simultaneously, and put growing weight on county seats as sign of a

that rather a nation's (historical, cultural and social) values and belief system explains their policy efforts and behaviour than the general material interests. Social construction of reality is the core concept, saying that actors and the constructed categories help to understand the world (BARNETT, 2017; KARANIKAKALLIORAS, 2018; JACKSON ED., 2019). The other theoretical school whose approach can be considered as useful is post-structuralism. Its main questions are how we construct the world and how construction of the world, people and places makes given policies seem natural/legitimate (HANSEN, 2017; JACKSON ED., 2019). These approaches bring up once again the issue of socially constructed "internal" and "social" space interpretations and have also an impact on given society's spatial structures. FARAGÓ calls our attention that our affairs are arranged in the world in accordance with our perception of our spatial existence. For example, a given government operationalizes its internal space interpretations through regionalization processes or polycentric development of spatial structures. In this respect territorial governance is a practical space-organizing intervention deriving from particular internal space interpretations (FARAGÓ, 2012).

Summarily, these socially constructed "internal", "social" space interpretations can influence the spatial structure of society, too. Historical, cultural and social characteristics of different societies result in different national administrative and governmental features' differences, converting societal space interpretation into political/administrative space structures. Climate adaptation planning and MRE system-building practices in different countries may root back to these above-mentioned differences.

Geography of political issues itself (more exactly: their external geographical space) is the essence of **geopolitics-related studies**, too. Numerous authors (COHEN, 1973; SACK, 1986; AGNEW, 1998; O'TUATHAIL, 1998; KELLY, 2016; MORGADO, 2020; PAASI, 2023) concentrate on the pivotal role of the geographical settings in their geopolitics definitions, focusing on political power's spatial framework¹¹⁹, where geography is defined basically as places. Place here means both the exact locations/settings where the aforementioned interactions occur, and connections between these places (COHEN, 2015; MORGADO, 2020). The impact of geography on politics is one of geopolitics' main focuses. While climate change does not respect political borders, however, the geographical/ontological framework of climate policy development is the world's political map. Geography's long regional analytic and space-oriented tradition can somehow counterweight the role of states in these examinations (TAYLOR, 2023, PAASI, 2023). Geographic proximity, differences in population density, or places' locations all influence political decisions. The picture is not constant: changes in the geographical settings (e.g., discovery/depletion of natural resources, movement of people and capital, etc.) make geopolitical perspectives

polycentric development approach. The two different approaches reflect the changing spatial concepts of different domestic political leaderships as well and in different times these different approaches are operationalized in reality. Similar impacts of different political leaderships' internal spatial interpretations and approaches can be imagined on climate adaptation policy and planning in practice (SÜTÖ, 2024).

¹¹⁹ COHEN, for instance, defined the discipline as relation between international political power and the geographical setting (COHEN, 1973), further refining this definition in the 21st century as scholarly analysis of geographical factors influencing IR and political relations (COHEN, 2015). Agnew considers geopolitics as examination of geographical assumptions and understandings within world policy making (AGNEW, 1998). O'Tuathail thinks that geopolitics is the discourse that describes cultural/political aspects of geography in international politics (O'TUATHAIL, 1998). Phil Kelly identifies the concept of geopolitics itself as a study of particular geographical features' (location, distance, topography, shape, etc.) influence on external policies and behaviour of states as opposed to political geography which concentrates on policies/behaviours only within national political boundaries. At the same time, he does not consider the impact of decision makers as part of his definition (KELLY, 2016). Morgado calls geography as the "bedrock of geopolitical studies" as it explains the impact of geographical setting; contrary to Kelly, he considers even the geopolitical agents' perceptions on foreign policy and international politics as crucial factors. He regards the so-called Area Study that uses a strong regional approach in an empirical way, as one of the most important methodological tools of geopolitics (MORGADO, 2020, p. 130; PAASI, 2023) - here we can recognize some similarities with regional study's regional analysis approach. Sack considers territoriality as a product of the geopolitical strategy that is used for the delimitation and control of a territory. Territoriality, as a result of strategies that affect people, is shaped through interaction and identifies with state territoriality. Therefore, state territoriality of a delimited territory is exercised by the State (SACK, 1986).

dynamic. Changes can also occur in the geopolitical situation. In the process of globalization, a much more complex geopolitical system stands out, restructuring existing geographical settings. Sub- and supranational levels' importance is increasing; macro regions, city regions, metropolitan entities, megalopolises competing even with states (ROSENAU, 1992; COHEN, 2015; VOGLER, 2017). The growing importance of these levels can also be detected in climate adaptation planning.

In the geo-political literature climate change issues inherently raise questions related to space, scale, and nature, which concepts are central to modern geographic thought. Climate change impacts and consequences vary from region to region that can change the existing situations (COHEN, 2015; MARSHALL, 2015). For instance, global warming and melting of ice caps make Arctic waters navigable and undersea energy sources buried in the continental shelves exploitable making these regions more attractive for great powers. Agriculture can extend into more northern areas in some regions (e.g., in Europe northern shifting of wine regions is already expected). Increasing climate migration triggered by famine, desertification, floods, etc. is threatening among others Greece, Türkiye, and other Levantine countries. Not only the geography- and political ecology-related literature explore generally climate change -related topics through case studies (ABRAHAMS&CARR, 2017), but among the main systemic changes, the long-term alterations in climate and the natural environment (e.g., the changing climatic factors influencing national strategies) are particularly mentioned in the geopolitical studies/articles (COHEN, 2015)¹²⁰. Climate planning ultimately represents in this respect a convergence of geopolitical manoeuvrings, technical-managerial framings, and uneven struggles over geography (WEINGER, 2021).

If we are looking for space interpretations in geopolitics basically the already known external spaces (geographical space with physical environmental elements), as localized outer space of politics and the relativist approach emerge again. Spatial presence of climate-related risks and their spatial structures are in the centrum of climate adaptation and the related research projects. Moreover, how given nations/states can use their climate adaptation policies in strengthening cooperation with or influence above other regions is also worth examining. Swart and his colleagues mentioned in their comparative national adaptation document analysis that employment and export opportunities of adaptation and related knowledge as well as development of cooperative strategies can even strengthen multilevel governance, international relations or positions of the "knowledge exporting" countries and their international policy making role, too (SWART ET AL., 2009). The sign of these intentions and the emergence of listed geographical factors of geopolitics are utilized as analytical aspects in the research's empirical analyses.

Besides different scientific disciplines even **those practical fields** are worth being dealt with that influence public and professional thinking about space. Among of the most important among these fields are **regional development policy and the related strategic and spatial planning activities**, as applied practical manifestations of regional geography, regional studies and regional economics.

Out of this practical space interpretation framework, a special mention must be made about *the notion of territorial cohesion*. The concept has been one of the essential pillars of the EU spatial development policies in the recent decades. Already the Treaty of Lisbon indicated that the need for capitalization, development, and exploitation of the European territory made territorial cohesion an integral part of cohesion policy, as an equal pillar with economic and social cohesion (EC, 2005). Yet the attempts to find a

¹²⁰ Climate change is frequently described as "threat multiplier" and beyond the unidirectional flow from climate vulnerability to conflict, scientists explore how climate change can create opportunities for peacebuilding as well as conflict and identify how climate adaptation activities can themselves become catalysts for conflict. Geographic lens on the relationship between climate change and conflict are essential to building meaningful understandings (ABRAHAMS&CARR, 2017).

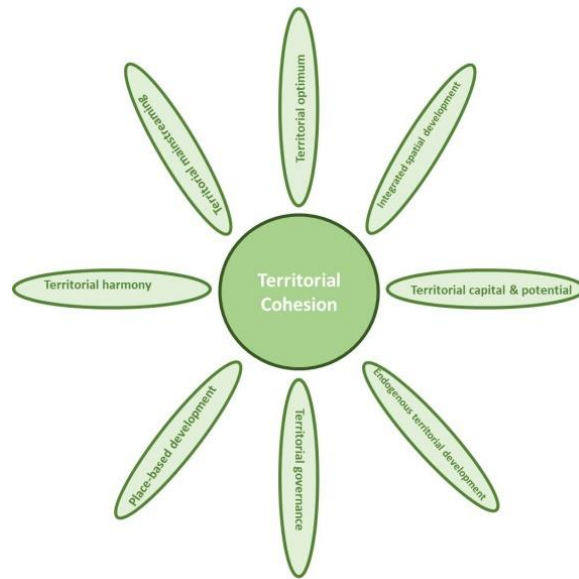
clear definition for the concept have failed so far, only a vague theoretical character of the cohesion concept can be detected. However, the main message of the European Union's Territorial Agenda 2020 (TA 2020) emphasised that "*territory matters*". The issue of territorial dimension has been since then considered ex-ante in EU support-related policy design. In connection with the improvement of the concept's definition, Karanika and Kallioras cited Waterhout (who were not explicitly concerned about territory but, instead, relates territorial cohesion with the substantive goals of territorial development through the lenses of balance, competitiveness and environment) and the Barca Report (that considered territorial cohesion as a springboard for promoting territorial development, putting territorial cohesion close to spatial planning) to underline these strengthening spatiality of cohesion policy (KARANIKA&KALLIORAS, 2018). SALAMIN calls our attention to the evolution of the territorial cohesion concept, too, from being a pure balancing policy of regional differences to a practice- and policy-oriented integrated space interpretation¹²¹. The author draws the same conclusion as the two Greek scientists, saying that since the elaboration of the TA 2020 document, territorial cohesion had become the subject of scientific research to an ever-growing extent. And although it remained a policy category and has not become a scientific concept (SALAMIN, 2018), its factors prove useful in the dissertation's space-oriented analytical aspect system.

Territorial cohesion's most comprehensive interpretation is introduced by the 2011 *Territorial State and Perspectives of the European Union*¹²² (TSP) document (DAMSGAARD ET AL, 2011) and the TA 2020 (MEMBER STATES' MINISTERS RESPONSIBLE FOR SPATIAL PLANNING AND TERRITORIAL DEVELOPMENT, 2011B), together with other related articles (PÉTI ET AL., 2009; SALAMIN&SÜTÖ, 2010). The TSP says that territorial cohesion means on the one hand the increasingly powerful *mainstreaming of territorial aspects into sectoral development directions*. At the same time, it underlines the importance of a *comprehensive and integrated (spatial) planning approach* that takes into consideration special geographical features and support the effective exploitation of potentials (*territorial capital*) of each spatial units (regions, cities and other spaces) for achieving EU-policy targets. Through this it intends to maximize the contribution of different places to the implementation of EU-level priorities and to achieving a "*territorial optimum*". In accordance with the Europe 2020 Strategy (as opposed to former balancing policies) territorial cohesion recognises and encourages the difference of regions. TA 2020, as the EU 2020's territorial extension, also emphasised that territorial cohesion aims at transforming diversity into an asset with geographically specific actions in each territory. It also propagated *harmonious, balanced, efficient and sustainable spatial structures*, where different territorial units at different territorial levels can make the most of their potentials and achieve their optimal long-term development and *territorial harmony* between economic, social and environmental sustainability.

The notion of *territorial governance* also came into the fore within the umbrella of territorial cohesion, as a forum where stakeholders (economic organisations, scientific institutes, public bodies, civil sector) from different territorial levels can cooperate with each other (multi-level governance). The concepts of *place-based and endogenous development* (based on the given territorial unit's own endowments) have also been highlighted within cohesion policy in the last decades (DAMSGAARD ET AL, 2011; MEMBER STATES' MINISTERS RESPONSIBLE FOR SPATIAL PLANNING AND TERRITORIAL DEVELOPMENT, 2011; SALAMIN, 2018). These main directions emerge indirectly in the recent Territorial Agenda of the European Union (TA 2030), too, but the accurateness of their description does not reach the level experienced in the TA 2020.

¹²¹ The first policy use of the term by the EC in 2004 gave a reason for this.

¹²² TSP is the policy strategy supporting background document of TA2020.



Territorial cohesion's different space-oriented interpretations in the 2010s in EU development policy. *Source: own editing.*

Regional development and cohesion policy, as we saw, identify several spatial objectives for different spatial levels of Europe. To systemize these objectives, spatial planning activity has a key role. In the first decades of the 21st century changing emphases of strategic and spatial planning can be observed: most authors underline that networked governance forms, and blurred boundaries of functional territories got increasing importance in the planning systems. Strategic interventions have appeared even at scales other than those of the statutory (local/regional) levels. Traditionally states organized their territories into territorial governance structures harmonizing with the administrative borders of elected bodies, covering the whole national state territory without overlapping. However, these boundaries were not flexible enough to handle current socio-economic problems. As a response, non-governmental and business organisations started to create new functional spatial units at different spatial levels. These new functional territories result in a non-state-centred spatial view (ROSENAU, 1992; SOMLYÓDINÉ, 2019, TAYLOR, 2023). Taylor explicitly says that sovereign territorial state is not sufficient to contain or define the boundaries of ecopolitics (TAYLOR, 2023)¹²³. As a result, new forms of partnership and networks appear. Policy making tends to focus on complex, multi-layered, flexible scales instead of rigid, formal, clear geographical boundaries of administrative units – functional territories seem to depict better the real processes. The management of these functional spatial units led to the definition of soft spaces, other than administrative ones (ALLMENDINGER & HAUGHTON, 2008; FALUDI, 2012; SOMLYÓDINÉ, 2019). Multi-level and geographically flexible territorial governance are propagated also by EU regional policy since the TA2020¹²⁴ (DAMSGAARD ET AL, 2011).

The EU's regional policy also deals with the problem of functional versus administrative regions. The TSP 2011 document emphasised that territorial cohesion is relevant not only at different territorial levels but even in different functional territories. Moreover, it advocated for a place-based approach that provides better tailored

¹²³ Environmental disasters, for instance, caused by human agency and the emphasis on borders can in fact prevent the actions needed to relieve the impacts of such catastrophes or simply to acquire and distribute information regarding them (TAYLOR, 2023).

¹²⁴ The TSP 2011 urges the management of different functional territories to ensure the balanced and coordinated contribution of the actors from different levels. The growing role of supra- and subnational organisations (macro regions, city regions and cross-border territories) are at the same time good indicators of decentralization and regionalisation (DAMSGAARD ET AL, 2011).

territorial messages for functional territorial units within the interventions of Cohesion Policy¹²⁵. Both the TSP and the TA 2020 (ad its newest version, the TA 2030 as well) urge that planning, and management activities of urban settlements must look over their administrative borders and focus on their peri-urban functional regions. Furthermore, cross-border and transnational functional regions emerge in the two mentioned documents as special functional entities and increasingly important places in the utilisation of territorial capital. Particularly in connection with the climate issue, the documents emphasise benefits of adaptation strategies targeting functional areas by acting and cooperating at levels of river- or lake-basin, seacoast or urban regions etc. (DAMSGAARD ET AL, 2011; MEMBER STATES' MINISTERS RESPONSIBLE FOR SPATIAL PLANNING AND TERRITORIAL DEVELOPMENT, 2011; MEMBER STATES' MINISTERS RESPONSIBLE FOR SPATIAL PLANNING AND TERRITORIAL DEVELOPMENT AND/OR TERRITORIAL COHESION, 2020).

Spatial planning plays an important role in western and northern European countries in regionalisation processes and in the acknowledgement of functional territories during the territorial rearrangements/rethinking of spaces and planning activities (SOMLYÓDINÉ, 2019). At the same time, post-growth-oriented approaches emerge even in spatial planning, assuming that spatial differentiation is necessary. Governance and planning raise the question of reference areas, spaces and spatiality of post-growth processes. At the same time, green economic development, circular economy, climate adaptation and mitigation issues have got increasing emphasis in spatial plans both at EU and at national level (LANGE ET AL. (ED), 2021).

Overall, regional development policy and the related strategic and spatial planning activities play crucial part in the research's practice- and applied policy-oriented approach. All the mentioned territorial cohesion-related notions indicate a special space sub-concept, rooted back partly to the approaches of regional study and social/economic geography but transform them into a more practice-oriented point of view. The listed sub-concepts emerge among the research's analytical aspects, as well as the problems of functional territories: climate impacts can be attributed more to ecological/functional frameworks than to administrative units. Climate change does not "recognize" political borders: ecological, natural processes are not operating in the framework of territorial statistical units. Emergence of functional territories as subjects/targets of adaptation planning and MRE activities is also worth examining within the analytical aspect system of the research.

¹²⁵ According to the propagated approach balanced urban-rural relationship must be achieved through strengthened natural functional relationships (e.g., catchment or commuting regions, local labour systems) within a given territory, improving the links between places that play different social and economic functions (DAMSGAARD ET AL., 2011).

Annex 3 – Processed and analysed documents

Annex 3a) List of the analysed national planning and situation analysis documents

Country	NAS					NAP					Background documents				
	Title	Date	Time horizon	Approved by	Elaborated by	Title	Date	Time horizon	Approved by	Elaborated by	Title	Date	Time horizon	Approved by	Elaborated by
ALB	Climate Change Strategy and Action Plans (Strategjia e Ndryshimeve Klimatike dhe Planet e Veprimit)	2019	2019-2030	Albanian Government	Albanian Government	Climate Change Strategy and Action Plans (Strategjia e Ndryshimeve Klimatike dhe Planet e Veprimit)	2019	2019-2030	Albanian Government	Albanian Government	National Adaptation Planning (NAP) to Climate Change in Albania Framework for the Country Process	2016	-	Inter-Ministerial Working Group on Climate Change	Ministry of Tourism and Environment
AUT	The Austrian strategy for adaptation to climate change Part 1 - Context (Die Österreichische Strategie zur Anpassung an den Klimawandel; Teil 1 – Kontext)	2024	2030, with an outlook to 2050	Federal Government	Federal Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology	The Austrian strategy for adaptation to climate change Part 2 - Action plan Die Österreichische Strategie zur Anpassung an den Klimawandel - Teil 2 – Aktionsplan Handlungsempfehlungen für die Umsetzung	2024	2030, with an outlook to 2050	Federal Government	Federal Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology					
BEL	National Climate Adaptation Strategy	2010	not declared	Federal Government	National Climate Commission	Belgian National Adaptation Plan	2017	2017-2020	Federal Government	National Climate Commission					
	Flemish Climate Adaptation Plan 2030	2022	2030	Government of Flanders	Flemish Environment, Nature and Energy department										
	Région Wallonne Plan d'Adaptation	2023	2024-34	Government of Wallon	Elia Group										
BIH	The 2020-2030 Climate Change Adaptation and Low Emission Development Strategy for Bosnia and Herzegovina	2020	2020-2030	Council of Ministers of Bosnia and Herzegovina	Ministry of Spatial Planning, Construction and Ecology of the Republika Srpska, Ministry of Foreign Trade and Economic Relations, BiH, Ministry of Environment and Tourism, Federation of BiH, Brčko District Government, United Nations Development Programme of BiH	Bosnia and Herzegovina National Adaptation Plan – NAP with proposed measures	2021	2020-2030	Council of Ministers of Bosnia and Herzegovina	Ministry of Spatial Planning, Construction and Ecology of the Republika Srpska, Ministry of Foreign Trade and Economic Relations, BiH, Ministry of Environment and Tourism, Federation of BiH, Brčko District Government, United Nations Development Programme of BiH	Country Climate and Development Report (CCDR)	2024	-	-	World Bank Group
											Climate risk country profile	2021	-	-	World Bank Group

Country	NAS					NAP					Background documents				
	Title	Date	Time horizon	Approved by	Elaborated by	Title	Date	Time horizon	Approved by	Elaborated by	Title	Date	Time horizon	Approved by	Elaborated by
BRG	National Climate Change Adaptation Strategy and Action Plan	2018	2050	Republic of Bulgaria	international experts in the framework of the World Bank Advisory Programme	Third national action plan on climate change	2012	2013-2020	Government	Ministry of Environment and Water	Climate risk country profile	2021	-	report	World Bank Group
											Eighth national communication on climate change	2022	-	UNFCCC	Ministry of Environment and Water
CRO	Strategija prilagodbe klimatskim promjenama u republici hrvatskoj za razdoblje do 2040. godine s pogledom na 2070. godinu (climate change adaptation strategy in the republic of croatia for the period until 2040 with a view to 2070)	2020	2040	Government	Ministry of economy and sustainable development						Seventh national communication and third biennial report of the republic of Croatia under the United Nations framework convention on climate change (unfccc)	2018	-	UNFCCC	MINISTRY OF ENVIRONMENT AND ENERGY
CYP	Εθνική στρατηγική για την προσαρμογή στην κλιματική αλλαγή (national strategy for adapting to climate change)	2017	not declared (presumably 2030)	Government	Ministry of agriculture, rural development and environment, department of environment						Adaptation preparedness scoreboard: Country fiche for Cyprus	2018	-	report	European Commission
											Eighth National Communication & Fifth Biennial Report	2023	-	UNFCCC	Department of Environment Ministry of Agriculture, Rural Development and Environment
CZE	Strategie přizpůsobení se změně klimatu v podmínkách ČR (Strategy for Adapting to Climate Change in the Conditions of the Czech Republic)	2015 (update 2021)	2021-30	GOVERNMENT OF THE CZECH REPUBLIC	Ministry of the Environment in interdepartmental cooperation using climatological data from the Czech Hydrometeorological Institute	Národní akční plán adaptace na změnu klimatu Implementační dokument Strategie přizpůsobení se změně klimatu v podmínkách ČR (National Climate Change Adaptation Action Plan Implementation Document of the Strategy for Adapting to Climate Change in the Czech Republic)	2021	2021-2025	GOVERNMENT OF THE CZECH REPUBLIC	Ministry of the Environment	Eighth national communication of the Czech Republic under the United Nations framework convention on climate change including supplementary information pursuant to article 7.2 of the kyoto protocol	2022	-	UNFCCC	Ministry of the Environment of the Czech Republic
DRK	Danish strategy for adaptation to a changing climate	2008	not declared (presumably 2025)	Danish Government	Danish Energy Agency	How to manage cloudburst and rainwater Action plan for a climate-proof Denmark	2012		Government of Denmark	Task Force for Climate Change Adaptation Danish Nature Agency					

Country	NAS					NAP					Background documents				
	Title	Date	Time horizon	Approved by	Elaborated by	Title	Date	Time horizon	Approved by	Elaborated by	Title	Date	Time horizon	Approved by	Elaborated by
ENG	The Third National Adaptation Programme (NAP3) and the Fourth Strategy for Climate Adaptation Reporting	2023	2023-2028	House of Commons	Department for Environment, Food and Rural Affairs						The Third National Adaptation Programme (NAP3) Annex 1: Climate risks and opportunities. The 61 climate risks and opportunities, and planned actions to address them by government departments	2023	2023-2028	House of Commons	Department for Environment, Food and Rural Affairs
											The Third National Adaptation Programme (NAP3) Annex 2: The Climate Change Committee's progress report Annex 3: Monitoring, evaluation and learning Annex 4: Adaptation Reporting power fourth round scope Annex 5: Acronyms and glossary	2023	2023-2028	House of Commons	Department for Environment, Food and Rural Affairs
											7th National Communication	2017	-	UNFCCC	Department for Business, Energy and Industrial Strategy
EST	Climate Change Adaptation Development Plan until 2030	2017	2030	Government	Republic of Estonia, Ministry of the Environment						Estonia's Eighth National Communication	2022	-	UNFCCC	Ministry of the Environment
FIN	Valtioneuvoston selonteko kansallisesta ilmastomuutokseen sopeutumis suunnitelmasta vuoteen 2030 Hyvinvointia ja turvallisuutta muuttuvassa ilmastossa VNS 15/2022 vp (Finland's National Climate Change Adaptation Plan 2030)	2022	2022-30	Government	Ministry of Agriculture and Forestry	Valtioneuvoston selonteko kansallisesta ilmastomuutokseen sopeutumis suunnitelmasta vuoteen 2030 Hyvinvointia ja turvallisuutta muuttuvassa ilmastossa VNS 15/2022 vp (Finland's National Climate Change Adaptation Plan 2030)	2022	2022-30	Government	Ministry of Agriculture and Forestry	Finland's Seventh National Communication under the United Nations Framework Convention on CLIMATE CHANGE	2017	-	UNFCCC	Ministry of the Environment and Statistics
											Finland's Eighth National Communication under the United Nations Framework Convention on Climate Change	2022	-	UNFCCC	Ministry of the Environment and Statistics
FRA	Plan national d'adaptation au changement climatique (National Climate Adaptation Plan, PNACC-3)	2025	2025-2027	Government of France	Government of France	Plan national d'adaptation au changement climatique (National Climate Adaptation Plan, PNACC-3)	2025	2025-2027	Government of France	Government of France					

Country	NAS					NAP					Background documents				
	Title	Date	Time horizon	Approved by	Elaborated by	Title	Date	Time horizon	Approved by	Elaborated by	Title	Date	Time horizon	Approved by	Elaborated by
DEU	Deutsche Anpassungsstrategie an den Klimawandel 2024 (2024 German Strategy for Adaptation to Climate Change)	2024	2030-2050	Federal Government	UBA										
GRC	Εθνική στρατηγική για την προσαρμογή στην κλιματική αλλαγή (national climate change adaptation strategy)	2016	2050	Government	Ministry of environment & energy general directorate of environmental policy directorate of climate change and atmospheric quality						8th national communication and 5th biennial report under the United Nations framework convention on climate change	2022	-	UNFCCC	MINISTRY OF ENVIRONMENT AND ENERGY
HUN	2nd National climate Change Strategy	2018	2030, with an outlook to 2050	Parliament	National Adaptation Centre	1st National Climate Change Action Plan of the NCCS-2	2020	2018-20	Government	National Adaptation Centre	Governmental Report about the Current and Expected Weather and Climate Change impacts on the Carpathian Basin	2020	-	Government	National Adaptation Centre
						2nd National Climate Change Action Plan of the NCCS-3	2021	2021-23	Government (not adopted)	National Adaptation Centre					
SLE	Í ljósi loftslagsvárs - Stefna um aðlögun að loftslagsbreytingum (In View of the Climate Crisis - Iceland's Strategy on Adaptation to Climate Change)	2021	not declared (presumably 2030)	Government	Ministry for the Environment and Natural Resources	Iceland's Climate Action Plan for 2018-2030	2018	2018-2030	Government	Ministry for the Environment and Natural Resources	Iceland's Seventh National Communication and Third Biennial Report	2018	-	UNFCCC	Ministry for the Environment and Natural Resources
											Iceland's 8th National Communication and 5th Biennial Report	2023	-	UNFCCC	Ministry for the Environment and Natural Resources
IRL	National Adaptation Framework Planning for a Climate Resilient Ireland	2024	2050	Government of Ireland	Department of the Environment, Climate and Communications						Seventh National Communication Ireland	2017	-	UNFCCC	Department of Communication, Climate Action and Environment
											Ireland's 8th National Communication	2023	-	UNFCCC	Department of The Environment, Climate and Communications

Country	NAS					NAP					Background documents				
	Title	Date	Time horizon	Approved by	Elaborated by	Title	Date	Time horizon	Approved by	Elaborated by	Title	Date	Time horizon	Approved by	Elaborated by
ITA	Strategia Nazionale di Adattamento ai Cambiamenti Climatici (National Strategy for Climate Change Adaptation)	2023	not declared (presumably 2030)	Government	Ministry of the Environment and Protection of Land and Sea (MATTM).	Strategia Nazionale di Adattamento ai Cambiamenti Climatici (National Strategy for Climate Change Adaptation)	2023	not declared (presumably 2030)	Government	Ministry of the Environment and Protection of Land and Sea (MATTM).	Seventh National Communication under the United Nations Framework Convention on Climate Change	2017	-	UNFCCC	Ministry for the Environment Land and Sea
	Piano Nazionale di Adattamento ai Cambiamenti Climatici ALLEGATO I Metodologie per la definizione di strategie e piani regionali di adattamento ai cambiamenti climatici (National Plan for Adaptation to Climate Change ANNEX I Methodologies for developing regional strategies and plans for adaptation to climate change)	2023	not declared (presumably 2030)	Government	Ministry of the Environment and Protection of Land and Sea (MATTM).										
KOS	Climate change strategy 2019- 2028 action plan on climate change 2019- 2021	2018	2021-2028	Government	Ministry of Environment and Spatial Planning	Climate change strategy 2019- 2028 action plan on climate change 2019- 2021	2018	2021-2028	Government	Ministry of Environment and Spatial Planning					
LTV	Latvijas pielāgošanās klimata pārmaiņām stratēģija laika posmam līdz 2030.gadam (latvian strategy for adapting to climate change until 2030 and latvian national plan for adaptation to climate change until 2030)	2018	2030	Government	Ministry of Environmental Protection and Regional Development	Latvijas pielāgošanās klimata pārmaiņām stratēģija laika posmam līdz 2030.gadam (latvian strategy for adapting to climate change until 2030 and latvian national plan for adaptation to climate change until 2030)	2018	2030	Government	Ministry of Environmental Protection and Regional Development	Latvia's eight national communication and fifth biennial report	2022	-	UNFCCC	Ministry of the Environmental Protection and Regional Development/ Climate Change Department
LTU	National energy and climate action plan of the republic of lithuania for 2021-2030	2021	2021-2030	Seimas of the Republic of Lithuania	Ministry of Environment						Lithuania's eighth national communication and fifth biennial report	2022	-	UNFCCC	Ministry of Environment of the Republic of Lithuania
	National climate change management agenda	2021		Seimas of the Republic of Lithuania	Ministry of Environment										

Country	NAS					NAP					Background documents				
	Title	Date	Time horizon	Approved by	Elaborated by	Title	Date	Time horizon	Approved by	Elaborated by	Title	Date	Time horizon	Approved by	Elaborated by
LUX	Stratégie et plan d'action pour l'adaptation aux effets du changement climatique au luxembourg 2018-2023 (strategy and action plan for adapting to the effects of climate change in luxembourg 2018-2023)	2018	2018-2023	The government of the Grand Duchy of Luxembourg	Ministry of Environment, Climate and Sustainable Development	Stratégie et plan d'action pour l'adaptation aux effets du changement climatique au luxembourg 2018-2023 (strategy and action plan for adapting to the effects of climate change in luxembourg 2018-2023)	2018	2018-2023	The government of the Grand Duchy of Luxembourg	Ministry of Environment, Climate and Sustainable Development					
MLT	National Climate Change Adaptation Strategy	2012	not declared (presumably 2030)	Government of Malta	Ministry for Resources and Rural Affairs						The Seventh National Communication of Malta	2017	-	UNFCCC	Malta Resources Authority on behalf of the Ministry for the Environment, Sustainable Development and Climate Change
											Malta's fifth biennial report	2022	-	UNFCCC	Malta Resources Authority on behalf of the Ministry for the Environment, Sustainable Development and Climate Change
											8th National Communication of Malta	2022	-	UNFCCC	Malta Resources Authority on behalf of the Ministry for the Environment, Sustainable Development and Climate Change
MON	Enhancing Montenegro's capacity to integrate climate change risks into planning: Annotated Project Document template for NAP/Readiness projects financed by the Green Climate Fund	2020	references to 2030	Government	UNDP	National programme of priority activities in the field of climate change mitigation and adaptation to the framework of cooperation with the green climate fund 2021-2023	2021	2021-2023	Government	Ministry of Sustainable Development and Tourism	Third biennial update report of Montenegro to the United Nations framework convention on climate change	2021	-	UNFCCC	Government of Montenegro
											Montenegro third national communication on climate change	2020	-	UNFCCC	Ministry of Sustainable Development and Tourism (MSDT) United Nations Development Programme (UNDP) in Montenegro
											Adaptation to climate change: Montenegro	2020	-	report	Adaptify

Country	NAS					NAP					Background documents				
	Title	Date	Time horizon	Approved by	Elaborated by	Title	Date	Time horizon	Approved by	Elaborated by	Title	Date	Time horizon	Approved by	Elaborated by
NIR	Northern Ireland Climate Change Adaptation Programme	2019	2019-2024	DAERA	Climate Change Unit, Environmental Policy Division, Environment, Marine and Fisheries Group, Department of Agriculture, Environment and Rural Affairs (DAERA)	Northern Ireland Climate Change Adaptation Programme	2019	2019-2024	DAERA	Climate Change Unit, Environmental Policy Division, Environment, Marine and Fisheries Group, Department of Agriculture, Environment and Rural Affairs (DAERA)					
MKD	Long-term strategy on climate action and action plan	2021	2050	Government of the Republic of North Macedonia,	Ministry of Environment and Spatial Planning						4th National Climate Change Communication	2023	-	UNFCCC	Ministry of Environment and Physical Planning
NOR	A changing climate – united for a climate-resilient society	2023	2028	Parliament	Norwegian Ministry of Climate and Environment						Norway's Seventh National Communication	2018	-	UNFCCC	Norwegian Ministry of Climate and Environment
POL	Polish National Strategy for Adaptation to Climate Change (NAS 2020)	2013	2020 (with an outlook to 2030)	Government	Ministry of the Environment						Eighth national communication and fifth biennial report under the United Nations Framework convention on climate change	2022	-	UNFCCC	National Centre for Emissions Management (KOBIZE)
PRT	Quadro Estratégico para a Política Climática (Strategic Framework for Climate Policy)	2015	2025	PRESIDENCY OF THE COUNCIL OF MINISTERS	Ministry of the Environment, Spatial Planning and Energy (MAOTE)	Programa de ação para a adaptação às alterações climáticas: p-3ac (action plan for climate change adaptation: p-3ac)	2019	2030	PRESIDENCY OF THE COUNCIL OF MINISTERS	Ministry of the Environment, Spatial Planning and Energy (MAOTE)	7th National Communication to the United Nations Framework Convention on Climate Change 3rd Biennial Report to the United Nations Framework Convention on Climate Change 4th National Communication in the Context of the Kyoto Protocol	2017	-	UNFCCC	Portuguese Environment Agency Climate Change Department
											8th National Communication to the United Nations Framework Convention on Climate Change 5th National Communication in the Context of the Kyoto Protocol	2022	-	UNFCCC	Portuguese Environment Agency Climate Change Department
ROU	Strategia Națională privind Adaptarea la Schimbările Climatice pentru perioada 2022-2030 cu perspectiva anului 2050 (SNASC) și a Planului Național de Acțiune pentru implementarea Strategiei Naționale privind Adaptarea la Schimbările Climatice (PNASC) (The National Strategy on Climate Change Adaptation for the period 2022-2030 with a perspective for 2050 (SNASC) and the National Action Plan for the implementation of the National Strategy on Climate Change Adaptation (PNASC))	2022	2022-2030, 2050	Government of Romania	Ministry of Environment, Water and Forests General Directorate for Impact Assessment, Pollution Control and Climate Change	Planul național de acțiune pentru implementarea Strategiei naționale privind adaptarea la schimbările climatice pentru perioada 2023-2030 (PNASC) (National Action Plan for the Implementation of the National Strategy on Climate Change Adaptation for the period 2023-2030 (NAPCCA))	2023	2023-2030	Government of Romania	Ministry of Environment, Water and Forests General Directorate for Impact Assessment, Pollution Control and Climate Change					
SCO	Scottish National Adaptation Plan 2024 – 2029 (SNAP3)	2024	2024-2029	Scottish Government	Cabinet Secretariat for Net Zero and Energy	CLIMATE READY SCOTLAND: Second Scottish Climate Change Adaptation Programme 2019-2024	2019	2019-2024	Scottish Government	Cabinet Secretariat for Net Zero and Energy					

Country	NAS					NAP					Background documents				
	Title	Date	Time horizon	Approved by	Elaborated by	Title	Date	Time horizon	Approved by	Elaborated by	Title	Date	Time horizon	Approved by	Elaborated by
SRB	Serbia's First National Adaptation Plan D R A F T	2015	not declared (presumably 220)	Ministry of Agriculture and Environmental Protection	UNDP	Climate change adaptation programme for the period 2023-2030	2023	2023-2030	Government of Serbia	Ministry of Agriculture and Environmental Protection and UNDP					
	Climate change adaptation programme for the period 2023-2030	2023	2023-2030	Government of Serbia	Ministry of Agriculture and Environmental Protection and UNDP										
SKV	Stratégia adaptácie slovenskej republiky na zmenu klímy (strategy for the adaptation of the slovak republic to climate change)	2018	2025-2031	Government	Ministry of the Environment of the Slovak Republic	Akčný plán pre implementáciu Stratégie adaptácie SR na zmenu klímy (Action Plan for the Implementation of the Slovak Republic's Climate Change Adaptation Strategy)	2021	2021-2030	Government	Ministry of Environment					
SLV	Strategic framework for climate change adaptation	2016	2050	National Assembly	Ministry of the Environment and Spatial Planning.										
ESP	Plan nacional de adaptación al cambio climático 2021-2030 (national climate change adaptation plan 2021-2030)	2020	2021-2030	Government	Ministry for the Ecological Transition and the Demographic Challenge (MITECO)	Plan nacional de adaptación al cambio climático programa de trabajo 2021-2025 (national climate change adaptation plan work program 2021-2025)	2021	2021-2025	Government	Ministry for the Ecological Transition and the Demographic Challenge (MITECO)	Seventh National Communication of Spain United Nations Framework Convention on Climate Change	2018	-	UNFCCC	Ministry of Agriculture, Fisheries, Food and Environment
SWE	Nationell strategi och regeringens handlingsplan för klimatanpassning (National Strategy and the Government's Action Plan for Climate Change Adaptation) (Skr. 2023/24:97)	2024	2030	Government	Ministry of the Environment and Energy						Sweden's third Biennial Report under the UNFCCC	2017	-	UNFCCC	Ministry of the Environment and Energy
											Sweden's Seventh National Communication on Climate Change	2017	-	UNFCCC	Ministry of the Environment and Energy
CHE	Adaptation to climate change in Switzerland	2012		Interdepartmental Committee on Climate (IDA Climate) project group	Federal Office for the Environment (FOEN)	Anpassung an den Klimawandel in der Schweiz Aktionsplan 2020–2025 (Adaptation to Climate Change in Switzerland Action Plan 2020–2025)	2020	2020-2025	Interdepartmental Committee on Climate (IDA Climate) project group	Federal Office for the Environment	Amendment to Switzerland's Seventh National Communication and Third Biennial Report under the UNFCCC	2019	-	UNFCCC	Swiss Federal Office for the Environment
											Switzerland's Seventh National Communication and Third Biennial Report under the UNFCCC	2019	-	UNFCCC	Swiss Federal Office for the Environment

Country	NAS					NAP					Background documents				
	Title	Date	Time horizon	Approved by	Elaborated by	Title	Date	Time horizon	Approved by	Elaborated by	Title	Date	Time horizon	Approved by	Elaborated by
NLD	National Climate Adaptation Strategy	2016	not declared (presumably 2030)	Government	Ministry of Infrastructure and Environment	Implementing with ambition - Implementation Programme 2018 – 2019 National Climate Adaptation Strategy (NAS) of the Netherlands	2018	2018-2019	Government	Ministry of Infrastructure and Water Management	Seventh Netherlands National Communication under the United Nations Framework Convention on Climate Change	2017	-	UNFCCC	Ministry of Economic Affairs and Climate Policy
						Deltaprogramme 2025	2025	2025	Government	Ministry of Infrastructure and Water Management Ministry of Agriculture, Fisheries, Food Security and Nature Ministry of Housing and Spatial Planning	Eighth Netherlands National Communication Under the United Nations Framework Convention on Climate Change	2022	-	UNFCCC	Ministry of Economic Affairs and Climate Policy
TUR	Climate Change Adaptation Strategy and Action Plan (2024-2030)	2024	2024-2030	Government	Ministry of Environment, Urbanization and Climate Change; Directorate of Climate Change	Climate Change Adaptation Strategy and Action Plan (2024-2030)	2024	2024-2030	Government	Ministry of Environment, Urbanization and Climate Change; Directorate of Climate Change					
WAL	Prosperity for All: A Climate Conscious Wales A climate change adaptation plan for Wales + Technical Annex	2019	2020-2025	Welsh Government	Natural Resources Wales										

Annex 3b) List of the analysed national MRE documents

Country	Monitoring reports					Evaluations					Methodological documents				
	Title	Date	Time horizon	Ordered by	Elaborated by	Title	Date	Time horizon	Ordered by	Elaborated by	Title	Date	Time horizon	Ordered by	Elaborated by
ALB						CLIMATE CHANGE STRATEGY IN ALBANIA 2020-2030, 2019-2021 Action Plan Monitoring	2022	2019-2021	Government	REC Albania, Westminster Foundation for Democracy Limited (WFD)					
						Albania's First Biennial Update Report	2021	-	UNFCCC	Ministry of Tourism and Environment					
						Albania's National Adaptation Plan First progress report March 2023	2023	2019-2023	Government	Ministry of Tourism and Environment					
AUT						Anpassung an den Klimawandel in Österreich Fortschrittsbericht	2015	2012-15	Federal Government	Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft					
						Zweiter Fortschrittsbericht zur österreichischen Strategie zur Anpassung an den Klimawandel	2021	2017-21	Federal Government	Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie					
						Austrian Assessment Report 2014 (AAR14) (Österreichischer Sachstandsbericht Klimawandel 2014)	2014	-	Federal Government	Austrian Panel on Climate Change (APCC)					
BEL						Mid-term evaluatie van het Nationale Adaptatie Plan	2019	2017-2018	Federal Government	National Climate Commission					
						Évaluation finale du plan national d'adaptation	2020	2017-2020	Federal Government	National Climate Commission					
BIH															
BRG						First official report on the implementation of the third national action plan on climate change 2013-2020	2017	2014-2016	Government	Ministry of environment and water					
CRO															
CYP															
CZE															

Country	Monitoring reports					Evaluations					Methodological documents				
	Title	Date	Time horizon	Ordered by	Elaborated by	Title	Date	Time horizon	Ordered by	Elaborated by	Title	Date	Time horizon	Ordered by	Elaborated by
DRK	Data catalog for climate adaptation Overview of existing data for use in municipal climate adaptation	2017	-	Government	The Secretariat for Terrain, Climate, and Water										
	Environmental indicators – indicators for assessing the effects of climate change	2021	-	Government	Aarhus University										
ENG						Evidence for the third UK Climate Change Risk Assessment (CCRA3) Summary for England	2022	-	Government / Climate Change Committee	Sustainability West Midlands					
						Progress in adapting to climate change 2023 Report to Parliament	2023	2018-2023	Government / Climate Change Committee	Climate Change Committee					
						UK Climate Change Risk Assessment 2022	2022	-	report	UK Government					
EST															
FIN						Adaptation to climate change in Finland Current state and future prospects	2022	-		Finnish Government					
						Evaluation of the Implementation of Finland's National Strategy for Adaptation to Climate Change 2009	2009	2005-2009	Government	Ministry of Agriculture and Forestry					
						Regional characteristics and vulnerabilities related to climate change in Finland A review as a background for the National Climate Change Adaptation Plan 2030	2023	-	report	Ministry of Agriculture and Forestry Helsinki					
						Evaluation of adaptation to climate change in Finland 2022	2022	-	Government	Prime Minister's Office					
						Climate and socioeconomic scenarios for climate change adaptation planning	2023	-	Government	Ministry of Agriculture and Forestry Helsinki					
						National risk and vulnerability assessment	2024	-	Government	Ministry of Agriculture and Forestry Helsinki					
FRA						Activity Report of the Observatory		2021-2022	report	Observatoire National sur les Effets du					

Country	Monitoring reports					Evaluations					Methodological documents				
	Title	Date	Time horizon	Ordered by	Elaborated by	Title	Date	Time horizon	Ordered by	Elaborated by	Title	Date	Time horizon	Ordered by	Elaborated by
										Réchauffement Climatique					
						Activity Report of the Observatory		2019-2020	report	Observatoire National sur les Effets du Réchauffement Climatique					
						Mid-term evaluation of the 2nd national climate change adaptation plan (2018-2021)	2022	2018-2021	report	Government of France					
DEU	Entwicklung eines Indikatorensystems für die Deutsche Anpassungsstrategie an den Klimawandel (DAS)	2011	-	Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit	German Environment Agency	Anpassung an den Klimawandel - Erste Fortschrittsbericht der Bundesregierung zur Deutschen Anpassungsstrategie an den Klimawandel (First Progress Report on the German Strategy for Adaptation to Climate Change (DAS))	2016	2008-2015	Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit	Independent evaluator team	Methodology for the evaluation of the German adaptation strategy	2017	-	Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit	German Environment Agency
	Handbuch zur Verfestigung der indikatorbasierten Berichterstattung zur Umsetzung der Deutschen Anpassungsstrategie an den Klimawandel (DAS)	2015	-	Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit	Bosch & Partner GmbH	Zweiter Fortschrittsbericht zur Deutschen Anpassungsstrategie an den Klimawandel (Second Progress Report on the German Strategy for Adaptation to Climate Change (DAS))	2019	2015-2019	Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit	Independent evaluator team					
	Monitoringbericht 2023 zur Deutschen Anpassungsstrategie an den Klimawandel Bericht der Interministeriellen Arbeitsgruppe Anpassungsstrategie der Bundesregierung	2023	-	Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit	German Environment Agency	2023 Monitoring Report on the German Strategy for Adaptation to Climate Change	2023	2019-2023	Interministerial Working Group on Adaptation to Climate Change	Independent evaluator team					
GRC															
ISL						Lofslagsbreytingar og áhrif þeirra á íslandi skýrsla vísindanefndar um loftslagsbreytingar (Climate Change and Its Effects in Iceland Report of the Scientific Committee on Climate Change)	2018	-	Government	Icelandic Meteorological Office					
HUN	Climate Change and Adaptation – Establishing the National Adaptation Geo-Information System (NAGIS). An effective tool to provide the right answers. HU04 – Programme for adaptation and climate change. EEA-CT11-1 project.	2016	-	-	Hungarian Mining and Geological Institute	Mid-term Evaluation report on the Implementation of the NCCS-2 and its Action Plans	2023	2018-23	Ministry of Energy	National Adaptation Centre	Proposal for a system concept directly basing the establishment and starting of operation of the hungarian climate policy monitoring, reporting and evaluation system (KIMER)	2020	-	Ministry of Energy	National Adaptation Centre

Country	Monitoring reports					Evaluations					Methodological documents				
	Title	Date	Time horizon	Ordered by	Elaborated by	Title	Date	Time horizon	Ordered by	Elaborated by	Title	Date	Time horizon	Ordered by	Elaborated by
						Evaluation of developments and central measures implemented to support adaptation to the impacts of climate change	2020	2014-20	Chancellery	Trenecon Kft.					
IRL	Policy Coherence in Adaptation Studies: Selecting and Using Indicators of Climate Resilience	2018	-	report	Environmental protection agency	Review of the National Adaptation Framework	2022	2018-2022	Government	Department of Environment, Climate and Communications					
						annual review 2021	2021	2021	Government	Climate Change Advisory Council					
ITA						Rapporto sullo stato delle conoscenze scientifiche su impatti, vulnerabilità ed adattamento ai cambiamenti climatici in Italia (Report on the state of scientific knowledge on impacts, vulnerabilities, and adaptation to climate change in Italy)	2014	-	Government	Ministry of the Environment and Protection of Land and Sea.					
						Piano nazionale di adattamento ai cambiamenti climatici allegato iii impatti e vulnerabilità settoriali (national plan for adaptation to climate change annex iii sectoral impacts and vulnerabilities)	2018	-	Government	Ministry of the Environment and Protection of Land and Sea.					
KOS															
LTV						Climate change scenarios for latvia report summary	2017	-	report	Latvian Environment, Geology and Meteorology Centre					
LTU						Lithuanian Economic Sector Analysis on the Implementation and Update of the Goals and Objectives of the National Climate Change Management Policy Strategy for the Period from 2021 Service Report	2019	-	Ministry of Environment	Smart Continent SC					
LUX															
MLT															
MON															
NIR						Northern Ireland Climate Change Adaptation Programme 2019 - 2024 Mid Programme Progress Review 2022	2022	2019-2022	DAERA	Climate Change and Green Growth Policy Division Department of Agriculture, Environment and Rural Affairs (DAERA)					
						Adapting to climate change Progress in Northern Ireland	2023	2023	Government	Climate Change Committee					

Country	Monitoring reports					Evaluations					Methodological documents				
	Title	Date	Time horizon	Ordered by	Elaborated by	Title	Date	Time horizon	Ordered by	Elaborated by	Title	Date	Time horizon	Ordered by	Elaborated by
						Evaluation of the first Northern Ireland Climate Change Adaptation Programme (NICCAP 1),	2019	2014-19	Government	Climate Change Committee					
						Evidence for the third UK Climate Change Risk Assessment (CCRA3) Summary for Northern Ireland	2023	-	report	Climate Northern Ireland					
MKD															
NOR						Study on the consequences for Norway of climate change in other countries (Utrødning om konsekvenser for Norge av klimaendringer i andre land)	2018	-	Ministry of Climate and Environment	Norwegian Environment Agency					
						Norway's first adaptation communication	2018	2010-2017	Government	Ministry of Climate and Environment					
POL															
PRT						Progress Report on the National Strategy for Climate Change Adaptation	2013	2010-2013	Ministry of the Environment, Spatial Planning and Energy (MAOTE)	Portuguese Environment Agency Department of Climate Change/Adaptation and Monitoring Division					
						National climate change adaptation planning and strategies	2021		European Commission / EEA	Ministry of the Environment, Spatial Planning and Energy (MAOTE)					
						National climate change adaptation planning and strategies	2023		European Commission / EEA	Ministry of the Environment, Spatial Planning and Energy (MAOTE)					
ROU															
SCO	Developing Indicators of Climate Change Adaptation for Scotland: A summary of the ClimateXChange adaptation indicator framework	2020	-	ClimateXChange	Anna Moss, University of Dundee and Suzanne Martin, RBGE.	Evidence for the third UK Climate Change Risk Assessment (CCRA3) Summary for Scotland	2022	-	UK Government	Ministry for Environment, Climate Change and Land Reform					
						Scottish climate change adaptation programme: progress report 2022 Third annual progress report on the "Climate Ready Scotland: Scotland's Climate Change Adaptation Programme 2019 to 2024"	2022	2022	Scottish Government	Ministry for Environment, Climate Change and Land Reform					

Country	Monitoring reports					Evaluations					Methodological documents				
	Title	Date	Time horizon	Ordered by	Elaborated by	Title	Date	Time horizon	Ordered by	Elaborated by	Title	Date	Time horizon	Ordered by	Elaborated by
						Final assessment: The first Scottish Climate Change Adaptation Programme	2019	2016-2019	Committee on Climate Change	Ministry for Environment, Climate Change and Land Reform					
						Scottish climate change adaptation programme: progress report 2023-24 Fifth annual progress report on the "Climate Ready Scotland: Scotland's Climate Change Adaptation Programme 2019 to 2024"	2024	2024	Scottish Government	Ministry for Environment, Climate Change and Land Reform					
						Scottish climate change adaptation programme: progress report 2023 Fourth annual progress report on the "Climate Ready Scotland: Scotland's Climate Change Adaptation Programme 2019 to 2024"	2023	2023	Scottish Government	Ministry for Environment, Climate Change and Land Reform					
SRB															
SKV						Revision and update of the national strategy on adaptation to climate change in Slovakia Deliverable 2.2: Report on the state of play of the climate adaptation policies and governance framework and proposal for a stakeholder engagement plan - Final Report	2024	2018-2024	Ministry of Environment of Slovakia	Trinomics and KRI					
SLV															
ESP	National plan for climate change adaptation v 2018-2020 monitoring report	2021	2018-2020	Government	Ministerio para la Transición Ecológica y el Reto Demográfico	Evaluation report of the Spanish national climate change adaptation plan	2019	2006-19	Government	Ministerio para la Transición Ecológica y el Reto Demográfico					
SWE						The first report from the National Expert Council for Climate Adaptation	2022	2018-2022	Government	National Expert Council for Climate Adaptation					
CHE	Anpassung an den Klimawandel in der Schweiz: Screening der Forschungs- und Umsetzungsaktivitäten sowie bestehender Monitoringsysteme	2015	-	Bundesamt für Umwelt (BAFU)	ProClim-Forum for Climate and Global Change	Climate change in Switzerland Indicators of driving forces, impact and response	2013	-	responsible ministry	FOEN					
	Climate change in Switzerland Indicators of driving forces, impact and response	2020		responsible ministry	FOEN	Evaluation of the Strategy for Adapting to Climate Change: Module A Final Report on behalf of the Federal Office for the Environment (FOEN)	2017	2012-2017	FOEN	Interface Politikstudien Forschung Beratung, Luzern					

Country	Monitoring reports					Evaluations					Methodological documents				
	Title	Date	Time horizon	Ordered by	Elaborated by	Title	Date	Time horizon	Ordered by	Elaborated by	Title	Date	Time horizon	Ordered by	Elaborated by
NRL	Navigeren naar een klimaatbestendig nederland (navigating towards a climate-resilient netherlands)	2021	-	report	Netherlands Environmental Assessment Agency	Aanbevelingen voor versnelde uitvoering van de Nationale klimaatadaptatiestrategie (Recommendations for accelerated implementation of the National Climate Adaptation Strategy)	2022	-	technical report	Ministry of Infrastructure and Water Management					
						Nationaal perspectief klimaatadaptatie Groeiende opgave in een snel veranderende omgeving	2020	2017-2019		Ministry of Infrastructure and Water Management					
TUR															
WAL	Prosperity for All: A Climate Conscious Wales A climate change adaptation plan for Wales; Monitoring and Evaluation Framework	2020	-	Welsh Government	Natural Resources Wales	Adapting to climate change Progress in Wales	2023	-	Welsh Government	Climate Change Committee					
						Prosperity for All: A Climate Conscious Wales Progress Report December 2022	2022	2019-2022	Welsh Government	Natural Resources Wales					
						Evidence for the third UK Climate Change Risk Assessment (CCRA3) Summary for Wales	2023	-	report	Netherwood Sustainable Futures					

Annex 4 – Best practices of adaptation planning and MRE’s spatial performances by European macro regions

Annex 4a) Western Europe – excellent results in MRE; spatial development objective-coherence and international spatial dimensions

Western-European countries showed summarily the best performances in our analysis. The final ranking of spatial sensitivity of climate policy planning and MRE comprises westerners in the first 7 positions. These countries basically perform well in the MRE-related aspects, show very strong coherence with both European and their own national level spatial policy objectives, and international spatial aspects are also strong in their policy approach. Four of them (Austria, the Netherlands, Germany, Scotland) is worth even for a detailed introduction. Switzerland shows very similar features to Austria and Germany, while England to Scotland. At the same time, France is the mixture of the others, so due to limitations of the dissertation’s extent, we concentrate only to the first four countries.

Austria – generally good performance in each aspect as a federal state

Austria has almost the whole spectrum of national level adaptation policy documents [national strategy (NAS), action plan (NAP), climate change risk and vulnerability assessments (CCRA, CVA)] exists in the country. Furthermore, beyond the national documents there are also regional adaptation strategies (RAPs) for special regions/spatial units, being also part of the canon. All nine federal states view climate change adaptation as part of an integrated climate protection policy and all of them has their Land-specific adaptation strategies. These latter ones are partly strategies, partly action plans supporting adaptation. Due to the responsibilities such as spatial planning, nature conservation and civil protection, regions (Länders, nine in total) have different adaptation strategies and plans, related to the respective priorities. Austria’s NAS Chapter 4 (Activities and implementation of the NAS) mentions 2 main levels in 3 dedicated subchapters (one about activities of the national, state level; one about activities of the province level and one about joint activities of the two levels). Regional focus is everywhere. The national portal “klimawandelanpassung.at” even offers an overview of adaptation activities in the federal states. KLAR! Regions also were launched in 2016, as a model project in 89 Austrian regions to mitigate regional damage caused by climate impacts and to exploit resulting opportunities, led by KLAR managers promoting adaptation to the consequences of climate change. Moreover, in some sectors (agriculture, forestry and water) adaptation strategies were elaborated, mostly within ministries in charge of these themes.

Considering the space phraseology of the document, Austria with more than 800 mentionings in its NAS and NAP document is uniformly strong in using each concept. In the NAS, 3-3 map and regional diagrams emerge. Beyond this, as another spatial emphasis, Austria made some short mentionings about its own Alpine area location within Europe in some parts of the NAS (the Introduction and the Research chapters). Moreover, spatial planning’s role is also underlined: Austria’s NAS in its Chapter 5 introduces impacts of climate change through 13 field-like subchapters and one of them is Raumordnung [spatial (physical) planning].

As for the spatial content of the whole objective system, the overall objective in Austria’s NAS is general but mentions the levels of “Bund” und “Ländern”. The strategic objective level is basically thematic, going through 6 thematic paragraphs (quasi specific objectives) and 15 thematic (sectoral) fields, only the latter contain 1 settlement/settlement network element-related and one spatial planning related sectoral field. Only 1-2 lower-level objectives focus on given territorial unit / regional type or generally deals with spatial differences/structures even in their title.

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A dedicated main chapter to spatial levels in the Austrian NAS. Source: Austrian NAS, 2025.

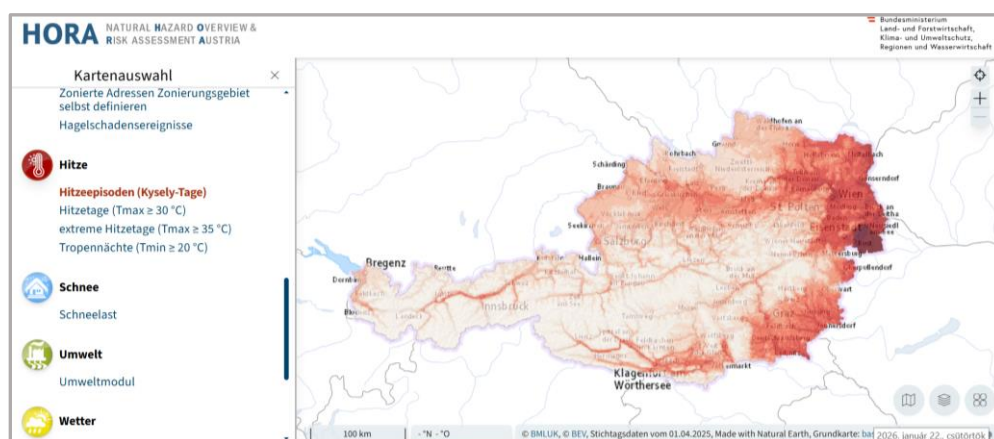
In the NAP part of the strategy proportion of measures with spatial content is quite high: more than 40% of measures (exactly 45,16 %) show spatial characteristics. In the aspect of “proportion of spatial planning-related measures”, Austria is again in the best category, composed only by itself, where more than 10% of the NAP measures are dealing with spatial planning.

The international content is also strong in the NAS. As for the “emergence of geographically climate related risks” Austria’s NAS subchapter 6.5."Security policy dimensions of climate change" deals directly, nominally with these issues and talks about regionally different worldwide challenges and global climate risks in general. Chapter 11 "Globaler Kontext" is a special, dedicated chapter to international risks mentioning that globally vulnerable populations and countries in the global South (South Asia, South America, small island states, majority of sub-Saharan Africa), in the Arctic and Central America have special challenges, insufficient financing options, and spatially determined greater vulnerability. Subchapter 11.4. about the climate change-related natural resource vulnerability, several times mentions the affectedness of the global South. The emergence of strengthening macro regional / international co-operations shows strong signs in NAS, too. Austria uses explicit reference for these issues in the document in the description of objectives/measures’ or in title of several individual measures or in the situation analysis’ texts.

The existing adaptation MRE system concentrates mostly on existing hazards, such as hail, wind/storm, flood (30, 100, 300-year events), etc. Spatial differences in the effectiveness of climate actions emerges only partly. MRE systems even have applied indicator sets in adaptation, collected and organised by the Ministry in charge of adaptation and the Environment Agency Austria. Indicators are from partly all spatial levels, depending on the hazard and territory. They consist of indices measuring changes in climate, loss and damage, changes over time (e.g. tree species changes, changes in pests, etc.).

Regarding adaptation evaluations, stakeholder workshops and indicators/criteria were combined that provide a picture of the progress in adaptation and its implementation over time. The spatial levels of evaluations are national and subnational, partly with municipal examples. The degree of spatial content in adaptation evaluations is beyond average, too. Serious evaluation background has been built up during the last decade in the field of adaptation, though spatial products are explicitly lacking. National documents, like the Climate Status Report contain spatial elements. Existing evaluation products and monitoring reports show only scarce use of geographically oriented maps or diagrams or info graphs (but at least a modest number of these emerge in the documents).

As for adaptation-oriented decision supporting, in Austria among the several knowledge-collector and climate data-oriented websites HORA can be particularly mentioned as one of the best practices (the NAS also introduces it). The project was initiated in 2002, following the severe flood events of recent decades, aiming at setting up a nationwide risk zoning system for natural hazards with a special focus on floods. In 2011, the platform was updated and expanded with a new version of the digital application (hora.gv.at), offering all citizens the possibility to obtain a first-hand risk assessment for various natural hazards and weather events (such as flooding, earthquakes, storms, hail, lightning, and snow load). Its visualization of hazardous areas serves as an important basis for the optimization and prioritization efforts of municipalities, states, and the federal government in flood protection and spatial planning¹²⁶.



Heatwave episodes displayed in one of HORA's thematic maps. Source: hora.gv.at

Territorial cohesion concepts and sub-concepts are also present in the NAS. The vision and the objective system's text mention 5 out of the 6 concepts: social (actually strongly territorial) cohesion, territorial integration, territorial optimum, multilevel governance and place-based approach appear implicitly in recurrent form throughout the NAS.

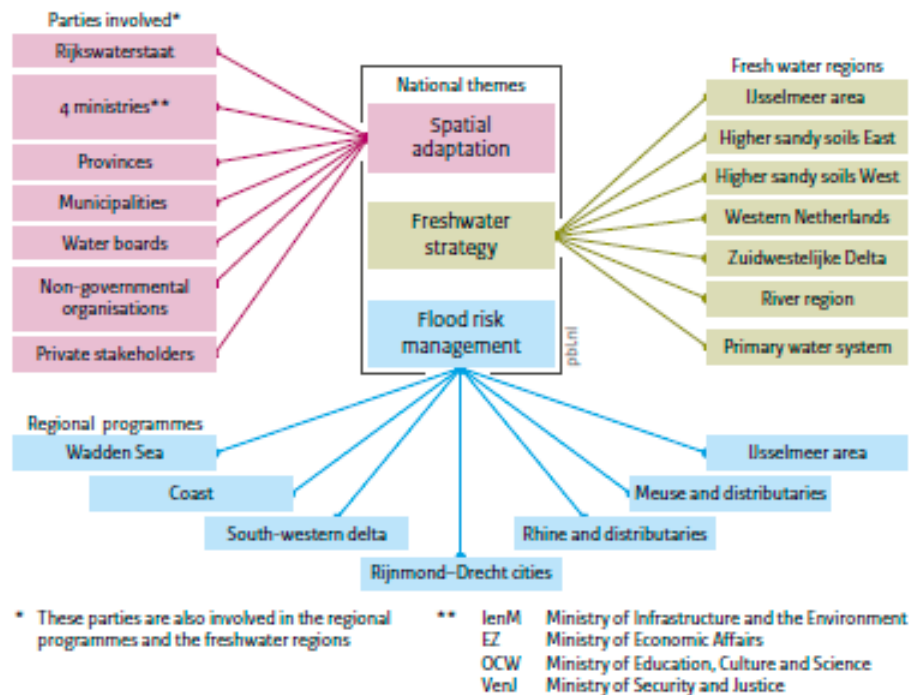
The Netherlands – regional level planning and MRE best practice

The Netherlands are one of the most exciting examples of analysis with its spatial adaptation programme and several spatial decision support systems. In the country, mitigation and adaptation pillars of climate policy are strongly separated institutionally. The legal basis for climate protection objectives is provided by the Climate Act adopted in 2019. The National Adaptation Strategy (NAS) describes the main climate risks the Netherlands facing and sets the course for addressing these risks. The first NAS was adopted in 2007 and the current, second one in 2016, with a NAP for 2018-19. The NAS and its NAP cover all aspects of adaptation policy, aim at raising awareness and promoting conscious action. Using a visual approach, the NAS uses four diagrams

¹²⁶ In addition, current weather warnings for floods, hail and heavy rainfall, earthquakes, etc., are also available (HORA-APP for smart phones, making an estimation of risk potential even easier) (AUSTRIAN NAS, 2024).

(heat/humidity/drought/sea level rise) to describe the nine sectors examined (water management and spatial planning; nature conservation and agriculture; horticulture and fisheries; health and welfare; recreation and tourism; transport infrastructure; energy; IT and telecommunications; public safety and the built environment). The structure of the strategy is based on the different adverse effects of climate change, six of which are considered to be particularly important and relevant¹²⁷ (NAS, 2016).

Under the NAS, actions have been identified in the form of the NAS Implementation Programme. This Programme is the NAS's operational programme currently. It identified measures for 2018-19 and concerns activities that are supplementary to the Delta Programme. The Program also sets the goal of preparing annual internal reports on the implementation of the interventions identified in the program¹²⁸.



Structure of the Delta Programme. Source: PBL, 2016.

Moreover, there is the Delta Programme for a special territory and 3 special topics. It is an essential national adaptation initiative and document, targeting the Ems-Meuse-Rhein-Scheldt delta area, focusing on flood protection, water supply provision and climate resilient spatial planning, with a vision of a region with climate-safe and resilient water systems by 2050, which can withstand the negative effects of increasingly frequent and intense weather extremes. Its activities are coordinated as supplementary elements of the NAS. The NAS and the Delta Programme will join forces where topics or networks overlap. The Plan is one of Europe's best examples of (functional) territory-oriented adaptation plans/implementation frameworks. As it is collective plan of the municipalities, district water boards, provinces and the central government (representing a real multi-level approach), the Programme runs under the joint ownership of the central government, the regions, water management bodies, local authorities, enterprises and NGOs. The Delta Programme 2015 (and its successors) contained five Delta Decisions and preferential strategies for each of the topics and

¹²⁷ These are heat stress caused by high temperatures; more frequent damage to basic network infrastructure (energy, telecommunications, transport); a drastic decline in average crop yields; difficulties in adapting natural wildlife to changing climate zones; increasing burdens caused by the spread of infectious and allergenic diseases; and crises spreading to other areas as a result of negative impacts on individual sectors (DUTCH NAS, 2016).

¹²⁸ Strong role of the municipalities and regions can be observed in flood or rainwater inundation protection. Municipal authorities and water management authorities are jointly responsible for reducing the risk of flooding (DUTCH NAP, 2018).

regions. Its spatial planning measures to mitigate the impact of water problems, heat stress, drought and flooding. It even puts emphasis on monitoring, reporting and evaluating the Delta decisions and the related strategies and the actions addressed in its three Delta Plans¹²⁹. An updated version of the Programme arrived in 2021). Since the Programme came into force, the related plans (Delta Plan) have been published annually.

The two projects (Delta and NAS) have been complementing each other since 2017. The NAS in various ways includes the production of the Delta Plan for Spatial Adaptation. However, it focuses primarily on sectors, supply chains, themes and climate risks that are not addressed in the Delta Programme or the Delta Plan for Spatial Adaptation, while additionally covering a number of themes that are parts of the Delta Programme. The Delta Programme in itself is the manifestation of a region (estuary area) oriented adaptation planning and activities.

Besides this spatial adaptation pilot activity, sectoral adaptation is strong¹³⁰: the relevant sectors' adaptation capacity is high, and measures have been incorporated into policy and implementation programmes. For this reason, the NAS does not devote special attention to aspects such as water management and flood safety in the urban area. Several sectoral action programs are put up under the NAS, partly based in the NAS implementation programme 2018-2019¹³¹.

The NAS especially emphasises the role and tasks of different spatial levels (e.g., provincial and municipal authorities). NAS specific objective 5's subgoal 2 says that Central government works alongside provincial and municipal authorities on spatial projects and programmes in all regions. The NAS itself also says that the government invites local and provincial authorities, private sector companies, water authorities and societal organizations to contribute to its implementation.

Based on the Delta Programme on Spatial Adaptation, national, regional and local risk dialogues were held as a follow up to stress tests, addressing given area's vulnerabilities to waterlogging, heat stress, drought, and flood risks. Local authorities are encouraged to devote attention to heat stress as part of a local climate scan. As a follow-up to the stress test Risk Dialogues are held with all stakeholders to evaluate the outcome of the risk analysis and to see which measures needs to be taken. Even the NAP is actively urging multilevel governance. NAP Chapter #3 (Ambitions and approach) introduces tasks of different spatial levels. NAP priority #4 emphasizes collaboration between provincial authorities.

In NAS 2016, the central government asked provincial authorities to take the lead in drawing up regional climate adaptation strategies. The Implementation Programme also supports the regional climate adaptation strategies and implementation plans, with due attention to the role of provincial authorities and partnerships in ensuring the manageability of climate risks¹³². The approaches of the provincial authorities of North

¹²⁹ Out of these, the Delta Plan for Spatial Adaptation (on how the various parties are to pursue the objectives of the Delta Decision on Spatial Adaptation, establishing the instruments and measures required to achieve the intended transition) directly deals with spatial issues and has defined seven ambitions: 1. Identifying vulnerabilities; 2. Conducting a risk dialogue and preparing a strategy; 3. Drawing up an implementation agenda; 4. Utilizing opportunities for synergy; 5. Encouraging and facilitating; 6. Regulating and assuring; 7. Taking action in the event of calamities (DUTCH NAS, 2016).

¹³⁰ Climate adaptation is an integral component of the Brabant Health Deal. The programme partners include the Province of Noord-Brabant, the five largest cities in the region including Eindhoven and Breda, water management authorities, municipal health departments, the National Institute for Public Health and the Environment, Utrecht University, the University of Tilburg and its Centre for Sustainable Development, Telos (DUTCH NAS, 2016).

¹³¹ Such as the Action Program Nature (2021), the Action Program Climate and Built Environment (2020), the Action Program Climate Adaptive Agriculture (2020), the Knowledge Agenda Climate Change and Health (2019), LIFE-IP NASCELERATE (2022-2027), the Implementation Agenda Climate Resilient Networks (2021), and the National approach climate adaptive built environment (2022-2024) (DUTCH NAS, 2016).

¹³² They have a statutory role (fulfilling their responsibility for policy making in such domains as infrastructure and nature conservation), they take the lead in various processes (encouraging a broad-based approach focusing on all sectors

Brabant, Gelderland, South Holland and Overijssel are good examples: they vary widely but are all inspiring in their own way.

In adaptation policy the Rijkswaterstaat carries out monitoring activities related to drinking water bases, PBL to climate adaptation issues, and the latter also coordinates the monitoring system related to the indicators of the adaptation strategy (NAS). As for plans to set up a comprehensive adaptation MRE system, specific objective #6 of the NAS says that the Ministry of Infrastructure and the Environment, assisted by the knowledge institutes, is to implement a basic monitoring system which allows central government, provincial authorities, local authorities, water management and other stakeholders to monitor climate adaptation progress. The intention is not to create an entirely new monitoring system but to adapt existing methodologies. NAP priority #5 also urges the monitoring of NAP implementation. The system essentially builds on the results and methodology of previously established monitoring systems, e.g. an MRE system has already been established in connection with the Delta Programme. It is based on the Measure, Know, Act (MWH) principle-triangle and the impact-and-risk assessments used by the PBL based on the best practices developed by provincial and local authorities. Several actors are involved in the monitoring activity, including the national government, provincial and local authorities, water management and other bodies (NAS, 2016). The adaptation monitoring activity is financed from the budget of Rijkswaterstaat – in addition to the budget of the regional water authorities. In addition, the Delta Decisions and Preferential Strategies are subjected to a systematic review every six years. The result of the first six-year review was presented in the Delta Programme 2021.

The NAS Implementation Report 2017-19 also introduces the Dutch MRE logic. According to this, climate adaptation MRE includes three components: 1) process monitoring of the agreed activities of the Implementation Programme; 2) output monitoring of climate risks (which are visualized in the NAS bubble diagrams); 3) outcome monitoring of actions and measures to promote climate resilience. The Delta Programme (DP) plays also an important role in monitoring of climate adaptation via its subprogramme “Monitoring, Analysing, Acting”¹³³. In 2024 and 2022 one-one spatial adaptation reports were published, but these are lacking maps - however, does have provincial subchapters. Within the Delta Programme on Spatial Adaptation, a Dutch Urban climate adaptation MRE system is also planned to be set up. Altogether,

and parties involved), and they also fulfil a supervisory role. Provincial authorities can also act as a catalyst for municipalities that are not yet working on climate adaptation (DUTCH NAP, 2018).

¹³³ This programme focuses on the questions whether the implementation of the DP is on schedule and within budget (output), is achieving the set goals (outcome), is addressing the tasks in an integrated manner, and takes place with participation of other parties (authorities, companies, NGO's and citizens). The system aims to implement a “reflexive monitoring and evaluation”, particularly in relation to 3 themes (flood protection, drinking water supply, spatial planning) and 2 regions (Rhine-Meuse delta; IJsselmeer region), where the stakeholders involved jointly check the results of the monitoring and comment on the changes that have occurred, comparing them with the objectives, discussing any necessary changes in the management of the program. It builds upon the traditional contexts-objectives-input-output-outcome logic, going through the entire planning-implementation-feedback chain, concentrating both on effectiveness and efficiency (DUTCH NAP, 2018).

several databases are operating in the country.¹³⁴ Local and regional monitoring activities are also vivid¹³⁵.

Indicators were developed for sectors and climate impacts that are not addressed by the Delta Programme. The Netherlands Environmental Agency (PBL) published a preliminary design for monitoring of adaptation already in 2015. NAP priority #5 says that a number of key indicators must be defined to enable measurement of progress in risk reduction, in coordination with the Delta Plan for Spatial Adaptation."

The Dutch Environmental Agency (PBL) actually started the work on structural monitoring and evaluation system for climate adaptation at national level. The first step was the assessment of the risks, impacts and vulnerabilities to climate change. Based on the assessments, PBL will design the Monitoring & Evaluation system as an integrated part of the policy cycle on climate adaptation, to follow the efficiency of policies, improvement of future policies, and assessing the extent to which implemented adaptation policies and measures reduced climate risks, impacts and vulnerabilities. Stakeholders will be involved in setting up the system. However, no words of spatial aspects can be detected.

Several adaptation-oriented GIS-based or decision supporting sites operate in the country.

- The Climate Impact Atlas (<https://www.klimaateffectatlas.nl/en>) has already been mentioned by the NAS and is updated regularly. It disseminates knowledge and best practices in adaptation, provides an initial impression of the (future) threats of flooding, waterlogging, drought and heat. It has a zoom function and includes several indicators for each threat. Several map layers are available for each of the topics. The Atlas is based on national data and is among others connected to the KNMI's 14-scenarios. Use of the atlas is free. One of the portal's key features is the digital versions of the diagrams presented by the NAS. It is very similar, regarding its logic, to the Hungarian NAGiS, being an excellent tool, containing a lot of explanations and rich map content.
- The Climate Damage Atlas (climatedamageatlas.com) is similar to the previous tool, only concentrates on damages (urban flooding, coastal flooding, heat waves, droughts)
- The Dutch Adaptation Portal (<https://klimaatadaptatienederland.nl/en>) is a knowledge-gathering site in climate adaptation. NAP priority #5 targeted its establishment. The central government, provincial, municipal and water authorities and other parties use this workspace to monitor their progress

¹³⁴ The Dutch meteorological institute, KNMI (Royal Netherlands Meteorological Institute), is legally obliged to provide observations on atmospheric, oceanic and terrestrial indicators; this includes data on expected extreme weather conditions. The national agency Rijkswaterstaat provides online information on water levels along the coast and in the main rivers and predicts these six hours before they occur. Monitoring extreme climate events is a responsibility of the KNMI. KNMI also provides a National database with Observation with regard to Climate Change. This includes an overview of national observations about temperature, precipitation, sea level, wind and storm, hail and thunder, clouds and solar radiation, evaporation and drought. These national observations are compared with the observations of the IPCC. The knowledge portal "Greenblue Networks" contains a database with results of research on the effectivity of climate adaptation measures, as well as examples of implemented measures. The Association of insurers developed the "Climate monitor", which shows the amount of damage caused by weather extremes in recent years. The platform "Waarstaatjegemeente.nl" collects and presents figures for Dutch municipalities on important policy areas, such as sustainable environment. Although not explicitly meant for climate adaptation, useful information can be found (i.e. the number of trees and the surface area of paved gardens) (DUTCH NAS, 2016).

¹³⁵ Special examples: In the region South-Netherlands, different governmental bodies are cooperating on a monitor to create more insight in the progress of climate adaptation programs. This monitor is also meant to provide a basis for evaluation and adjustment of the Implementation programme South-Netherlands. The province of Utrecht intends to develop a monitoring system for climate adaptation, in cooperation with regions and knowledge institutes (DUTCH NAS, 2016).

climate adaptation. In the medium to long term, it may provide guidance even for monitoring activities (LAUDIEN ET AL., 2019).

- The Climate Proof Together Platform (Platform Samen Klimaatbestendig) was set up under the Delta Plan for Spatial Adaptation for the purpose of sharing experiential knowledge.

Adaptation evaluation processes in the Netherlands are fundamentally based on the traditional context-objectives-input-output-outcome system, which forms the basis of internal dynamics and runs through the entire planning-implementation chain. According to the NAS regular progress reports are issued in the Netherlands about the NAS. Based on these, if necessary, a revised and updated version of the strategy can also be produced. In the Delta Program evaluation system, the logical chain is concentrating on effectiveness (achievement of requirements set analysing the way the results resulting from the interventions regarding social and environmental problems) and efficiency (appropriateness of resource use by assessing the consequences of the responses and inputs taken to meet the policy objectives, measured by various indicators).

In 2020 The National Perspectief klimaatadaptatie - Groeinde opgave in een snel veranderde omgeving " document was published, as a Report about the NAS implementation 2017-19. The document dealt with implementation processes and does not show any special emphasis on spatiality, only scattered references when it goes through the NAS' and NAP's preferential sectors (agriculture, nature, critical infrastructure, physical environment, regional planning insurances)¹³⁶. The document contains two spatial-like info graphs: one for main climate effect, one for heat stress in cities. Its NAS-based climate impact-table mentions areas with insufficient water supplies, the Delta-territory and the spatial cross-effects of climate change. Regional planning, process of National Heat Plan implementation and Local Heat Plan elaborations gets bigger emphasis in more points of the document. In the report Bulb diagrams are included from the NAS/NAP. These are visualizations of the consequences of climate change, as identified in the first national climate risk analysis and assessment of 2015. Provinces and regions use these bulb diagrams, too, via a tool when preparing adaptation or risk dialogues and when creating regional adaptation strategies. The tool is used frequently: about 40 to 50 times a week.

The National Adaptation Strategy was evaluated in 2022. The Evaluatie NAS (Anbevelingen voor versnelde uitvoering van de NAS) document does not reflect any special spatial logic, only scattered references¹³⁷. MRE is continuously urged, even in sectors, but without spatial hints. Each year the Delta Programme reports on the implementation of its decisions and strategies (Delta Plan on Flood Risk Management; Delta Plan on Fresh Water Supply; Delta Plan on Spatial Adaptation). A Summary Report is prepared annually for the parliament on the progress of the Delta Programme and the implementation of the measures taking place within its framework. Delta Programme reports have sometimes provincial subchapters.

¹³⁶ In connection with agriculture climate policy says that "Examples of additional impulses are 1) Strengthening regional cooperation, aimed at taking overarching climate adaptation measures; 2) Extra efforts on the Delta Plan for Agricultural Water Management (DAW) to gain knowledge about sharing climate adaptation with farmers"; 3) Nature point mentions South Holland province, critical infra point that "The spatial planning aspects of the climate effects mean that the Dutch infrastructure will only be made climate-proof if RWS and ProRail tackle this in collaboration with all other owners and managers of infrastructure, interested parties" (DUTCH NAS IMPLEMENTATION REPORT, 2020).

¹³⁷ In its Introduction it mentioned that "Although global warming offers opportunities for tourism and recreation, it mainly has negative consequences, including for flood safety, spatial planning, agriculture, nature and public health." The result of evaluation is that the implementation of the NAS must be continued, but that the policy must indeed be intensified in order to reduce the 'adaptation gap' between policy and task. To achieve this three recommendations have been made: 1. Setting concrete goals, gaining more insight into progress and effectiveness; 2. More control and coordination, more implementation power; 3. More attention to the consequences of climate change for people, culture and nature (DUTCH NAS EVALUATION, 2022).

In the country, the traditional Dutch way can be highlighted in the fields of strategic planning and MRE, i.e. the pursuit of consensus between different professional and political trends, during the drafting of the documents. They also strive to ensure that the participation of the parties involved in the process continues during the implementation, since the sectors responsible for the individual measures will be the same as those who participated in the development. These involvements and consensus seeking permeate all spatial levels and support the involvement of regional/local knowledge/interest.

Germany – systematic approach to adaptation MRE

Climate adaptation in Germany is a long-term endeavour that is guided by a politically agreed legal, institutional and methodological framework, involving all sectoral policies and therefore every federal ministry (GERMAN NAS, 2024). Similarly to Austria, in Germany the whole spectrum of adaptation planning and MRE documents exist at national level: Climate Law (KAnG, *Klimaanpassungsgesetz*), National Adaptation Strategy (DAS, *Deutsche Anpassungsstrategie*), National Adaptation Plan (APA, *Aktionsplan Anpassung*), climate change risk assessment (KWRA, *Klimawirkungs- und Risikoanalyse*) and the Monitoring Report. Furthermore, all federal states (*Länder*) have their own adaptation strategies, some even have risk assessments and monitoring reports, some also have climate adaptation acts. In some sectors sectoral adaptation plans (SAPs) are also applied (agriculture, forestry, health, transport), additional to the cross sectoral national adaptation documents mentioned above.

In December 2023, the first Federal Climate Adaptation Act (*Klimaanpassungsgesetz*, KAnG) was adopted in Germany, establishing a binding framework for climate adaptation at different spatial levels. The Act requires the Federal Government, federal states and municipalities to address the impacts of climate change and identify adaptation measures (GERMAN NAS, 2024).

As for the logic in adaptation, sectoral approach is prevailing with some spatial information (cross sectoral national assessments also include spatial information in the form of maps). Our interviewee personally also prefers sectoral information at the different spatial levels (national, regional, local). According to Inke Schauser, Germany has a federal structure, so spatial analysis are difficult, spatial issues are mostly present in the climate risk assessment. At the provincial level, the coordination of adaptation activities is the responsibility of the regional governments, even a committee was established to channel regional aspects into the federal state level planning (Standing Committee for Adaptation to Climate Change Impacts). The Conference of Environmental Ministers was established in June 2009 to coordinate adaptation activities in the provinces. The local level plays also an important role, e.g. in the implementation of the NAS, ensuring that subsidiarity is upheld.

Similarly to the Netherlands, mitigation and adaptation policies form separate subsystems, with each area having its own institutional framework. In addition to the country's climate protection plan, a federal adaptation strategy (German Adaptation Strategy – DAS) was also adopted in 2008, reviewing the potential risks and opportunities in 15 areas and laying down the main principles of climate adaptation. Thirteen of these areas¹³⁸ are classic sectors; while two are horizontal themes (spatial development and planning; civil protection). Based on the aspects of the strategy, action plans containing the operational details of the implementation of adaptation are prepared every five years (the first was adopted in 2011).

The DAS creates the frameworks of the adaptation to climate change impacts, orienting the stakeholders. The new strategy builds on the broad scientific foundations of the 2008 German Strategy for Adaptation (GERMAN NAS, 2024). Functions of the NAS

¹³⁸ These are human health; construction; water management; coastal and marine protection; soil protection; biodiversity; agriculture; forestry; fisheries; energy; financial services; transport, transport infrastructure; trade, industry and tourism (GERMAN NAS, 2024).

comprises identification and specification of possible long-term climate consequences for Germany and its regions; naming and communicating dangers and risks; quantifying and making transparent the probabilities of occurrence and damage potential as well as the uncertainties of climate impacts; sensitize stakeholders; providing basis for decision-making; showing options for action; formulate and implement measures with clear responsibilities. The action plan under the DAS underpins those directions mentioned in DAS focusing on actions with specific federal activities in the coming years.

The concrete spatial content in the DAS is not so much but references to general importance of the spatial approach emerge in several points of the strategy. E.g.: the Executive Summary says that "This basis can be used to assess the consequences for sectors and regions and to derive the need for action." It also mentions different spatial levels' role in MRE. Chapter 1 (Ziele und Rahmen) underlines that states must develop, implement and regularly update national and, if necessary, regional programs that facilitate appropriate adaptation to climate change." Chapter 2 is especially about federal states' recent related activities as good examples (in Germany the ever-actual adaptation strategy aims at delineating the responsibilities and competences between the federal government, the federal states, the regions and the local level) (GREIVING&FLEISCHHAUER, 2012). Chapter 3.1. about general climate change impacts, trends, time horizon emphasises that regional differences in the endowment and use of natural resources also can regionally and locally influence the ability to adapt and thus the extent of the effects of climate change. Regional differences can also arise in terms of positive or negative consequences. Situation analysis chapters "Construction", "Agriculture", "Forestry", "Fishery", "Transport" and "Industry" mention several spatial references/information. DAS Chapter 3.5. about R&D also expresses that questions about adaptation to climate change can be viewed and addressed on the one hand on a sectoral basis and on the other hand on a spatial (regional) basis. Among the horizontal principles of DAS "Subsidiarity, self-provision, adaptive capacity and proportionality"; "Integral approach and consideration of climate impacts in planning and Decisions" and "Acting under uncertainty" contain general regional/territorial references.

As for data background of MRE activities, Chapter 3.8.3. of the new DAS mentions: "at the federal, federal state and municipal levels, nationwide standardised basic data sets on climate trends will ensure coherent basic data and enable comparability of the adaptation strategies and plans developed at different levels¹³⁹. Following the adoption of the Federal Climate Adaptation Act, it is expected that all public authorities (Federal Government, federal states and municipalities, as well as bodies discharging public functions) will need more climatological, hydrological and oceanographic basic data sets and portfolios that can be used to tailor adaptation measures. To provide data quickly and in the required spatial and temporal resolution, it will be necessary to carry out specialised development work and set up a data delivery system that is also geared to the requirements of the regional and municipal levels (GERMAN NAS, 2024).

Similarly to its Northwestern neighbour, several adaptation-oriented decision-supporting tools are functioning in Germany.

- The German Climate Preparedness Portal (klivportal.de) provides quality approved services and offers guidance in taking precautionary measures against

¹³⁹ Four higher federal authorities of the Federal Ministry for Digital and Transport are involved in the DAS Data Service in its current stage of development: German Meteorological Service, the Federal Institute of Hydrology, the Federal Maritime and Hydrographic Agency and the Federal Waterways Engineering and Research Institute. In close cooperation and based on the current state of research (in particular IPCC), the partner authorities develop climatological, hydrological and maritime data products in high spatial resolution and provide a wide range of climate services to various user groups (GERMAN NAS, 2024).

the effects of climate change. It is rather a link collection of other services, serving basically as a knowledge gathering and dissemination tool.

- The website of the Federal Environmental Office (<https://www.umweltbundesamt.de/themen/klima-energie/klimafolgen-anpassung>) comprises links to regional sites (Länder level) with several maps about present situation and future.
- The [zentrum-klimaanpassung.de](https://www.zentrum-klimaanpassung.de) is another information and knowledge portal.
- The website of the German Meteorological Service (Deutscher Wetter Dienst, DWD - [deutschesklimaportal.de/DE/Home/home_node.html](https://www.deutschesklimaportal.de/DE/Home/home_node.html)) is the meteorological service's official web portal with several climatic data presented. It also shows results of impact models. The Climate Atlas of the DWD¹⁴⁰ also provides data from Länder (regional level). This knowledge, as information basis and as overview is utilised in adaptation planning and MRE, but for more adequate planning, more detailed (local) data is needed.

The Monitoring Report, published every four years as one of the most important parts of the Progress Report, provides an overview of monitoring activities. It forms the scientific basis for evaluating progress towards achieving the targets and for updating the climate adaptation strategy (GERMAN NAS, 2024). The report is based on a system of indicators developed to track the achievement of DAS targets. The Federal Environment Agency (UBA) is responsible for coordinating and organizing monitoring activities, and almost all federal authorities participate by sharing their experiences and providing regular data.¹⁴¹ Although in the Monitoring Reports even if map content is not so strong, there are a plenty of narrative references to spatial issues in the documents¹⁴².

Progress towards the targets is measured by an indicator-based monitoring system, which covers major areas of expertise that appear as areas of intervention in the DAS. Already the DAS Chapter 5.2. mentions that "*The Federal Government will therefore develop proposals for a methodical approach to vulnerability assessment and suitable indicator systems. Through a concept study on indicators and monitoring for the*

¹⁴⁰ In particular, the German Meteorological Service provides basic climatological data and services digitally through various distribution channels and platforms (such as climate advisory services, the German Climate Atlas, Climate Data Centre, climate forecast website, open data server, etc.). With the development of the natural hazard portal for Germany, the German Meteorological Service also provides information on the situation and precautionary measures as well as early warnings for a continuously growing number of natural hazards. These are published in a central website in a standardised and accessible format containing all the data needed to understand the information and warnings. The DAS Climate and Water Data Service, which has been available since 2020, is gradually expanding the range of standardised and quality-tested basic data sets and climate services that meet requirements, both for the past (climate monitoring) and for the potential climate future (climate forecasts and climate projections) (GERMAN NAS, 2024). For further information, visit the https://www.dwd.de/DE/klimaumwelt/klima/klima/klima_node.html website.

¹⁴¹ Examples of the 28 authorities include the German Weather Service (DWD), the Federal Office for Civil Protection and Disaster Assistance (BBK), the Federal Agency for Building and Regional Planning (BBSR), and the Federal Institute of Hydrology (BfG) (VAN RÜTH ET AL. 2019). The Ministry of the Environment is responsible for providing financial support, and the data is processed and evaluated at the federal level. According to the assessment of a colleague working for the UBA who responded to our online questionnaire, cooperation between the Federal Environment Agency and the relevant federal authorities has become increasingly effective since 2008 thanks to mutual communication and detailed documentation of methodological experiences.

¹⁴² The Monitoring Report itself contains few maps (Days with heat warnings in DWD warning districts – mean of the years 2017–2021; Rainfall erosivity – district mean for 2017–2021; Wider tourism type areas in Germany), but at least they emerge and several regionally information-serving diagrams (GE-I-3: Birch pollen burdens; GE-I-4: Ragweed pollen burden; GE-I-5: Pathogen vectors – case study; GE-I-8: Index – case study UV radiation; WW-I-2a: Groundwater level and spring flow – Northern Region; WW-I-2b: Groundwater level and spring flow – Southern Region; WW-I-4: Floodwater; WW-I-7 and 8 and 9: Water levels and temperature and spring algae blooms in lakes; WW-I-9: Spring algal bloom in lakes, etc.; KM-I-2: Sea levels; KM-I-3: Height of storm surges; KM-I-5: Change of flow direction; KM-I-6: Pumping station performance – case study; LW-I-4: Infestation with pest organism – case study; BAU-I-1: Heat stress in urban areas – case study; BAU-R-1: Recreation areas - according to settlement network element types; VE-I-1: High-water closures to shipping on the Rhine; VE-I-2: Low-water restrictions to shipping on the Rhine; TOU-I-1: Coastal bathing temperatures; TOU-I-2: Snow cover for winter tourism; TOU-I-3: Market shares held by wider tourism areas; TOU-R-1: Seasonality of bed-nights in wider tourism areas;). The text parts comprise detailed references to spatial distribution of CC impacts, impacted territories, spatial units (GERMAN NAS, 2024).

German Adaptation Strategy, the indicator system can also be expanded and used in a later step for monitoring and evaluating adaptation". In the Interministerial Working Group on Adaptation to Climate Change (IMAA) 28 higher federal authorities work together on climate adaptation, in particular on monitoring climate impacts and adaptation, as well as on the assessment of risks, policy instruments and measures (GERMAN NAS, 2024). Data collection responsibilities are distributed between different authorities. All information come together at the Umweltbundesamt based on established process (started already 2008). Germany, moreover, intends to develop a new MERL Framework starting from 2025.

The general responsibility for developing, collecting and updating the indicators measuring progress towards achieving the targets lies with the ministries with lead responsibility for each target. To measure the extent to which the targets of DAS have been achieved, indicators are applied, some of which already exist and some of which still need to be developed or further refined, as part of the Federal Government's monitoring system, which has been in place since 2009. This is in line with the requirement in section 5 of the Federal Climate Adaptation Act, which stipulates that the Federal Government produces a monitoring report based on state-of-the-art methods about the observed impacts of climate change and progress towards achieving policy targets. Indicators are collected mainly at national level; however, some regional examples also exist, and spatial aggregation from lower levels also occurs¹⁴³. The report presents the indicators in a way that clearly shows which indicators are used to measure progress towards the strategy's targets and which – mostly existing impact indicators – are used to provide general information on the impacts of climate change (GERMAN NAS, 2024).

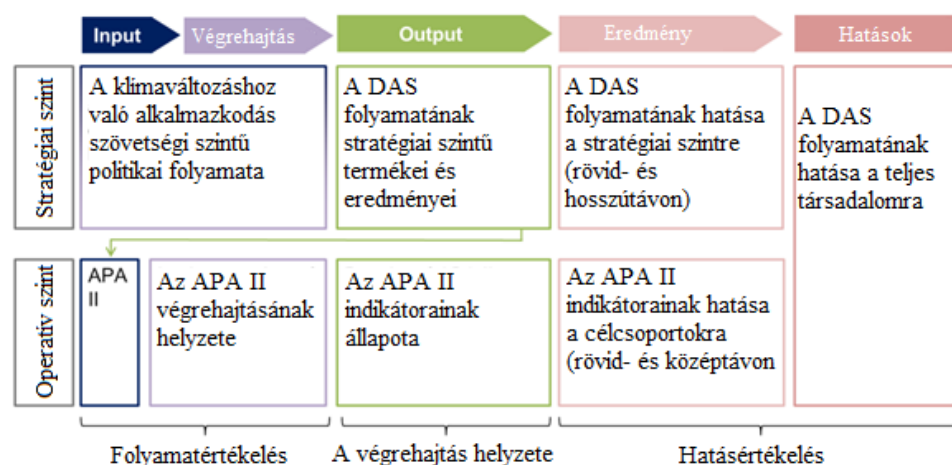
A standardized summary of each indicator was prepared in the form of data sheets and fact sheets (one for each indicator developed!), which are regularly updated; a background study on the development process of the indicators was also prepared. The purpose of the fact sheets is to summarize the characteristics of each indicator, including why it was selected, how it can be measured, what sources it can be obtained from, where it fits into the monitoring system, how useful it is, and what its weaknesses are (how interpretable, accessible, and understandable it is). The indicator system is expected to be updatable while maintaining its original structure and consistency, even if individual indicators are deleted or new ones are added. The data sheets are supplemented with graphs and figures, the purpose of which is to illustrate the indicators in the Monitoring Report, but the Excel format data sheets also contain metadata about the data, thus ensuring that the calculation of a given indicator can be repeated and reproduced at any time. In addition, guidelines were also elaborated for the preparation of monitoring reports: what chapters, illustrations, and trend analyses they should contain. The original indicator system was developed through interministerial cooperation, involving numerous experts, state and regional agencies, and private organizations. In the first step, a total of 102 indicators were defined. Of these, 55 were climate impact indicators, 42 response indicators, while 5 comprehensive indicators monitoring adaptation activities at the federal government level. Several indicators are clearly spatial (SCHÖNTALER & VON ANDRIAN-WERBURG, 2015)¹⁴⁴.

¹⁴³ The system uses both impact, outcome, output, financial and performance indicators. It comprises 1) Impact indicators (about climate change impacts) to describe climate change and climate change impacts with time series in the action areas and clusters. 2) Response indicators to describe climate adaptation: the indicators assigned to the measurable targets (GERMAN NAS, 2024).

¹⁴⁴ The monitoring system is under continuous renewal and updating (for the background and mechanism, see the following subsection), as a result of which 21 new indicators were introduced between 2015 and 2019, partly by replacing previous indicators and partly by creating new ones. According to the Monitoring Report published in 2019, the system includes 105 indicators (of which 56 reflect the impacts of climate change, 44 reflect adaptation responses, and 5 reflect both aspects). When selecting indicators (a process that took six years), two basic criteria were kept in mind. First, the indicator must be closely linked to climate change and climate adaptation. In the case of impact indicators, this means that they must reflect a factor that is affected by climate change or is expected to be affected in the future. Based on the same criterion, response indicators must reflect activities that either facilitate or hinder adaptation. The second criterion

Regarding adaptation evaluations, an actual system of assessments exists, too. The Interministerial Adaptation Working Group (IMAA) decides on the evaluation of the implementation of the DAS, and the Working Group also adopts the most important aspects and methods of the evaluation. The evaluations and reports focus on the achievement of climate adaptation goals. At the end of the assessment process, the results and recommendations are formulated in a manner relevant to the federal government (KIND ET AL., 2019). The current comprehensive assessment is still in progress; the former one did not contain spatially oriented products. The Climate Law is calling mainly the responsible ministries to measure their own progress in adaptation.

The main objectives of the evaluation are to create knowledge base for the further evaluation process; to monitor the implementation of specific measures, identify success factors and challenges in implementation, and document the achievement of objectives. The model has two layers, strategic and operational, covering both levels in terms of the input-implementation-output-result-impact phases. The strategic level analyses the planning and further development of the DAS, while the operational level analyses the implementation of the strategy. The evaluation process thus provides an opportunity for parallel analysis of the adaptation strategy and action programs, followed by a summary of the impacts. The main difficulties are the lack of data availability and the absence of quantitatively assessable phenomena¹⁴⁵ (KIND ET AL., 2019, p. 13).



The structure of the Germany climate adaptation evaluation system. Source: Kind et al, 2019.

The DAS action plan is updated every five years. As part of the review process, additional "progress reports" are prepared for the Government, which contain specific steps for the further development and implementation of the DAS, compiling the current knowledge base on the impacts of climate change and the evolution of vulnerability (GERMAN NAS, 2024). As part of the current (and ongoing) update of the DAS, four documents are prepared:

is that the data needed to measure the indicator must be available, that it must be possible to measure the phenomenon in question in the future, and that the cost of producing the indicator and the resources required to do so must be proportionate to the value of the information provided by the indicator, thereby ensuring continuous monitoring at national level. Particular attention was also paid to ensuring that the thematic priorities of the specialist areas were clearly defined and that the indicators used were relevant to policy. The indicator system developed was not intended to replace or supersede any existing sectoral systems (SÜTŐ (ED), 2020).

¹⁴⁵ At the strategic level, the review of the input phase in the DAS and the action plans (APA I-III so far). The product of the implementation of the process (output) is, on the one hand, the completion of the strategic and operational documents themselves and, on the other hand, the embedding of the institutional reforms specified in them into the activities of federal agencies. The outcomes include the specific interventions carried out by designated actors at the federal or local government level, as well as the practical implementation of the specified adaptation measures by the sectors concerned. At the operational level, the purpose of the evaluation is to monitor specific measures (currently designated in APA IV) by analysing the method and status of implementation. At this level, the outcome evaluation analyses the short- and medium-term effects of the measures on the target groups and beneficiaries. In the impact phase, the overall impact of the entire DAS (and APA) process would be assessed (SÜTŐ (ED), 2020).

- the Monitoring Report (MR), based on a defined set of indicators, tracks past and current climate trends, impacts, and adaptation activities in the country. Its purpose is to provide a comprehensive picture at the national level rather than detailed analyses. The material is approved by the IMAA. The report also forms the scientific basis for evaluating progress in achieving the targets and for updating the climate adaptation strategy in accordance with the provisions of the Federal Climate Adaptation Act (GERMAN NAS, 2024);
- the current Adaptation Action Plan as a measure-oriented operative document of the NAS;
- the evaluation of the then-current NAS;
- Vulnerability Assessments, which assess the risks arising from climate change and identify the most vulnerable regions. The current version was compiled in 2021. The Vulnerability Assessment is prepared by the Vulnerability Network, which brings together representatives of federal authorities. In addition to geographically delineating the areas most at risk and most vulnerable to climate change, the Network also contributes to the development of future intervention options.

The 2015 and 2020 progress reports focused on specific, measurable targets, including the associated indicators, instruments and measures, dividing them into seven clusters: infrastructure; land and land use; human health and care provision; urban development, spatial planning and civil protection; water; economy; and a cluster with cross-sectoral action areas including municipal climate adaptation planning, expenditure and damage assessment, research on climate adaptation, cultural and natural heritage and climate-adapted federal properties. Clusters identified in the Climate Impact and Risk Assessment 2021 for Germany (Klimawirkungs- und Risikoanalyse für Deutschland 2021, KWRA 2021) require particularly urgent action. Progress towards the targets is measured by an indicator-based monitoring system. The fourth Adaptation Action Plan (APA IV), as part of the climate adaptation strategy, summarises further climate adaptation instruments and measures of the Federal Government that go beyond the specific targets. The Federal Government already reported on the activities of the ministries in 2011 and in the 2015 and 2020 progress reports concentrating on the content of the Adaptation Action Plans I-III (APA I-III). The new APA IV follows this format (GERMAN NAS, 2024).

The outcome of this climate adaptation assessment process is a report of almost 100 pages. The first report on the implementation and further development directions of the DAS was prepared in 2015, based on the first Monitoring Report published in May of that year, which focused on describing the consequences of climate change in individual sectors, offsetting these effects, and on the results and responses of recent related developments, informing decision-makers and shaping broader perspectives. The more recent DAS assessments are similar in their approaches.

Together, the listed documents of climate adaptation evaluation defined also in the Federal Climate Adaptation Act (Monitoring Report, current NAP, NAS evaluation, CVA) form the 4 pillars of the German climate **adaptation reporting system** (GERMAN NAS, 2024). Among them, the Monitoring Report (the latest: VAN RÜTH ET AL., 2019) stands out in terms of its scope and content, which aims to reach as many citizens as possible in addition to political decision-makers, as a broad description of climate adaptation goals and adaptation strategies significantly increases the acceptance of the DAS. (Schönthaler, von Andrian-Werburg 2015). It is richly illustrated, and the most important results and conclusions are summarized in an easily understandable form at the end of each smaller structural unit. Its main chapters are built around the intervention areas defined in the DAS, and it also contains a comprehensive methodological overview of the operation of the monitoring system.

The Federal Government produces a climate risk assessment as well at least every eight years. It is another type of evaluation, which analyses the possible future impacts of climate change in Germany, assesses the associated climate risks and evaluates the need for action and the effectiveness of potential adaptation measures to mitigate risk. Section 4 of the Federal Climate Adaptation Act sets out the central role of the climate risk analysis as the scientific basis for climate adaptation planning at federal level and for the derivation and further development of adaptation targets for climate adaptation planning in Germany. In the recent KWRA 2021, over 100 climate-related impacts – categorised into 13 action fields of the German Strategy for Adaptation to Climate Change – were analysed and assessed in terms of level of the associated risk. For selected impacts, the study considered the extent to which and how quickly adaptation can mitigate climate risk. The KWRA even identifies clusters that requiring urgent action during the NAS/NAP updates. The next strategy monitoring report is scheduled for publication in 2027 and will serve as the basis for the Federal Government's first assessment of progress towards the targets. In 2028, an updated climate risk analysis will also be presented as a basis for further strategy development (GERMAN NAS, 2024).

Germany also sees potential to improve cooperation with other countries in climate adaptation issues through learning by exchange of experience and trying to find harmonised guidelines with enough flexibility to be transferred to different regions and levels. Dissemination of own good practise is part of the international cooperations.

Scotland – objective system and international considerations rich in spatial hints

Scotland, similar to Wales and Northern-Ireland were handled besides England as individual country(parts) in the comparative analysis, because of the administrative devolution processes progressed significantly in the UK. Among the analysed parts of the Kingdom, Scotland performed the best. In the country, similarly to other outstanding West- and North-European countries, international spatial dimensions of adaptation and spatial references in the objective system show the best performances. The NAS's space phraseology is excellent, more than 400 mentionings emerge in the document, in a country where administration is strongly local level focussed. Consequently, the word "local" shows particularly frequent mentionings. But all in all, majority of the analysed space-related concepts are present.

Within the objective system planning-related parts of the NAS, Scotland's Vision (that is almost identical in its structure with the objective system) is basically sectoral, but it is organised into 5 main pillars, among which one is directly spatial ("*Nature connects across our land, settlements, coasts and seas*"), one indirectly ("*Communities are creating climate-resilient, healthy and equitable places*", mentioning settlements and coast in general), and one is international connections-related ("*Scotland's international role supports climate justice and enhanced global action on adaptation*"). Further two subchapters are of "Just Transition" and "Public engagement", the first mentions place-based adaptation, and the different impacts on different communities within Scotland.

The NAS's specific objective #2 (Communities) and its C1 and C2 subobjectives (Regional and place-based collaborations; Locally led adaptation) concentrate directly on regional and local level adaptation activities, mentioning several related projects, programmes, initiatives. The different levels of the objective system explicitly mention spatial vulnerability characteristics of special geographic areas; settlement network elements; region types; functional areas; general spatial logic (spatial mapping of spatial differences). The proportion of lower-level objectives with spatial content is 26,08% - it means almost third of the objectives comprises spatial references in their title or in their detailed description. Scotland is among the countries where spatial planning has great traditions and adaptation planning has seen 2-3 cycles so far, so based on their experiences we could expect already before the analysis that the country may put great emphasis on spatial issues when designing their adaptation objectives - and evidence

show that the situation is exactly that. In Scotland, adaptation MRE system is also planned, in the form of an intervention of the NAS, with hints for spatial data use. Similarly, an adaptation-oriented thematic, GIS-based decision supporting tool's establishment is planned currently in the form of a NAS intervention, too.

As for the international dimensions of adaptation policy, results are outstanding. The emergence of geographically climate-related risks is strong – Scotland's NAS contains explicit references for the issue in the description of objectives/measures. The emergence of strengthening macro regional / international co-operations is shown by IA objective's general introduction Sub-objective B4 (National economic development point) mentions international trade, its Food security point talks about international cooperation. IA2 sub-objective's international engagement-related points and IA3 sub-objective (Knowledge advocacy - international cooperation) in its entirety can be mentioned. The emergence of strengthening macro regional / international influence can be observed in in IA objective's general introduction; IA1 sub-objective concentrates on financing foreign vulnerable communities; IA2 sub-objective (International Advocacy) on influencing developing countries' adaptation activities.

Outcomes and objectives for adaptation	
Five adaptation outcomes; 23 objectives	
Nature Connects	
Nature connects across our lands, settlements, coasts and seas.	
NC1: Nature-based solutions	NC2: Landscape scale solutions
NC3: Development planning	NC4: Nature networks
NC5: Marine, coastal and the blue economy	NC6: Natural carbon stores and sinks
Communities	
Communities are creating climate-resilient, healthy and equitable place.	
C1: Regional and place-based collaborations	C2: Locally-led adaptation
C3: Community resilience	C4: New and existing buildings
C5: Culture and historic environment	C6: Coastal communities
Public Services & Infrastructure	
Public services are collaborating in effective and inclusive adaptation action.	
PS1: Public body duties and capacity	PS2: Public service and infrastructure resilience
PS3: Scotland's water resources	PS4: Transport system
Economy, Business & Industry	
Economies and industries are adapting and realising opportunities in Scotland's Just Transition.	
B1: Business understanding of climate risk	B2: Support for farming, forestry, fishing and aquaculture sectors
B3: Innovation opportunities	B4: Economic development and supply chains
International Action	
Scotland's international role supports climate justice and enhanced global action.	
IA1: Supporting vulnerable communities globally	IA2: International Advocacy
IA3: Knowledge advocacy	

Figure 1: SNAP3 Outcomes and Objectives

Objective system of the Scottish NAS. Source: Scotland's NAS, 2022.

The degree of spatial content in adaptation evaluations shows above-average results, too. In the UK's parts (so in Scotland as well) the UK Climate Change Risk Assessment (currently the UKCCRA3)'s country-part-related Executive Versions contain several spatial references (mentioning of region types, concrete places, settlement network elements,) but mostly follow a basic sectoral logic. Even the spatial visualization in adaptation evaluation aspect brought upper-middle category result in Scotland, where though the existing evaluation products and monitoring reports show only scarce use of geographically oriented maps or diagrams or info graphs, but at least a minimal number of these emerge in the documents.

Coherence with EU spatial planning is outstanding: Scotland represent all priorities of the then-actual Territorial Agenda of the Union (the TA2030). Similarly, the basic territorial concepts' emergence is strong. The vision and the objective system's text mention numerous concepts. The Scottish NAS mentions multilevel governance mostly

implicitly (urging regional partnerships and local actions¹⁴⁶. The Vision's Just Transition subchapter especially mentions place-based adaptation. This latter is emphasised throughout the whole document. Natural capital as a close relative to territorial capital emerging in several places in the strategy. There are references to territorial cohesion in the vision chapter and also during the objectives, which is a rare case in European NASs. Spatially balanced development is also emerging in the form of “*equality in development, the reduction of urban-rural division and the support for people and communities most vulnerable to climate change*”, that are explicit goals of the NAS.

Annex 4b) Northern Europe - special attention on international and geopolitical perspectives

Almost all of the Northern European countries (with the exclusion of Iceland) performed well in the comparative analysis, positioning themselves in the upper ranks of the final spatial sensitivity list, showing good results particularly in international spatial perspectives and coherence with regional development priorities as well as in their objective system's spatiality.

Sweden

Regarding the main logic of adaptation policy, the chain of command is that the NAS sets out the governments' directions and goals for adaptation which sets the course for all adaptation work in Sweden from national to regional and local level. Sectoral Agencies have their own adaptation plans and goals set out by themselves and so do the County Administrative Boards.

Sweden's NAS and NAP are parts of the same document, called the National Strategy and the Government's Action Plan for Climate Change Adaptation (Skr. 2023/24:97). Beyond the national documents there are also regional adaptation strategies for special regions/spatial units¹⁴⁷. All County Administrative Boards are tasked with having an updated climate adaptation plan for their region. A lot of municipalities in Sweden also have local adaptation plans. Some regions also have regional development plans which highlights adaptation needs. Moreover, all sectoral National Agencies answering to the Swedish Decree on adaptation (Förordning (2018:1428) om myndigheters klimatanpassningsarbete) have their own action plans for adaptation within their sector (such as housing, environment, infrastructure, health and so on).

As for active spatial levels from adaptation policy point of view, the NAS is full of related content. Chapter 2.3.2. about sectoral climate change consequences mentions that risks that can be managed through climate adaptation are often local and specific. Consequently, responsibility for climate adaptation lies primarily at the local level, where land and property owners are responsible for protecting property and municipalities are responsible for physical planning. The NAS also talks about the

¹⁴⁶ “As outlined in Objective C1 the Scottish Government will work in partnership with local government and a broad range of others to facilitate mature regional adaptation partnerships and collaborations covering all regions in Scotland by 2029.” or “to collaborate at multiple levels – with subnational, regional and national governments as well as with international bodies like the United Nations” (SCOTTISH NAS, 2024).

¹⁴⁷ Dedicated regional adaptation strategies in Sweden, according to the Climate ADAPT website, are as follows: Regional action plan for climate adaptation in the county of Västernorrland, Adaptation to a changed climate - regional action plan for Blekinge, Regional plan for climate adaptation in Dalarna, Regional action plan for climate adaptation in the county of Gotland 2018–2020, Regional action plan for climate adaptation in the county of Gävleborg, Introduction to climate adaptation in Halland, Action plan for climate adaptation (county of Jämtland), 2021:26 Adaptation to a changing climate - Program of measures 2021-2025 for Jönköping county, Regional action plan for climate adaptation (Kalmar), Regional action plan for climate adaptation in the county of Kronoberg, Climate change in Norrbotten, consequences and adaptation, Regional action plan for climate adaptation 2020-2024 (Skåne), A robust society - regional action plan for climate adaptation in the county of Stockholm, Regional action plan for climate adaptation in the county of Uppsala, Värmland in a changing climate - action plan climate adaptation 2020-2025, Adapt Västerbotten to a changing climate 2020 – 2025. Regional guidelines and action plan, Action plan climate adaptation 2021–2024 (Västra Götaland), Action plan climate adaptation 2021–2025 (Östergötland) (<https://climate-adapt.eea.europa.eu/en>).

Ordinance (2022:1395) on Government Grants to Municipalities for preventive measures against natural disasters (flooding, landslides, landslides or erosion). Chapter 2.3.3. mentions that under the Act (2003:778) on protection against accidents (LSO), municipalities are expected to build the capacity required based on local risk profiles.

NAS chapter 3.1.; 4.4.1. and 4.1.6. say that climate risks and vulnerabilities differ across Sweden. Many municipalities have a strategy for their work on climate adaptation. The regions have an important role in strengthening the coordination of climate adaptation and crisis preparedness. The County Administrative Boards have a central role in evaluation work on climate adaptation, supporting municipalities, coordinating regional climate adaptation work; initiating and following up the municipalities' climate adaptation works. Moreover, they analyse how the county and, if necessary, neighbouring counties are affected by climate change; contributing to and develop data for increased knowledge and planning and support work in river catchment areas. NAS chapter 4.5.1. (Physical community planning) is especially mentions local and regional climate adaptation tasks.

Lower-level adaptation planning is urged also by several points of the NAS: Chapter 2.3.3. mentions that municipalities and regions are expected to build the capacity required based on the local risk profile. NAS chapter 3.1. says that responsibility for climate adaptation lies primarily at the local level, where land and property owners are responsible for protecting their property and municipalities are responsible for physical planning. Risks and vulnerabilities are therefore best assessed at the local level. Municipalities, have a central role through their planning monopoly. Many municipalities have a strategy for their work on climate adaptation. NAS point 4.5.7 (Reindeer husbandry) mentions that *"during 2018–2023, 12 Sami villages have developed their own climate and vulnerability analyses and action plans for climate adaptation."* NAP's 4.1.9. "Knowledge and research" point mentions that *"Municipalities are requesting climate-related planning documents at the local level."* Furthermore, situation analyses mention spatial planning in one or more subchapters as an important activity.

Despite these spatial contents, Sweden's NAS shows basically thematic logic along the description of climate impacts/consequences and sectors (as opposed to the previous NAS, whose 6.2.3. chapter "Effects and consequences at different parts of Sweden" was a directly spatial subchapter focusing on Swedish regions; such chapter is lacking from the current material).

Chapter 2.3.1. mentions Sweden's global and macro regional situation briefly; chapter 2.3.2. refers to Northern Europe as a climate-affected macro region. Chapter 3's introduction can be considered as Vision. It mentions that *"As an import and export-dependent country, Sweden needs to have a global analysis and value chain perspective. Vulnerabilities and inadequate climate adaptation in other countries can also contribute to increased migration and refugee flows"* – this statement shows clear macro regional aspects. NAP 4.7. "International work on climate adaptation" chapter dedicates a given point to the topic of "Cooperation in the Nordic Region and the Arctic", which is particularly for macroregional cooperation!

Within the objective system, Sweden is in the second-best category regarding the proportion of lower-level objectives with spatial content aspect (30,3% of the lower-level priorities contain spatial content either in its title or detailed description). Another spatial strength of the NAS is that it refers to all 3 main challenges and to the 4 priority fields of the Swedish national regional development concept.

The other spatially strong parts of the Swedish NAS-NAP are the international perspective-oriented chapters. All 3 analytical sub-aspects performed very well in this category. In the situation analysis a dedicated subchapter (2.3.2. - Geopolitical aspects and effects on energy and food supply) deals directly with global spatial climate risks

and consequences (border-transcending issues, prolonged conflicts, uncertain food supply lines, migration pressure on southern Europe, cross-border risks) and the Nordic macroregional position. Chapter 3's Vision urges a global analysis and value chain perspective¹⁴⁸. NAP specific objective 1's lower-level objective 8 is directly about geopolitical risks ("Climate adaptation, disaster risk reduction, crisis preparedness and civil defiance"), mentioning several global climate-related and geopolitical risks, emphasising among other things importance of coordination between adaptation- and risk management authorities, organisations. Specific objective 4's lower-level objective 7 "International work on climate adaptation" is directly about international cooperation and influence exertion in its entirety but talks also about global climate risks, too, especially in its "Security, conflict and migration" subpoint. International cooperation also gets strong emphasis. Sweden's NAS Vision mentions that "*Climate adaptation work in Sweden needs to be developed and knowledge of how other countries' vulnerabilities and climate adaptation affect Sweden needs to be strengthened*", clearly indicating the need for cooperation. Specific objective 2's lower-level objective 5 "Resilience of the Oceans" says that "*Active regional cooperation, not least through the regional sea conventions, as well as within the EU and internationally, is central to strengthening the protection of the sea, reversing the loss of biodiversity and managing the impact of climate change on the sea.*" Specific objective 5's lower-level objective 6 „Cultural heritage and environments" mentions the newly developed Nordic and international cooperation on cultural heritage and climate change in which Sweden is part of a working group on *Strengthening Cultural Heritage Resilience from Climate Change*." Specific objective 4's lower-level objective 6 "Human Health" mentions the need for cooperation with other countries regarding transboundary risks, too. Specific objective 4's lower-level objective 7 "International work on climate adaptation" is directly about international cooperation and influence exertion in its entirety. Its subpoints "*Biodiversity on land and in the sea*", "*Secure food supply and sustainable food systems*" and "*Water*" are not directly territorial cooperation-oriented ones, but implicitly, you can read the importance of the topic between the lines. "Health" subpoint explicitly mentions the need for international cooperation and coordination to prevent disease spreading related problems. "*Cooperation in the Nordic Region and the Arctic*" subpoint is particularly dedicated for macroregional cooperation. Also dedicated subpoints deal with "*Cooperation with the EU*" and "*Cooperation with the UN*".

International influence exertion also emerges in the NAS/NAP: Sweden has a leading role in international climate finance. Its NAP lower-level objective 4.7. "International work on climate adaptation" is directly about international cooperation and influence exertion in its entirety, especially the point "*International financing and global resilience to climate risks*" subpoint deals with the latter. "Sweden as an international actor" point says that the Government intends to continue to have an ambitious global commitment to adaptation and intends to expand and make Swedish climate assistance more efficient and, in addition, to a greater extent mobilise private capital and technological innovation, concentrating on major investments and local capacity developments in developing countries. The government intends to continue to push for ambitious and effective climate adaptation work within the frameworks of regional, EU and UN level cooperations.

According to our interviewee, there is a functioning adaptation-related monitoring system in Sweden. All national agencies and County Administrative Boards are tasked with reporting their annual work to the government, to indicate progression. The Swedish Expert Council of Adaptation is also tasked with evaluating the adaptation work and the vulnerability status through a climate and vulnerability analysis. However, a new comprehensive monitoring system for Sweden with a broader scope is under

¹⁴⁸ "Vulnerabilities and inadequate climate adaptation in other countries can also contribute to increased migration and refugee flows" (SWEDISH NAS, 2024).

implementation. To date no indicator set has been established. However, GIS-data sets and climate analysis for different climatic indicators are readily available down to regional and even municipal level from different databases.

As for GIS based decision support systems in climate (adaptation) policy, in Sweden there is several GIS-based data sets as decision support during planning activities available for actors to use in their evaluation of climate related risks. There are even climate change issue related evaluations, however, they concentrate on sectors rather than geographical regions.

Norway

Norway shows similar characteristics (with significant international spatial dimensions) to other Scandinavian countries. Basically, in the NAS sectoral logic prevails both in the situation analysis and the description of the objectives of the NAS; only Svalbard and the urban settlements get one-one special objectives and dedicated situation analysis subchapters.

According to the Climate-ADAPT website both sectoral and regional adaptation strategies exist in the country. The latter feature is also underlined by the fact that within the NAS's generally weaker space phraseology an exceptionally frequent mentioning of "region" is outstanding. Both national and lower (regional, local) spatial levels are mentioned by the strategy/legislation as levels of adaptation activities, but no dedicated chapter about spatial levels is part of the NAS.

Regarding spatial visualization of the situation analyses *Denmark and Norway* are two interesting examples - using larger number of photographs instead of maps about impacts (8 and 9 respectively). Interestingly, similarly to the NAS situation analyses, in Norway's adaptation-related evaluations only diagrams/photos indicating spatial issues emerge in the documents.

In *Norway's* NAS the overall objective is basically thematic, and it is followed by no specific goals but 8 lower-level objectives. Out of these, two are spatial (one for sea level rise in coastal areas and one for the Sami territories), one is settlement focussed (storm waters in cities and towns) and one deals with the close spatial issue-related land use issue ("*Land use management and climate resilient society*"). Altogether more than 50% of the NAS lower-level objectives comprises spatial references in their title or in their detailed description, which is an outstanding proportion. *As for horizontal goals*, the NAS Introduction chapter comprises four horizontal principle-like paragraphs ("*Government is strengthening efforts in adaptation*"; "*Nature plays an important role*"; "*Adaptation works is anchored in global goals*"; "*Municipalities are important actors in adaptation*") among which the last one has spatial (or territorial level-related) reflections, emphasising the role of local actors, multilevel governance, lower level adaptation work, spatial CVAs and spatial planning's importance.

At the level of actions/interventions Norway dedicates in the NAS one urban or spatial planning-related measure group and several (more than 10) nominally spatial unit-, regional type-related or generally spatial logic-based individual measures to spatial issues.

In the *Norwegian NAS* the "*Foreign defence and security policy*" measure group is dedicated especially to the issue of global (spatial) climate risks and consequences. Moreover, the issue of geopolitical risks appears in several other parts of the document. The "*Aid and development cooperation*" measure group is dedicated for international cooperation in adaptation. Strengthening international/geopolitical influence already appear in the introduction, in several of the thematic situation analysis chapter's introductory parts and in subchapter #3. Subchapter 10.1. "*Vulnerability is unevenly distributed*" mentions the need for help vulnerable regions of the World (East, Central and West Africa, South Asia, Central America, the Caribbean and island states are even

nominated). Objective chapter' subchapter #6.8.3. about climate adaptation and international security and #6.9.1. about reducing climate vulnerability in developing countries also touch the issue.

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Structure of the objective system and actions in the Norwegian NAS. Source: Norway's NAS, 2021.

Finland

In Finland, climate adaptation policy coordination and exchange of relevant good practices/experiences between sectors is provided by an inter-ministerial working group established in 2008 to implement and monitor the NAS adopted in 2005 and to manage a related national research programme. In 2014, a new NAS was finally adopted with a time horizon of 2022, and a new working group was established for the period 2015-2018 to coordinate the document's implementation, with specific monitoring, reporting and evaluation mandates. The main task of the working group was to set up and maintain a national monitoring system, to monitor the implementation of national adaptation objectives and actions and to continuously report on this to the Parliament.

The importance of lower-level spatial levels' involvement has always gotten special emphasis. Since the first convening of the working group in 2008, the Association of Finnish Municipalities had delegated a permanent member to represent local and regional decision-making; however, there have been many criticisms that the representation of sub-national territorial levels had not been resolved. To answer to this problem, during 2010-13, some large cities committed to climate issues formally joined the working group. A representative of the Regional Centres for Economy, Transport and Environment was also included in the working group, fulfilling a special intermediary role towards other regional government agencies. The role of the local/regional level was altogether strengthened by regional meetings organized by the working groups; and by communication and awareness-raising actions focusing on local government issues.

Beyond the NAS, even sectoral adaptation is also strong: there are significant number of sectoral adaptation strategies in Finland. Some examples are the Action Plan for the Adaptation to Climate Change of the Environmental Administration¹⁴⁹; the revised Ministry of Agriculture and Forestry's adaptation plan¹⁵⁰, adaptation strategies of the Ministry of Social Affairs and Health¹⁵¹ and the Ministry of Defence¹⁵². Parallel with these, however, some municipalities (mainly the bigger cities) and regions have their own adaptation plans or strategies, too. They are independent actors and therefore this work is not coordinated nationally. This also indicates the importance of lower spatial levels. Regarding the related content of the NAS, already the Introduction mentions that municipalities undertake the requirement of adaptation planning. Chapter 2.1.3. mentions the important role of regional and local governments beyond the central one. Local/regional planning's propagation is mentioned, too. Sub-objective #8 and measure 8.3. urge the mapping of regionally different land use, subobjective 9. the consideration of climate challenges of energy infrastructure's zone planning, sub-objective #10 and Measure #10.3. mention water catchment area-based planning, sub-objective #13 and #13.1 drought-responding regional planning, Subobjective #16 actually focus on regional planning (point 16.1. propagates regional adaptation strategies; point 16.2. sectoral adaptation strategies; point 16.3. regional CCRA's and CVAs). Altogether 41,6% of lower-level objectives show some sign of spatiality.

Some spatial content can be found already in Finland's adaptation vision. It is free of any territorial/regional/spatial reflections but contains some hints to geopolitics. Basically sectoral/thematic approach can be observed in the NAS document. Sub-objectives and measures are organized by sectors, only one sub-objective is nominally spatial.

¹⁴⁹ urn.fi/URN:ISBN:978-952-11-4629-9

¹⁵⁰ urn.fi/URN:ISBN:978-952-366-736-5

¹⁵¹ urn.fi/URN:ISBN:978-952-00-8424-0

¹⁵² defmin.fi/documents/236553176/238659714

International considerations emerge with significant weight. As for global spatial risks, Chapter 2.2.4.7. on international reflections mentions people's transboundary migration into Finland as an attractive target region for people from harsh-climate-regions. It refers to geopolitical factors (weakening resource availability, increasing exposure of sectors based on value chains outside Finnish borders, food security, wars, conflicts). Even the Vision mentions some global spatial risks (war, covid crises, supply security). Measures 3.1. -3.3 and 4.2. again, mention climate change's impacts in connection with migration, security and food security.

International cooperation comes up in our interviewee's thoughts, who sees potential in cooperation. Learning best practices / experiences and co-creating solutions as well as taking some of the Finnish experience to countries are the main motivations. Chapter 2.2.4.7., about international reflections mentions the need for international cooperation; Subobjective #21 and its actions 21.1.-21.3. focus explicitly on macroregional cooperation. Action 21.1 is about to develop regional and cross-border cooperation on adaptation, e.g. in the Nordic, Arctic and Barents regions; Action 21.2 strengthens Finland's contribution in the negotiation processes for the UN Climate Agreement and the Paris Agreement adaptation, as well as in the work of the IPCC. Action 21.3 concentrates on influencing the implementation of the EU-level adaptation strategy and actively participate in EU-level cooperation to address climate change risks.

International influence exertion in adaptation emerges in Chapter 2.2.4.7. on international reflections. Its Objective 19 emphasises the need for increasing promotion of adaptation in international cooperation, especially for the most vulnerable countries. Within the objective, Measure 19.1. focuses on geopolitical influence (support developing countries in adapting to climate change and increase international climate financing). Objective 20 "Developing countries' means and capabilities to adapt to climate change" and its measures 20.1. and 20.3. emphasise influence building towards Africa and island states (the worldwide export of Finnish adaptation solutions).

Monitoring data that supports adaptation is available, for example, from the databases of Statistics Finland and research institutes. The ICT sector intends to prepare tools that facilitate monitoring of climate and the environment. Monitoring of adaptation has varied across administrative sectors (HILDEN ET AL., 2022). Regarding actual Finnish adaptation monitoring activities, the follow-up of adaptation actions has focused so far mainly on progress made in policy measures, as an important part of the latest national climate change adaptation plan. In 2023, the Finnish Environment Institute (Syke) undertook a project to assess the indicators available for monitoring of the implementation of climate change adaptation actions. The project was the first step in the implementation of the measure "*Updating the indicator collection supporting adaptation monitoring and expanding the utilisation of indicator data in adaptation monitoring*" outlined in the recent NAS. It outlines that by 2026; Finland must set up a monitoring system for climate change adaptation and ensured the conditions for its implementation. On top of that, several measures of the NAS mention MRE activities, but not from a spatial point of view. Spatial content is touched only slightly sideways, e.g. in the form of regional data collection's mentioning in subobjective #24.

Our interviewee says that for each NAP, a regional vulnerability assessment has to be created. So, to some extent, they do track risks and vulnerabilities at the regional level, but it is not systematic and does not have indicators etc. The current risk assessment process will be developed soon. The existing adaptation monitoring system only monitors at the national level and does not disaggregate into smaller regions. Regional adaptation monitoring is actively being developed as part of regional adaptation planning activities. Monitoring data on adaptation at the local level is mainly available from bigger cities (especially members of the Covenant of Mayors network) that have the necessary resources and identified the need for managing key climate and weather

risks¹⁵³ (HILDEN ET AL., 2022). The regions and municipalities that have adaptation plans may have their own monitoring systems for their regions. They hope that some developments soon provide more insight into how the national level could learn more about what is done in regions.

As for other sectors, existing monitoring activities or intentions to development monitoring have been mentioned in the strategies or adaptation plans of various sectors, either as a goal or as a policy measure. Flood risk management is the most advanced sector in terms of monitoring outcomes and effectiveness of adaptation plans and measures¹⁵⁴. For other hazards and sectors, systematic monitoring of adaptation action is still evolving. Cross cutting monitoring has been implemented, for example, in monitoring and evaluating the implementation of the Arctic Policy Strategy (PMO 2021) and the Sustainable Development Goals (Agenda 2030) (HILDEN ET AL., 2022).

So far, the MRE of adaptation actions has focused on policy monitoring. However, in order to evaluate the development/possible shortcomings of adaptive capacity, scenarios examining the progress of climate change and evaluation of policy effectiveness are needed. So far, only the environmental administration has consistently evaluated the implementation of the adaptation action programme. Based on the evaluation, progress has been made in taking adaptation needs into account in the administrative branch (HILDEN ET AL., 2022).

The NAS itself mentions only general structure of evaluation and reporting activities. In connection with adaptation policy evaluation, spatial content is touched only slightly, e.g. in the form of regional data collection's mentioning in subobjective #24. Chapter 7 also says that an improved management system will be introduced for the national climate adaptation work - with the preparation of regular climate vulnerability analyses and routines for updating the climate adaptation policy.

In the last decade, several evaluations were prepared in practice. The *Regional characteristics and vulnerabilities related to climate change in Finland 2023*¹⁵⁵ is spatial even in its title and content; the other three documents [*Evaluation of adaptation to climate change in Finland 2022*¹⁵⁶; *Climate and socioeconomic scenarios for climate change adaptation planning*¹⁵⁷; *National risk and vulnerability assessment*¹⁵⁸] are rather sectoral-minded. Moreover, each NAP gets a mid-term evaluation, and the last one had a final evaluation. There is no set form for the evaluations, so they could look at regional data. The next NAP will be prepared in 2026 and is planned to have some regional evaluations, but we cannot see it yet, to what extent.

Annex 4c) Southerners: strong spatial descriptive and objective system-related content

The Mediterranean area's countries show mixed results in the analysis. The bigger ones (Türkiye, Spain, Greece, Italy, Portugal) present remarkable results in their situation analyses' spatial approach or in their objective systems' spatial emphases; while the smaller ones (Malta, Cyprus or countries from the Southern Balkan) performed rather generally weakly. The next subchapters show two outstanding practices, but we must note, that instead of Spain Italy, Portugal or Greece also could have been a proper

¹⁵³ "In the Helsinki Metropolitan Area, efforts have been made to promote monitoring of the effectiveness of adaptation measures based on the indicators developed by Helsinki Region Environmental Services" – cited Hilden and his colleagues Kankaanpää (2017) (HILDEN ET AL., 2022).

¹⁵⁴ A central guiding document is the EU Floods Directive as part of which Finland reports on indicators and other related information biennially. The regional measures proposed in the management plans have an estimated implementation schedule and their implementation is monitored annually through the Flood Information System. The indicator assesses the proportion of completed measures out of the total number of proposed measures that can be complete. (HILDEN ET AL., 2022).

¹⁵⁵ urn.fi/URN:ISBN:978-952-366-588-0

¹⁵⁶ urn.fi/URN:ISBN:978-952-383-118-6

¹⁵⁷ urn.fi/URN:ISBN:978-952-366-867-6

¹⁵⁸ urn.fi/URN:ISBN:978-952-383-566-5

example, but due to strict length constraints, we include only Spain beyond Türkiye in the chapter.

Türkiye -excellent CVA content in the NAS and newly established DS system

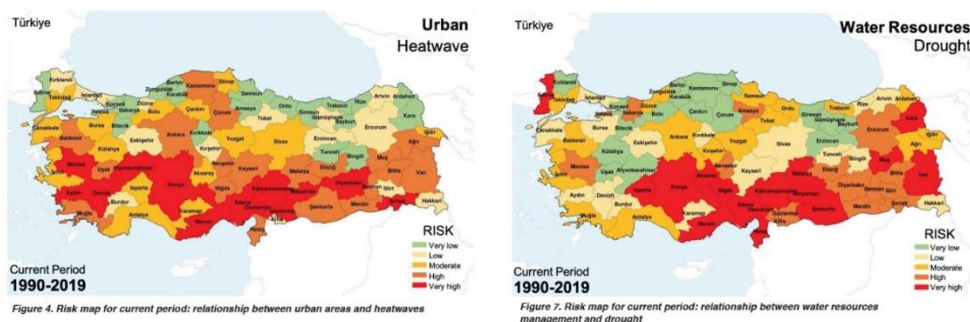
The country has both its own National Adaptation Strategy and Action Plan (integrated into a single document, called NASAP 2024-2030)¹⁵⁹. As a preliminary study for the preparation of NASAP, even a vulnerability and risk analysis (VRA) have been conducted, but the detailed report of it has not been published. Considering the NASAP's space phraseology the majority of the analysed concepts are present, showing an outstanding result within Europe in this respect. As for visualization the Turkish NAS is again the best practice of the whole research, having 25, mostly vulnerability-, or risk-oriented maps throughout the document.

Regarding the subnational activities, several documents can be mentioned. In response to the needs that emerged following natural disasters such as floods and landslides in 2019, the *Black Sea Region Climate Change Action Plan* were prepared, with needs and solution proposals identified at the regional level in order to increase the resilience of the Black Sea Region. In 2021, *vulnerability and risk analyses were conducted for 4 different provinces* as a pilot application, and based on these, local climate change adaptation strategies and action plans of their provinces were prepared. As an ongoing study, after the completion of the climate projections being updated according to the IPCC SSP scenarios, *vulnerability and risk analyses will be conducted for the priority sectors of all 12 NUTSI regions of Türkiye*. Furthermore, the Climate Law was published in July 2025. According to this law, the local governments of all 81 provinces will prepare local climate change action plans defining strategic directions and action lines covering the entire provincial boundaries by 2028. The NASAP itself contains 11 sectoral sub-strategies and action plans related to climate change in the so-called "Sectoral Legislative Framework and Responsible Institutions" subsection. There are several examples for sectoral adaptation planning and risk management strategic documents¹⁶⁰.

The planned local climate change action plans are expected to take local endowments into account. Propagation of adaptation planning at lower territorial levels emerges in Türkiye's NAS Chapter 1.2. that mentions the Regulation on Local Climate Change Action Plan among the primary legislation and policy papers being drafted, with completion planned as soon as possible. A concrete action also can be mentioned from the NASAP: CCI4 is about setting up a legislative infrastructure to prepare a Local Climate Change Action Plan (LCCAP) and drafting LCCAPs for all provinces. Our interviewee finds it useful to strengthen the spatial focus in adaptation planning in general. For this reason, he considers it necessary, too, to prepare local climate change action plans to further detail adaptation planning.

¹⁵⁹ Turkey has a national climate change strategy and action plan, integrated in a single document covering the period 2024-2030. The document has an adaptation focus and a sectoral approach. The former CCASAP was formulated for 2011-2023. Since the period covered by the previous plan concludes in 2023, preparatory work for the new CCASAP (2024-2030) has been carried out under the "Enhancing Adaptation Action in Turkey Project" implemented in collaboration with the UNDP and jointly financed by the EU and the Republic of Türkiye ([iklim.gov.tr/db/turkce/icerikler/files/Uyum\(1\).pdf](https://iklim.gov.tr/db/turkce/icerikler/files/Uyum(1).pdf)).

¹⁶⁰ Türkiye's Strategy and Action Plan to Combat Agricultural Drought (2023-2027); Ecosystem-based Adaptation Strategy for Anatolian Steppe Ecosystems (2022-2036); National Programme and Action Plan for Reducing Negative Impacts of Climate Change on Health (2015); Türkiye Disaster Management Strategy (TDMS); Türkiye Disaster Risk Reduction Plan (TDRRP); Provincial Disaster Risk Reduction Plan (PDRRP); Türkiye Disaster Response Plan (TDRP); Provincial Disaster Response Plan (PDRP); Türkiye Post-Disaster Recovery Plan (TPDRP); - Provincial Post-Disaster Recovery Plan (PPDRP) (TURKISH NAS, 2023).



Two risk maps of the Turkish NASAP from the more than 20 cartograms. Source: Türkiye's NASAP, 2024.

Although concrete joint situation analysis or assessment are lacking from the NASAP document, but most sectoral chapters comprise a sub-section called "Climate Change Impact", which is basically a territorially oriented climate vulnerability/risk assessment. In other words, all affected sector has its own dedicated spatial CVA results and cartograms, with the exclusion of Chapters "CROSS CUTTING ISSUES" and "SOCIAL ISSUES". Altogether there are 25 provincial level maps in the document, all of them connected to climate change vulnerability, impacts or risks. These vulnerability/risk maps show spatial differences at provincial level in Turkey. Annex 1 directly introduces (spatial) CVA methodology of the sectoral situation assessments parts. Nevertheless, though sectoral vulnerability and risk analyses were conducted in spatial logic, and provinces were ranked relative to each other, the strategies and actions were written for the entire country: sectoral approach prevails in Türkiye's NASAP.

The aforementioned sectoral chapters' situation-introductory part has relatively strong spatial content. On top of that, there are also implicit and nominated spatial references in the text of the associated descriptions, mentioning region types (e.g. riverside, coastal area, slopes, plateaus, territories, sprawling urban regions, irrigated areas), concrete territories (e.g. Mediterranean coast, Central Black Sea, Central Anatolia region, Eastern Mediterranean Marmara region and many more) or concrete administrative units / settlements (Malaya, Trabzon, Antalya, İzmir, İstanbul, Bursa) consequently through the document. The spatial content of the whole objective system is similar, but a bit weaker. In the objective system, specific objectives have strategic objectives (=lower-level objectives). These sectoral strategy objectives of the document include spatial aspects, mainly indirectly, especially in relation to spatial planning, without any direct mentioning of them. Moreover, call for adaptation-focused or adaptation-oriented spatial planning is reflected in the NAS sectoral chapters. Finally, Türkiye represent all or almost all priorities of the then-actual Territorial Agenda of the Union (all in their cases the TA2030), but its own national spatial scopes get lesser emphasis.

The country is planning the setting up of a monitoring system in adaptation (NASAP Chapter 1.4 "Monitoring and evaluation" states that an online monitoring and evaluation system is planned for the future to track the NASAP¹⁶¹), that could monitor the implementation status of climate actions. The planned data background has not indicated spatial hints so far. There is also related indicator sets developed for monitoring adaptation actions. In the monitoring process, the action owners will be able to enter data related to these indicators into the system annually. After the data entry is

¹⁶¹ "In this context, an online monitoring and evaluation system will be established to track the Climate Change Adaptation Strategy and Action Plan. Institutions responsible for each action under the CCASAP will input the previous year's developments into the system, which will be open for data entry from 1 January to 31 March annually. Based on the information entered annual monitoring and evaluation reports will be prepared by the DCC of MoEUCC by 30 June each year, with input from the key responsible institutions. The recommendations and actions outlined in the reports will be discussed in the CCACB Working Groups. The annual evaluation report, drafted in coordination with the DCC will be submitted to the CCACB by 31 December of the monitoring year. Where necessary, the action plan may be revised on a case-by-case basis."- says the Turkish NAS (TURKISH NAS, 2023).

completed, the Climate Change Department, as the coordinator prepares a monitoring report. The first monitoring cycle was conducted in 2025. Data is being collected for the entire country, but there is no spatial aggregation. They collect rather output indicators.

There has been no NAGiS-like GIS-based decision support system in the country, however, as an umbrella site, a portal (<https://iklimportal.gov.tr/projects>) for adaptation-related knowledge-gathering, where publications and projects are uploaded, was set up. It was developed by the Directorate of Climate Change with financial support from the EU and technical support from UNDP. The portal was officially launched in November 2024 in Ankara. It aims to create a national climate change archive that creates awareness and assists informed decision-making processes, facilitate communication and collaboration among stakeholders as a platform for sharing information. Additionally, it includes an interface for tracking, reporting, and sharing progress on climate action plans. The portal currently provides users with the ability to filter content according to their needs, learn about Türkiye's climate change policies, national strategies, and action plans, about current national and international legislation and regulations, and access research, reports and educational materials. The portal shares the analysis of Türkiye's climate change data, including greenhouse gas emissions, temperature changes, and precipitation rates. It includes a national climate change database and GIS infrastructure for spatial data. The users will also be able to follow all climate change-related activities and events across the country such as projects, workshops and trainings via an interactive map and calendar. Similarly to NAGiS, the portal is a comprehensive resource for various stakeholders¹⁶². The portal was developed based on similar models in Europe, first and foremost the Climate-ADAPT with the intention of continuous update and expansion, improved data provision, analyses and information. It seeks to become a central platform for tracking and reporting Türkiye's national climate targets and actions. The only field, towards which further development is worth contemplating by the portal's operators, is a decision supporting system-oriented CVA/CCRA database building.

Climate adaptation- related regular evaluations have not been conducted yet. Currently only the NAS/NAP aims the setting up of an evaluation system or at least the elaboration of products, but no assessment has been published in practice yet. However, the future NASAP monitoring report is planned to be presented at the coordination committee in front of senior executives of all institutions, but there is no plan to prepare a related document. *Spatial levels of evaluations though not exist, similarly to other emerging countries in the adaptation planning scene, like Hungary, Türkiye has at least a theoretically detailed, elaborated evaluation system concept talking about spatial levels as well.*

Spain – objectives, measures and international considerations reflect spatial emphases

Spain, similar to Portugal, Greece and Italy, put modest emphasis on spatial issues in its NAS situation analysis (e.g. among the space-related concepts only “geography” and “geographic(al)” are mentioned more than by others) but put stronger focus on them in their objective systems. Spain's overall objective¹⁶³ is quite general. To achieve this goal, 9 specific objectives and 19 +7 lower-level objectives (19 “areas of work” and 7 “transversal issues”) have been defined. The first specific objective promotes the

¹⁶² Public institutions and policymakers can access necessary information and resources for developing and implementing climate policies, whereas academics and researchers can access to studies with scientific data, reports, and current research. Private sector and investors may gain insights on climate finance and investment opportunities in the field of climate change, while NGOs and individuals can find materials for awareness campaigns and community engagement (iklim.gov.tr).

¹⁶³ To promote coordinated and coherent action to address the effects of climate change in Spain in order to avoid or reduce present and future damage from climate change and to build a more resilient economy and society (SPANISH NAS, 2020).

elaboration of regionalised climate projections; the second knowledge generation but without spatiality; the sixth involvement of all spatial levels in adaptation (multilevel governance emerging here implicitly); the eighth the role of Spain in international cooperation and the ninth adaptation MRE activities but without spatial hints. Among the 19 “areas of work” one already in its very name is directly about cities, one for coastal areas. As a complement to the sectoral actions, the NAS defines 7 transversal (horizontal goal-like) aspects (Chapter 8), which must be promoted in the different areas of work: among these the first is again the deepening in the geographical and social components of vulnerability to climate change; the third is the analysis of cross-border effects¹⁶⁴.

Moreover, in Spain the NAS sets out a number of guiding principles as fundamental and common aspects to be taken into consideration in all areas of work and lines of action and guide decisions and steer adaptation policies and measures (Chapter 5). These contain among other things the consideration of social and spatial dimensions (emphasising that social components of exposure and vulnerability, as well as their geographical distribution, should be taken into account in climate risk analyses and in the definition of adaptation initiatives). The NAS summarily urges incorporation of spatial analyses and identification of high-risk-areas into adaptation planning and calls the attention to climate change’s different forms in different spatial typologies, like mountains, rural areas and islands.

At the operational level, proportion of measures with spatial content is in the lower-middle category in Spain with 25,76% of the actions showing spatial considerations (the highest category, however, comprises surprisingly some big, theoretically spatially interested South-Eastern countries, like Italy or Portugal). Regarding the proportion of spatial MRE-related measures, the Spanish NAS performs well, being in the upper-middle category, together with Greece, as another southerner.

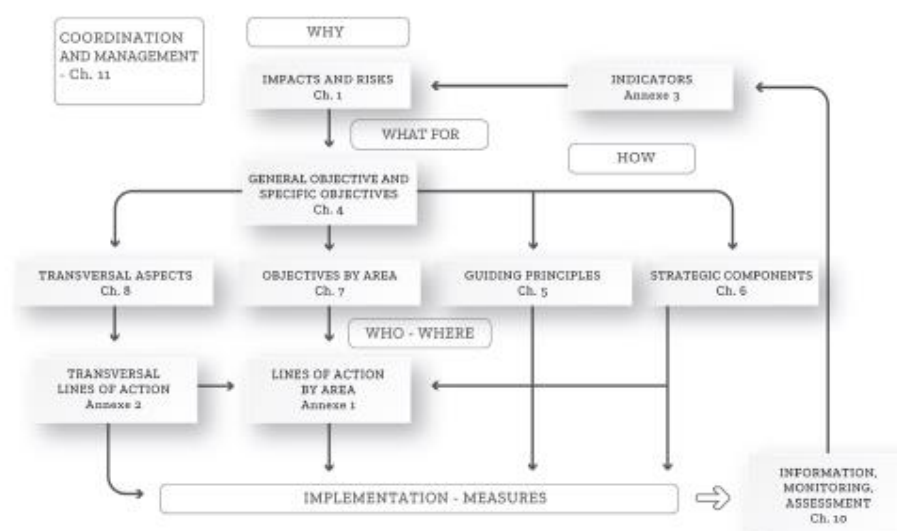
As for the international spatial dimensions of adaptation, emergence of geographically climate- related risks in Spain’s NAS occurs already in the Executive Summary that mentions the importance of recognising global risks: *"Pandemics and climate change have something important in common: they are global risks that can lead to systemic impacts"*. Among different elements of the objective/action system, several deal with global climate risks¹⁶⁵. Spain performs well in the “emergence of strengthening macro regional / international co-operations” aspect. The Spanish NAS sets out a number of guiding principles; these contain among other things, *"Transversality and integration in different fields of public management"*, where integration of international commitments are mentioned particularly. The closing parts of the NAS emphasise the importance of international cooperation & coordination within the Iberian Peninsula with Portugal. The topic even gets a dedicated box. Transversal Action Line T3 (Cross border effects) also touches international cooperation.

In Spain MRE systems are planned in adaptation, in the form of an action or objective of the NAS/NAP, with hints for spatial data use. Currently the country collects only lower-level objective-related impact/result indicators (and possibly output indicators),

¹⁶⁴ The *"deepening in the geographical and social components of vulnerability to climate change"* is particularly worth for mentioning it says *"The actual and potential impacts of climate change are unevenly distributed across the territory. These territorial differences (...) must be identified in risk studies and taken into account in the definition of adaptation measures"* (SPANISH NAS, 2020).

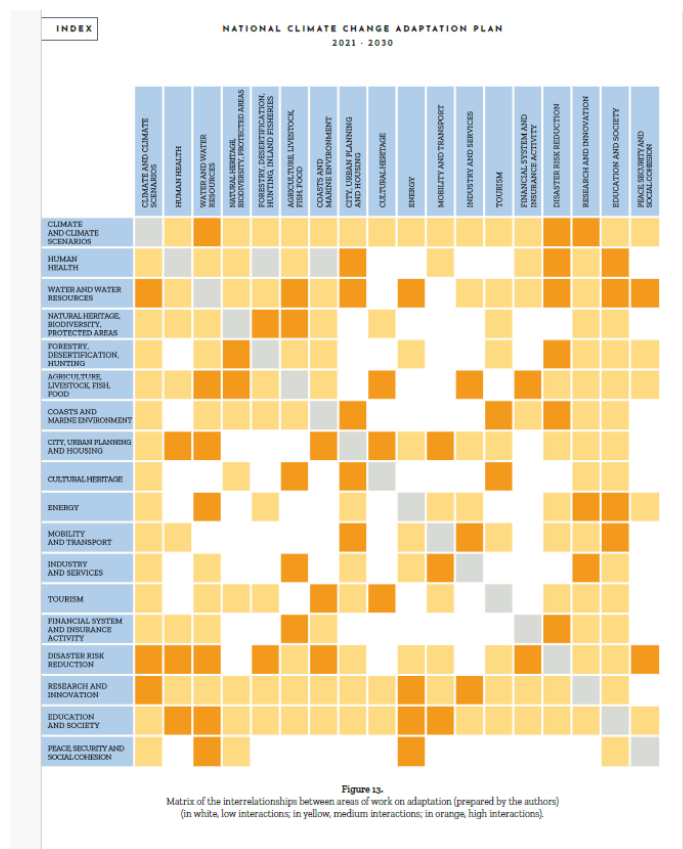
¹⁶⁵ Out of the “Objective Areas of work”, *"Peace Security and Social Cohesion"* directly mentions global CC risks, emphasising the early detection of potential conflicts for its prevention, strengthening mechanisms to promote peace, security and social cohesion in the face of climate change. Out of the Transversal Aspects, *"Cross border effects"* mentions geopolitics and international cooperation nominally. Action line group *"Peace security and social cohesion"* in all its actions (18.1., 18.2.) deals with global climate risks and related consequences and Transversal action line T3 *"Cross border effects"* also deal with management of international river basins; risks to supply chains in the agri-food sector; cross-border migrations caused by adversities associated with climate change; changes in tourist flows due to changes in climate; changes in maritime transport routes due to the opening of new shipping routes; risks associated with investments in territories and sectors with a high vulnerability to climate change" (SPANISH NAS, 2020).

but no spatial breakdown can be identified nor any geographic/regional specification detected in these activities. Decision support system planning is in its early phase. A platform focusing on Climate Change Adaptation (AdapteCCa) was created in 2013 within the framework of the Spanish NAS and has become a valuable instrument for accessing information on impacts, vulnerability and adaptation to climate change in Spain. Its full functionality keeps improving constantly.



Structure of the Spanish NAS. Source: PNACC 2021-2030.

Spain represents in its NAS all priorities of the then-actual Territorial Agenda of the Union (TA2030). Characteristically the last three TA2030 priorities (“Healthy Environment” with NBSs, ecosystems, spatial planning, disaster management, climate resilience, local level empowering, protection of natural, cultural and landscape values; “Circular Economy”, including energy transition and “Sustainable Connections” are the most frequently reflected in all European NAS documents at all, cherry picking those sectors that are most affected to climate change. Spain and other bigger southerners put emphasis even on cross-border issues, functional regions and sometimes on balanced spatial structures strong implicitly. The NAS consequently uses the concepts of multilevel governance; place-based approach; and territorial integration.



Areas of work in the Spanish NAS. Source: PNACC 2021-2030.

Annex 4d) Eastern Europe – Space orientation remains within the situation analyses

We find most of the Eastern-Central-European countries in the second and third categories. The two best-performing states, Poland and Hungary stand out of the others mainly with their situation analyses' spatial performances: space phraseology, map content and other spatially relevant topics emerge relatively frequently in the evidence-seeking parts of the NAS documents Hungary presents a particularly great example in GIS-based decision support activities, too, in the form of its NAGiS system.

Hungary – best practices in spatial visualization (NCCS-2 and NAGiS)

Hungary's aggregated spatial performance in the analysis puts the country in the upper half of the second-best category, while several of its situation analyses- or GIS-based decision support system-related results are simply the best within Europe. However, average/weaker performances of the other aspects prevent the country from considering Hungary's adaptation policy in its entirety among the best ones. In Hungary, similarly to some other Eastern-Central European countries (e.g. Slovakia, Slovenia, Baltic states) the primary climate policy challenge is less the volume of GHG emissions, but the adaptation to the already experienced climate effects, so adaptation must be the main pillar of climate policy. The floods and flash floods, municipal rainwater inundations, extreme storms and droughts of recent years in Hungary focused the attention particularly on climate adaptation, urging regional and local response measures.

The two definitive legislations regarding Hungarian climate policy are the 2020/XLIV Law on Climate Protection and the 2007/LX Law on the Implementation of the UNFCCC and its Kyoto Protocol. The first § of the Law on Climate Protection states that climate change and the increasing frequency of extreme weather events can be clearly felt everywhere in the world, and the natural, economic and social effects caused

by them affect more and more people. The point clearly indicates the emphasis put on the issue. The Government, says the Law, must implement short-, medium- and long-term climate protection and climate adaptation measures – which are defined by the second National Climate Change Strategy (NCCS-2) and its action plans (identified also by paragraph 2). According to § 2 of the law, the national climate policy must provide valid answers concerning the whole Carpathian basin – a clean macroregional approach emerges here.

The basic policy document of outmost importance in Hungary's climate policy currently is the NCCS-2. Its legal basis is the LX/2007 Law, according to which Hungary must have a (regularly revised and updated) national climate change strategy. The first National Climate Change Strategy (NCCS-1) was adopted in 2008. Its evaluation and review were followed by the elaboration of the NCCS-2; the document was adopted by the Parliament on October 30, 2018, [in the form of Parliamentary Decree 23/2018. (X. 31.)]. The NCCS-2 contains national-level goals and strategic directions of the domestic climate policy both in the fields of mitigation, adaptation and awareness raising for the period 2018-2030. At the same time, it provides an outlook for the period up to 2050. It consists of three modular sub-strategies, one of which is the National Adaptation Strategy (NAS) aimed at adapting to and preparing for the effects of climate change (the other two are for decarbonisation and awareness raising).

The NAS itself comprises detailed introduction of climate impacts on natural assets (soils, forests, waters and habitats), climate change consequences on different sectors and short medium and long-term action line recommendations for 9 preferential sectors particularly affected by climate change. These chapters are followed by a specifically spatial vulnerability-oriented section, going through preferential vulnerability topics of Hungarian relevance (heatwaves, flash floods, forests, habitats, arable lands, water supplies, etc.) based on National Adaptation Geo-Information System (NAGiS) data and presenting results of spatial vulnerability assessments in the form of map content. This appearance of particular aspects of spatial vulnerability is an outstanding practice among the European NAS and CCRA documents, clearly showing the uniqueness of the NAGiS system.

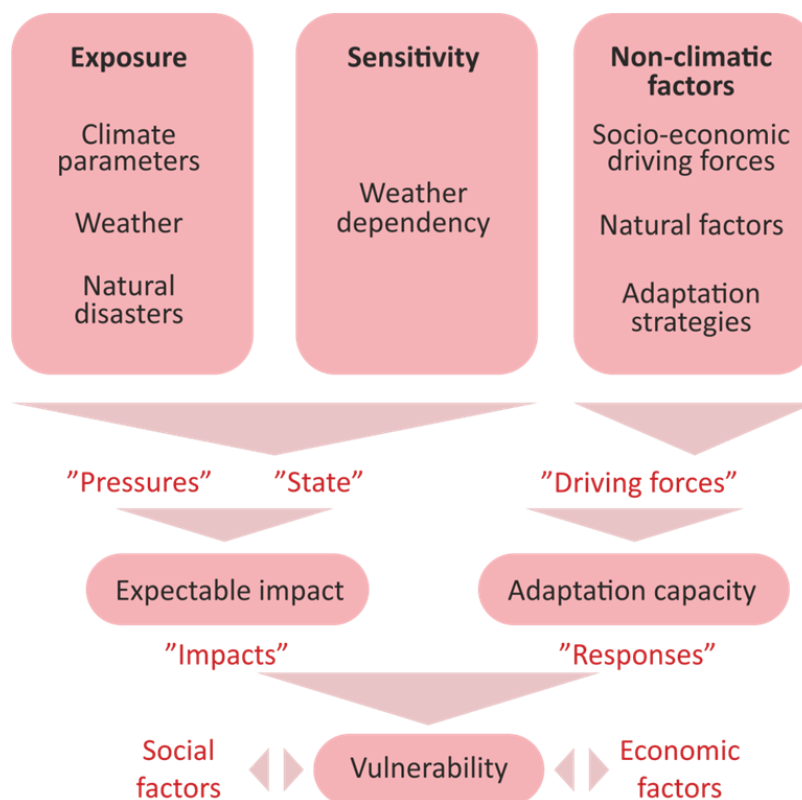
The NCCS-2's national level climate policy objectives and action lines are put into practice in the form of concrete measures by consecutive action plans (NACCPs). Among the national documents related to adaptation, it is important to mention the Carpathian Report, which is the most recent background material that analyses and evaluates the current situation and outlines updated strategic directions, too. Similarly to the NCCS-2, the Report was based again on research results, maps and datasets related to exposure, sensitivity, adaptability and vulnerability provided by the NAGiS.

As opposed to the national one, at lower spatial levels, there are no obligatory and prescribed climate adaptation-oriented strategic planning tasks. To counterweight this situation the government initiated financial support for elaboration of regional and municipal climate change strategies between 2017 and 2021. As a result, the county (NUTS3) level is now fully covered by climate strategies from EU's Structural and Investment Funds-related sources and many municipalities¹⁶⁶ also have had their climate strategies, or SECAPs. The plan hierarchy is implemented, so the sub-national plans are related to the NCCS-2 and, as they are horizontal plans, to other strategic documents in the given area. Unfortunately, the mentioned OP funds ran out. Currently, new tenders for municipal climate strategy-making are not available¹⁶⁷.

¹⁶⁶ Approximately 150 Hungarian settlements have had their adopted strategies by the end of 2022.

¹⁶⁷ The main task for the following years is to implement the planned actions of the existing county and municipal strategies. It is also necessary to prepare new climate strategies for those municipalities that have not got their own already. For this purpose, it is essential to provide funds because, in Hungary, climate strategy is mandatory only at the national level. Only financial incentives can encourage settlements to elaborate their strategy at lower territorial levels. The whole situation is, however, aggravated by the current alarming financial situation of the local governments. The

The other important content of the LX/2007 Law was about the decision on the establishment of a national level decision supporting system in climate adaptation. To offer effective responses to negative climate impacts taking into consideration spatial location, the NAGiS was established as the principal and partly open-access decision supporting tool of domestic adaptation policy. The rules for its operation were defined by the Governmental Decree 94/2014. The system is developed and operated by HungaroMet's National Adaptation Centre and its predecessor organisations. It provides its target groups with regularly updated data from climate observation and modelling, data about climate change impacts, consequences and potential adaptation capacities by sectors/thematic vulnerability topics. These target groups consist of national, regional and municipal level decision makers and planners both in the field of climate policy and other related sectors (settlement development, tourism, forestry, water management, public health, etc.), public administration, higher education, consulting firms and the wider public.



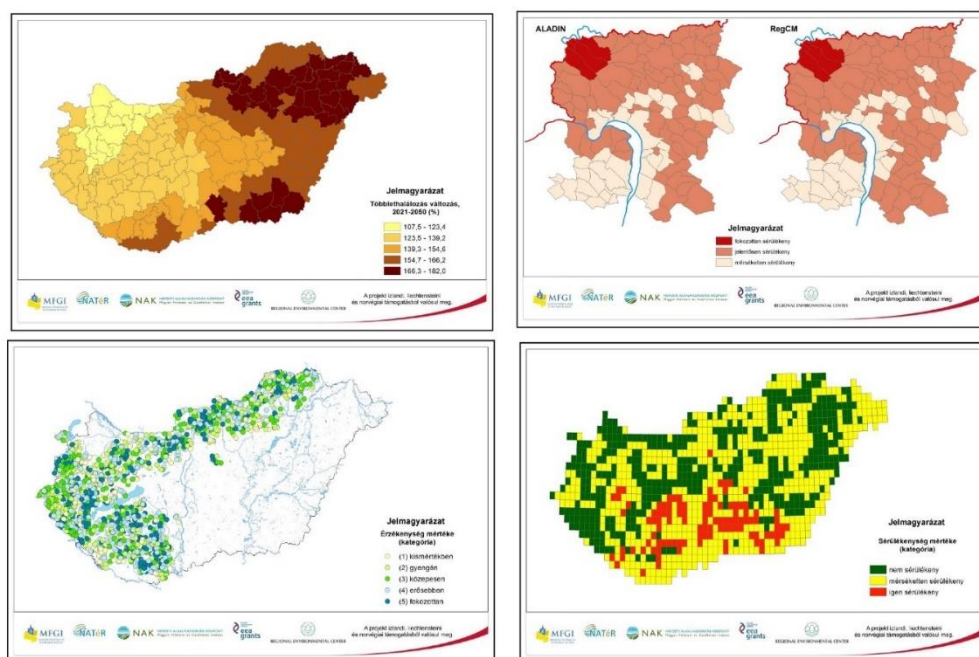
Vulnerability assessment framework of the CIVAS model. Source: Sütő (ed.) (2016), based on Pálvölgyi et al. (2010).

The NAGiS analyses are based on an impact-chain-based logical framework called the CIVAS-model (Climate Impact and Vulnerability Assessment Scheme), which is originated from the approach published in the 4th Assessment Report of IPCC¹⁶⁸. Numerous experiences of CIVAS' application can be found in scientific literature and in the practice as well, as it is logical, easy to understand and use in practice –and though the IPCC have developed new, risk-centred methodological framework for CVAs since

county strategies from 2018 recently reach the date of their revision and update (this date is declared in the strategies). To support this process the Ministry of Energy and its adaptation-related background institute, the National Adaptation Centre is contemplating to coordinate the monitoring, revision and re-planning of these strategic documents.

¹⁶⁸ The model was developed in the framework of the CLAVIER international climate research project to examine the impacts of climate change on ecology and on the built environment and to provide a standardized methodological background to quantitative climate impact assessments. It operates with an impact-chain based methodology, in accordance with IPCC4's vulnerability notion as a combination of exposure, sensitivity, impacts and adaptive capacity (SÜTŐ (ED.), 2016).

then in its consecutive assessment reports, significant part of the literature and existing systems, like the NAGiS, still use the former, vulnerability-oriented frameworks.



Heatwave vulnerability, drinking water basis sensitivity, flash flood sensitivity and ecosystem vulnerability maps in the NAS's spatial vulnerability subchapter. Source: NCCS-2.

The NAGiS first and foremost presents spatial results of vulnerability analyses for various topics: demographics, climate, building stock vulnerability, forestry, groundwater level, land cover, geological hazards, economy, heatwaves, drinking water resources, climate change attitudes, ecology, ecosystem services, agriculture production's vulnerability, tourism climatology, tourism sector's complex vulnerability, and flash floods. This complexity of its scope makes the system a standalone tool in Europe. In almost all topics, climate indicator -based exposure, social/economic/environmental data-based sensitivity and adaptive capacity indicators are available in the system. From these indicators complex impact and vulnerability indicators have been calculated and presented by the NAGiS (KAJNER ET AL, 2017)¹⁶⁹.

As a result of the first development phase (2013-2016), a multi-sectoral GIS system and database was created. Its 4 main pillars included a mapping system¹⁷⁰; the GeoDat database¹⁷¹; a metadata base¹⁷²; and a document repository¹⁷³. During its second

¹⁶⁹ During the first development phase climate simulations were based on the future climate projections given by ALADIN-Climate and RegCM RCM models. In the second development phase, four climate model-emission scenario combinations were used based on data from the EURO-CORDEX database. Simulations were created with the RCA4 regional climate model which used data as threshold conditions from the CNRM-CM5 and EC-EARTH global models, and these were combined with two IPCC GHG-emission scenarios, RCP4.5 and RCP8.5 of the IPCC. Climatic indicators of the system in general reflect both on past data and cover future projections based on different climate models. The system's database includes climate projections-based vulnerability assessment results (sensitivity, adaptive capacity and vulnerability indicators) for present and future time windows (2040-2071 and 2071-2100) introducing projected situations/estimations for the middle and the end of the century. Impact and vulnerability indicators were also calculated for the three time horizons. Sensitivity and adaptive capacity indicators are considered constant in time. (KAJNER ET AL, 2017).

¹⁷⁰ a 10x10 km resolution map displaying system containing hundreds of layers, visually showing how different climate impacts may affect various regions of the country. The mapping system is freely available (KAJNER ET AL, 2017).

¹⁷¹ It comprises the observed and modelled climate data; calculated climatic data-based exposure; and environmental, economic, and social sensitivity/expected impact/adaptability/vulnerability data and calculated indices across 16 vulnerability topics Registered users can use the database for analyses and data extraction (KAJNER ET AL, 2017).

¹⁷² It helps users navigate the information, acting as a "data map" for what and where data can be found, with multiple search options across data layers. While the metadata base displays all data layers uploaded to GeoDat, only a narrow subset is represented on the map (KAJNER ET AL, 2017).

¹⁷³ It includes research reports, manuals, publications, handbooks and awareness-raising materials created during the different development phases.

development phase (2017-2020) the NAGiS was expanded thematically. General user friendliness of the system was also improved. The system's decision-support capabilities were improved, allowing the system to provide easily accessible, exportable thematic queries and reports and overviews of adaptation topics at municipal and regional levels, enabling stakeholders to access relevant data for their specific operational contexts¹⁷⁴.

The NAGiS results are widely used. The NCCS-2 situation analysis and all the county- and municipal-level climate strategies elaborated between 2017-2021 were based on NAGiS data and map content. Higher education, ESG analyses of the private sector, SECAP planning processes of settlements and micro regions as well as risk assessment within applied/scientific projects (e.g. LIFE-CLIMCOOP, LIFE-COOLZONE, LIFE-MICACC, LIFE-LOGOS4WATERS) or planned interventions also use its data. The mentioned strong NAGiS-based map content of the NCCS-2 is reflected by the good performance of Hungary in the "visualisation of situation analyses" sub-aspect of the dissertation's empirical work phase, where it is 2nd after Türkiye in the ranking.

After 2020 the further large-scale development of the system with the exclusion some individual projects (e.g. comprehensive project about vulnerability assessment of gas, district heating, electricity networks and solar energy production), came to a halt. Currently the NAC, together with responsible Ministry is working on finding proper financial sources for the regular update and further development of the system. Recurring development topics emerge in the annual research plans of the NAGiS system itself, as well in the Carpathian Report (2020) and the national reports of Hungary to the OECD (2023, 2025), EC (2021, 2023, 2025) and UNFCCC (2017, 2024, 2025). On the one hand, the implementation of the priority thematic development directions¹⁷⁵, on the other hand, the geographical expansion of the system in a macro regional scale¹⁷⁶ are planned.

In Hungary, the output indicator-based professional and financial evaluation of various development projects implemented from public funds (especially those implemented with EU support) has basically been solved. However, the indirect climate protection benefits and spillover effects of development projects/programs and the fulfilment of Hungarian climate policy objectives are still unknown. Therefore, it has become a priority for domestic climate policy to learn about achievements of related development projects and programs, as well as to monitor the implementation of Hungarian climate policy objectives. The demand for developing a domestic climate policy MRE system is not without precedent in Hungarian climate policy, several international and domestic plans/reports/guidelines clearly indicate the need to set up a comprehensive system¹⁷⁷.

¹⁷⁴ These newly created tools for policy and local government decision support comprised the so-called Settlement Adaptation Barometer (an online situation analysis-supporting survey facilitating local strategic planning by identifying key local climate impacts and potential responses, guiding and encouraging broader stakeholder engagement); the Municipal Decision Support Module (a tool supporting evidence-based preparatory studies for local strategy planning by making climate change impacts and responses more accessible and customizable for local governments); and the Municipal Housing Stock Vulnerability Estimator modules were activated with enhanced online access. These newly created modules support urban development, climate adaptation planning and implementation, project preparation, development, and implementation, as well as continuous information sharing with decision-makers and the local public.

¹⁷⁵ These are as follows: analysis of changes in the water regime of Hungary's large rivers, analysis of the complex vulnerability of the Hungarian tourism sector, study of health effects of climate change in Hungary; analysis of the built environment's complex vulnerability in settlements.

¹⁷⁶ This macro region could be the Carpathian Basin, the Danube catchment area or wider Eastern-Central Europe.

¹⁷⁷ Several international organizations and their documents (EU Adaptation Strategy, UN Agenda 2030; UN Sendai Framework for Disaster Management; Paris Agreement) also call for the development of the indicated activities (monitoring, evaluation) at the national level; Hungary's 7th National Communication in 2017 within the framework of the UNFCCC, also identifies the problem; the international reporting obligations to the EU and the OECD have regularly been touching on the issue (most recently in the 2023 reporting round); the latest recommendation of the World Meteorological Organization (WMO) strongly recommends that individual countries and regions establish climate service frameworks, which would organize the collection of data related to climate change impacts and vulnerability issues into a system (in our case at the national level) and its provision to numerous target groups, and the preparation of queries and reports from these, thus ensuring the increase in the efficiency of policy planning, implementation and evaluation activities; The European Climate Adaptation Plan – ECAP or European Climate Resilience and Risk

Parallel with that the responsible Ministry's adaptation-oriented background institute, the National Adaptation Centre (NAC) reviewed the domestic and European adaptation monitoring, reporting and evaluation practices. The NAC developed a comprehensive proposal for setting up a system (identifying the operating principles, as well as the possible financial, institutional and human resource background of such a system). In spite of the comprehensive plans, the current stock of evaluation activities and reports is quite moderate. No systematically elaborated system of adaptation evaluations exists and there are only few individual assessments, either. Only one explicit climate strategy evaluation is known, as a result of one of the most important planning and evaluation acts in Hungarian climate policy that took place in 2022-23. According to the parliamentary decree on the adoption of the NCCS-2, the first review of the document must be taken place five years after its adoption, in 2023 at the latest. The Evaluation Report prepared during the review serves several purposes¹⁷⁸.

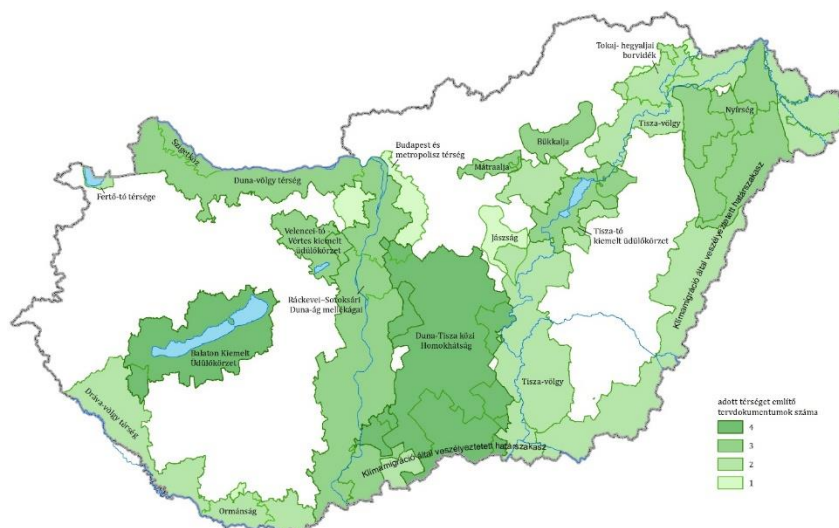
At the start of the evaluation task, in the absence of a similar volume of strategy/action plan evaluations in the Hungarian climate policy, the evaluators turned for methodological inspiration and background information, partly to domestic development policy evaluations and partly to international adaptation evaluation practice (particularly to countries with a strong tradition of strategic planning). After reviewing these examples, three tools were ultimately selected: 1) analysis of climate policy and sectoral planning documents from the perspective of climate policy directions; 2) professional interviews with planners/experts of affected sectors, mainly those responsible for NCCS-2 action line- and NCCAP measure planning; and 3) where data was available, assessment of NCCAP output indicators and NCCS-2 result indicators (SÜTÖ, 2025A).

Among the conclusions of the assessment, we can see that the analyses also examined the presence of a spatial approach, noting its absence. Climate-oriented spatial thinking and/or strong spatial focus are not the feature of the analysed sectors or of climate policy itself. It would be beneficial to incorporate these aspects into more sectoral documents and, above all, into climate policy, as the effects of climate change manifest themselves differently in different types of regions. The publication presenting the evaluation also include map information¹⁷⁹ on the "climate-related spatiality" of the analysed national climate policy and sectoral strategies (SÜTÖ, 2025A).

Management Framework - ECRRMF) planning process currently led by the EU Commission aims to put the EU adaptation strategy into practice. Among the planned 5 ECAP priority axes [1) innovation and competitiveness; 2) strengthening the climate resilience of the climate finance and insurance scene; 3) resilience through design; 4) a package of proposals for a legislative framework strengthening resilience; 5) reaching risk bearers with appropriate digital tools], in addition to the renewal of the EUCRA, the encouragement and framing of national climate risk assessment activities are also discussed in connection with the strengthening of the legislative framework, in addition to the legislative support for climate-resilient governance issues, and the legislative foundation and framing of monitoring-assessment-reporting activities. In connection with reaching risk bearers, the development of appropriate digital decision-support tools and GIS-based tools is also given special emphasis. Within the framework of the UNFCCC UAE-BELÉM work programme, a global (100-piece) set of adaptation indicators is being created for the global adaptation goal, and their mapping and collection at the national level will be an important task in the coming years. The NCCS-1 also indicated the lack of monitoring activity in climate policy and required the development of a monitoring and evaluation plan within the NCCS-2. The latter strategy assigned this task into the framework of its 1st National Climate Change Action Plan (NACCP). The 1st NACCP developed the preliminary, comprehensive framework of the monitoring and evaluation of the domestic climate policy, in the form of a dedicated chapter, and called the initiation of a research for the foundation of the system in the form of a dedicated NCCAP measure ("Action V1", "Creation the basis of a comprehensive monitoring and evaluation framework for measuring the results of energy and climate policy measures"). A European outlook and a summary of Hungarian experiences of mitigation monitoring systems were elaborated, coordinated by the Swedish SEPA (Swedish Environmental Agency), from the SRSP support as part of the V1 Action.

¹⁷⁸ These include conducting an interim assessment of the implementation and achievement of the objectives of the NÉS-2 document; informing policy makers; and feeding back information gained during implementation into the next NÉS and Climate Change Action Plan (ÉCsT) planning cycles. This makes it possible to modify the NES if necessary and to quantify to some extent the results of the developments that have taken place since 2018 (SÜTÖ, 2025A).

¹⁷⁹ According to this, of all the regions and region types mentioned, excluding the settlement network categories (settlement, large city, medium-sized city, etc.) and the general types of land use covering the whole country or a significant part of it, and selecting specific, named landscape or spatial units, and mapping them, a strong connection to geographical features (e.g., rivers, large lakes, alluvial fans, foothills) in climate-related issues, landscape classification



Appearance of actual spatial/landscape units in Hungarian national climate policy and sectoral strategies adopted after 2017. Source: Sütő, 2025.

The evaluation concludes that different impacts in different areas require different adaptation responses. This assumes that to increase climate policy's effectiveness, it would be crucial to apply a spatial/territorial approach and take into account geographical conditions, spatial and settlement network structures. In contrast, the assessment found that, currently, territorial/regional considerations are weak or absent, both in the adaptation guidelines and strategy chapters of the sectors and in the general approach and content of climate policy adaptation planning documents. If we want to achieve progress in this area in the future, there are basically two options: either a regional-based reform of the entire domestic adaptation planning and monitoring system, or a further strengthening of territorial emphases within the current framework. Whichever solution the professional management chooses, the sector's spatial sensitivity can definitely move in a positive direction (SÜTŐ, 2025A).

All in all, in Hungary the strategic planning and legislative background of climate (and within it, adaptation) policy has been established, but targeted MRE frameworks are still missing. At lower spatial levels the adaptation planning activities have also started but without any MRE attributions. Spatiality in climate policy does not show significant weight, which fact, taking into consideration of the strong sectoral affiliation of strategic planning and policy making in the country, is not surprising. However, strong intentions can be detected in the responsible institutions dealing with adaptation policy planning and MRE to move towards the direction of a more spatial approach.

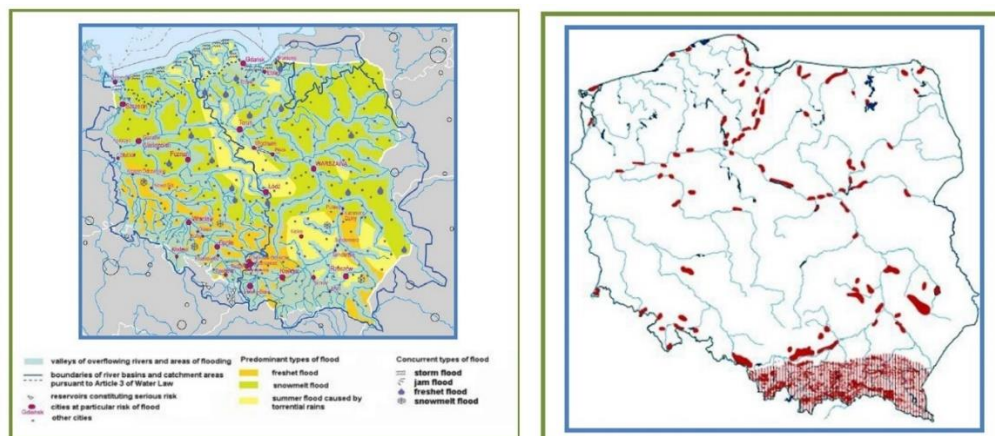
Poland – special emphasis on spatial levels and implicit spatial content throughout the documents

Poland is the best-performing Eastern-European country in our examination, due to its balanced values during the analysis – with less outstanding values than of Hungary or Lithuania but with a stable performance throughout all aspects of the whole analytical system. One of its few really outstanding parts is the spatial levels of adaptation activities. The NAS Chapter 4.2. "*Specificities of adaptation actions in regional terms*" summarizes the tasks of voivodships. Chapter 5 (Implementation) mentions different spatial administrative levels (central, voivodships, local)/describing adaptation planning activities in details in all of these.

Poland also dedicates special actions for GIS development, but no information is available yet about the implementation of these ideas. The NAS applies quasi-

(specific landscape units), and actual destinations (e.g., Tokaj, Lake Balaton, Lake Tisza) are clearly visible (SÜTŐ, 2025A).

consequent spatial unit- or regional type-mentioning in all sectoral situation analysis subchapters: coastal areas, mountain areas, urban zones and spatial planning get recurring, stable emphasis throughout the entire document. The situation analysis subchapters use 9 maps and one regional table, which is also beyond average in European terms. This consequent spatial content is present in the entire situation analysis, mixing sectoral and spatial logic. Some subchapters are typically sectoral (e.g. energy, forestry, etc.), some are spatial (those about mountain areas, coastal zones, urban areas and spatial development) (SÜTÖ, 2025B).



Maps of flood-prone and landslide-prone areas in Poland. Source: Polish NAS.

In Poland's NAS several objective system levels refer to the issue of lower-level planning activities. The Objective system's introductory "*Horizontal actions*" list contains the "*Operational actions*" aspect that talks about the importance of spatial and sectoral strategic planning at local and regional level, even urging these activities. Action lines 4.2.1. and 4.2.2 focus on urban spatial policy making, urging development of local adaptation plans and adaptation mainstreaming into spatial documents. Action line 6.1.4. urges community planning through which tool local plans are supported.

Poland also applies mixed types of objectives, out of which two („Efficient adaptation in rural areas”; „Sustainable regional and local development”) are directly spatial. Coastal areas, mountain areas, urban zones and spatial planning are recurring topics through the entire objective system; however, their nominated presence is scarce, only appearing here and there in the narrative descriptions of objectives¹⁸⁰ (SÜTÖ, 2025B). The proportion of lower-level objectives with spatial content is 31,25%: with this, Poland is in the second-best category (between 20-35%), which value also suggests that Poland is catching up in the field of strategic planning's spatial focus to the leading westerners. At least one lower-level objective/one vision sentence deal with the MRE aspects directly, too (SÜTÖ, 2025A). Similarly, in “the proportion of measures with spatial content” aspect Poland also presents itself in the best category with more than 40% of actions (exactly: 41,02%) showing spatial characteristics.

There is a functioning GIS-based adaptation decision support system in Poland, after already the NAS Action line 1.5. proposed the development of an adaptation-oriented spatial monitoring system. Moreover, several adaptation policy-oriented websites exist in the country. The susza.iung.pulawy.pl is an agriculture-focussed drought monitoring system. The Klimada project (klimada2.ios.gov.pl) intended the establishment of a Central Emission Database. It contributed to the formulation of emission reduction

¹⁸⁰ Poland's NAS mentions regional types in general in the narrative sub-objective descriptions coastal areas, mountainous areas and urban zones. Moreover, spatial planning also gets recurring stable emphasis. Action line 1.1 (adaptation of water management) explicitly describes spatial differences as well as Action Line 2 (Adaptation of coastal zones). Action line 4.1. nominates cities and rural areas, Action line 4.2. urban spatial policy. Territorial monitoring and GIS tool development appear in Action line 1.5. (SÜTÖ, 2025A).

policy in view of environmental costs; and developed climate scenarios, to forecast temperature and precipitation changes in the perspective up to 2100, with a special focus on 2050. It also established a knowledge database on adaptation to climate change. The website of the meteorological service (klimat.imgw.pl) comprises climate data but not much decision support focus can be detected there.

The Polish NAS considers European spatial development objectives quite well (the country is in the upper-middle category), and majority of the basic territorial cohesion's sub-concepts emerges, too. One specific goal is directly for "Ensuring the sustainable regional and local development with consideration of climate change" showing strong relation to balanced spatial development. The NAS's 5.2. implementation subchapter nominates multilevel governance, while the notion implicitly is present in other parts of the document as well. Urging integrated development strategies at different spatial levels and particularly local integrated adaptation strategies are in harmony with the concept of territorial optimum/territorial synthesis and the place-based approach (SÜTŐ, 2025A).

Annex 5 – Country interviews

Annex 5a) Interview/questionnaire transcripts

Finland

Name of the expert: Katriina Virtanen

Country: Finland

Organisation: Finnish Environment Institute

Position: adaptation coordinator

Date of the interview: 2025.12.04.

- Please introduce shortly your country's climate adaptation –related strategic planning background!
- What kind of planning documents does exist in your country at national level? NAS? NAP? CCRA? CVA? Please name the actual documents with exact title and availability.

There is a national level document, mixture of NAS/NAP, called NAP2030. Link to the document is available: <https://urn.fi/URN:ISBN:978-952-383-814-7>. Another document is called “Regional characteristics and vulnerabilities related to climate change in Finland 2023”. Link to the document is available: <http://urn.fi/URN:ISBN:978-952-366-588-0> (in Finnish). A national level assessment called Evaluation of adaptation to climate change in Finland 2022 is available under the link: <http://urn.fi/URN:ISBN:978-952-383-118-6>. Climate and socioeconomic scenarios for climate change adaptation planning is available at: <http://urn.fi/URN:ISBN:978-952-366-867-6> (in Finnish). A national risk and vulnerability assessment is available at <https://urn.fi/URN:ISBN:978-952-383-566-5> (in Finnish).

- Do you have subnational/regional and local strategic documents in the field of adaptation? (local/regional adaptation strategies, programs, action plans)?

Yes, some municipalities and regions have adaptation plans or strategies. They are independent actors and therefore this work is not coordinated nationally. Those are mainly the bigger cities that have plans and smaller municipalities that don't.

- Do you have sectoral strategic documents dealing directly with adaptation? (sectoral adaptation strategies, programs, action plans)?

There are some examples.

1. Action Plan for the Adaptation to Climate Change of the Environmental Administration 2022 (revision adopted in 2016). The action plan is to be updated in 2024–2026. Link to the document is available in Finnish: <https://urn.fi/URN:ISBN:978-952-11-4629-9>
2. Ministry of Agriculture and Forestry adaptation plan (revision adopted in 2024). Link to the document is available at <https://urn.fi/URN:ISBN:978-952-366-736-5>.
3. Ministry of Social Affairs and Health (adopted in 2021). Link to the document is available at <https://urn.fi/URN:ISBN:978-952-00-8424-0>.
4. Ministry of Defence (adopted in 2023). Link to the document is available in Finnish: https://defmin.fi/documents/236553176/238659714/PM_PILMUS-raportti_FIN_A4_DIGI-V4.pdf/577fb6aa-306c-5ccc-9f4a-497a62de24a3/PM_PILMUS-raportti_FIN_A4_DIGI-V4.pdf?t=1745497754906.

- Which logic is prevailing in your country regarding climate policy strategic planning, regional or sectoral in strategic planning? (if they vary, please describe in detail which document follows which logic, and why). In our approach “regional” means: the document’s situation analysis and objective system are structured according to different region hit differently by climate change. “Sectoral” means: the document’s situation analysis and objective system are structured according to different sectors /thematic fields hit differently by climate change.

Sectoral. Our NAP has 24 targets each focusing on a specific sector.

- Do you find it useful to strengthen the spatial focus of adaptation planning or find the sectoral orientation better?

At the national level ministries are legally responsible for the adaptation work done under their administrative branches. For this reason, it is more practical to divide work by sectors and define who is responsible for which target.

However, as Finland is a large country and the north and south have very different climatic conditions, consequently adaptation looks very different too. It is more practical to approach adaptation sectorally, but information and implementation look very different in different regions.

- Do you see potential in climate adaptation to improve cooperation with other countries in the field of adaptation?

Yes.

- If so, for what purposes? To gain new experiences in adaptation? To gain new markets for your country’s adaptation- oriented or green economy? To disseminate your best practices/knowledge?

Learn best practices and experiences and co-create solutions. Take some of our learnings to countries that are as far as we are.

- Do you have a functioning monitoring system in adaptation?

Yes.

- If so, do you actually monitor spatial changes in vulnerability and/or spatial differences in adaptation action’s effectiveness?

For each NAP, a regional vulnerability assessment has to be created (linked in a previous question). So, to some extent, we do track risks and vulnerabilities at the regional level, but it is not systematic and does not have indicators etc. The risk assessment process will be developed soon.

The adaptation monitoring system only monitors at the national level and does not disaggregate into smaller regions. The regions and municipalities that have adaptation plans may have their own monitoring systems for their regions. There will hopefully be some development in these conditions soon as well to gain more insight into how the national level could learn more about what is done in regions.

- If not, is there a plan to implement / develop such a system?

-.

- Do you have applied indicator sets in adaptation?
 - Yes.
- If yes, who collect (and process and make available) these indicators?
 - Ministries, research institutes, regional representatives, other government offices.
- Are these indicators collected from all spatial levels? Does your monitoring system do any spatial aggregation of indices?
 - No, they are collected only at national level.
- If yes, what do they measure? (e.g.: Changes in climatic factors? Spatial vulnerability? Policy effectiveness?)
 - .
- What kind of indicators do you use? (impact, outcome, output, financial, performance, etc.)?
 - A range, depending on information available in different sectors. We have a report coming out about this in Finnish in 2025 and in English in 2026 that will list all indicators and methods, etc.
- Does any GIS based DS system being used in climate (adaptation) policy in your country?
 - Yes.
- If so, is it a mono- (it deals only with 1-2 vulnerability topics) or multi thematic DS (covering several climate impacts/vulnerability topics)?
 - It's not specifically for adaptation, but we have flood mapping, drought mapping, some forest mapping and probably more. They are separate systems.
- Is it utilised in adaptation planning and MRE?
 - To a limited extent, MRE looks at national averages and it's difficult to get one number from GIS that represents the whole country.
- Is there any other adaptation-related website functioning /planned (knowledge collector and dissemination sites)?
 - Yes.
 1. The website <https://www.climateguide.fi/> provides information on mitigation and adaptation, regionally and nationally.
 2. The website <https://www.vesi.fi/en/> displays mapping of water related issues.
- If not, does your country plan to set up such a system?
 - .
- Are there any climate adaptation related evaluations in your country?
 - Yes. Some of them has already been mentioned in the first answer.
- If not, is it planned to elaborate such documents?
 - .

- If so,
- are there among them explicitly (in some cases even in their title) geographically/spatially oriented evaluation products, rich in territorial chapters, analytical aspects, evaluation questions?

Each NAP gets a mid-term evaluation, and the last one had a final evaluation (linked previously). There is no set form for the evaluations, so they could look at regional data. The next one is prepared in 2026 and will have some regional evaluations as well, but we will have to see to what extent.

- Or are there large number of adaptation evaluation products, established system but with minor or no territorial content?

The question was answered before.

- Or only sectoral /thematic/general evaluations exist?

The question was answered before.

- The NAS/NAP aims to set up an evaluation system or elaboration of products, but no such products are in practice yet.

We have some from the past, but the format varies.

- What are the spatial levels of evaluations?
- Are there only national level evaluations, or even regional/local ones, too (does explicitly territorially oriented evaluation reports in adaptation at subnational and local levels emerge)?

Municipalities and regions can do their own evaluations, but I don't know of any that have been done.

- Does spatial visualization (graphic solutions to present territorial differences, characteristics) emerge in adaptation evaluations and reports?

It could, but to my knowledge, it hasn't yet.

- Do you take into consideration European level regional development objectives in your adaptation planning?

Yes.

- If so, how?

Our NAP is our guiding document and prepared roughly every 8 years. European objectives are considered in its preparation but also outside of it when planning actions where needed.

- Do you take into consideration national level regional development objectives in your adaptation planning?

No.

- If so, how?

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- Can you mention any good practice in your country from national or regional level about planning/monitoring/evaluation practices in adaptation that takes into consideration spatial issues significantly?

Some of the mapping linked before. We also have specifically regional evaluations: <http://hdl.handle.net/10138/341832> (in Finnish) and this info is also available in climateguide.fi.

Our NAP has 3 targets that focus on regional level adaptation generally.

Germany

Name of the expert: Inke Schauser

Country: Germany

Organisation: Umweltbundesamt

Position: Scientific officer

Date of the interview: 2025.09.08.

- Please introduce shortly your country's climate adaptation –related strategic planning background!
- What kind of planning documents does exist in your country at national level? NAS? NAP? CCRA? CVA? Please name the actual documents with exact title and availability.

We have a relevant act [KAnG (Klimaanpassungsgesetz)], a national strategy [NAS = DAS (Deutsche Anpassungsstrategie)], a NAP [APA (Aktionsplan Anpassung)], and as evidence basis, a climate risk assessment [CCRA = KWRA (Klimawirkungs- und Risikoanalyse)], and a Monitoring report. The Climate Adapt website and the last EEA publications give further and deeper description.

- Do you have subnational/regional and local strategic documents in the field of adaptation? (local/regional adaptation strategies, programs, action plans)?

Yes, all Länder (states) have their own adaptation strategies, some even have risk assessments and monitoring reports, some also have climate adaptation acts.

- Do you have sectoral strategic documents dealing directly with adaptation? (sectoral adaptation strategies, programs, action plans)?

Yes, sectoral adaptation strategies exist in in agriculture, forestry, health, transport, in addition to the cross sectoral documents mentioned by question 1.

- Which logic is prevailing in your country regarding climate policy strategic planning, regional or sectoral in strategic planning? (if they vary, please describe in detail which document follows which logic, and why). In our approach “regional” means: the document's situation analysis and objective system are structured according to different region hit differently by climate change. “Sectoral” means: the document's situation analysis and objective system are structured according to different sectors /thematic fields hit differently by climate change.

In my opinion sectoral approach is prevailing unambiguously with some spatial information also included in the planning documents. Cross-sectoral assessments also include spatial information in the form of maps.

- Do you find it useful to strengthen the spatial focus of adaptation planning or find the sectoral orientation better?

I prefer sectoral information, on different spatial levels (national, regional, local).

- Do you see potential in climate adaptation to improve cooperation with other countries in the field of adaptation?

Yes.

- If so, for what purposes? To gain new experiences in adaptation? To gain new markets for your country's adaptation- oriented or green economy? To disseminate your best practices/knowledge?

The most important advantages are learning by exchange of experience and trying to find harmonised guidelines with enough flexibility to be transferred to different regions and levels. Dissemination of our own good practises is part of this, naturally.

- Do you have a functioning monitoring system in adaptation?

Yes.

- If so, do you actually monitor spatial changes in vulnerability and/or spatial differences in adaptation action's effectiveness?

We basically monitor vulnerability or risk changes over time (using time series).

- If not, is there a plan to implement / develop such a system?

..

- Do you have applied indicator sets in adaptation?

Yes.

- If yes, who collect (and process and make available) these indicators?

The related responsibilities are distributed between different authorities. All of the information come together at Umweltbundesamt Deutschland based on a long-established process (started already 2008).

- Are these indicators collected from all spatial levels? Does your monitoring system do any spatial aggregation of indices?

Indicators are showing mainly national level information, with some regional examples. Time series are based on spatial aggregation.

- If yes, what do they measure? (e.g.: Changes in climatic factors? Spatial vulnerability? Policy effectiveness?)

All of them.

- What kind of indicators do you use? (impact, outcome, output, financial, performance, etc.)?

All of them.

- Does any GIS based DS system being used in climate (adaptation) policy in your country?

Yes.

- If so, is it a mono- (it deals only with 1-2 vulnerability topics) or multi thematic DS (covering several climate impacts/vulnerability topics)?

I would not call them DS, they rather show the results of impact models, i.e. the Climate Atlas of Deutsche Wetter Dienst (https://www.dwd.de/DE/klimaumwelt/klimaatlas/klimaatlas_node.html). Similar data is provided by different Länder (regional level).

- Is it utilised in adaptation planning and MRE?

They are utilised as information basis and as a tool for overview, but for adaptation planning more detailed (local) data would be needed.

- Is there any other adaptation-related website functioning /planned (knowledge collector and dissemination sites)?

Of course there are many other websites, at national level, supported by Umwelt Bundesamt Deutschland and Deutsche Wetterdienst, good example worth of mentioning, is the so-called klivo-portal (https://www.klivoportal.de/DE/Home/home_node.html).

- If not, does your country plan to set up such a system?

More detailed DS system would be useful.

- Are there any climate adaptation related evaluations in your country?

Yes.

- If not, is it planned to elaborate such documents?

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- If so,

- are there among them explicitly (in some cases even in their title) geographically/spatially oriented evaluation products, rich in territorial chapters, analytical aspects, evaluation questions?

The actual evaluation is still in progress; the former one did not contain spatially oriented products.

- Or are there large number of adaptation evaluation products, established system but with minor or no territorial content?

No.

- Or only sectoral /thematic/general evaluations exist?

Yes.

- The NAS/NAP aims to set up an evaluation system or elaboration of products, but no such products are in practice yet.

Yes, KAnG act is calling mainly the responsible ministries to measure their own progress in adaptation.

○ What are the spatial levels of evaluations?

- Are there only national level evaluations, or even regional/local ones, too (does explicitly territorially oriented evaluation reports in adaptation at subnational and local levels emerge)?

I have not enough relevant information to answer this question. I basically deal with the federal level.

○ Does spatial visualization (graphic solutions to present territorial differences, characteristics) emerge in adaptation evaluations and reports?

Again, I have not enough relevant information to answer this question.

- Do you take into consideration European level regional development objectives in your adaptation planning?

Yes.

○ If so, how?

I pressed yes, because I do not know how far this is done.

- Do you take into consideration national level regional development objectives in your adaptation planning?

Yes.

○ If so, how?

I do not know exactly.

- Can you mention any good practice in your country from national or regional level about planning/monitoring/evaluation practices in adaptation that takes into consideration spatial issues significantly?

We must see that Germany has a federal structure, so the issue of spatial analysis is a difficult question, spatial issues are mostly present in the climate risk assessment.

Türkiye

Name of the expert: Neslihan Ağartan

Country: Türkiye

Organisation: Directorate of Climate Change, Ministry of Environment, Urbanization and Climate Change

Position: Expert

Date of the interview: 2025.08.13.

- Please introduce shortly your country's climate adaptation –related strategic planning background!
 - What kind of planning documents does exist in your country at national level? NAS? NAP? CCRA? CVA? Please name the actual documents with exact title and availability.

Here in Türkiye, we have National Adaptation Strategy and Action Plan (NASAP) (2024-2030) ([https://iklim.gov.tr/db/turkce/icerikler/files/Uyum\(1\).pdf](https://iklim.gov.tr/db/turkce/icerikler/files/Uyum(1).pdf)) in a single document. As a preliminary study for the preparation of NASAP, vulnerability and risk analysis (VRA) have been conducted, but the detailed report has not been published.

- Do you have subnational/regional and local strategic documents in the field of adaptation? (local/regional adaptation strategies, programs, action plans)?

In response to the needs that emerged following natural disasters such as floods and landslides in 2019, which caused significant loss of life and property, the Black Sea Region Climate Change Action Plan were prepared, where the needs and solution proposals identified that should be addressed at the regional level in order to increase the resilience of the Black Sea Region against climate change.

In 2021, vulnerability and risk analyses were conducted for 4 different provinces as a pilot application, and based on these, local climate change adaptation strategy and action plans of these provinces were prepared.

As an ongoing study, after the completion of the climate projections being updated according to the IPCC SSP scenarios, vulnerability and risk analyses will be conducted for the priority sectors of all 12 NUTS1 regions of Türkiye.

The Climate Law was published in July 2025. According to this law, the local governments of all 81 provinces will prepare local climate change action plans covering the entire provincial boundaries by 2028.

- Do you have sectoral strategic documents dealing directly with adaptation? (sectoral adaptation strategies, programs, action plans)?

Although there is no sector-specific strategic document focused on adaptation, NASAP defines the strategic directions and action lines that 11 sectors (water resources management, agriculture and food security, biodiversity and ecosystem services, urban, public health, energy, industry, transportation and communication, tourism and cultural heritage, social development and disaster risk management) need to implement for adaptation.

- Which logic is prevailing in your country regarding climate policy strategic planning, regional or sectoral in strategic planning? (if they vary, please describe in detail which document follows which logic, and why). In our approach “regional” means: the document’s situation analysis and objective system are structured according to different region hit differently by climate change. “Sectoral” means: the document’s situation analysis and objective system are structured according to different sectors /thematic fields hit differently by climate change.

Although the sectoral vulnerability and risk analysis was conducted spatially and provinces were ranked relative to each other, the strategies and actions were written for the entire country. In other words, the sectoral approach prevails in Türkiye's NASAP (2024-2030).

- Do you find it useful to strengthen the spatial focus of adaptation planning or find the sectoral orientation better?

I find it more useful to strengthen the spatial focus in adaptation planning. For this reason, I consider it necessary to prepare local climate change action plans to further detail adaptation planning.

- Do you see potential in climate adaptation to improve cooperation with other countries in the field of adaptation?

Yes.

- If so, for what purposes? To gain new experiences in adaptation? To gain new markets for your country’s adaptation- oriented or green economy? To disseminate your best practices/knowledge?

It could be to gain new experiences in adaptation.

- Do you have a functioning monitoring system in adaptation?

Yes.

- If so, do you actually monitor spatial changes in vulnerability and/or spatial differences in adaptation action’s effectiveness?

We monitor the implementation status of climate actions, but the data is not spatial.

- If not, is there a plan to implement / develop such a system?
- Do you have applied indicator sets in adaptation?

Yes.

- If yes, who collect (and process and make available) these indicators?

There are indicator sets developed for monitoring adaptation actions. In the monitoring process, the action owners enter data related to these indicators into the system annually. The first monitoring cycle is being conducted in 2025. After the data entry is completed, the Climate Change Department, as the coordinator, will prepare a monitoring report.

- Are these indicators collected from all spatial levels? Does your monitoring system do any spatial aggregation of indices?

No. Data is being collected for the entire country, but there is no spatial aggregation.

- If yes, what do they measure? (e.g.: Changes in climatic factors? Spatial vulnerability? Policy effectiveness?)

-.

- What kind of indicators do you use? (impact, outcome, output, financial, performance, etc.)?

-.

- Does any GIS based DS system being used in climate (adaptation) policy in your country?

No.

- If so, is it a mono- (it deals only with 1-2 vulnerability topics) or multi thematic DS (covering several climate impacts/vulnerability topics)?

-.

- Is it utilised in adaptation planning and MRE?

-.

- Is there any other adaptation-related website functioning /planned (knowledge collector and dissemination sites)?

There is a portal (<https://iklimportal.gov.tr/projects>) where publications and projects related to climate adaptation policy and developments in the country are uploaded.

- If not, does your country plan to set up such a system?

-.

- Are there any climate adaptation related evaluations in your country?

No.

- If not, is it planned to elaborate such documents?

The NASAP monitoring report is planned to be presented at the coordination committee where senior executives of all institutions, but there is no plan to prepare a related document.

- If so,

- are there among them explicitly (in some cases even in their title) geographically/spatially oriented evaluation products, rich in territorial chapters, analytical aspects, evaluation questions?
There is no information available yet.

- Or are there large number of adaptation evaluation products, established system but with minor or no territorial content?
There is no information available yet.

- Or only sectoral /thematic/general evaluations exist?
There is no information available yet.

- The NAS/NAP aims to set up an evaluation system or elaboration of products, but no such products are in practice yet.
There is no information available yet.

- What are the spatial levels of evaluations?

- Are there only national level evaluations, or even regional/local ones, too (does explicitly territorially oriented evaluation reports in adaptation at subnational and local levels emerge)?

There is no information available yet.

- Does spatial visualization (graphic solutions to present territorial differences, characteristics) emerge in adaptation evaluations and reports?

There is no information available yet.

- Do you take into consideration European level regional development objectives in your adaptation planning?

No.

- If so, how?

-.

- Do you take into consideration national level regional development objectives in your adaptation planning?

Yes.

- If so, how?

Local climate change action plans are expected to take local development elements into account.

- Can you mention any good practice in your country from national or regional level about planning/monitoring/evaluation practices in adaptation that takes into consideration spatial issues significantly?

Not really.

Sweden

Name of the expert: Timo Persson

Country: Sweden

Organisation: Environmental Protection Agency

Position: Climate Adaptation Coordinator

Date of completion: 2025.08.06. 15:53:36

- Please introduce shortly your country's climate adaptation –related strategic planning background!

In our country there is both a NAS and a NAP (in the same document). It is called the “National Strategy and the Government’s Action Plan for Climate Change Adaptation” (number of the legislation is Skr. 2023/24:97).

- Do you have subnational/regional and local strategic documents in the field of adaptation? (local/regional adaptation strategies, programs, action plans)?

Yes, all County Administrative Boards are tasked with having an updated climate adaptation plan for their region. A lot of municipalities in Sweden also have local adaptation plans for their municipalities. Some regions also have regional plans which highlights adaptation needs.

- Do you have sectoral strategic documents dealing directly with climate adaptation? (sectoral adaptation strategies, programs, action plans)?

Yes, all sectoral National Agencies answering to the Swedish Decree on adaptation (Förordning (2018:1428) om myndigheters klimatanpassningsarbete) have their own action plans for adaptation within their sector (such as housing, environment, infrastructure, health and so on).

- Which logic is prevailing in your country, regional or sectoral in adaptation policy's strategic planning (if they vary, please describe in detail which document follows which logic, and why)? In our approach, regional" means: the document's situation analysis and objective system are structured according to different region hit differently by climate change; "Sectoral" means: the document's situation analysis and objective system are structured according to different sectors /thematic fields hit differently by climate change.

Do not understand clearly the question of "logic". But if it's the chain of command then: NAP sets out the governments work and goals for adaptation which sets the course for all adaptation work in Sweden from national to regional and local level. Sectoral Agencies have their own adaptation plans and goals set out by themselves and so do the County Administrative Boards. However, the main organisation principle in the elaboration of strategies is a sectoral approach.

- Do you have a functioning adaptation-related monitoring system?

Yes, there is a functioning adaptation-related monitoring system.

- If so, do you actually monitor spatial changes of climatic factors or vulnerability and/or spatial differences in the effectiveness of climate actions?

To some extent. All national agencies and County Administrative Boards are tasked with reporting their annual work to the government, which is an indicator of how work is progression. The Swedish Expert Council of Adaptation is also tasked with evaluating the adaptation work and the vulnerability status through a climate and vulnerability analysis. However, a new monitoring system for Sweden with a broader scope is under evaluation/implementation.

- If not, is there a plan to set up such a system?

-.

- Do you have applied indicator sets in adaptation?

No, not yet.

- If yes, who collect (and process and make available) these indicators?

-.

- Are these indicators collected from all spatial levels? Does your monitoring system do any spatial aggregation of indices?

-.

- If yes, what do they measure? (e.g.: changes in climatic factors? Spatial vulnerability? Policy effectiveness?)

-.

- What kind of indicators do you use? (impact, outcome, output, financial, performance, etc.)?

-.

- Are there any GIS based decision support (DS) system in climate (adaptation) policy in your country?

Yes.

- If so, please introduce it shortly.

In Sweden there is several GIS-based data sets available for actors to use in their evaluation of climate related risks. This serves as decision support when planning.

- If not, is there any other adaptation-related (e.g. knowledge collector) website is functioning /planned but without signs of GIS/DS system?

-.

- Are there any climate adaptation related evaluations in your country? (Yes or no)

Yes, there are evaluations.

- If the answer is not, is it planned to elaborate such documents?

-.

- If the answer is yes, are there among them explicitly (in some cases even in their title) geographically/spatially oriented products, rich in territorial chapters, analytical aspects and evaluation questions?

There are evaluations but they are, however, based on sectors rather than geographical regions to my knowledge in the national climate and vulnerability analysis.

- What are the spatial levels of evaluations (what spatial levels (national, subnational, municipal) are they prepared for)?

GIS-data sets and climate analysis for different climatic indicators are readily available down to regional and even municipal level. But a comprehensive system of spatially focussed evaluations does not exist yet.

Austria

Name of the expert: Markus Leitner

Country: Austria

Organisation: Environment Agency Austria

Position: Head of Team

Date of completion: 2025.10.07.

- Please introduce shortly your country's climate adaptation –related strategic planning background!

- What kind of planning / analytical documents exist in your country at national level? NAS? NAP? CCRA? CVA? Please name the actual documents with exact title and availability.

The whole spectrum of strategic documents is available: Austria has a national level strategy (NAS), a national level action plan (NAP), risk assessment (CCRA), vulnerability assessment (CVA) and several regional strategies (RAPs).

- Do you have subnational/regional and local strategic documents in the field of adaptation? (local/regional adaptation strategies, programs, action plans)?

Yes, we have nine regional adaptation programmes (RAPs). These are partly strategies, partly action plans, partly programs supporting adaptation.

- Do you have sectoral strategic documents dealing directly with climate adaptation? (sectoral adaptation strategies, programs, action plans)?

In some sectors, like agriculture, forestry and water sectoral adaptation strategies exist, mostly within ministries in charge of these themes.

- Which logic is prevailing in your country, regional or sectoral in adaptation policy's strategic planning (if they vary, please describe in detail which document follows which logic, and why)? In our approach "regional" means: the document's situation analysis and objective system are structured according to different region hit differently by climate change; "sectoral" means: the document's situation analysis and objective system are structured according to different sectors /thematic fields hit differently by climate change.

Due to the responsibilities such as spatial planning, nature conservation and civil protection, the sub-national/regional level (nine units in total) have different adaptation strategies and plans, related to the respective responsibilities.

- Do you have a functioning adaptation-related monitoring system?

Yes.

- If so, do you actually monitor spatial changes of climatic factors or vulnerability and/or spatial differences in the effectiveness of climate actions?

We only partly monitor spatial changes of climatic factors or vulnerability and/or spatial differences in the effectiveness of climate actions. Mostly the mentioned activities are related to existing hazards, such as hail, wind/storm, flood (30-, 100-, 300-year-frequency events), etc.

- If not, is there a plan to set up such a system?

-

- Do you have applied indicator sets in adaptation?

Yes.

- If yes, who collect (and process and make available) these indicators?

The Ministry in charge of adaptation policy and the Environment Agency of Austria.

- Are these indicators collected from all spatial levels? Does your monitoring system do any spatial aggregation of indices?

Indicators are collected only partly from spatial levels, depending on the type of hazard and the related territory.

- If yes, what do they measure? (e.g.: changes in climatic factors? Spatial vulnerability? Policy effectiveness?)

They measure mainly changes in climate indices, extent of loss and damage, condition changes over time (e.g. tree species changes, changes in pests, etc.).

- What kind of indicators do you use? (impact, outcome, output, financial, performance, etc.)?

We use a mix of all of them (impact, outcome, output, performance), complemented also with some financial information, related to the amount of spending within the Austrian Green Bond initiative.

- Are there any GIS based decision support (DS) system in climate (adaptation) policy in your country?

Yes.

- If so, please introduce it shortly.

HORA - <https://hora.gv.at>. The project was initiated in 2002, following the severe flood events of recent decades, aiming at setting up a nationwide risk zoning system for natural hazards with a special focus on floods. In 2011, the platform was updated and expanded with a new version of the digital application (hora.gv.at), offering all citizens the possibility to obtain a first-hand risk assessment for various natural hazards and weather events (such as flooding, earthquakes, storms, hail, lightning, and snow load). Its visualization of hazardous areas serves as an important basis for the optimization and prioritization efforts of municipalities, states, and the federal government in flood protection and spatial planning.

- If not, is there any other adaptation-related (e.g. knowledge collector) website is functioning /planned but without signs of GIS/DS system?

-.

- Are there any climate adaptation related evaluations in your country? (Yes or no)

Yes.

- If the answer is not, is it planned to elaborate such documents?

-.

- If the answer is yes, are there among them explicitly (in some cases even in their title) geographically/spatially oriented products, rich in territorial chapters, analytical aspects and evaluation questions?

Not really. Information obtained from stakeholder workshops and indicators/criteria provide a picture of the progress in adaptation and its implementation over time. But explicitly spatial evaluation documents, even in their title, are not the mainstream.

- What are the spatial levels of evaluations (what spatial levels (national, subnational, municipal) are they prepared for)

There are national and subnational evaluations, partly with municipal examples.

- Is there anything you want to highlight or share with us that was not covered in the questionnaire?

Thank you for Hungary's effort in this field, I am looking forward to seeing the next steps from your side - warm regards, Markus Leitner.

Estonia

Name of the expert: Hedy Eeriksoo

Country: Estonia

Organisation: Ministry of Climate

Position: Adviser

Date of completion: 2025.08.15.

- Please introduce shortly your country's climate adaptation –related strategic planning background!
 - What kind of planning / analytical documents exist in your country at national level? NAS? NAP? CCRA? CVA? Please name the actual documents with exact title and availability.

There is a comprehensive NAS (Climate Change Development Plan until 2030), available under the link <https://kliimaministeerium.ee/sites/default/files/documents/2021-06/Climate%20Change%20Adaption%20Development%20Plan%20until%202030%20%28in%20English%29.pdf>. The strategy has also elements that are rather NAP-like ones.

- Do you have subnational/regional and local strategic documents in the field of adaptation? (local/regional adaptation strategies, programs, action plans)?

77% of our local governments have their own climate and energy plans (SECAPs), which include adaptation plans.

- Do you have sectoral strategic documents dealing directly with climate adaptation? (sectoral adaptation strategies, programs, action plans)?

The most vulnerable sectors have adaptation goals and plans integrated into sectoral policies, for example in the

1. Internal Security Development plan
(https://www.siseministeerium.ee/sites/default/files/documents/2021-10/siseturvalisuse_arengukava_2020_2030_03.06.2021.pdf),
2. Agriculture and Fisheries Development Plan until 2030
(<https://www.agri.ee/sites/default/files/documents/2021-09/poka-2030-taistekst.pdf>),
3. Energy Development Plan 2030
(<https://kliimaministeerium.ee/sites/default/files/documents/2023-07/Energiamajanduse%20arengukava%20aastani%202030.pdf>),
4. Transport and Mobility Development Plan 2021–2035
(<https://www.valitsus.ee/sites/default/files/documents/2021-11/Transpordi%20ja%20liikuvuse%20arengukava%202021%E2%80%932035.pdf>),

5. National Health Plan (<https://www.sm.ee/sites/default/files/documents/2023-03/National%20Health%20Plan%202020-2030.pdf>).

- Which logic is prevailing in your country, regional or sectoral in adaptation policy's strategic planning (if they vary, please describe in detail which document follows which logic, and why)? In our approach "regional" means: the document's situation analysis and objective system are structured according to different region hit differently by climate change; "sectoral" means: the document's situation analysis and objective system are structured according to different sectors /thematic fields hit differently by climate change.

Sectoral policies are sector oriented and regional planning documents are concentrated on regional needs and plans.

- Do you have a functioning adaptation-related monitoring system?

Yes.

- If so, do you actually monitor spatial changes of climatic factors or vulnerability and/or spatial differences in the effectiveness of climate actions?

Monitoring climatic factors is the responsibility of our national meteorological service. For planning we have a so-called Climate Atlas project going on, which will take climate projections into account. New climate projections are calculated and will be available in 2026. After that we plan to renew our climate risk assessments, which will contain vulnerable sectors. Current climate risk assessments are 10 years old but still used for adaptation planning.

- If not, is there a plan to set up such a system?

-

- Do you have applied indicator sets in adaptation?

Yes.

- If yes, who collect (and process and make available) these indicators?

We have some indicators in the NAS, and some indicators are furthermore attributed to sectoral policies, but we feel the current situation is insufficient. We are currently renewing our adaptation-related indicator system.

- Are these indicators collected from all spatial levels? Does your monitoring system do any spatial aggregation of indices?

No.

- If yes, what do they measure? (e.g.: changes in climatic factors? Spatial vulnerability? Policy effectiveness?)

We have reliable weather data collected since 1865, and we will continue to collect this data to observe climatic changes.

- What kind of indicators do you use? (impact, outcome, output, financial, performance, etc.)?

We have different indicators in place, for example under the NAS we have impact, outcome and performance indicators.

- Are there any GIS based decision support (DS) system in climate (adaptation) policy in your country?

Yes.

- If so, please introduce it shortly.

We have existing GIS based tools, for example in connection with flood hazard areas, heat islands etc. They are located under the link <https://geoportaal.maaamet.ee/eng/web-maps-p35.html>. We are also preparing a Climate Atlas with various climate parameters, which will contain historic and future climate projections. The goal of the Climate Atlas is to create an interactive web-based tool for monitoring and displaying climate change, which provides an overview of past and future climate using maps and graphs. The Climate Atlas is a tool for decision-makers, planners, scientists and citizens, which allows them to assess and visualize climate change and the risks associated with it, and to take the necessary measures to prevent risks and adapt to climate change.

- If not, is there any other adaptation-related (e.g. knowledge collector) website is functioning /planned but without signs of GIS/DS system?

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- Are there any climate adaptation related evaluations in your country?

Yes.

- If the answer is not, is it planned to elaborate such documents?

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- If the answer is yes, are there among them explicitly (in some cases even in their title) geographically/spatially oriented products, rich in territorial chapters, analytical aspects and evaluation questions?

As previously mentioned, the products of our Geoportal are map-based and with different levels of accuracy (<https://geoportaal.maaamet.ee/eng/web-maps-p35.html>). The Climate Atlas will also be with a local government level of accuracy.

- What are the spatial levels of evaluations (what spatial levels (national, subnational, municipal) are they prepared for)

See previous answer (19).

- Is there anything you want to highlight or share with us that was not covered in the questionnaire?

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Romania

Name of the expert: Valentina Visan

Country: Romania

Organisation: Ministry of Environment, Waters and Forests

Position: senior adviser

Date of completion: 2025.08.06.

- Please introduce shortly your country's climate adaptation –related strategic planning background!

- What kind of planning / analytical documents exist in your country at national level? NAS? NAP? CCRA? CVA? Please name the actual documents with exact title and availability.

Romania has both NAS and NAP document in force.

- Do you have subnational/regional and local strategic documents in the field of adaptation? (local/regional adaptation strategies, programs, action plans)?

No.

- Do you have sectoral strategic documents dealing directly with climate adaptation? (sectoral adaptation strategies, programs, action plans)?

No.

- Which logic is prevailing in your country, regional or sectoral in adaptation policy's strategic planning (if they vary, please describe in detail which document follows which logic, and why)? In our approach "regional" means: the document's situation analysis and objective system are structured according to different region hit differently by climate change; "sectoral" means: the document's situation analysis and objective system are structured according to different sectors /thematic fields hit differently by climate change.

Rather sectoral, if I must choose.

- Do you have a functioning adaptation-related monitoring system?

Yes.

- If so, do you actually monitor spatial changes of climatic factors or vulnerability and/or spatial differences in the effectiveness of climate actions?

RO-ADAPT.

- If not, is there a plan to set up such a system?

-.

- Do you have applied indicator sets in adaptation?

Yes.

- If yes, who collect (and process and make available) these indicators?

Ministry of Environment, Waters and Forests/Climate Change Department

- Are these indicators collected from all spatial levels? Does your monitoring system do any spatial aggregation of indices?

Not yet.

- If yes, what do they measure? (e.g.: changes in climatic factors? Spatial vulnerability? Policy effectiveness?)

-.

- What kind of indicators do you use? (impact, outcome, output, financial, performance, etc.)?

A mixture of indicator types.

- Are there any GIS based decision support (DS) system in climate (adaptation) policy in your country?

Yes.

- If so, please introduce it shortly.

RO-ADAPT, <https://www.roadapt.ro/>. On the website, there is only a climate data-oriented GIS-based system, without risk, vulnerability, sensitivity or adaptive capacity measurements.

- If not, is there any other adaptation-related (e.g. knowledge collector) website is functioning /planned but without signs of GIS/DS system?

-.

- Are there any climate adaptation related evaluations in your country?

Yes.

- If the answer is not, is it planned to elaborate such documents?

-.

- If the answer is yes, are there among them explicitly (in some cases even in their title) geographically/spatially oriented products, rich in territorial chapters, analytical aspects and evaluation questions?

Partially spatial, not structured by regions.

- What are the spatial levels of evaluations (what spatial levels (national, subnational, municipal) are they prepared for)

Only national.

- Is there anything you want to highlight or share with us that was not covered in the questionnaire?

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Lithuania

Name of the expert: Vasarė Tamošauskaitė

Country: Lithuania

Organisation: Lithuanian Hydrometeorological Service under the Ministry of Environment

Position: senior specialist

Date of completion: 2025.10.07.

- Please introduce shortly your country's climate adaptation –related strategic planning background!

- What kind of planning / analytical documents exist in your country at national level? NAS? NAP? CCRA? CVA? Please name the actual documents with exact title and availability.

2 documents can be mentioned particularly:

- 1) NAP - National Adaptation to Climate Change Plan (2024-2030). Link to the document:

<https://enmin.lrv.lt/public/canonical/1727959989/5217/Priedas%20Nr.%205%20Prisitaikymo%20prie%20klimato%20kaitos%20planas.pdf>. It is a part of National energy and climate action plan (2021-2030), Annex 5 https://commission.europa.eu/document/download/e4569d35-7ab0-4445-8fa6-017357d04546_lt?filename=LT_FINAL%20UPDATED%20NECP%202021-2030%20%28Lithuanian%29.pdf. It was also adopted by Government of Lithuania on 11 December 2025. Link to the document: <https://eseimas.lrs.lt/portal/legalAct/lt/TAD/b7ff6bd1b7b811efbb3fe9794b4a33e2?jfwid=-wdjtcs52d>

- 2) NAS - National Adaptation Strategy - National Climate Change Management Agenda. Link to the document: <https://eseimas.lrs.lt/portal/legalAct/lt/TAD/219a2632a6b311ecaf79c2120caf5094?jfwid=-56ckr0gcc>.

- Do you have subnational/regional and local strategic documents in the field of adaptation? (local/regional adaptation strategies, programs, action plans)?

Yes, we do have 8 municipalities adaptation plans. In 2025, Ministry of Environment is planning to prepare adaptation plans for 8 more municipalities.

- Do you have sectoral strategic documents dealing directly with climate adaptation? (sectoral adaptation strategies, programs, action plans)?

We do not have sectorial documents that directly connected with adaptation to climate change, just some document including adaptation like Flood Risk Management Plan, Water Development Plan, Coastal Zone Management Programme.

- Which logic is prevailing in your country, regional or sectoral in adaptation policy's strategic planning (if they vary, please describe in detail which document follows which logic, and why)? In our approach "regional" means: the document's situation analysis and objective system are structured according to different region hit differently by climate change; "sectoral" means: the document's situation analysis and objective system are structured according to different sectors /thematic fields hit differently by climate change.

In 2021, Lithuania adopted the National Climate Change Management Agenda (NCCMA), where climate change adaptation targets and objectives for 2030 and a long-

term direction for adaptation to climate change by 2050 were set out. NCCMA shall be updated every 10 years or in the event of changes in the legal framework. The targets and objectives outlined in the NCCMA for the 2021–2030 period shall be pursued through the implementation of the National Progress Plan and the NCCMA implementation plan, i.e. the NECP. This plan adheres to the requirements of Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action. The NECP, approved by the Government on 11 December 2024, has included the National Adaptation to Climate Change Plan as an annex.

The Ministry of Environment of the Republic of Lithuania (MoE) is the primary coordinating institution for climate change adaptation policy development and implementation. It oversees the legal, institutional, and procedural framework for adaptation efforts and coordinates the integration of sectoral goals into national adaptation strategies. The MoE collaborates with other ministries and governmental institutions to collect relevant information, align sectoral objectives, and ensure coherence in policy implementation.

In the NCCMA climate change adaptation goals are pursued across multiple sectors within the competence of the Ministry of Economy and Innovation, Ministry of Energy, Ministry of Finance, Ministry of National Defence, Ministry of Culture, Ministry of Social Security and Labour, Ministry of Transport and Communications, Ministry of Health, Ministry of Education, Science and Sport, Ministry of Foreign Affairs, Ministry of the Interior, and Ministry of Agriculture. Each ministry is responsible for implementing adaptation measures relevant to their respective sectors, developing sector-specific plans, and contributing to the integration of adaptation goals into broader national strategies and projects.

Local governments play a critical role in implementing climate adaptation measures by incorporating national objectives into regional and local development plans. They address local vulnerabilities, manage resources, and engage with communities to foster resilience at the local level. Additionally, municipalities are responsible for developing and implementing their own adaptation plans, which outline specific actions and strategies to address local risks related to climate change.

- Do you have a functioning adaptation-related monitoring system?

No.

- If so, do you actually monitor spatial changes of climatic factors or vulnerability and/or spatial differences in the effectiveness of climate actions?

–.

- If not, is there a plan to set up such a system?

MoE is collecting information on adaptation measures every two years as requested by the regulation, but we face challenges in obtaining detailed information, so far, we can only assess progress in adapting to climate change to a very limited extent.

- Do you have applied indicator sets in adaptation?

Yes, indicators had been set in NCCMA.

- If yes, who collect (and process and make available) these indicators?

In Lithuania, adaptation indicators are collected by the Ministry of Environment

- Are these indicators collected from all spatial levels? Does your monitoring system do any spatial aggregation of indices?

Not really.

- If yes, what do they measure? (e.g.: changes in climatic factors? Spatial vulnerability? Policy effectiveness?)

-.

- What kind of indicators do you use? (impact, outcome, output, financial, performance, etc.)?

-.

- Are there any GIS based decision support (DS) system in climate (adaptation) policy in your country?

Yes.

- If so, please introduce it shortly.

Lithuania applies several GIS-based decision-support systems in climate adaptation policy. Some examples are:

1. The Environmental Protection Agency (EPA) integrates datasets of floods.
2. The Lithuanian Hydrometeorological Service (LHMS) provides spatial climate monitoring tools.
3. The MoE in the ClimAdapt-LT project developed a GIS-based decision-support tool for municipalities to assess climate risks and plan adaptation actions.

- If not, is there any other adaptation-related (e.g. knowledge collector) website is functioning /planned but without signs of GIS/DS system?

-.

- Are there any climate adaptation related evaluations in your country?

No.

- If the answer is not, is it planned to elaborate such documents?

We had conducted an evaluation before updated our NCCMA. The evaluation, in accordance with the Intergovernmental Panel on Climate Change (IPCC) methodology, taking into account the conclusions of the SWOT analysis and based on existing studies, carried out an assessment of the sensitivity of sectors to the impacts of climate change, assessed the risks and opportunities for adaptation to climate change and submitted proposals for legally binding short-term goals and objectives for adaptation to the consequences of climate change by 2030 and elaborated the related implementation measures in the sectors of the Lithuanian economy most sensitive to the impact of climate change. Moreover, financial resources were identified together with proposals for indicative medium-term (2040), long-term (2050) and even longer-term (2100) goals and objectives at the national level and in individual sectors of the Lithuanian economy. Link to the document: <https://am.lrv.lt/uploads/am/documents/files/KLIMATO%20KAITA/Studijos%2C%20metodin%C4%97%20med%C5%BEiaga/2019%2012%2017%20Analyze%20del%20klimato%20kaitos%20GALUTINE.pdf>

- If the answer is yes, are there among them explicitly (in some cases even in their title) geographically/spatially oriented products, rich in territorial chapters, analytical aspects and evaluation questions?

-.

- What are the spatial levels of evaluations (what spatial levels (national, subnational, municipal) are they prepared for)

-.

- Is there anything you want to highlight or share with us that was not covered in the questionnaire?

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Slovenia

Name of the expert: Luka Honzak

Country: Slovenia

Organisation: Slovenian Environment Agency, ARSO

Position: Head of climate-dependent activities support division

Date of completion: 2025.08.15.

- Please introduce shortly your country's climate adaptation –related strategic planning background!

- What kind of planning / analytical documents exist in your country at national level? NAS? NAP? CCRA? CVA? Please name the actual documents with exact title and availability.

There is the Strategic Framework for Climate Change Adaptation (SFCCA), adopted by the Government in 2016. It is quasi a NAS. Link to the document: https://www.gov.si/assets/ministrstva/MOPE/Okolje/Podnebne-spremembe/SOzP_ang.pdf

- Do you have subnational/regional and local strategic documents in the field of adaptation? (local/regional adaptation strategies, programs, action plans)?

At regional level some examples can be mentioned:

1. Gorenjska region - link to the document: https://leag.si/wp-content/uploads/2025/05/Strategija-prilagajanja-Gorenjske-regije-na-podnebne-spremembe_compressed.pdf

2. Goriška region - link to the document: https://www.golea.si/wp-content/uploads/2025/06/Strategija-prilagajanja-Severno-Primorske-Gori%C5%A1ke-RR-na-podnebne-spremembe_koncna.pdf

At local level the Ljubljana, Kranj, Velenje towns have their own strategies (source: <https://www.samolplanet.si/eu-misije/>)

- Do you have sectoral strategic documents dealing directly with climate adaptation? (sectoral adaptation strategies, programs, action plans)?

A good example is public health - link to the document: <https://nijz.si/moje-okolje/podnebne-spremembe/ocena-ranljivosti-in-tveganja-za-zdravje-zaradi-podnebnih-sprememb-po-podnebnih-regijah-v-sloveniji/>.

Strategic documents for other sectors are under elaboration (source: <https://www.gov.si/zbirke/projekti-in-programi/strategija-prilagajanja-podnebnim-spremembam/>).

○ Which logic is prevailing in your country, regional or sectoral in adaptation policy's strategic planning (if they vary, please describe in detail which document follows which logic, and why)? In our approach "regional" means: the document's situation analysis and objective system are structured according to different region hit differently by climate change; "sectoral" means: the document's situation analysis and objective system are structured according to different sectors /thematic fields hit differently by climate change.

Both is present, at national level rather the sectoral is prevailing.

- Do you have a functioning adaptation-related monitoring system?

No.

- If so, do you actually monitor spatial changes of climatic factors or vulnerability and/or spatial differences in the effectiveness of climate actions?

-.

- If not, is there a plan to set up such a system?

Yes, Ministry of Environment, Climate and Energy is responsible for adaptation.

- Do you have applied indicator sets in adaptation?

No.

- If yes, who collect (and process and make available) these indicators?

-.

- Are these indicators collected from all spatial levels? Does your monitoring system do any spatial aggregation of indices?

-.

- If yes, what do they measure? (e.g.: changes in climatic factors? Spatial vulnerability? Policy effectiveness?)

-.

- What kind of indicators do you use? (impact, outcome, output, financial, performance, etc.)?

-.

- Are there any GIS based decision support (DS) system in climate (adaptation) policy in your country?

No.

- If so, please introduce it shortly.

-.

- If not, is there any other adaptation-related (e.g. knowledge collector) website is functioning /planned but without signs of GIS/DS system?

No, not yet - in the framework of the project "LIFE4ADAPT"

(<https://www.samolplanet.si/>) a website will be upgraded with content related to adaptation (including good practices).

- Are there any climate adaptation related evaluations in your country?

No.

- If the answer is not, is it planned to elaborate such documents?

We don't know.

- If the answer is yes, are there among them explicitly (in some cases even in their title) geographically/spatially oriented products, rich in territorial chapters, analytical aspects and evaluation questions?

-.

- What are the spatial levels of evaluations (what spatial levels (national, subnational, municipal) are they prepared for)

-.

- Is there anything you want to highlight or share with us that was not covered in the questionnaire?

-.

Name of the expert: Zala Strojin Božič

Country: Slovenia.

Organisation: Ministry of Environment, Climate and Energy

Position: undersecretary,

Date of completion: 2025.10.11.

- Please introduce shortly your country's climate adaptation –related strategic planning background!

- What kind of planning / analytical documents exist in your country at national level? NAS? NAP? CCRA? CVA? Please name the actual documents with exact title and availability.

The relevant documents at national level are as follows:

1. Strategija prostorskega razvoja Slovenije <https://www.gov.si/zbirke/projekti-in-programi/strategija-prostorskega-razvoja-slovenije/>
2. Resolucija o Dolgoročni podnebni strategiji Slovenije do leta 2050 (ReDPS50) <https://pisrs.si/pregledPredpisa?id=RESO131>
3. Strateški okvir prilagajanja podnebnim spremembam <https://www.gov.si/assets/ministrstva/MOPE/Okolje/Podnebne-spremembe/SOzP.pdf>

- Do you have subnational/regional and local strategic documents in the field of adaptation? (local/regional adaptation strategies, programs, action plans)?

Slovenia does not have regional government authorities; however, it comprises 12 statistical/development regions, each with regional development and energy agencies that fulfil a coordinating role for various purposes. These agencies are involved in planning and preparing new regional spatial plans and in negotiating the allocation of European funds. Under the Climate Law, regional agencies are to be also responsible for preparing regional climate adaptation action plans. There are 2 regions that already prepared regional adaptation strategy.

Slovenia has 212 local communities with varying competences. The majority of municipal responsibilities relate to spatial planning, building construction, local public services, environmental protection, primary education, childcare, and other areas. The Climate Law also foresees the preparation of climate adaptation action plans for all urban municipalities.

- Do you have sectoral strategic documents dealing directly with climate adaptation? (sectoral adaptation strategies, programs, action plans)?

Only for agriculture and forestry. Agriculture is highly dependent on weather and climate conditions, as factors such as air and soil temperature, solar radiation, air humidity, the amount and distribution of precipitation, and the frequency and intensity of extreme weather events have a decisive impact on agricultural production. A similar situation applies to forests in Slovenia, which, with approximately 60% forest cover, ranks as the third most forested country in Europe. The role of forests and forestry in climate change adaptation and mitigation is multifaceted. The first aspect is “protective forest management”, which focuses on reducing CO₂ emissions to the atmosphere; the second is “carbon storage-oriented forest management”, aimed at increasing carbon stocks in vegetation and soils; and the third is “substitution-based forest management”, which promotes the replacement of non-renewable materials and fuels with wood.

- Which logic is prevailing in your country, regional or sectoral in adaptation policy’s strategic planning (if they vary, please describe in detail which document follows which logic, and why)? In our approach “regional” means: the document’s situation analysis and objective system are structured according to different region hit differently by climate change; “sectoral” means: the document’s situation analysis and objective system are structured according to different sectors /thematic fields hit differently by climate change.

We are still in the early stages of climate change adaptation system building. We have adopted the first Climate Law only in July 2025. The Law foresees preparation of one national adaptation strategy that will be based on sectoral climate change vulnerability and risk assessments. The strategy will be followed by regional action plans. So, we will have sectoral climate change vulnerability and risk assessments and interdisciplinary strategy with common goals and indicators.

- Do you have a functioning adaptation-related monitoring system?

No.

- If so, do you actually monitor spatial changes of climatic factors or vulnerability and/or spatial differences in the effectiveness of climate actions?

–.

- If not, is there a plan to set up such a system?

Yes, after the adoption of the new national climate change adaptation strategy.

- Do you have applied indicator sets in adaptation?

Yes.

- If yes, who collect (and process and make available) these indicators?

The Slovenian Environmental Agency - Kazalci okolja
<https://kazalci.arso.gov.si/sl/themes/climate-change-adaptation>.

- Are these indicators collected from all spatial levels? Does your monitoring system do any spatial aggregation of indices?

It depends on the indicator.

- If yes, what do they measure? (e.g.: changes in climatic factors? Spatial vulnerability? Policy effectiveness?)

Again, it depends on the indicator.

- What kind of indicators do you use? (impact, outcome, output, financial, performance, etc.)?

Various kinds of indicators are used.

- Are there any GIS based decision support (DS) system in climate (adaptation) policy in your country?

Yes.

- If so, please introduce it shortly.

See the following links: <https://kazalci.arso.gov.si/sl/themes/climate-change-adaptation/>; <https://www.gov.si/teme/nacrt-zmanjsevanja-poplavne-ogrozenosti/> and <https://narcis.gov.si/ords/r/narcis/narcis/o-sistemu>.

- If not, is there any other adaptation-related (e.g. knowledge collector) website is functioning /planned but without signs of GIS/DS system?

-.

- Are there any climate adaptation related evaluations in your country?

No.

- If the answer is not, is it planned to elaborate such documents?

Yes, with time.

- If the answer is yes, are there among them explicitly (in some cases even in their title) geographically/spatially oriented products, rich in territorial chapters, analytical aspects and evaluation questions?

-.

- What are the spatial levels of evaluations (what spatial levels (national, subnational, municipal) are they prepared for)

-.

- Is there anything you want to highlight or share with us that was not covered in the questionnaire?

-.

Slovakia

Name of the expert: Viktória Látal Pokorná

Country: Slovakia

Organisation: Ministry of Environment

Position: policy officer

Date of completion: 2025.08.28.

- Please introduce shortly your country's climate adaptation –related strategic planning background!

- What kind of planning / analytical documents exist in your country at national level? NAS? NAP? CCRA? CVA? Please name the actual documents with exact title and availability.

3 important current documents are the NAS, the NAP and the CCRA.

1. NAS, adopted in 2018, currently being revised (STRATÉGIA ADAPTÁCIE SLOVENSKEJ REPUBLIKY NA ZMENU KLÍMY, link to the document:

<https://www.minzp.sk/files/odbor-politiky-zmeny-klimy/strategia-adaptacie-sr-zmenu-klimy-aktualizacia.pdf>);

2. NAP, adopted in 2021 (Akčný plán pre implementáciu Stratégie adaptácie SR na zmenu klímy, link to the document: <https://www.minzp.sk/files/odbor-politiky-zmeny-klimy/akcny-plan-implementaciu-nas.pdf>);
 3. Revision and update of the national strategy on adaptation to climate change in Slovakia, Deliverable 2.3: Climate Risk and Vulnerability Assessment Slovakia (CRVA, 2024, link to the document: https://www.klima-adapt.sk/cms/documents/2025/d2.3-sk-crva-report-final-version-en_67eb962f2d167.pdf).
- o Do you have subnational/regional and local strategic documents in the field of adaptation? (local/regional adaptation strategies, programs, action plans)?

Yes, the list is here: <https://www.sazp.sk/zivotne-prostredie/starostlivost-o-krajinu/zelena-infrastruktura/adaptacne-strategie-a-akcne-plany-na-zmenu-klimy>.

Several cities and some regions have climate strategies

1. (2025) Stratégia adaptácie na zmenu klímy pre mesto Lučenec (pdf, 12,7MB)
2. (2024) Stratégia adaptácie na zmenu klímy obce Dubová (pdf., 12,8 MB)
3. (2024) Stratégia adaptácie na zmenu klímy pre mesto Púchov (pdf., 8,2 MB)
4. (2024) Akčný plán pre zmierňovanie a prispôbovanie sa zmene klímy na území mesta Brezno (pdf., 27,2 MB)
5. (2024) Akčný plán mesta Šaľa pre zmierňovanie a prispôbovanie sa zmene klímy (pdf., 24,2 MB)
6. (2024) Klimatická stratégia mesta Malacky (pdf., 24,7 MB)
7. (2023) Akčný plán – zmierňovanie a prispôbovanie sa zmene klímy v meste Bardejov (pdf., 85,2 MB)
8. (2023) Zelený akčný plán mesta Rožňava (pdf., 8,25 MB)
9. (2023) Stratégia a akčný plán adaptácie na nepriaznivé dôsledky zmeny klímy na území mesta Žilina (pdf., 18,4 MB)
10. (2023) Adaptačná stratégia na zmenu klímy PSK
11. (2023) Adaptačný plán BSK na zmenu klímy (pdf., 52,9 MB)
12. (2023) Akčný plán pre mitigáciu a adaptáciu na zmenu klímy mesta Banská Bystrica (pdf., 10,7 MB)
13. (2022) Stratégia adaptácie mesta Prievidza na zmenu klímy (pdf., 2,63 MB)
14. (2022) Akčný plán pripravenosti na zmenu klímy – Snina – mesto pripravené na zmenu klímy (pdf., 5,48 MB)
15. (2022) Adaptačný plán mesta Košice na zmenu klímy 2022 -2030 (pdf., 24,5 MB)
16. (2021) Stratégia adaptácie na nepriaznivé dôsledky zmeny klímy – mesto Hlohovec (pdf., 12,6 MB)
17. (2020) Adaptačná stratégia na zmenu klímy v Košickom kraji (pdf., 2,59 MB)
18. (2020) Klimatický akčný plán Mestská časť Bratislava - Karlova Ves 2020-2030 (pdf., 2,17 MB)
19. (2019) Stratégia adaptačných opatrení na zmenu klímy pre mesto Nitra (pdf., 14,7 MB)
20. (2019) Mesto Senec - Adaptačné opatrenia na nepriaznivé dôsledky zmeny klímy (pdf., 14,8 MB)

21. (2019) Stratégia adaptability mesta Trenčín na klimatickú zmenu (pdf., 29,6 MB)
22. (2018) Základná stratégia adaptácie na nepriaznivé dôsledky zmeny klímy na území mesta Prešov (pdf., 6,67 MB)
23. (2017) Akčný plán adaptácie na zmenu klímy hlavného mesta SR Bratislavy 2017 – 2020 (pdf., 27,5 MB)
24. (2017) Spoločná adaptačná stratégia na dopady zmeny klímy v pilotnom území (okres Michalovce, Sobrance a Užhorod) (pdf., 6,4 MB)
25. (2017) Lokálna adaptačná stratégia na zmenu klímy obce Spišská Teplica (pdf., 6,37 MB)
26. (2015) Adaptačná stratégia na zmenu klímy (využitie dažďovej vody) Zvolen (pdf., 4,74 MB)
27. (2015) Stratégia adaptácie mesta Kežmarok na zmenu klímy so zameraním na rast častosti intenzívnych zrážok (pdf., 6,2 MB)
28. (2015) Stratégia adaptácie mesta Trnava na dopady zmeny klímy - vlny horúčav (pdf., 7,9 MB)
29. (2014) Stratégia adaptácie na nepriaznivé dôsledky zmeny klímy na území hlavného mesta SR Bratislavy (pdf., 2,54 MB)
30. (2014) Stratégia adaptácie Mestskej časti Košice - Západ (pdf., 3,2 MB)
31. (2012) NÁVRH - Stratégia adaptácie na dopady zmeny klímy v meste Spišská Nová Ves a okolí (pdf., 4,05 MB)

- Do you have sectoral strategic documents dealing directly with climate adaptation? (sectoral adaptation strategies, programs, action plans)?

Not exactly.

- Which logic is prevailing in your country, regional or sectoral in adaptation policy's strategic planning (if they vary, please describe in detail which document follows which logic, and why)? In our approach "regional" means: the document's situation analysis and objective system are structured according to different region hit differently by climate change; "sectoral" means: the document's situation analysis and objective system are structured according to different sectors /thematic fields hit differently by climate change.

Regarding the NAS and the NAP, they have clearly sectoral logic.

- Do you have a functioning adaptation-related monitoring system?

Yes.

- If so, do you actually monitor spatial changes of
- climatic factors or

Yes.

- vulnerability and/or

No.

- spatial differences in the effectiveness of climate actions?

No.

- If not, is there a plan to set up such a system?

In the NAS there is strong references to MRE development but no mentioning of spatial levels.

- Do you have applied indicator sets in adaptation?
Yes.
- If yes, who collect (and process and make available) these indicators?
The Ministry of Environment collects data.
- Are these indicators collected from all spatial levels? Does your monitoring system do any spatial aggregation of indices?
No.
- If yes, what do they measure? (e.g.: changes in climatic factors? Spatial vulnerability? Policy effectiveness?)
Status of implementation of individual measures.
- What kind of indicators do you use? (impact, outcome, output, financial, performance, etc.)?
Performance indicators mainly.
- Are there any GIS based decision support (DS) system in climate (adaptation) policy in your country?
Yes.
- If so, please introduce it shortly.
Climate scenarios are available at <https://www.klima-adapt.sk/scenare-buducej-klimy>.
- If not, is there any other adaptation-related (e.g. knowledge collector) website is functioning /planned but without signs of GIS/DS system?
-.
- Are there any climate adaptation related evaluations in your country? (Yes or no)
Yes.
- If the answer is not, is it planned to elaborate such documents?
-.
- If the answer is yes, are there among them explicitly (in some cases even in their title) geographically/spatially oriented products, rich in territorial chapters, analytical aspects and evaluation questions?
Just a chapter on sub-national level, https://www.klima-adapt.sk/cms/documents/2024/state-of-play_67330086d1201.pdf
- What are the spatial levels of evaluations (what spatial levels (national, subnational, municipal) are they prepared for)?
Only national evaluations are known to me.

- Is there anything you want to highlight or share with us that was not covered in the questionnaire?

All important information is on our platform <https://www.klima-adapt.sk/>. E-mail address: adaptacia@enviro.gov.sk

France

Name of the expert: Robert Bellini

Country: France

Organisation: ADEME

Position: Head of Climate Change Adaptation Department

Date of completion: 2025.10.04.

- Please introduce shortly your country's climate adaptation –related strategic planning background!

- What kind of planning / analytical documents exist in your country at national level? NAS? NAP? CCRA? CVA? Please name the actual documents with exact title and availability.

Our current NAP 3 (PNAAC3) (actually an integrated NAS-NAP) was issued in March 2025. The original NAS is from 2006.

- Do you have subnational/regional and local strategic documents in the field of adaptation? (local/regional adaptation strategies, programs, action plans)?

Regarding regional climate strategies, they are mostly oriented to mitigation. Regional roadmaps are in progress, under a national umbrella programme. Local climate strategies and local action plans also exist. There is a public helpdesk service focusing on national and regional governance. Moreover, there are programs at regional level, targeting at coastal and mountainous areas, focusing on nature-based solutions.

- Do you have sectoral strategic documents dealing directly with climate adaptation? (sectoral adaptation strategies, programs, action plans)?

Sectoral programs steered at national level exist in agriculture, building sector and the energy sector. Other programs steered at regional level focus on risk assessment consultancy for SMEs. Sectoral guidelines have also been elaborated for tourism.

- Which logic is prevailing in your country, regional or sectoral in adaptation policy's strategic planning (if they vary, please describe in detail which document follows which logic, and why)? In our approach "regional" means: the document's situation analysis and objective system are structured according to different region hit differently by climate change; "sectoral" means: the document's situation analysis and objective system are structured according to different sectors /thematic fields hit differently by climate change.

Regional planning started earlier and is still prevailing. However, with NAP3 sectoral planning is being encouraged.

- Do you have a functioning adaptation-related monitoring system?

No.

- If so, do you actually monitor spatial changes of
 - climatic factors or
 - .
 - vulnerability and/or
 - .
 - spatial differences in the effectiveness of climate actions?
 - .
- If not, is there a plan to set up such a system?

NAP3 proposes a bottom-up system.
- Do you have applied indicator sets in adaptation?

Yes.
- If yes, who collect (and process and make available) these indicators?

The National Meteorological Office collects climatological data; state representatives regional environmental/social/economic data in regions and local authorities locally.
- Are these indicators collected from all spatial levels? Does your monitoring system do any spatial aggregation of indices?

No.
- If yes, what do they measure (e.g.: changes in climatic factors changes? Spatial vulnerability? Policy effectiveness)?

Climatic factors.
- What kind of indicators do you use? (impact, outcome, output, financial, performance, etc.)?

Both hazard, impact and financial indicators.
- Are there any GIS based decision support (DS) system in climate (adaptation) policy in your country?

Yes.
- If so, please introduce it shortly.

Two main examples can be mentioned.

 1. The DRIAS portal (<https://www.drias-climat.fr/>) sets of climatic indicators at different time horizons.
 2. The Facili-TACCT website (<https://facili-tacct.beta.gouv.fr/>) sets of non-climatic (current) indicators.
- If not, is there any other adaptation-related (e.g. knowledge collector) website is functioning /planned but without signs of GIS/DS system?

-.
- Are there any climate adaptation related evaluations in your country? (Yes or no)

No.

- If the answer is not, is it planned to elaborate such documents?

NAP3 contains plans to elaborate sectoral or macro evaluations. However very limited resource is dedicated to evaluations.

- If the answer is yes, are there among them explicitly (in some cases even in their title) geographically/spatially oriented products, rich in territorial chapters, analytical aspects and evaluation questions?

Not decided yet.

- What are the spatial levels of evaluations (what spatial levels (national, subnational, municipal) are they prepared for)?

–.

Bosnia and Herzegovina

Name of the expert: Sabina Hodzic

Country: Bosnia and Herzegovina

Organisation: Hydrometeorological Institute of Federation of Bosnia and Herzegovina

Position: Assistant director

Date of completion: 2025.10.01.

- Please introduce shortly your country’s climate adaptation –related strategic planning background!

- What kind of planning / analytical documents exist in your country at national level? NAS? NAP? CCRA? CVA? Please name the actual documents with exact title and availability.

We have adopted a NAP document (which is some kind of mixture between a typical NAS and NAP). Bosnia and Herzegovina finalizes country's first climate change National Adaptation Plan as well on January 09, 2023.

- Do you have subnational/regional and local strategic documents in the field of adaptation? (local/regional adaptation strategies, programs, action plans)?

Yes, the “2020-2030 CLIMATE CHANGE ADAPTATION AND LOW EMISSION DEVELOPMENT STRATEGY FOR BOSNIA AND HERZEGOVINA”.

- Do you have sectoral strategic documents dealing directly with climate adaptation? (sectoral adaptation strategies, programs, action plans)?

We do not have standalone sectoral strategic documents.

- Which logic is prevailing in your country, regional or sectoral in adaptation policy’s strategic planning (if they vary, please describe in detail which document follows which logic, and why)? In our approach “Regional” means: the document’s situation analysis and objective system are structured according to different region hit differently by climate change; “Sectoral” means: the document’s situation analysis and objective system are structured according to different sectors /thematic fields hit differently by climate change.

In Bosnia and Herzegovina, sectoral logic prevails in the strategic planning of climate change adaptation policies. This is evident in both the National Adaptation Plan (NAP) and the Climate Change Adaptation and Low Emission Development Strategy 2020–2030. Both documents structure their situation analyses and objectives around thematic sectors rather than geographic regions.

- Do you have a functioning adaptation-related monitoring system?

No.

- If so, do you actually monitor spatial changes of climatic factors or

- vulnerability and/or

- spatial differences in the effectiveness of climate actions?

- If not, is there a plan to set up such a system?

Yes.

- Do you have applied indicator sets in adaptation?

Yes.

- If yes, who collect (and process and make available) these indicators?

Federal Environmental Fond in FB&H should collect these indicators.

- Are these indicators collected from all spatial levels? Does your monitoring system do any spatial aggregation of indices?

In Bosnia and Herzegovina, climate adaptation indicators are collected across multiple spatial levels, but the monitoring system does not yet perform systematic spatial aggregation of indices in a fully integrated way. There's a breakdown based on the National Adaptation Plan (NAP) and related sources.

- If yes, what do they measure? (e.g.: changes in climatic factors? Spatial vulnerability? Policy effectiveness?)

It depends on the institution.

- What kind of indicators do you use? (impact, outcome, output, financial, performance, etc.)?

For example, my Institute prepare meteorological indicators like precipitation, river discharge, drought frequency etc.

- Are there any GIS based decision support (DS) system in climate (adaptation) policy in your country?

No.

- If so, please introduce it shortly.

-.

- If not, is there any other adaptation-related (e.g. knowledge collector) website is functioning /planned but without signs of GIS/DS system?

Information system in Environmental Fond in FB&H

- Are there any climate adaptation related evaluations in your country? (Yes or no)

No.

- If the answer is not, is it planned to elaborate such documents?

Yes.

- If the answer is yes, are there among them explicitly (in some cases even in their title) geographically/spatially oriented products, rich in territorial chapters, analytical aspects and evaluation questions?

There is no detailed information available yet.

- What are the spatial levels of evaluations (what spatial levels (national, subnational, municipal) are they prepared for)?

There is no detailed information available yet.

Hungary

Name of the expert: Pál Selmeczi
Country: Hungary
Organisation: HungaroMet National Adaptation Centre
Position: Head of Unit
Date of completion: 2026. 01.07.

- Please introduce shortly your country's climate adaptation –related strategic planning background!
 - What kind of planning documents does exist in your country at national level? NAS? NAP? CCRA? CVA? Please name the actual documents with exact title and availability.

Briefly the second National Climate Change Strategy (NCCS-2), and the National Energy and Climate Plan are currently in force; while Action Plans of the NCCS-2, and the Climate Protection Action Plan were adopted but are not in force currently. As for the background, the elaboration of a national level integrated climate change strategy is declared by Act LX/2007. Currently the second National Climate Change Strategy is in force (adopted by the Parliament in 2018). Its implementation is based on 4 consecutive, 3-year-long Action Plans. Out of these only the 1st was adopted by the Government in 2020. One of the current most important tasks of climate policy is the rehabilitation of the Action Plan planning process.

- Do you have subnational/regional and local strategic documents in the field of adaptation? (local/regional adaptation strategies, programs, action plans)?

There are different subnational/regional and local climate change related documents: local climate change strategies (all county and larger cities and some settlements) based on a Hungarian methodology and SECAP's based on the methodology of the Covenant of Mayors.

There are no legal requirements for these activities, but from 2014-21 OP sources all Hungarian counties, Budapest and its districts and approximately 130 settlements (mostly towns) planned their integrated climate change strategies. Several further settlements had their SECAPs elaborated.

- Do you have sectoral strategic documents dealing directly with adaptation? (sectoral adaptation strategies, programs, action plans)?

Not really. Of course, many sectoral strategic documents deal indirectly with adaptation, especially the key sectors: water management and agriculture. But real sectoral adaptation strategies are not present.

- Which logic is prevailing in your country regarding climate policy strategic planning, regional or sectoral in strategic planning? (if they vary, please describe in detail which document follows which logic, and why). In our approach “regional” means: the document’s situation analysis and objective system are structured according to different region hit differently by climate change. “Sectoral” means: the document’s situation analysis and objective system are structured according to different sectors /thematic fields hit differently by climate change.

Unambiguously the sectoral approach. This fact was underlined by the recent half-time evaluation of the NCCS-2 conducted by the National Adaptation Centre (NAC) in 2022-23 and by the article written about this evaluation in the Journal of Territorial Statistics.

- Do you find it useful to strengthen the spatial focus of adaptation planning or find the sectoral orientation better?

By all means. The update of the NCCS-2 is being prepared currently and we are working on the strengthening of spatial emphases within the documents general content, in its objective system and in the implementation frameworks.

- Do you see potential in climate adaptation to improve cooperation with other countries in the field of adaptation?

Basically yes, currently we have several international projects even in the NAC. The Innovative Municipal Cooperation and Integrated Solutions for Managing Heatwaves in Functional Urban Areas planned duration is October 2025-September 2030, with the lead partner as the Ministry of Public Administration and Spatial Development. HungaroMet is also a project partner, among others. The project aims at addressing the intensifying impact of heatwaves and the urban heat island effect from the approach of functional urban areas (FUA). In the framework of Horizon National Adaptation Hubs, we are working on the establishment of a national adaptation platform linking together different spatial levels’ stakeholders and different sectors’ stakeholders. The main objective of the Danube-ADAPT project is to address the climate change challenges of the Danube Region, as a macro-region with specific geographical and socio-economic characteristics, based on a unified vulnerability assessment based on international good practices and the NATéR system approach. Through these, the aim is to 1) identify the main risk areas influencing vulnerability to climate change impacts, paying particular attention to macro-regional and transboundary environmental and socio-economic factors; 2) conduct climate impact chains and model vulnerability assessments to implement them based on a unified approach, 3) and facilitate the integration of these practices into strategic planning.

- If so, for what purposes? To gain new experiences in adaptation? To gain new markets for your country’s adaptation- oriented or green economy? To disseminate your best practices/knowledge?

Mostly for gaining new experiences in adaptation, but between 2018-2022 we regularly disseminated our best practices/knowledge in the field of adaptation planning and GIS-based system development to Western-Balkan countries.

- Do you have a functioning monitoring system in adaptation?

There isn’t any functioning adaptation monitoring system in Hungary. The NCCS-2 defined the main tasks of the monitoring the implementation, and the result indicators. After the adoption of the NCCS-2, its 1st Climate Change Action Plan defined outcome indicators for the measures. These documents also defined goals and measures for setting up a monitoring system, but this haven’t been developed yet.

The NAGiS system monitors the changes in thematic and spatial vulnerability situation. Moreover, as we wrote in our last BTR report to the UNFCCC in 2025, “*In Hungary, actual adaptation priorities are identified in the second National Climate Change Strategy (NCCS-2) and its adaptation sub-strategy, the National Adaptation Strategy (NAS). Based on these and the short- and medium-term sectoral action lines of NCCS-2, concrete adaptation measures were elaborated in the National Climate Change Action Plans (NCCAPs) of the NCCS-2. The Ministry for Energy’s Deputy State Secretariat for Climate Policy, and within it the Climate Policy Department regularly monitors the status of the measurements of National Climate Change Actions Plans (NCCAPs) from time to time. However, a related wider goal of the Ministry is to set up a comprehensive monitoring and evaluation framework related to energy- and climate policy, as the existing monitoring practice can vary from sector to sector and their managed data are diverse. Frequency of data collection and date of data publishing are very diverse, too. The NCCS-2 and its first NACCP declared a definite demand for the establishment of a complex climate policy oriented MRE system in Hungary.*

The highest challenge is that the given databases, inventories are not interconnected with each other into a single national database. Between 2019 and 2021 a project financed by the EU Structural Reform Support Programme was implemented to help Hungary in setting up this comprehensive MRE system, with recommendations. The project focused on European and Hungarian mitigation monitoring practices. Parallel with this, the National Adaptation Centre (today a unit of the HungaroMet Hungarian Meteorological Service) as the Ministry’s background institute in the field of climate adaptation conducted a complementary and wider survey about European and Hungarian adaptation-related monitoring, evaluation and assessment practices and the related system building processes. Based on the lessons learned from these two projects, studies and experiences, international and domestic examples, in 2024 a restructured and expanded development idea was submitted by the National Adaptation Centre to the Deputy State Secretariat for Climate Policy about the directions of the planned MRE system. According to the plans the system will comprise 3 main parts: 1) an integrated database, comprising spatial climate vulnerability data based on the current NAGiS GeoDat database; spatial GHG emission data based on existing databases of the HungaroMet; and data on the implementation of climate policy objectives and interventions. 2) a map displaying tool based on the current NAGiS mapping system; 3 and a group of interactive decision support tools, such as the municipal adaptation inventory; the municipal housing stock vulnerability estimator module; climate policy monitoring tool. The system’s set-up is planned to start in practice in the coming years, depending on political decision.”

- If so, do you actually monitor spatial changes in vulnerability and/or spatial differences in adaptation action’s effectiveness?

Currently rather the first but there is the intention to start even in the other direction, too.

- If not, is there a plan to implement / develop such a system?

The above-mentioned hiatus also raises the question of ensuring the availability of an adequate data background, which points towards the need for further development/restructuring of the NAGiS and the establishment of a complex integrated climate policy MRE system. A strengthening of the complex, real-time forecasting functions of NAGiS, instead of the current approach favouring a once-per-development- cycle, end-of-period updates, have also been encouraged by many interviewees to move towards a regularly updated, functional monitoring system. The current NAGiS could be an excellent vulnerability assessment pillar for such a complex monitoring and evaluation system.

- Do you have applied indicator sets in adaptation?

More or less. The 1st Action Plan of the NCCS-2 elaborated an output indicator system for the monitoring the achievement of the Action Plan’s measures and a result indicator

system for the monitoring the achievement of the NCCS-2's lower-level objectives. Nonetheless, the regular gathering of the latter type of data has not been occurred yet.

- If yes, who collect (and process and make available) these indicators?

The final system has not been established yet. According to the plans, collection will be the responsibility of the NAC, under the supervision of the responsible Ministry.

- Are these indicators collected from all spatial levels? Does your monitoring system do any spatial aggregation of indices?

The system has not been established yet.

- If yes, what do they measure? (e.g.: Changes in climatic factors? Spatial vulnerability? Policy effectiveness?)

Mostly policy effectiveness.

- What kind of indicators do you use? (impact, outcome, output, financial, performance, etc.)?

As I mentioned above, mostly output and results. With the future transformation of the NAGiS, even impact indicators could be available.

- Does any GIS based DS system being used in climate (adaptation) policy in your country?

As we wrote in the 2025 BTR report to the UNFCCC, "*climate adaptation seeks spatially tailored responses to the geographically different climate change impacts of different territories. Since different regions of Hungary are vulnerable to climate impacts in adverse ways, a key task is the regional comparison of vulnerability levels. Regional-level climate vulnerability assessments reveal the relative spatial/territorial differences in climate change risks across various areas and municipalities. In 2012, the government recognized the importance of this activity when it decided to establish a national-level, GIS-based adaptation system: the amendment of the 2007/LX Act ordered the establishment of the National Adaptation Geo-Information System (NAGiS). The NAGiS serves the goals outlined above, functioning as a decision-support and strategic planning tool and a key instrument for planning adaptation measures. The rules for its operation were defined in Government Decree 94/2014.*

As a result of the first development phase (2013-2016), a multi-sectoral, versatile GIS system and database was created, which facilitates the identification of climate change impacts, the determination of vulnerability in different areas, and encourages adaptation to these impacts. Its 4 main pillars include: 1) Mapping system: A 10x10 km resolution system containing hundreds of layers, which visually shows how different climate impacts may affect various regions of the country. The mapping system is freely available. 2) GeoDat database: Contains observed and modelled climate exposure data, furthermore environmental, economic, and social sensitivity/expected impact/adaptability/vulnerability data across 16 vulnerability topics. Registered users can use the database for analyses and data extraction. 3) Metadata base: Helps users navigate the information, acting as a "data map" for what and where data can be found, with multiple search options across data layers. While the metadata base displays all data layers uploaded to GeoDat, only a narrow subset is represented on the map. 4) Document repository: Includes research reports, manuals, publications, handbooks and awareness-raising materials created during the different development phases.

Between 2017-2020 occurred the second development phase of the system. During this period 1) existing vulnerability topics were further developed and new ones (e.g., urban building stock vulnerability to storms, climate exposure of shallow geological hazards) were established; 2) the system's user-friendliness and decision-support capabilities were improved, allowing the system to provide easily accessible, exportable thematic queries and reports and overviews of adaptation topics at municipal and regional

levels, enabling stakeholders to access relevant data for their specific operational contexts (creating tools for policy and local government decision support; 3) the Settlement Adaptation Barometer (an online situation analysis-supporting survey facilitating local strategic planning by identifying key local climate impacts and potential responses, guiding and encouraging broader stakeholder engagement) and Municipal Decision Support Module (a tool supporting evidence-based preparatory studies for local strategy planning by making climate change impacts and responses more accessible and customizable for local governments) and the Municipal Housing Stock Vulnerability Estimator modules were activated with enhanced online access. These newly created modules support urban development, climate adaptation planning and implementation, project preparation, development, and implementation, as well as continuous information sharing with decision-makers and the local public.

After 2020 the further development of the system with the exclusion of a comprehensive project about vulnerability assessment of energy infrastructure (gas, district heating, electricity) networks and solar energy production, came to a halt. Currently the responsible Ministry is working on finding proper financial sources for the update and further development of the system. The directions of this further improvement and the intention of turning the NAGiS into an integrated MRE system is introduced in Chapter “Monitoring and evaluation of adaptation actions and processes” in a more detailed way.

The NAGiS currently holds data and conducted CVAs in the following thematic areas: demographics, climate, building vulnerability, forestry, groundwater level, land cover, geological hazards, economy, heatwaves, drinking water resources, climate change attitudes, ecology, ecosystem service indicators, field crop farming, tourism climatology, complex tourism sector vulnerability, and flash floods”.

- If so, is it a mono- (it deals only with 1-2 vulnerability topics) or multi thematic DS (covering several climate impacts/vulnerability topics)?

Multi-thematic, as the previous point showed.

- Is it utilised in adaptation planning and MRE?

Yes, it is utilised in adaptation planning. However, its entire potential has not exploited yet, either. It was and is used in NCCS and action plan planning, county and settlement level climate strategic planning and sectoral planning as well.

- Is there any other adaptation-related website functioning /planned (knowledge collector and dissemination sites)?

Yes, there are many adaptation-related websites in Hungary: eghajlat.met.hu; klimadat.met.hu; nater.met.hu, masfelfok.hu. However, the NAGiS’ importance is overwhelming, it can be assessed as a benchmark example even in European terms.

- If not, does your country plan to set up such a system?

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- Are there any climate adaptation related evaluations in your country?

Not really. There was only one thematic, adaptation-oriented OP-evaluation in 2019-20 and the mid-term evaluation of the NCCS-2, conducted by NAC in 2022-23. The article of my colleague (the chief evaluator of the project) about the process is available here: https://www.ksh.hu/statszemplar_archive/terstat/2025/2025_01/ts650101.pdf

- If not, is it planned to elaborate such documents?

Plans and background documents of the future comprehensive Hungarian climate policy MRE system talks about a whole system of spatial analysis. But these plans have not been transformed into practice so far.

- If so,
- are there among them explicitly (in some cases even in their title) geographically/spatially oriented evaluation products, rich in territorial chapters, analytical aspects, evaluation questions?

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- Or are there large number of adaptation evaluation products, established system but with minor or no territorial content?

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- Or only sectoral /thematic/general evaluations exist?

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- The NAS/NAP aims to set up an evaluation system or elaboration of products, but no such products are in practice yet.

As I wrote above, this is exactly the situation.

- What are the spatial levels of evaluations?
- Are there only national level evaluations, or even regional/local ones, too (does explicitly territorially oriented evaluation reports in adaptation at subnational and local levels emerge)?

Currently only national level evaluations exist, the above mentioned two.

- Does spatial visualization (graphic solutions to present territorial differences, characteristics) emerge in adaptation evaluations and reports?

Not really. Only my colleague's above-mentioned article started to deal with spatial visualization, but in an embryotic form.

- Do you take into consideration European level regional development objectives in your adaptation planning?

Of course, yes.

- If so, how?

In the form of coherence analysis at the beginning of a national planning process.

- Do you take into consideration national level regional development objectives in your adaptation planning?

Of course, yes.

- If so, how?

In the form of coherence analysis at the beginning of a national planning process.

- Can you mention any good practice in your country from national or regional level about planning/monitoring/evaluation practices in adaptation that takes into consideration spatial issues significantly?

NAGiS already in its current form a good example in GIS-based decision supporting; however, with its potential further transformation it could be a perfect policy MRE tool as well.

Annex 5b) Former interviews from other research projects

In addition to the e-mail interviews, I conducted in the framework of this PhD research project, there are additional interview results from another, related applied research project of mine, from 2020, with useful parts that have been utilised during my PhD studies.

As for the background of the mentioned earlier project, in the Hungarian climate policy, there has been a declared demand for years, both domestically and internationally, for information on the measurement of the effectiveness and efficiency of interventions and the development of the vulnerability of individual sectors and regions. The need for the establishment of a comprehensive system is clearly emphasized by numerous documents and reporting activities. Additionally, the NCCS-2 also indicated the lack of monitoring activity in climate policy, prescribing the development of a monitoring and evaluation plan, assigning this task to the framework of the 1st NCCAP. The action plan did indeed develop a comprehensive concept for the monitoring and evaluation of domestic climate policy, in the form of its own chapter, and also designated the launch of research serving to establish the system as a measure. In the framework of this measure a European outlook and a summary of Hungarian experiences on mitigation monitoring systems were prepared from the SRSP support of the measure, coordinated by the Swedish SEPA (Swedish Environment Agency). However, the specific system setup must be preceded by clarifying the concept of the system, clarifying the financial, human resource and institutional foundations of the setup, and specifying the basic principles of the system's operation. So parallel with the Swedish attempt, the National Adaptation Centre reviewed domestic and European adaptation monitoring, reporting and evaluation practices with a significantly broader spectrum than the previous study (examining the monitoring and evaluation systems of states leading in adaptation strategic planning, such as Germany, Switzerland, the United Kingdom, the Netherlands, and as a control group, the climate policy situation and the status of system building of the V4 states). The study formulates a system concept proposal necessary for the setup and launch of this Hungarian climate policy monitoring, reporting and evaluation system (KIMÉR), taking into account domestic and international experiences.

In the following I publish the related parts of those interviews prepared with the experts of the aforementioned countries (Germany, the Netherlands, Switzerland and Wales) in 2020, that are relevant from the dissertation's point of view. The interviews, similarly, to the whole research have not been published yet, but the information they contain proved to be useful additions to the recent PhD research.

Wales

Name of the expert: Dr. Clive Walmsley

Country: Wales

Organisation: Natural Resource Wales

Position: expert

Date of the interview: 2020.08.17.

- Please introduce shortly your country's climate adaptation –related strategic planning background!
 - What kind of planning documents does exist in your country at national level? NAS? NAP? CCRA? CVA? Please name the actual documents with exact title and availability.

Net Zero emissions in UK by 2050 with 95% emission reduction in Wales by 2050 with interim targets for 2030 and 2040, and also 5-yearly carbon budgets and low carbon delivery plan of mitigation actions to achieve that budget. Carbon neutral public sector by 2030 in Wales policy ambition/goal. Full details are set out in the Low Carbon Delivery Plan for Wales (https://gov.wales/sites/default/files/publications/2019-06/low-carbon-delivery-plan_1.pdf). In terms of adaptation, there are some 113 sub-actions within the adaptation plan for Wales, with outputs and outcomes along with indicators identified within the Monitoring and Evaluation plan with a mix of qualitative and quantitative (see: https://gov.wales/sites/default/files/publications/2019-11/prosperityfor-all-a-climate-conscious-wales_0.pdf for the actions and <https://gov.wales/sites/default/files/publications/2020-07/prosperity-for-all-a-climate-conscious-walesmonitoring-and-evaluation-framework.pdf> for the outputs, outcomes and indicators). These are very specific to each action so hard to summarise.

The Welsh Government's Department for Environment, Energy and Rural Affairs is responsible for the production of both the mitigation and adaptation plans, including monitoring and evaluation with other organisations such as NRW providing input during development and MRE. The plans are official policy documents but are not legally adopted by the Welsh Parliament.

- Do you have subnational/regional and local strategic documents in the field of adaptation? (local/regional adaptation strategies, programs, action plans)?

Both regional and sectoral adaptation strategies are there in Wales.

- Do you have sectoral strategic documents dealing directly with adaptation? (sectoral adaptation strategies, programs, action plans)?

The original Climate Change Strategy for Wales did not have the statutory legal underpin of the legislation, and it set out a desire for sectoral adaptation planning that unfortunately was neither properly resourced or driven forward by the Welsh Government so certain sectors ensured delivery through their own recognition of the value of a sectoral process while other sectors did not.

- Do you have a functioning monitoring system in adaptation?

Yes. However, as outlined below there is no single system so it is not really possible to say what the focus is but all the above elements, outputs, outcomes, impacts, risks are covered by different components of the devolved or non-devolved system.

- If so, do you actually monitor spatial changes in vulnerability and/or spatial differences in adaptation action's effectiveness?

GHG emissions are collated at UK level in UK GHG Emissions Inventory with separate data available for each nation in the UK. Monitoring of the actions within the Low Carbon Delivery Plan for Wales is undertaken by Welsh Government with input from others such as NRW. Monitoring of adaptation activities in terms of their governance and institutional process are clearly set out in Part 1 of the Monitoring and Evaluation plan - see: <https://gov.wales/sites/default/files/publications/2020-07/prosperity-for-all-a-climate-conscious-wales-monitoring-and-evaluation-framework.pdf>. The monitoring of each action is delivered by those responsible for each sub-action i.e. stakeholders/delivery partners. There is no specific separate budget for MRE. However, there is no integrated climate change MRE system as suggested for Hungary. Within the UK this is complicated by adaptation and many aspects of GHG mitigation being a devolved area while international reporting, some aspects of energy and climate change research are undertaken at the UK-level.

As a result, there is a UK Climate Change Risk Assessment that drives development of separate national Low Carbon Delivery Plans and Adaptation Plans that have separate national MRE. While it may appear (particularly from outside the UK) that there is a complex and uncoordinated approach due to devolution the combination of independent policy advice and evaluation from the UKCCC with Welsh Government led policy development with input from a wide range of stakeholders/delivery partners including NRW does deliver a systematic approach. with the UK wide research led CCRA providing the underpinning input to help develop adaptation policy at the national level. As the UK Climate Change Act and Welsh Environment Act set a legislative framework requiring UKCCC advice, and requiring 5 yearly carbon budgets and Low Carbon Delivery Plans the approach is underpinned in law - particularly so for mitigation and to a lesser extent for adaptation too.

- If not, is there a plan to implement / develop such a system?
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- Do you have applied indicator sets in adaptation?

Yes, related to the NAS/NAP document.

- If yes, who collect (and process and make available) these indicators?

The Welsh Government coordinates monitoring and evaluation with input from a wide range of partners set out as Stakeholders and delivery partners in the adaptation plan.

- Are these indicators collected from all spatial levels? Does your monitoring system do any spatial aggregation of indices?

National level spatial resolution, policy level monitoring.

- If yes, what do they measure? (e.g.: Changes in climatic factors? Spatial vulnerability? Policy effectiveness?)

As outlined above there is no single system so it is not really possible to say what the focus is but all the above elements, outputs, outcomes, impacts, risks are covered by different components of the devolved or non-devolved system.

- What kind of indicators do you use? (impact, outcome, output, financial, performance, etc.)?

All in all: mostly output indices for the current NAS/NAP; majority of them general, sectoral, not spatial. Spatial hints only in a few.

- Are there any climate adaptation related evaluations in your country?

I think my answers to the last section covering monitoring cover MRE, in that there are a combined Monitoring and Evaluation Framework for reporting progress of the Adaptation Plan for Wales. However, with regards mitigation monitoring of GHG emissions is undertaken by UK GHG Inventory that is produced by an independent contractor to the UK BEIS Ministry while the overall evaluation of policy for UK Government and Welsh/Scottish Governments is undertaken by the joint UK Govt and Devolved Administration funded UK Committee on Climate Change who advise on policy and review progress including Annual reports to the UK Govt, and periodic reports to Welsh and Scottish Governments. I think this is covered above - not entirely clear what is meant by institutional vs organisational as much the same thing. There are specific budgets to fund the UK Emissions Inventory contract (for monitoring) and to run the UKCCC (for evaluation) provided by UK and devolved governments.

The UK Committee on Climate Change provides independent review of progress in delivery of the various UK and Welsh/Scottish mitigation and adaptation plans, including an annual report.

- If not, is it planned to elaborate such documents?

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- If so,

- are there among them explicitly (in some cases even in their title) geographically/spatially oriented evaluation products, rich in territorial chapters, analytical aspects, evaluation questions?

No particularly special methods are used - the UKCCC evaluates GHG emissions generally annually to assess progress versus the 5 yearly carbon budgets that were recommended by the Committee and set by the Government. As set out earlier/above, the system isn't integrated due to the combination of UK level and nation level elements as set out under monitoring. In many ways the structure is driven by what is or isn't devolved.

- Or are there large number of adaptation evaluation products, established system but with minor or no territorial content?

The UK Climate Change Risk Assessment has previously not considered progress in delivering adaptation action. It has been focussed on the assessment of risk and vulnerability but the latest CCRA3 which is under development has considered qualitatively the extent of adaptation action and its impact on risk for the first time. It will be published 2021. Its focus will be the assessment of mitigation/adaptation activities' effectiveness.

- Or only sectoral /thematic/general evaluations exist?

The UKCCC has produced specific sectoral reports for many topics, such as energy, land use, domestic etc. However, these specific sectoral reports are not produced in a systematic way to specific timescales unlike the evaluation of progress in relation to the 5 yearly GHG emission budgets that the UK, Welsh and Scottish Governments each produce that are based on earlier advice from the UKCCC.

- The NAS/NAP aims to set up an evaluation system or elaboration of products, but no such products are in practice yet.

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- What are the spatial levels of evaluations?

- Are there only national level evaluations, or even regional/local ones, too (does explicitly territorially oriented evaluation reports in adaptation at subnational and local levels emerge)?

Mostly national level ones.

- Does spatial visualization (graphic solutions to present territorial differences, characteristics) emerge in adaptation evaluations and reports?
- Can you mention any good practice in your country from national or regional level about planning/monitoring/evaluation practices in adaptation that takes into consideration spatial issues significantly?

In the first Climate Change Strategy for Wales (2010) there was an attempt to create Sectoral Adaptation Plans for a series of areas. e.g. Health, Natural Environment, Communities, Business etc. However, only some e.g. Health and Historic Environment were developed to a conclusion so rather than a one size fits all approach different sectors are adopting different approaches to adaptation but with their outputs, outcomes feeding into the MRE for the Welsh Adaptation Plan.

Having independent advice and evaluation from the UKCCC on setting carbon budgets and targets along with evaluation of progress in reducing emissions is a real benefit rather than the whole process being dealt with within the Ministry/Agency. The UKCCC also provide an overview evaluation of progress with adaptation objectives for each nation but their main focus in evaluation is the NAS for England, with relatively little assessment of Welsh adaptation.

Switzerland

Name of the expert: Martina Zoller

Country: Switzerland

Organisation: Federal Office for the Environment

Position: expert

Date of the interview: 2020.09.08.

- Please introduce shortly your country's climate adaptation –related strategic planning background!
- What kind of planning documents does exist in your country at national level? NAS? NAP? CCRA? CVA? Please name the actual documents with exact title and availability.

Adaptation:

- Law: CO2 Act, Art. 7

- Strategy: Adaptation to climate change in Switzerland - First part of the Federal Council's strategy.

Adopted on 2 March 2012 (first part of strategy)

- Action plan 2014–2019. Part 2 of the Federal Council strategy of 9 April 2014. 2014 (second part of strategy)

- Action plan 2020–2025. Part 3 of the Federal Council strategy of 19 April 2020. 2020 (third part of strategy)

Federal Office for the Environment (lead), in collaboration with the other federal office involved in climate change adaptation.

- Do you have subnational/regional and local strategic documents in the field of adaptation? (local/regional adaptation strategies, programs, action plans)?

There are cantonal documents/activities as well. Cantonal heat measures plan to protect vulnerable population groups during heat waves. While the most western Swiss cantons and the canton Ticino have developed such plans, they exist not in the German-speaking Swiss cantons. The picture is heterogeneous depending on the cantonal water strategies.

Ten cantons have such a strategy. One is currently being developed in four cantons One is planned in two cantons.

- Do you have a functioning monitoring system in adaptation?

Yes.

- If so, do you actually monitor spatial changes in vulnerability and/or spatial differences in adaptation action's effectiveness?

Adaptation: MRE of climate change adaptation, led by Federal Office for the Environment. Adaptation: MRE is based on a logic model. We monitor Mitigation/adaptation activities' results, impacts.

MRE concentrates on the national level and the project level.

- If not, is there a plan to implement / develop such a system?

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- Do you have applied indicator sets in adaptation?

Yes. The first action plan defines 63 adaptation indicators, of which 54 focus on individual sectors, while another 9 reflect cross-sectoral aspects, such as the available scientific knowledge on adaptation and mitigation, the coordination of adaptation, or citizen awareness (Nauser et al., 2014). The latest action plan, adopted in 2020, defines the goals and tools for 2020-2025 (Il Consiglio federale, 2020).

- If yes, who collect (and process and make available) these indicators?

- Are these indicators collected from all spatial levels? Does your monitoring system do any spatial aggregation of indices?

Indicators are developed on national level in collaboration with cantonal representatives with the goal to have a final set of indicators for monitoring of climate change adaptation that is accepted on both federal and cantonal level.

- If yes, what do they measure? (e.g.: Changes in climatic factors? Spatial vulnerability? Policy effectiveness?)

Assessment of mitigation/adaptation activities' effectiveness.

- What kind of indicators do you use? (impact, outcome, output, financial, performance, etc.)?

On the FOEN website, the indicators monitored as a result of the monitoring activities are listed item by key area (Figure 16) (<https://www.bafu.admin.ch/bafu/en/home/state/indicators.html>). Most of these are impact indicators, but there are also some response indicators. For example, the emission of various greenhouse gases related to the atmosphere, while the level of underground water resources appears as an impact indicator in relation to water. At the same time, in these sectors, citizens' awareness of air pollution or awareness of wastewater treatment can be considered as response indicators (the Swiss response indicator definition broadly corresponds to the result indicators of Hungarian practice).

- Are there any climate adaptation related evaluations in your country?

Yes.

- If not, is it planned to elaborate such documents?

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- If so,

- are there among them explicitly (in some cases even in their title) geographically/spatially oriented evaluation products, rich in territorial chapters, analytical aspects, evaluation questions?

Not really.

- Or are there large number of adaptation evaluation products, established system but with minor or no territorial content?

There are reports on:

1. Evaluation of Strategy on Climate Change Adaptation in Switzerland
 2. Reporting of Climate Change Adaptation on cantonal level
 3. Reporting of Climate Change Adaptation on federal level.
- Or only sectoral /thematic/general evaluations exist?

Water management, Agriculture, Forestry, Energy, Tourism, Biodiversity management, Health, Spatial development.

- The NAS/NAP aims to set up an evaluation system or elaboration of products, but no such products are in practice yet.

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- What are the spatial levels of evaluations?
- Are there only national level evaluations, or even regional/local ones, too (does explicitly territorially oriented evaluation reports in adaptation at subnational and local levels emerge)?

Mostly national.

- Does spatial visualization (graphic solutions to present territorial differences, characteristics) emerge in adaptation evaluations and reports?

Qualitative method based on a logic model is used.

In adaptation an evaluation methodology is based on logic model. Institutionally a working group exists on federal level (horizontal working group), on cantonal level as well, led by the federal level (vertical working group).

- Can you mention any good practice in your country from national or regional level about planning/monitoring/evaluation practices in adaptation that takes into consideration spatial issues significantly?

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Germany

Name of the expert: Petra van R  th

Country: Germany

Organisation: UBA Germany, KomPass

Position: scientific employee

Date of the interview: 2020.08.17.

- Please introduce shortly your country's climate adaptation –related strategic planning background!
 - What kind of planning documents does exist in your country at national level? NAS? NAP? CCRA? CVA? Please name the actual documents with exact title and availability.

In Germany, separate policy fields have been developed for climate protection and adaptation. The following comments refer to adaptation to climate change. The German Adaptation Strategy aims to reduce the vulnerability to climate change impacts, sustaining or enhancing the adaptive capacity of natural, societal and economic systems. In Germany, adaptation to climate change is a permanent task established along an agreed and politically adopted institutional and methodological framework. Scientific research

programmes, participation and consultation processes as well as the establishment of ongoing reporting systems are set up. On the national level nearly, all federal ministries are represented in the “Interministerial Working Group on Adaptation to Climate Change” (IWG Adaptation), led by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. To coordinate adaptation activities with the federal states the Conference of Environmental Ministers established in June 2009 a standing committee for the adaptation to climate change impacts. On the national level near-all federal ministries are represented in the “Interministerial Working Group on Adaptation to Climate Change” (IWG Adaptation), led by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

The Action plans of the German Adaptation Strategy are updated every five years together with “progress reports” and adopted by the Cabinet. The progress reports contain an updated action plan with concrete steps for the further development and implementation of the German Adaptation Strategy. The reports draw on findings and results from the Monitoring Report (second report November 2019, the English Version will be published soon), Vulnerability Assessments (next in summer 2021), the Adaptation Action Plan and the Evaluation of the adaptation strategy (published in November 2019). Together, they form a reporting system for the planning process for adaptation to climate change in Germany. The process can be divided into four phases based on the adaptation policy cycle.

In 2015 the Federal Government of Germany adopted the first progress report of the DAS. This report gives an overview of the primarily federal activities since the adoption of the DAS in 2008 and the Adaptation Action Plan APA I (2011). The German Adaptation Strategy is updated every five years in the form of “progress reports” and adopted by the Cabinet, next progress report with Action Plan III is foreseen for November 2020. The progress reports present concrete steps for the further development and implementation of the German Adaptation Strategy. The reports draw on findings and results from the Monitoring Report, Vulnerability Assessments, the Adaptation Action Plan and the Evaluation of the adaptation strategy. Together, they form a reporting system for the planning process for adaptation to climate change in Germany.

- Do you have subnational/regional and local strategic documents in the field of adaptation? (local/regional adaptation strategies, programs, action plans)?

Yes, all states have their own adaptation strategies.

- Do you have sectoral strategic documents dealing directly with adaptation? (sectoral adaptation strategies, programs, action plans)?

Yes, sectoral adaptation strategies exist.

- Which logic is prevailing in your country regarding climate policy strategic planning, regional or sectoral in strategic planning? (if they vary, please describe in detail which document follows which logic, and why). In our approach “regional” means: the document’s situation analysis and objective system are structured according to different region hit differently by climate change. “Sectoral” means: the document’s situation analysis and objective system are structured according to different sectors /thematic fields hit differently by climate change.

Rather sectoral.

- Do you have a functioning monitoring system in adaptation?

Yes. Measuring the effects of climate change on natural, social and economic systems is easier to implement than a monitoring system for the effects of adaptation at national level. Challenges are posed in particular by the availability of measured data, so that the assessment of adaptation is more qualitative in the context of evaluation. The monitoring system supports the evaluation with its results based on measured data. In Germany, we have developed monitoring of climate impacts and adaptation, evaluation of the policy process and the implementation of action plans, and reporting in progress reports as different products that constitute the reporting system for adaptation to climate change. This is regularly supplemented by vulnerability analyses.

- If so, do you actually monitor spatial changes in vulnerability and/or spatial differences in adaptation action's effectiveness?

Rather the latter.

- If not, is there a plan to implement / develop such a system?

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- Do you have applied indicator sets in adaptation?

Yes.

- If yes, who collect (and process and make available) these indicators?

The Federal Environment Agency is responsible for coordinating the work. Almost all national federal authorities contribute with their knowledge and data to updating and further developing the content of the monitoring system. The indicator system was developed within the framework of research projects financed by the Ministry of the Environment. The technical work of the authorities is carried out as part of their regular tasks.

- Are these indicators collected from all spatial levels? Does your monitoring system do any spatial aggregation of indices?

The Indicator System underlying the Monitoring Report and the overall report itself were created and agreed politically in an inter-departmental process with the participation of numerous experts from the competent sectors of agencies at Federal and Länder level and from scientific and private institutions. Spatial resolution is mainly national, level is strategic.

- If yes, what do they measure? (e.g.: Changes in climatic factors? Spatial vulnerability? Policy effectiveness?)

The monitoring system is structured according to the 15 fields of action of the German Strategy for Adaptation to Climate Change. Indicators have been developed for the fields of action that map the impacts of climate change and adaptation to these impacts. In addition, there are indicators for overarching activities for adaptation to climate change. The climate development in Germany is presented in a separate chapter. It focuses on mitigation/adaptation measures' implementation, results and impacts.

- What kind of indicators do you use? (impact, outcome, output, financial, performance, etc.)?

All of them.

- Are there any climate adaptation related evaluations in your country?

So far, we can say little about effectiveness assessment of measures / strategy as a whole. In Germany we put further effort on the determination of concrete adaptation targets set against the background of resilience / sustainable development. The interministerial working group has commissioned an external evaluation. An evaluation method was initially developed and agreed with the working group. The evaluation was carried out by a research group. The project was technically supervised by the Federal Environment Agency. The methodology is presented in the following report: <https://www.umweltbundesamt.de/publikationen/methodology-for-the-evaluation-of-the-german>. It focuses on accomplishment of strategic objectives.

- If not, is it planned to elaborate such documents?

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- If so,

- are there among them explicitly (in some cases even in their title) geographically/spatially oriented evaluation products, rich in territorial chapters, analytical aspects, evaluation questions? Not really.

- Or are there large number of adaptation evaluation products, established system but with minor or no territorial content?

As the main product, the evaluation team wrote an evaluation report, which was submitted to the Interministerial Working Group in early 2019 to reflect on the findings and recommendations. The evaluation report was published in autumn 2019 and contains an English summary of the main findings and recommendations. <https://www.umweltbundesamt.de/publikationen/politikanalyse-zur-evaluationder-deutschen..>

- Or only sectoral /thematic/general evaluations exist?

This is the situation.

- The NAS/NAP aims to set up an evaluation system or elaboration of products, but no such products are in practice yet.

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- What are the spatial levels of evaluations?
- Are there only national level evaluations, or even regional/local ones, too (does explicitly territorially oriented evaluation reports in adaptation at subnational and local levels emerge)?

Mainly national.

- Does spatial visualization (graphic solutions to present territorial differences, characteristics) emerge in adaptation evaluations and reports?

Partly.

- Can you mention any good practice in your country from national or regional level about planning/monitoring/evaluation practices in adaptation that takes into consideration spatial issues significantly?

We have had good experience with cooperation between the federal authorities; this cooperation on the cross-cutting issue of adaptation to climate change has been developed since 2008. The cooperation of the Federal Environment Agency and the other federal authorities for the development and updating of the indicator system was part of the development process. Structured documents are used to document the technical principles and to collect data. These are reviewed and updated in the updating process.

It has proven successful to have the evaluation carried out by an external team of experts. We have had good experience with a consortium consisting of experts for the evaluation of political strategies and experts for adaptation to climate change. The evaluation team worked independently of the interministerial working group. However, it has proved to be a good idea to coordinate the methods of the evaluation with the working group in order to prepare the best possible support for the work and the acceptance of the evaluation results.

The Netherlands

Name of the expert: Jelle van Minnen

Country: The Netherlands

Organisation: PBL

Position: senior expert

Date of the interview: 08.08.2020.

- Please introduce shortly your country's climate adaptation –related strategic planning background!
 - What kind of planning documents does exist in your country at national level? NAS? NAP? CCRA? CVA? Please name the actual documents with exact title and availability.

Important documents:

1. Dutch Deltaprogramme (concerning 3 themes; flood risk management, freshwater supply, spatial planning and 8 geographical regions)
<https://english.deltacommissaris.nl/delta-programme/what-is-the-delta-programme>)
The aim is to ensure that our flood risk management, freshwater supply, and spatial planning will be climate-proof and water-resilient by 2050, so that our country will continue to be able to cope with the increasing weather extremes. This time around we will try and prevent a disaster, rather than devise measures on the aftermath.
For that reason, the government has adopted a new approach to working on the delta, in concert with other organisations, focusing on three areas:
 - New flood protection standards have been implemented: these are not only linked to the probability of flooding, but also to the impact of a flood (risk-based approach). The stringency of the standards is determined by the scope of the potential impact.
 - The availability of fresh water for agriculture, industry, and nature must become more predictable.
 - Spatial planning must become more climate-proof and water-resilient.
2. National adaptation strategy
Concerning climate adaptation of 10 sectors. Link to the document:
<https://ruimtelijkeadaptatie.nl/english/policy-programmes/nas/>.
The NAS uses four diagrams ('Hotter', 'Wetter', 'Drier' and 'Rising Sea Level') to visualize the effects of climate change within nine sectors: water and spatial management; nature; agriculture, horticulture and fisheries; health and welfare; recreation and tourism; infrastructure (road, rail, water and aviation); energy; IT and telecommunications; public safety and security and the 'building environment'.
Six climate effects which call for immediate action have been identified:
 - I. Greater heat stress leading to increased morbidity, hospital admissions and mortality, as well as reduced productivity.
 - II. More frequent failure of vital systems: energy, telecommunications, IT and transport infrastructures.
 - III. More frequent crop failures or other problems in the agricultural sector, such as decreased yields or damage to production resources.
 - IV. Shifting climate zones whereby some flora and fauna species will be unable to migrate or adapt, due in part to the lack of an internationally coordinated spatial policy.

- V. Greater health burden and loss of productivity due to possible increase in infectious diseases or allergic (respiratory) conditions such as hay fever.
- VI. Cumulative effects whereby a systems failure in one sector or at one location triggers further problems elsewhere.

Do you have subnational/regional and local strategic documents in the field of adaptation? (local/regional adaptation strategies, programs, action plans)?

The Delta Programme 2014. Working on the delta. Promising solutions for tasking and ambitions.

<https://english.deltacommissaris.nl/deltaprogramme/documents/publications/2013/09/17/delta-programme-2014> I

- Every year there is a publication of the progress of the Delta programme. <https://english.deltacommissaris.nl/delta-programme/delta-programme-2020>
 - In the Delta programme 2021 the tasks and ambitions of the Delta programme are recalibrated; the publication will become available this year.
 - Delta programme commissioner. The Delta Programme Commissioner is a government commissioner. The Delta Programme Commissioner serves as a liaison between the government, the provinces, water boards, and local authorities. He involves NGOs, knowledge institutes, and the business community in the programme, and monitors the cohesion between the various component parts of the Delta Programme.
 - The Delta Programme Commissioner falls under the political responsibility of the Minister of Infrastructure and Water Management. <https://english.deltacommissaris.nl/delta-programme/question-and-answer>.
- Do you have sectoral strategic documents dealing directly with adaptation? (sectoral adaptation strategies, programs, action plans)?

Sectoral adaptation is strong: There are some climate effects for which the relevant sectors are well prepared: their adaptation capacity is high, and measures have been incorporated into policy and implementation programmes. For this reason, the NAS does not devote special attention to aspects such as water management and flood safety in the urban area. Several action programs are being put up under the NAS – partly based in the NAS implementation programme 2018-2019.

- Do you have a functioning monitoring system in adaptation?

Yes. Legally required and funded. More than 95% of the national funding (with respect to climate adaptation) is spend on flood protection.
- If so, do you actually monitor spatial changes in vulnerability and/or spatial differences in adaptation action's effectiveness?

The main objectives of national monitoring activities: assessment of mitigation/adaptation activities' effectiveness, accomplishment of objectives, assessing the quality of implementation, analysing cross-cutting development topics.

There is a special monitoring progress for delta plans.

 - The progress of actions ('Deltaplans') are published every year in the Delta programme publication. <https://english.deltacommissaris.nl/delta-programme/delta-programme-2020>
 - Progress of flood protection measures is annually reported by the Flood Protection Programma (HWBP Hoogwaterbeschermingsprogramma). Once in 12 year

there is an evaluation by the Human Environment and Transport Inspectorate of the Ministry of Infrastructure and Water Management.

- Fresh water supply (of the main water system) is monitored by Rijkswaterstaat. <https://www.rijkswaterstaat.nl/english/water/index.aspx>

- Progress of other climate adaptation items are reported on ad hoc basis. PBL is working on monitoring system with output and outcome indicators.

- Main findings of the progress (flood protection and fresh water supply) are annually reported in the Delta programme.

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- If not, is there a plan to implement / develop such a system?

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- Do you have applied indicator sets in adaptation?

In progress.

- If yes, who collect (and process and make available) these indicators?

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- Are these indicators collected from all spatial levels? Does your monitoring system do any spatial aggregation of indices?

In progress. Among other things, the annual publication of the progress of the Delta programme is used for reporting to parliament.

- If yes, what do they measure? (e.g.: Changes in climatic factors? Spatial vulnerability? Policy effectiveness?)

In progress.

- What kind of indicators do you use? (impact, outcome, output, financial, performance, etc.)?

In progress.

- Are there any climate adaptation related evaluations in your country?

For adaptation, PBL was asked to develop a framework for the monitoring and evaluation of the Delta Programme:

- If not, is it planned to elaborate such documents?

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- If so,

- are there among them explicitly (in some cases even in their title) geographically/spatially oriented evaluation products, rich in territorial chapters, analytical aspects, evaluation questions?

A mention must be made about the document “Keeping track of adaptation in the Dutch delta (2016)”. The Delta Programme is a nation-wide initiative with a complex network structure involving many parties, such as provincial authorities, municipalities, district water boards, social organisations and private stakeholders. Together, they form the delta community. In line with the characteristics of the Delta Programme and at the request of the Delta Programme Commissioner, PBL’s design for a monitoring and evaluation framework is based on a reflexive approach, in combination with the challenges related to adaptation. The report presents concrete recommendations for the set-up of a monitoring and evaluation system, with respect to: 1) Increasing the Delta Programme's capacity for systemic learning; 2) Integrating adaptive management; 3) Creating a basis for shared accountability; 4) Creating a basis for trust and transparency.

<https://www.pbl.nl/en/publications/keeping-track-of-adaptation-in-the-dutch-delta>.

- Or are there large number of adaptation evaluation products, established system but with minor or no territorial content?

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- Or only sectoral /thematic/general evaluations exist?

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- The NAS/NAP aims to set up an evaluation system or elaboration of products, but no such products are in practice yet.

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- What are the spatial levels of evaluations?
- Are there only national level evaluations, or even regional/local ones, too (does explicitly territorially oriented evaluation reports in adaptation at subnational and local levels emerge)?

The Delta programme and its evaluations are themselves the manifestation of spatially focussed evaluation.

- Does spatial visualization (graphic solutions to present territorial differences, characteristics) emerge in adaptation evaluations and reports?

Not really.

- Can you mention any good practice in your country from national or regional level about planning/monitoring/evaluation practices in adaptation that takes into consideration spatial issues significantly?

The difficulty with adaptation on local level (municipalities) is that they are many and there is no strict format for reporting progress on climate adaptation. So, it is difficult to monitor progress.

Municipalities are stimulated to engage with climate adaptation (to make a 'stress test' to find out adaptation bottle necks and to develop an adaptation plan) but small municipalities sometimes fail because lack of capacity (or other priorities). Municipalities have no budget for climate adaptation, problems have to be solved with existing budgets (for sewer, green maintenance etc.).