



BMVBS-Online-Publikation, No. 21/2010

**National strategies of European countries  
for climate change adaptation:  
A review from a spatial planning and territorial  
development perspective**

**Imprint**

**Published by**

German Federal  
Ministry of Transport, Building and Urban Development (BMVBS)

**Scientific Support**

Federal Institute for Research on Building, Urban Affairs and  
Spatial Development (BBSR) within  
Federal Office for Building and Regional Planning (BBR)

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**Quotation**

BMVBS (Ed.): National strategies of European countries for climate  
change adaptation: A review from a spatial planning and territorial  
development perspective. BMVBS-Online-Publikation 21/2010.

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ISSA 1869-9324

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A project within the research programme "Modellvorhaben der Raumordnung (MORO)"  
conducted by the German Federal Ministry of Transport, Building and Urban Development  
(BMVBS), supervised by the Federal Institute for Research on Building, Urban Affairs and  
Spatial Development (BBSR) within the Federal Office for Building and Regional Planning (BBR).

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## Executive summary

### Problem setting

Since 2005 several national adaptation strategies to climate change have been developed and adopted in the EU Member States. The role of sectoral planning, such as water management, is highlighted throughout the national adaptation strategies, but the role of spatial planning or territorial development often remains unclear.

The main objective of the comparative study "National climate change adaptation strategies of European states from a spatial planning/regional development perspective" was to provide an overview and systematic characterisation of different national approaches to developing strategies for climate change adaptation from a spatial planning/regional development perspective. The results shall contribute to the implementation of the Territorial Agenda of the EU as well as to the current Demonstration Projects of Spatial Planning (MORO) and Experimental Housing and Urban Development Projects (ExWoSt) of the German federal government that deal with climate change adaptation from a spatial perspective.

The central research hypotheses of this research were as follows:

- Climate change leads to regionally differentiated impacts in Europe. This should influence the main focus of national adaptation strategies and planning related fields of activity.
- Also the differences in the political-administrative system play a decisive role because the instruments and procedures of spatial planning should have an important influence on strategies and measures for climate change adaptation and especially where they are placed institutionally.

### Main results

The results of the first research step showed that spatial planning is only given minor attention in the assessed analyses (with the exception of the studies from Schuster and from Roggema). Spatial planning is rather seen as one of many other sectors. This might be due to the fact that the cross-sectoral coordination function of spatial planning but also the specific mandate to "organise and safeguard" land use and spatial development as stipulated in German legislation is not common in other European countries.

In Europe, large differences exist concerning the regional exposure and sensitivity to climate change. The countries that are assessed in this study thus cover the most relevant regional climate change types. The planning systems of the countries show large differences as well. It could be observed that the development function of spatial planning in most other countries dominates the function of spatial organisation. Thus, experiences from other countries can be transferred to the German situation only in the field of spatial development rather than in spatial or regional planning.

In regard to the adoption of national adaptation strategies the assessed countries differ greatly. Finland (2005) has to be seen as a pioneer whereas the large majority of countries have only developed national adaptation strategies after 2006: France and Spain in 2006, Germany, the Netherlands, Hungary and the United Kingdom in 2008. Greece and Poland have not yet developed any national climate change adaptation strategy. No significant correlation can be observed between the swiftness of adopting climate change adaptation strategies and a country's degree of climate change exposure or sensitivity. Also, no such correlation can be observed concerning the different types of planning systems.

The adaptation strategies can be grouped according to spatial planning aspects in the following way:

- Due to not yet existing adaptation strategies there are no statements possible concerning the role of spatial planning in Poland and Greece.
- The role of spatial planning is mentioned but not specifically specified in Finland and Spain.
- Spatial planning is assigned a specific role, which is yet to be implemented in practice in Germany, France and Hungary.
- The adaptation strategy and subsequent documents that directly focus on spatial planning are already in the implementation process in the United Kingdom and in the Netherlands.

From a German perspective the question has to be raised how the role of spatial planning in climate change adaptation can be strengthened for the implementation of the EU's Territorial Agenda on the one hand and at the German national, regional and local level on the other hand. For this purpose, a set of recommendations was developed:

- explicit designation of the cross-sectoral orientation and multi-level governance of adaptation strategies,
- integration of the importance of climate change adaptation into spatially guiding principles,
- consideration of climate change in the distribution of spatially relevant funding,
- development of integrated concepts,
- stronger orientation on strategic objectives and systematic monitoring of achieving these,
- stronger emphasis on the role of spatial planning for building adaptation capacities.

Further, climate proofing is discussed as an approach to integrate principles of climate change adaptation into planning processes. A conceptual discussion with the

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climate proofing approach in the assessed countries could only be found in the Netherlands. However, also in other countries approaches can be found that have elements corresponding to the principles of climate proofing.

Finally, the report discusses the question of how 'no regret' or 'low regret' strategies can be operationalised – a topic that has not yet been addressed in adaptation strategies but has large relevance for planning practice.

### **Research methodology**

In a first step already existing assessments and analyses of climate change adaptation strategies were assessed in a meta evaluation. The main research interest was to answer the question which role spatial planning and spatial development play in climate change adaptation strategies. The results of this assessment were used to structure the assessment design for the national case studies.

In a second step nine country studies were carried out. The countries were to cover all parts of Europe including the different regional climate change impacts and were also to represent the variety of spatial planning systems. The case study countries thus selected were Germany, Finland, France, Greece, the Netherlands, Poland, Hungary and the United Kingdom. The countries were assessed in a cross-sectional analysis from the perspective of spatial planning/spatial development.

Finally, recommendations for the implementation of the Territorial Agenda of the EU and the German demonstration projects "Spatial development policies for climate change" and "Urban strategies for climate change: Climate change-proof urban development" were given.

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# 1 Introduction

## 1.1 *Problem setting and objectives of the study*

### **Problem setting**

Planning and planners are generally responsible to reduce vulnerability<sup>1</sup> and to develop climate mitigation and adaptation capacities against the impacts of climate change (Stern 2006, IPCC 2007). Also, the World Bank Report „The Global Monitoring Report 2008“ which deals with climate change and the Millennium Development Goals (MDGs) concludes that the development of adaptive urban development strategies is a fundamental field of action for dealing with the challenges of climate change (World Bank 2008).

In the EU Territorial Agenda (BMVBS 2007) it is stipulated under priority 5: “(23) Joint transregional and integrated approaches and strategies should be further developed in order to face natural hazards, reduce and mitigate greenhouse gas emissions and adapt to climate change. Further work is required to develop and intensify territorial cohesion policy, particularly with respect to the consequences of territorially differentiated adaptation strategies.”

Also the EU White Paper „Adapting to climate change: Towards a European framework for action“ (European Commission 2009) explicitly relates to spatial planning and territorial development, respectively: „Extreme climate events cause huge economic and social impacts. Infrastructure (buildings, transport, energy and water supply) is affected, posing a specific threat to densely populated areas. The situation could be exacerbated by the rise in sea level. A more strategic and long-term approach to spatial planning will be necessary, both on land and on marine areas, including in transport, regional development, industry, tourism and energy policies.”

Further, the EU Commission aims to define guidelines and exchange best practice “to ensure that account is taken of climate change impacts when implementing the Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) Directives and spatial planning policies” (European Commission 2009).

### **Objective of the study and overview of contents**

Policy documents on different levels show that spatial planning is regarded as an important player for the adaptation of regions to climate change. At the same time there is only little knowledge about the role that is attributed to spatial planning in the Member States of the European Union and to which extent the potential importance of spatial planning is reflected in practice. Against this background it is

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<sup>1</sup> The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity (IPCC 2001).

the main objective of this study to provide an overview and a systematic classification of different national approaches to developing climate change adaptation strategies from a spatial planning and territorial development perspective. In fact, a number of comparative studies on adaptation strategies already exist (see Chapter 2); however, these in general do not take a "spatial" perspective. The results of this study shall support the implementation of the Territorial Agenda of the EU and may furthermore be a source of ideas for the development of spatially oriented adaptation strategies within the EU Member States.

Access to national adaptation policies that are often not well known internationally was made possible by involving spatial planning experts from the assessed countries. The selection process of experts is described in Section 1.2.

In order to assess the transferability of the country studies' results it is necessary to gather knowledge about the political-administrative system as well as the climate change vulnerability of the respective country. This will also be portrayed in the following Section 1.2.

Chapter 2 aims at a spatial planning oriented cross-section analysis of already existing climate change adaptation assessments or analyses, respectively. The main objective of this meta evaluation was to identify the role spatial planning and territorial development play in the analyses and thus in the national adaptation strategies.

Chapter 3 shows the results of the cross-country analysis of nine national climate adaptation strategies from a spatial planning/territorial development perspective (see the following Section 1.2 for the selection of the country studies). These country reports were written in English and edited by native speakers in order to guarantee an extensive access to the national sources and planning practice. The structure of the country reports is similar for all studies because they were carried out according to a standardised set of research questions which were developed from the meta evaluation of adaptation assessments (see Chapter 2). The main focus of the country studies is the extensive characterisation of the national adaptation strategy and especially the role of spatial planning within this strategy. The main results are shown in Table 5 which allows a quick comparability of the spatial planning oriented approach of the national adaptation strategies.

Finally, recommendations for the implementation of the Territorial Agenda of the EU as well as for adaptation to climate change by regional and local planning are made in Chapter 4.

## ***1.2 Hypotheses and selection of country studies***

In the following, research hypotheses will be developed and on this basis appropriate country studies are selected from EU 27 countries. This step is based on own research results as well as policy documents and other research results (e. g. ESPON

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Climate, White Paper „Adapting to climate change“, EEA study “Impacts of Europe’s changing climate”).

Hypothesis 1: Climate change impacts in Europe are distributed differently in European regions due to the variation in climate stimuli. However, some common spatial patterns of climate change impacts can be identified, i. e. regions with similar climate change impacts. The regional differences should influence the design of the national adaptation strategies in Europe as well as the planning related fields of action.

The analysis of regional differences should differentiate between regional types of climate change exposure due to climate stimuli and the sensitivity of regions towards climate change which in combination determine potential climate change impacts. Furthermore, a regional differentiation is made according to the adaptive capacity and coping capacity<sup>2</sup>. This is recommended by the study of Massey & Bergsma (2008) which shows a focus on the coping capacity towards extreme weather events, especially for southern Europe. This distinction is necessary to characterise the main focus of the adaptation strategies and planning related fields of action and to assess the transferability of innovative approaches.

The present approaches pursued by different European institutions to generate an overview of climate change exposures, sectoral sensitivities and impacts have to be seen in this context. However, these studies (EU Commission 2009a, EEA 2008) do not have a specific territorial or spatial focus. This, on the other hand, is the main focus of the ESPON Climate project („Climate change and territorial effects on regions and local economies“) which is co-ordinated by the Faculty of Spatial Planning at the TU Dortmund University. The ESPON Climate Interim Report presents the results of a cluster analysis of eight indicators which led to a typology of regional climate change in Europe (see Table 1). The typology was developed on the basis of the so called CLM model<sup>3</sup> and calculated with the A1B emission scenario<sup>4</sup> which assumes that similar improvement rates apply to all energy supply and end-use

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<sup>2</sup> While the concept of coping capacity is more directly related to an extreme event (e.g. a flood or a winter storm), the concept of adaptive capacity refers to a longer time frame and implies that some learning either before or after an extreme event is happening. The higher the coping capacity and adaptive capacity, the lower is the vulnerability of a system, region, community or household (Peltonen 2005).

<sup>3</sup> The CLM model (climate version of the local model of the German Meteorological Service [Deutscher Wetterdienst, DWD]) has in the meantime been renamed COSMOCLM and further developed. It is a co-operative development of about 25 leading research institutions and especially offers the possibility to carry out regional climate projections (Walkenhorst and Stock 2009).

<sup>4</sup> Emission scenarios are used as a basis for the climate projections in the IPCC. Scenarios may be derived from projections, but are often based on additional information from other sources. Scenarios that have a similar demographic, societal, economic, and technical-change storyline. Four scenario families comprise the SRES scenario set: A1, A2, B1, and B2. Scenarios within a family that reflect a consistent variation of the storyline belong to a scenario group. The A1 scenario family includes four groups designated as A1T, A1C, A1G, and A1B that explore alternative structures of future energy systems. Scenarios are based on storylines, narrative descriptions of a scenario (or family of scenarios) highlighting the main scenario characteristics, relationships between key driving forces, and the dynamics of their evolution. The A1B scenario is often regarded as most likely to happen (IPCC 2001).

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technologies. 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. The validity of this typology however is supported by the fact that it correlates with Europe's bio-geographical regions (EEA 2009: 19) and that the most important topographic patterns of Europe are represented (Alps, Balkans, Pyrenees, Apennines but also, e.g. the Black Forest).

The following Table 1 shows that the decrease in the number of frost days and the change in annual mean temperature were of special importance for all clusters. In contrast, the indicator "change in annual mean number of days with snow cover" is only valid for two of the regional types.

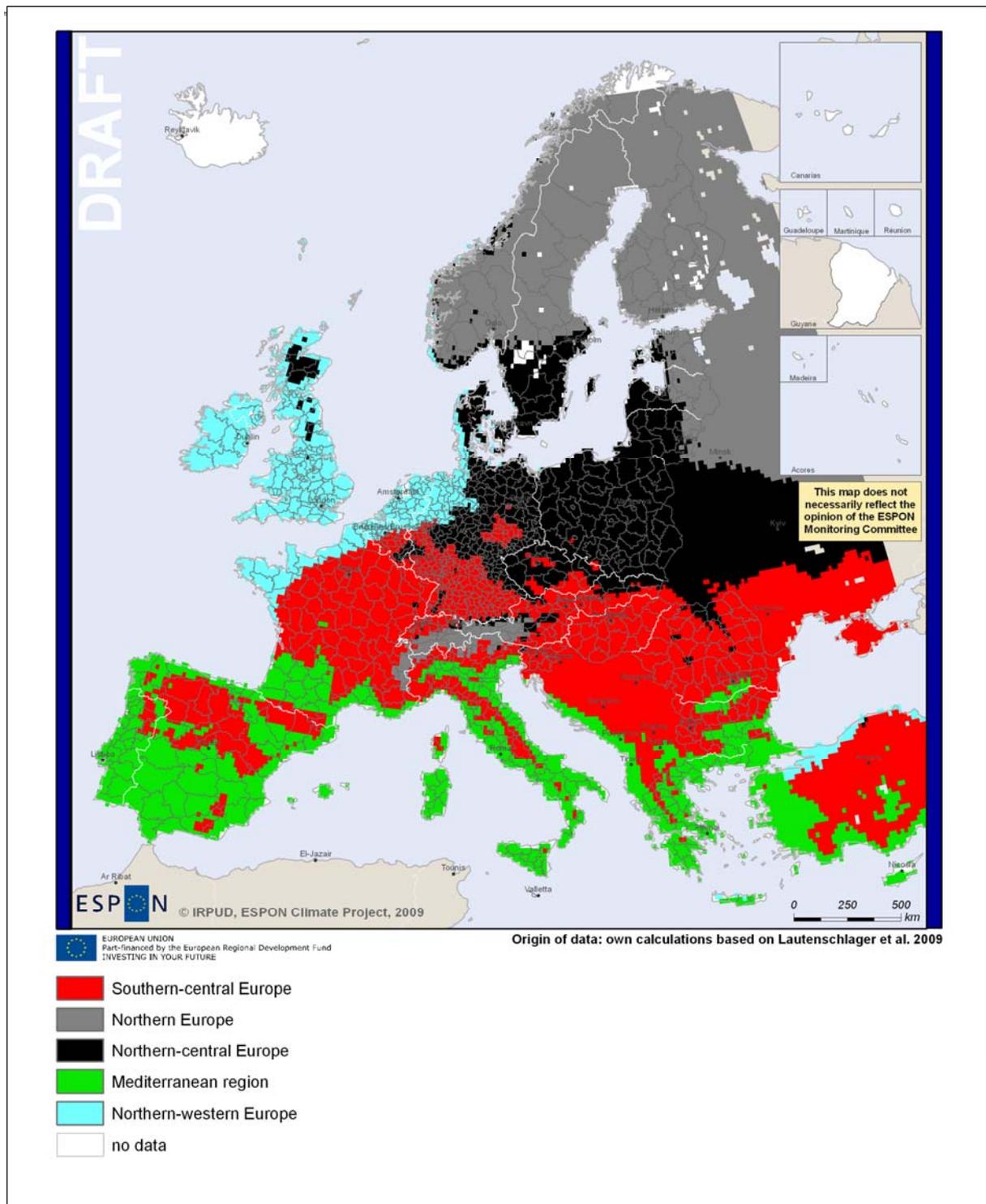
**Table 1: Different types of regions characterised by climate change based on a cluster analysis**

Cluster/Stimuli	Northern-central Europe	Northern-western Europe	Northern Europe	Southern-central Europe	Mediterranean region
Change in annual mean temperature	+	+	++	++	++
Decrease in number of frost days	--	-	--	--	-
Change in annual mean number of summer days	+	+	0	++	++
Relative change in annual mean precipitation in winter months	+	+	++	0	-
Relative change in annual mean precipitation in summer months	-	-	0	--	--
Change in annual mean number of days with heavy rainfall	0	+	+	0	-
Relative change in annual mean evaporation	+	0	+	0	-
Change in annual mean number of days with snow cover	-	0	--	0	0

- ++ Strong increase
- + Increase
- 0 Insignificant stimulus for the characterisation of the cluster
- Decrease
- Strong decrease

(Source: Greiving et al. 2010, p. 29.)

The following Figure 1 shows the spatial patterns of climate change regions in Europe: „South-central Europe“ encompasses large parts of northern Spain, France, south-western Germany, the Balkans, southern Ukraine and the central parts of Turkey. „Northern Europe“ stretches over large parts of Scandinavia and northern Belarus and Russia. „Northern-central Europe“ covers southern Sweden, eastern Germany, southern Belarus and northern Ukraine. The „Mediterranean region“ represents all Mediterranean countries with the exception of the mountainous regions of northern Spain and Italy. „North-western Europe“ includes the area that is influenced by the Atlantic climate including the British Isles, north-western France, the Netherlands and north-western Germany.



**Figure 1: Map of the climate change typology (Source: Greiving et al. 2010, 31)**

For the selection of country studies it was important that all five types of regions were represented by at least one case study. This was necessary to portray the broad range of potential climate change impacts that – according to Hypothesis 1 – influence the main focus of adaptation strategies and planning related fields of action.

The vulnerability assessment of regions against these climate impacts in the ESPON Climate project still in progress. In view of the study „Regions 2020 – The Climate

Change Challenge for European Regions”, published by DG Regio in March 2009 (DG Regio 2009) it becomes obvious that there are also spatial patterns concerning climate change vulnerability as a result of climate impacts and adaptive capacities (Figure 2).

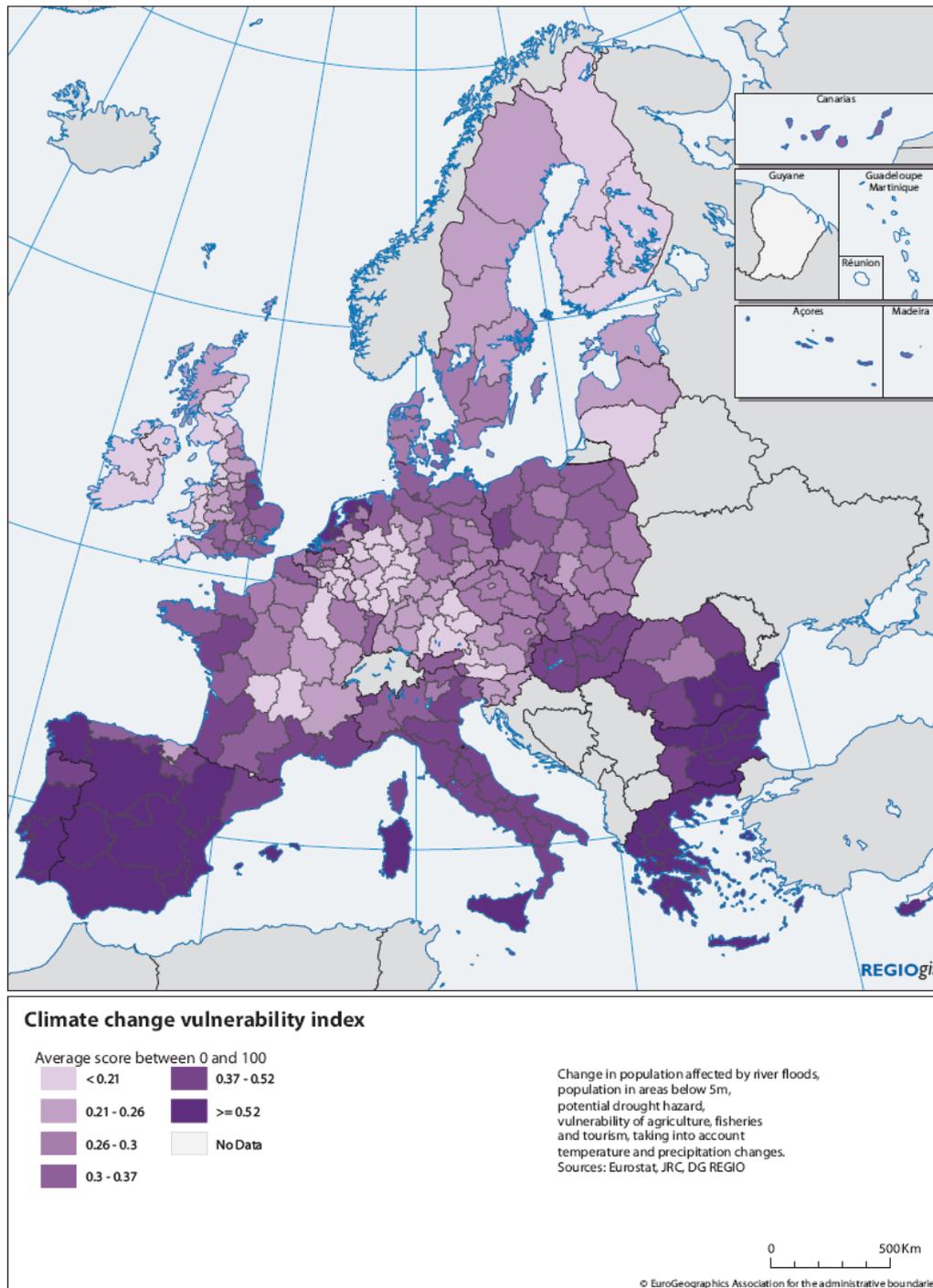


Figure 2: Climate change vulnerability index (Source: DG Regio 2009, 24)

Figure 2 shows that especially the Iberian Peninsula, Italy, the Balkans and large parts of the Netherlands can be regarded as highly vulnerable, whereas the rest of the EU 27 has a rather moderate or low climate change vulnerability. The high vulnerability of the Netherlands and the high vulnerability of the German, southern English and French coastal regions mainly depends on the potential impacts of climate change induced sea level rise (storm surges, permanent loss of land). Methodologically this may be criticized because adaptation capacities such as coastal protection seem to be disregarded.

Nevertheless Figure 2 shows the need to select countries with high climate change vulnerability as well as those that are – from a European perspective – most likely to be less vulnerable. This selection criterion is also met in this study (see Table 3).

Finally it shall be taken into consideration for the selection of case studies that the European Commission is also informed about the national adaptation strategies of the Member States Denmark, Finland, France, Germany, Hungary the Netherlands, Spain, Sweden and the United Kingdom (EU Commission 2009a). In the PEER Report „Europe Adapts to Climate Change - Comparing National Adaptation Strategies“ (Swart et al. 2009) Lithuania and Portugal are furthermore mentioned. Approaches of other countries, especially in southern and eastern Europe are not yet well documented and are therefore of special interest for the selection of case studies.

Hypothesis 2: The legal framework as well as the political-administrative system significantly determine how strategies and measures for climate change adaptation are designed and by which institutions they are implemented. As an example, the setting of legally binding and spatially specific objectives (e. g. to keep an area free of further settlement development) presumes that there are laws enabling the enactment and enforcement of such spatial objectives. Thus, the differences in the political-administrative systems shall be taken into consideration for the selection of the country studies. Furthermore, there is a need to know about the characteristics of the political-administrative systems of the assessed countries before the transferability of main findings to other countries can be estimated.

Of course it would go far beyond the scope of this study to analyse the planning instruments of all EU 27 Member States in detail. Thus, Table 2 focuses on the question 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).

**Table 2: Comparison of main attributes of national planning systems**

<b>State (Source)</b>	<b>Structure of the state</b>	<b>Spatial planning at the regional level</b>	<b>Co-ordination between the regional and the local level</b>	<b>Spatial planning at the local level</b>
Finland (Jarva/Virkki 2006)	Central state, consisting of six provinces	19 regional councils that are constituted by local representatives are the responsible bodies for regional planning. The regional plan (scale 1 : 100,000) addresses land use questions that are of national or regional significance.	The regional plan guides local land-use planning but at the same time has to consider existing local plans.	Local master plan (scale 1 : 5,000 – 1 : 50,000) with programmatic character and a detailed plan (scale 1 : 2,000) that regulates the land use. Furthermore, every municipality has its own building regulations.
France (Fleischhauer 2006)	Central state, consisting of 22 regions and 96 provinces	At the regional level there is programmatic development planning which has no direct connection to land use questions.	There is a lack of legal settings for the co-ordination between the planning levels. There is no binding effect of regional plans for the local level. In fact, the co-ordination is based on informal agreements.	At inter-municipal level a strategic development plan exists that prescribes planning principles and objectives but without any spatially specific regulations for land use.  At the local level there is a non-obligatory land use plan (zones of different land use) that is binding for public authorities.
Germany	Federation, consisting of 16 federal states („Länder“) which possess competences for spatial planning	Spatial plans for federal states (scale 1 : 100,000 – 1 : 300,000) and regional plans for parts of a federal state (scale 1 : 50,000 – 1 : 100,000) with graphically designated regulations concerning spatial functions and land use.	Principle of countervailing influence  Binding effects for sectoral planning of the state and local land-use planning on the one hand and local responsibility or involvement in the design of regional plans, respectively, on the other hand.	Land-use planning consisting of a preparatory plan for the whole municipal area (binding for authorities; scale in general 1 : 10,000 – 1 : 20,000) and a detailed plan for parts of the municipal area (binding for everybody; scale usually 1 : 500 – 1 : 1,000)

**Table 3: Comparison of main attributes of national planning systems (continuation)**

<b>State (Source)</b>	<b>Structure of the state</b>	<b>Spatial planning at the regional level</b>	<b>Co-ordination between the regional and the local level</b>	<b>Spatial planning at the local level</b>
Greece (Beriatos 2004)	Central state, consisting of 13 regions and 54 provinces	Strategic framework plan for regional development in the region but without specific regulations for land use.	The prescriptions of the regional framework plan have to be taken into consideration at the local level.	Framework plan for the whole municipality. Furthermore, a series of specialized binding plans exists for parts of the municipal area aiming at the implementation of general objectives.
Hungary (Eder/Schilcher 2009)	Central state, consisting of 19 districts which – just as towns and municipalities – have autonomy	National master plan with legally binding regulations for landscape protection. Strategic spatial development concepts at the district level without binding character.	During the design of spatial development concepts the interests of municipalities are taken into consideration. It is not allowed to interfere with municipal planning decisions.	Land-use planning consisting of a preparatory plan (binding for authorities) and a detailed plan for parts of the municipal area (binding for everybody)
The Netherlands (Larsson 2006)	Central state, consisting of 12 provinces	At the provincial level programmatic development plans (“Streekplannen”) are set up which cover the whole province or parts of it at the scale of 1 : 25,000.	Streekplannen only have a guiding but no strict binding effect for the local level.	For every municipality there exists a “Structuurplannen” that displays the main features of land use. „Bestemmingsplannen“ are set up for the built-up and rural areas each and regulate specifically the type of land use; they are the basis for making decision on building applications.

**Table 4: Comparison of main attributes of national planning systems (continuation)**

<b>State (Source)</b>	<b>Structure of the state</b>	<b>Spatial planning at the regional level</b>	<b>Co-ordination between the regional and the local level</b>	<b>Spatial planning at the local level</b>
Poland (Wanczura 2006)	Central state, consisting of 16 regions with regional autonomy	Regional development plan with programmatic character without specific regulations concerning land use.	The regional development plan is binding for the local level.	At the local level there is an integrated development plan that is binding for authorities. Furthermore there is the opportunity (but not obligation) to set legally binding land use plans.
Spain (Cantos 2006)	Central state, consisting of 17 regions with regional autonomy	Programmatic regional development plan that covers the whole region (scale 1 : 200,000 – 1 : 400,000). At the same time spatial and sectoral plans exist.	The regional development plan and the sectoral plans are binding for the local level.	A programmatic master plan with integrated land use plans at the scale of 1 : 1,000 – 1 : 5,000
United Kingdom (Fay 2006)	Central state, consisting of the entities England, Scotland, Wales and Northern Ireland	Spatial strategy documents at the regional level.	The local development plans in general have to be in line with national policies and regional spatial policy documents.	Local development plans determine programmatic prescriptions for projects which are decided upon in a „planning permission“. A legally binding zoning of the municipal area (as known from continental Europe) does not exist in the U.K.

(Source: own elaboration)

In summary, Table 2 shows that there is a significant demarcation line concerning the character of spatial planning at the regional level. In some of the EU Member States, especially in Germany, a new development is legally allowed when it is conforming to the land use as laid down in the legally binding regional plan. This so called regulatory function of spatial planning is known under the term “conforming planning” in the international discourse on planning theory (Rivolin 2009: 167ff, Larsson 2006: 93ff). In most of the EU Member States and thus also in the majority of country studies, however, the so called development function dominates at the regional level which is discussed under the term “performing planning”. This planning type is characterized by legally non-binding programmatic and/or strategic statements. Potential projects are then evaluated against the question whether they support the implementation of the programme or strategy. Furthermore, there are – if at all – only partially binding effects for the subordinated local level. At the local level, in contrast, the similarities between the planning systems between the Member States are much higher compared to the regional level. Throughout Europe – with the well known exception of the United Kingdom – there are two-level planning systems at the local level, consisting of a legally binding zoning of the urban or municipal area (“conforming planning”). It shall be mentioned that also at the European level the development function of territorial development has a much larger importance due to the non-existing legislative competences of the EU in the field of spatial planning (see European Spatial Development Perspective, Territorial Agenda of the EU, White Paper on Adapting to Climate Change).

These findings mean in the end that the main exchange between the Member States concerning the integration of climate change adaptation into policies at the regional level will be in the area of regional development rather than in the area of the conforming type of regional planning.

The following Table 3 shows how the selected criteria are represented by the case study countries:

- coverage of all five climate change typologies,
- representation of states with high, medium and rather low climate change vulnerability, and
- coverage of the main types of European spatial planning systems.

**Table 5: Main attributes of the selected countries**

<b>Member State</b>	<b>Climate change typology</b>	<b>Climate change vulnerability</b>	<b>Characteristics of the planning system</b>
Finland	Northern Europe	Low	Central state Regional plans with spatially specific regulations No binding effects for the local level Two level land-use planning
France	Northern-western Europe Northern-central Europe Southern-central Europe Northern Europe Mediterranean region	Low (central parts of the country) to high (coastal areas)	Central state Programmatic regional planning without reference to land use No binding effects for the local level One level land-use plan
Germany	Northern-western Europe Northern-central Europe Southern-central Europe Northern Europe	Low to medium (coastal areas)	Federal state Regional plans with spatially specific regulations Principle of countervailing influence Two level land-use planning
Greece	Southern-central Europe Mediterranean region	Very high	Central state Strategic framework plan Strategic objectives have to be considered Two level land-use planning
Hungary	Southern-central Europe	High	Central state Programmatic regional development plans No binding effects for the local level Two level land-use planning
The Netherlands	Northern-western Europe Southern-central Europe	Medium to very high (coastal provinces)	Central state Programmatic regional development plans No binding effects for the local level Two level land-use planning
Poland	Northern-central Europe Southern-central Europe	Medium to high	Central state Programmatic regional development plans Strategic objectives have to be considered One level land-use planning with option for 2 <sup>nd</sup> level
Spain	Southern-central Europe Mediterranean region	In most parts very high	Central state Programmatic regional development and sectoral plans Binding effects for the local level One level land-use plan
United Kingdom	Northern-western Europe Northern-central Europe	Low to high (coastal areas in the south east)	Central state Strategic regional planning Strategic objectives have to be considered Programmatic local development plans

(Source: own elaboration).

Summary: In Europe, large regional differences exist in terms of exposure and vulnerability to climate change impacts. The main regional types are covered by the country studies conducted within this study. Planning systems also vary greatly across Europe, but at the regional planning level the development function typically dominates the regulatory function of planning. The selected case studies cover all climate change types, show differences in their climate change vulnerability and represent different planning systems.

## 2 A review of comparative studies on climate change adaptation strategies

In the following chapter state of the art analyses of adaptation strategies are documented, commented on and then compared in a concluding section. The results of this meta analysis serve as the basis for the research design of the country studies (see Chapter 3). Furthermore, its conclusions are integrated into the recommendations of Chapter 4.

The studies analysed in this chapter in general have a broad scope and only in three cases a clear spatial planning or territorial development perspective (Schuster 2008, Roggema 2009, Fleischhauer et al. 2006).

**Table 6: Overview of the selected comparative climate change adaptation studies**

<b>Authors and title of the study</b>	<b>Context</b>	<b>Central contribution to this study</b>
European Commission (2009b): Towards a European framework for action impact assessment.	This impact assessment to the White Book on Climate Change Adaptation included comparative statements.	Integration of climate proofing into the strategic environmental assessment.
Ribeiro et al. (2009): Design of guidelines for the elaboration of Regional Climate Change Adaptation Strategies.	Commissioned by the EU Commission. Compared national and regional adaptation strategies.	The high importance of the involvement of stakeholders; national adaptation strategies to legitimise regional strategies.
Swart et al. (2009): Europe Adapts to Climate Change. Comparing National Adaptation Strategies.	The study was carried out by the non-governmental PEER network in order to allow insights into the different strategies of European countries.	The need to integrate climate change adaptation into existing planning instruments and communicate the benefits of spatial planning as co-ordinator of sectoral planning.
Mickwitz et al. (2009): Climate Policy Integration, Coherence and Governance	The study was carried out by the non-governmental PEER network in order to reflect upon the political implementation of adaptation strategies.	The divergence between the claim and the factual relevance of spatial planning for the adaptation process.
Brooks et al. (2009): Prioritizing Climate Change Risks and Actions on Adaptation - A Review of Selected Institutions, Tools, and Approaches	The study was carried out for the Canadian „Policy Research Initiative“ and analyses institutional adaptation concepts with the aim to prioritise risks from climate change impacts and adaptation options.	The relevance of prioritizing risks from climate change impacts for the development of adaptation options.
CIRCLE ERA-Net (2009): Outcomes of the 1st International CIRCLE Workshop on Climate Change Adaptation	CIRCLE aims at establishing a European research platform for climate impact research, adaptation and vulnerability and organizing the exchange between climate research and politics.	Focus on synergies instead of conflicts between climate change mitigation and adaptation.

**Table 7: Overview of the selected comparative climate change adaptation studies (continued)**

<b>Authors and title of the study</b>	<b>Context</b>	<b>Central contribution to this study</b>
Schuster (2008): Klimaanpassungsstrategien in europäischen Nachbarländern	Core questions were the identification of adaptation measures with spatial planning relevance from countries neighbouring Germany and the transferability of such measures to Germany.	Concrete spatial planning related adaptation measures for specific vulnerabilities.
Meister et al. (2009): Schwimmende Häuser und Moskitonetze: Weltweite Strategien zur Anpassung an den Klimawandel - Nationale Strategien und Projektbeispiele	Guiding question of the study was how the analysed countries prepare for the impacts of climate change. The study derives success factors for the development and implementation of adaptation strategies that shall provide a first orientation in this new policy field.	Success factors for adaptation strategies (cross-cutting topic, multitude of stakeholders, long-term perspective, actions under uncertainty, local implementation in a global context)
Roggema (2009): Adaptation to Climate Change: A Spatial Challenge	This study is part of the book „Adaptation to Climate Change: A Spatial Challenge“. Guiding question of the study is which role spatial planning can play in adaptation strategies.	The variety of adaptation strategies and their influencing factors
Fleischhauer et al. (2006): Natural Hazards and Spatial Planning in Europe	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.
Massey/Bergsma (2008): Assessing adaptation in 29 European countries	The study was commissioned by the Netherlands Environmental Assessment Agency in order to provide an overview of the state of European adaptation approaches.	Regionally differentiated vulnerability and specific adaptation strategies and measures.

(Source: own elaboration).

In the following these studies are analysed from a spatial planning point of view. The studies cover more or less the same countries because many of them were pioneers in climate change adaptation (such as Finland or the Netherlands). Other countries, however, such as Greece or Poland are not covered because they do not have any adaptation strategy yet.

### **Which were the studies' core research questions?**

Already during the analysis of the core research questions of the studies listed above it became obvious that spatial planning was only of marginal interest. Instead, the studies focused on the state of implementation of national adaptation strategies and the included sectors. Sometimes success factors, weaknesses and knowledge gaps were identified. Particular projects or the role of specific planning instruments was of less interest. The studies that specifically focused on the role of spatial planning in adaptation strategies, however, were an exception in this respect: Schuster (2008) and Roggema (2009) as well as the study of Fleischhauer, Greiving & Wanczura

(2006), which primarily focused on natural hazards and not on national adaptation strategies.

**To which degree did aspects of spatially relevant planning (sectoral planning, regional planning and development, urban planning and development) play a role?**

First there is the need to distinguish between the role of planning relevant topics (land use, urban design) and spatial planning as an actor.

For example, land use is often mentioned as a cross-cutting topic. Land-use related adaptation measures mentioned in these studies such as recycling of brownfield areas, reduction of land consumption or the adaptation of buildings to higher temperatures or extreme weather events often dedicate a certain role to spatial planning. However, spatial planning is generally seen to play only a subordinated role – with the exception of the studies from Schuster (2008) and Roggema (2009). Interestingly, spatial planning is often categorized as one of many sectors and the authors of the studies hardly recognise the co-ordinating function of spatial or regional planning.

Roggema regards spatial planning as an important tool in any adaptation process due to its integrating character. This might be due to the fact that Roggema is Dutch and that the Netherlands are the only country within the present study that assigns a key role to spatial planning in climate change adaptation.

The studies also show that all assessed countries are unique. The generally missing focus on spatial planning has a lot to do with the circumstance that a cross-sectoral co-ordination function and the mandate to regulate and safeguard spatial development as known e. g. in Germany is not common in most European countries.

**To which extent was the role of spatial planning systematically analysed?**

In view of the above findings it is not surprising that only the studies of Schuster (2008) and Roggema (2009) that have a focus on spatial planning explicitly discuss the role of spatial planning.

In all other studies spatial planning is discussed – if at all – only as one of many sectors that are affected by climate change.

**Which sectors were assessed?**<sup>5</sup>

In all of the above studies water management is seen as the key sector for climate change adaptation. It is remarkable that only the Netherlands assign a key role to spatial planning, but at the same time do not consider public health facility planning as a key component of planning. The EU Commission emphasizes the central importance of spatial planning as a "sector". In most national adaptation strategies

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<sup>5</sup> The designation and categorisation of sectors is almost similar in all countries and can be traced back to the United Nations Framework Convention on Climate Change (UNFCCC) where the member states had to report four times so far about their status in the areas of climate change mitigation and adaptation in so called „National Communication Reports“.

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communication infrastructure is not explicitly regarded as a sector of its own. Other infrastructures are typically subsumed under sectors such as transport, water management or energy. Economic impacts are explicitly mentioned and assessed quantitatively in Finland, France and the Netherlands.

Analysing national adaptation strategies, the EU White Book on climate change adaptation and the reviewed secondary literature one comes to the conclusion that the Member States obviously regard themselves to be similarly vulnerable because the adaptation strategies address similar sectors with specific climate change vulnerability. However, the definition of key sectors does not necessarily imply a high vulnerability because also the options for future actions can be a defining criterion.

Presumably significant differences can only be identified when looking at particular measures that are tailored to the specific bio-geographical, socio-economic and political-administrative circumstances. This also corresponds with the findings of the study by Massey & Bergsma (2008).

The study by Schuster (2008) highlights those sectors that are especially relevant from a spatial planning perspective such as water management, coastal regions, urban planning, housing, architecture and energy efficiency, recreation and tourism, transport, infrastructure and energy as well as adaptation to spatial risks and natural hazards (hazard mapping)

The following Table 5 provides an overview of the sectors that are addressed in national adaptation strategies.

**Table 8: Vulnerable sectors in the assessed EU Member States<sup>4</sup>**

Vulnerable sectors	DE <sup>1</sup>	ES <sup>2</sup>	FI <sup>1</sup>	F <sup>1</sup>	GR <sup>3</sup>	HU <sup>2</sup>	NL <sup>1</sup>	UK <sup>1</sup>	EU <sup>2</sup>
<b>Key sectors</b>									
Biodiversity	+	+	+	++	+	+	+	+	++
Health	+	+	+	++	+	+	-	+	+
Agriculture	+	+	+	+	+	+	+	+	+
Water resources	+	+	+	++	+	+	++	+	++
<b>Other sectors</b>									
Soil conservation	+	+	-	-	-	-	-	-	++
Energy	+	+	+	+	+	+	-	+	+
Insurance industry	+	+	+	+	-	+	+	+	-
Fisheries	+	+	+	-	+	-	-	+	+
Forestry	+	+	+	-	-	+	+	+	+
Buildings	+	+	+	+	-	-	+	+	+
Industry	+	+	+	+	+	+	-	+	+
Communication and infrastructure	+	-	+	-	-	-	-	-	+
Disaster management	+	-	-	-	-	-	-	-	-
Spatial planning/ land use	+	+	+	-	-	+	++	+	++
Tourism	+	+	+	+	+	-	+	+	-
Transport	+	+	+	+	+	+	-	+	-
<b>Types of vulnerable regions</b>									
Mountainous areas	+	+	-	-	-	-	-	-	-
Coastal zones	+	+	-	-	-	-	+	+	+
<b>Economic impacts</b>									
(own assessment)	-	-	++	++	-	-	++	+	+

++ Key sector; + addressed sector; – not explicitly mentioned sector/aspect

<sup>1</sup> Swart et al. 2009: 54.

<sup>2</sup> European Commission 2009a: 120ff.

<sup>3</sup> Greece has not yet been assessed in any comparative analysis. A national adaptation strategy does not exist so far. The information was provided by the Economic and Social Commission of Greece (OKE) which delivered a basis for the development of a national adaptation strategy with the study *OKE Opinions: Climate Change*, No 208, December 2008.

<sup>4</sup> Poland has not yet been assessed in any comparative analysis. A national adaptation strategy does not exist so far. Also informal documents do not provide any information about potentially affected sectors. Thus, Poland is not presented in this table.

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### **Which were the general findings of the studies?**

In most of the studies the importance of a sound information basis is highlighted. However, they emphasise that in spite of the existing uncertainty concerning the dynamics and impacts of climate change there is already sufficient knowledge at hand to act now, especially because of the long-term nature of climate change. Therefore, thinking in scenarios is needed as well as the often postulated focus on no regret or low regret measures.

Continuity in planning and implementation and a periodic evaluation of the objectives of strategies and measures are therefore essential. The potential importance of impact assessments – also for prioritising climate change impacts and monitoring – is often highlighted and discussed especially in the context of strategic environmental assessment.

All studies assign a key role to the involvement of stakeholders in any kind of adaptation process. Often the development of cross-departmental, cross-sectoral and cross-level governance structures with stakeholder networks is discussed, resulting in so called multi-level governance structures. Nevertheless, many studies conclude that only little attention is paid to communication processes at present and especially in the first phases of an adaptation process.

All studies agree that climate change adaptation is a cross-sectoral topic that touches a broad range of policy fields. It remains open, however, how the horizontal and vertical co-ordination could be guaranteed. The studies only mention that the integration of climate change adaptation into the different sectoral policies is very important. The potential importance of spatial planning in this respect is not recognised. This may be due to the fact that most of the reviewed studies do not consider spatial planning at all and that the cross-sectoral co-ordination function of regional planning only exists in a few countries.

The importance of prioritising adaptation measures, e. g. on the basis of cost-benefit-analyses, is often mentioned. The conflicts between climate change mitigation and adaptation on the other hand only play a minor role in the reviewed studies.

### **Which economic approaches are addressed?**

Economic approaches are only covered in very few studies: in the PEER-Report No. 2 (Mickwitz et al. 2009), in the Impact Assessment of the EU Commission and in case studies by Meister et al. (2009) and Roggema (2009). But even there the descriptions remain quite vague. Economic approaches mentioned in the studies are the adaptation of existing development funds, climate proofing of nationally and EU funded investments and the option of carbon taxes.

Cost-benefit analyses only exist for the sectors of coastal protection and health. Existing economic models focus primarily on determining an optimal policy mix of climate change mitigation and adaptation.

More informative are the best practice examples in studies such as the London Climate Change Partnership (<http://www.london.gov.uk/lccp>), where economic incentives for the adaptation of the building stock to climate change have been developed. This is based on an economic model that improves the understanding of how incentives could influence people to consume more adaptation related products and services. Furthermore, the London study also includes vulnerability studies of important sectors such as finance and transport and check lists for planners on how to deal with climate change. In the Netherlands the Delta Committee formulated twelve short- and long-term policy recommendations, among them the demand that decisions to allow development in flood-prone areas should in the future be based on a cost-benefit analysis. The costs for protection measures should not be covered by the public but by the investor.

### **Which were the specific (spatial) planning related results of the studies?**

First of all, most of the reviewed studies do not have a spatial planning focus. The authors of the present study had to therefore take an open and interpretive approach when analysing the studies in regard to spatial planning (with the notable exceptions of the studies by Schuster and Roggema).

It is interesting that in the Impact Assessment Report (European Commission 2009a) adaptation options are classified into "grey" infrastructure related approaches, "green" structural and "flexible" non-structural approaches. Spatial planning can be seen as a relevant actor in all three areas. This is similarly valid for the explicitly mentioned measures concerning the selection or change of sites, the design of infrastructure and buildings, flood risk and coastal zone management and the improvement of disaster prevention in order to cope with risks (including climate change risks).

The suggestion that national adaptation policies can extend (spatial) planning instruments by also including aspects of climate change adaptation is likewise worth considering. Nevertheless, quite a few studies conclude that so far no cross-sectoral approaches in the assessed countries that could serve as a basis for an effective co-ordination of all sectoral adaptation needs at the regional level.

Only the study carried out by Schuster addresses 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.

Apart from the reviewed studies there some related publications in Member States. For example a handbook for climate change adaptation that supports local decision-makers (Climate Change Adaptation by Design, UK) focuses on adapting the building stock to climate change. The cross-sectoral National Programme Climate Adaptation and Spatial Planning (Adaptie Ruimte en Klimaat – ARK, NL) also aims at a better co-

ordination and co-operation between different actors in climate change adaptation. Spatial development in the Netherlands should be oriented according to the national adaptation strategy based on the principles of climate proofing.

### **Which conclusions were drawn in general and concerning spatial planning and territorial development?**

First it shall be emphasised that the EU Commission itself acknowledges the importance of spatial planning and territorial development and thus promotes the co-ordination of land-uses at the EU level and the introduction of climate proofing in spatial planning processes (European Commission 2009a, 75). Furthermore, the Commission aims at defining guidelines that take the impacts of climate change into account when implementing the directives on environmental impact assessment (EIA) and strategic environmental assessment (SEA). The study by Fleischhauer, Greiving & Wanczura (2006) also highlights the possibility to integrate elements of risk management into the strategic environmental assessment.

Other studies, like the PEER-Report I (Swart et al. 2009), also point out the importance of spatial planning instruments for an effective assessment of all kinds of (spatial) development, for an appropriate involvement of stakeholders, for the setting of specific regional and sectoral adaptation goals and appropriate indicators, for the development of co-ordinated and coherent policies and measures, for providing a formal basis for regular reporting to superordinated authorities and a formal frame for continuous monitoring. However, the PEER-Report II (Mickwitz et al. 2009) as well as the study by Roggema (2009) come to a sobering conclusion concerning the factual opportunities of spatial planning when they state that in practice there are only very few success stories in this regard.

The biggest challenge therefore is seen in the need to integrate "adaptation knowledge" into spatially relevant decisions and to use the potentials of the existing planning instruments.

### **How relevant are the studies for the present study?**

The Impact Assessment of the EU Commission (European Commission 2009a), the PEER-Report I (Swart et al. 2009) and the study by Ribeiro et al. (2009) have the biggest relevance for this study because they give sound and systematic statements that are also highly important for spatial planning. In contrast, the other studies are only of limited importance because they do not explicitly include or refer to spatial planning. This also applies to both studies that explicitly focus on the role of spatial planning: They show methodological deficits, only deal with a limited number of systematic and coherent research questions and are based on heterogeneous information concerning the assessed countries. The study by Fleischhauer, Greiving & Wanczura (2006) is an exception by explicitly asking for the role of spatial planning, its potentials and limitations in the risk management of natural hazards, but it does not relate these aspects to climate change adaptation strategies.

Summary: The objective of this section was to document and comment on the already existing comparative analyses of national adaptation strategies. According to most of the studies (with the exception of the studies by Schuster and Roggema) spatial planning is only regarded as playing a minor role. Spatial planning is at most considered as one of many sectors. The low profile of spatial planning might be due to the fact that the cross-sectoral co-ordination function of spatial planning but also the specific mandate to “organise and safeguard” land use and spatial development as known in Germany is not common in most other European countries.

### 3 Analysis of country studies

Chapter 2 presented an analysis of already existing cross-country studies on climate change adaptation. Chapter 3 will analyse the country studies that were carried out exclusively for the present study. This happens along a common table of contents for all country studies. In cases where the complete table of contents could not be covered this was due to missing information. For example some national adaptation strategies do not cover all the points or an adaptation strategy does not exist at all. The analysis focuses on the following general aspects:

- the main elements of the national adaptation strategies or (in the case of Greece and Poland) informal documents for the preparation of an adaptation strategy (Section 3.1),
- the role of spatial planning in the field of adaptation to climate change (Section 3.2),
- findings and conclusions (Section 3.3).

The country studies were carried out at the beginning of the year 2010 by the following authors:

Finland	Dr. Philipp Schmidt-Thomé Geological Survey of Finland, Espoo Kaisa Schmidt-Thomé Helsinki University of Technology
France	Marjory Angignard, MA TU Dortmund University, Institute of Spatial Planning
Germany	Prof. Dr. Stefan Greiving TU Dortmund University, Institute of Spatial Planning
Greece	Prof. Kalliopi Sapountzaki Prof. Louis Wassenhoven Harokopio University of Athens
Hungary	Dr. Erzsébet Vajdovich VÁTI Hungarian Public Nonprofit Company for Regional Development and Town Planning, Budapest
The Netherlands	Dr. Mark Fleischhauer TU Dortmund University, Institute of Spatial Planning
Poland	Dr. Sylvia Wanczura TU Dortmund University, Institute of Spatial Planning
Spain	Dr. David Sauri Autonomous University of Barcelona
United Kingdom	Prof. Simin Davoudi Newcastle University

### **3.1 Main elements of the national adaptation strategy**

In the assessed countries a very differentiated picture emerges concerning the adoption of national adaptation strategies. Finland (2005) has to be seen as a pioneer whereas the large majority of countries has developed national adaptation strategies only after 2006: France and Spain in 2006, Germany, the Netherlands, Hungary and the United Kingdom in 2008.<sup>6</sup> Greece and Poland have not yet developed any national climate change adaptation strategy. However, the development of an adaptation strategy has a high priority in Greece, whereas in Poland it seems that the importance of this topic has not yet been fully recognised. No significant correlation can be observed between the speediness of developing a national adaptation strategy and the degree of climate change exposure or sensitivity. This can be illustrated by the fact that Finland with relatively low climate change vulnerability belongs to the pioneer states, whereas the highly vulnerable Greece has not yet developed any adaptation strategy.

In general the development of the national adaptation strategies happened under the leadership of the respective ministry for the environment, often in co-operation with national cross-sectoral authorities (France, Germany, United Kingdom, Greece, Poland, Spain). In the Netherlands the spatial planning and environmental ministry is the co-ordinating institution. In some of the countries the strategy was developed in an intensive co-operation process with several ministries (France, the Netherlands, Spain).

All strategies are starting points for further implementation oriented programmes that were often developed afterwards or are still to be developed. In Finland the implementation is part of an energy and climate strategy (2005), in the United Kingdom a climate change adaptation programme (2008) was adopted as a law, in Spain two work programmes were set up until 2009 and in the Netherlands a national adaptation agenda was launched. In France, the national adaptation plan and in Germany the action plan for adaptation are to be adopted in 2011.

The national adaptation strategies are informal, non-binding documents of a very different character. For example, in France the national adaptation strategy aims at setting up a frame for the subsequent implementation strategy, but the prescriptions of the adaptation strategy are not binding. In the Netherlands the national adaptation strategy serves as an orientation both for the substantive implementation (adaptation agenda) as well as for the organizational implementation (inter-provincial agreement). In Germany the adaptation strategy aims more at delineating

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<sup>6</sup> The information was obtained from the European Environmental Agency (EEA) (<http://www.eea.europa.eu/themes/climate/national-adaptation-strategies>). Other sources give slightly different information (e. g. KomPass at [http://www.anpassung.net/cln\\_110/nn\\_700470/DE/Fachinformationen/NAS\\_\\_in\\_\\_EU/NAS\\_\\_in\\_\\_EU\\_\\_node.html?\\_\\_nnn=true](http://www.anpassung.net/cln_110/nn_700470/DE/Fachinformationen/NAS__in__EU/NAS__in__EU__node.html?__nnn=true)), which is not surprising as the publication of first documents, their formal adoption or the decision to develop an action plan for the implementation can be interpreted as the starting point for a national climate change adaptation process.

the responsibilities and competences between the federal government, the federal states, the regions and the local level. In the United Kingdom the strategy is very much focused on the stakeholders that are relevant for the implementation of the strategy and directly addresses public and private organisations.

In all countries water management is the dominant sector concerning climate change adaptation. In Finland this is the sector that is most advanced in terms of implementation. In the Netherlands, naturally, the whole area of climate change adaptation is closely connected to the water sector – only to give two examples from the country reports. In all assessed countries the cross-sectoral character of climate change adaptation is considered. Consequently multiple sectors and different types of regions are addressed in many strategies.

### **Costs and benefits of adaptation measures**

The costs and benefits of adaptation measures are increasingly discussed at different levels. One aspect is the comparison and analysis of costs and benefits, the other is the general question of how adaptation measures can be funded. Although these questions seem to be of central importance they are only marginally touched upon in the national adaptation strategies, most likely due to the methodologically open questions of how to estimate costs and benefits of adaptation measures. Above all the question of economic or financial aspects is generally only asked in the context of the subsequent implementation of the strategies.

In the Finnish adaptation strategy costs of climate change adaptation are addressed by looking at the costs of adaptation needs in different sectors without going into detail. Furthermore, in the work plan for the implementation of the adaptation strategy reference is given – however in a qualitative way – to who shall pay the costs of specific adaptation measures. In the adaptation strategy itself this was not mentioned (Schmidt-Thomé & Schmidt-Thomé 2010).

In Poland, sectoral adaptation strategies are planned to be available by 2012 and are also expected to give statements on the costs and benefits of adaptation strategies (Wanczura 2010).

In the Netherlands, the costs and benefits of adaptation measures are not mentioned in the national adaptation strategy but in an accompanying document that has been developed on the basis of the relevant national research programmes (“Summary Routeplanner”). Costs and – where possible – benefits of adaptation measures are compared between sectors. The Netherlands therefore belong to the very few countries that are specifically addressing this aspect at all. It is planned to develop a system of social cost-benefit analyses which shall serve as the basis for decision-making regarding identification and assessment of adaptation measures (Fleischhauer 2010).

In the French adaptation strategy costs and benefits are discussed in a separate section within the adaptation strategy and have in the meantime been partly

quantified by an inter-ministerial working group. Furthermore, funding opportunities for adaptation measures are also mentioned. Finally, financial impacts of climate change on sectors like agriculture, viticulture or biodiversity have been assessed for different climate change scenarios and time periods (until 2030, 2050 and 2100). However, provisions regarding interdependencies and concrete financial statements are included in these documents. They also lack estimates of the benefits of adaptation measures (Angignard 2010).

### **Monitoring**

In most countries monitoring of climate adaptation activities vis-a-vis the national adaptation strategies has not been specified yet. In the United Kingdom an indicator (NI 188) was developed by the state government that is to enable policy makers at the local level to present and integrate adaptation principles in the whole decision-making process (Davoudi 2010). Apart from this, indicators for monitoring the implementation of the adaptation plans – that shall also be used in the regions – have only been developed in Spain (Sauri 2010).

### **Synergies and conflicts between climate change mitigation and adaptation**

Finally there is the open question concerning synergies and conflicts between climate change mitigation and adaptation measures on the one hand and adaptation measures regarding climate change and other important trends (demographic changes, globalisation, etc.) on the other hand. Only few statements can be found in this regard in the country studies. In the German adaptation strategy synergies and conflicts between mitigation and adaptation are explicitly mentioned and it is emphasised that adaptation measures shall not be implemented at the expense of mitigation. The Hungarian adaptation strategy points at potential synergies and conflicts between adaptation and mitigation without going into detail (Vajdovich 2010).

### **Country-specific characteristics**

All in all, there are big differences between the national adaptation strategies in regard to the objectives, the substantive scope, the spatial focus etc. The addressed sectors are nevertheless similar to each other which reinforces the findings of Chapter 2 (Table 5). Country related aspects are outlined in section 3.2.

## **3.2 The role of spatial planning for climate change adaptation**

On the basis of the country studies this section concentrates on the role that spatial planning plays in the context of the analysed national adaptation strategies and supporting documents. Special emphasis is given to formalised spatial planning (regional planning, local land-use planning), but spatially relevant sectoral planning like water management are also considered.

Overall, there are considerable differences among the nine countries. There is no visible connection between the attention paid to spatial planning and the type of planning system of the respective country. Consequently, other factors than just the availability of certain legal instruments (such as priority zones, or zoning ordinances) determine the relevance of planning for adaptation.

With respect to the role of spatial planning the adaptation strategies can be grouped as follows (see the following sections for more detailed information):

1. Greece, Poland: A national adaptation strategy does not exist. The role of spatial planning is officially not yet defined. Nonetheless, a preliminary judgement of the current situation is possible based on scientific literature and informal documents (Wassenhoven et al 2009, Karaczun et al 2009);
2. Finland, Spain: The existing national adaptation strategies acknowledge spatial planning as a sector and/or relevant actor. A detailed description of its role is missing;
3. France, Germany, Hungary: The existing national adaptation strategies acknowledge spatial planning as a sector and relevant actor. The particular role of planning is described, but not translated into planning practice yet;
4. The Netherlands, United Kingdom: The existing national adaptation strategies as well as actions plans acknowledge spatial planning as a key sector and relevant actor. The particular role of planning is described and (partly) implemented in planning law and practice.

### **3.2.1 Greece**

#### **National Adaptation Strategy**

A National Adaptation Strategy (NAS) has not been produced yet, although it exists among the priorities of the newly created Ministry for the Environment, Energy and Climate Change and of the National Commission for Climate Change. The report of the Economic and Social Commission of Greece can be seen as the most important document that may serve as a background for building an official NAS in the future. Recommendations are:

- Coping with the environmental impacts of climate change
- Improvement of the processes of emergency crises and disaster management

- Development of strategies for social and economic adaptation

Potential synergies or conflicts between mitigation and adaptation policies have not been identified in the Greek context.

A main focus of the Greek adaptation strategy will be on the environmentally related impacts of climate change, improvement of disaster management but also aspects of social and economic adaptation.

### **Role of spatial planning**

The ISTAME study on “green development” emphasises the potential role of spatial planning for a climate vulnerability assessment in great detail and discusses several adaptation options mainly for coping with extreme events (mitigating the effects, but also the sensitivity of land-uses).

The ISTAME Study on Green Development, classified in the category of an advisory document, contains recommendations for spatial planning actions (Wassenhoven et al. 2009).

- Speeding-up cadastral surveys by giving priority to exposed and vulnerable areas;
- Harmonization of adaptation policies with the spatial planning system;
- Prescribing a horizon of 20 years or more as a time-frame for any new spatial study so as to address long-term climate changes;
- Incorporation of the issue and parameters of urban vulnerability to heat waves in town planning briefs and standards;
- Renewal/regeneration programmes for urban neighbourhoods that are highly vulnerable to heat waves and the heat island effect;
- Introduction of special spatial plans mixed forest-residential areas to address forest-fire risk; use of innovative land-use classifications in forest areas according to vulnerability;
- Introduction of special spatial plans for coastal, low-lying and overdeveloped holiday-making or tourism zones to shift further development away, towards inland zones;
- Review of Regional Frameworks of Spatial Planning and Sustainable Development so as to update any measures, policies and proposals that do not match the climatic projections.

The 12 statutory Regional Frameworks of Spatial Planning and Sustainable Development (FSPSD) do not refer explicitly to climate change yet. The term does not even appear in their texts. In several cases there is a reference to natural and technological risks and hazards, which are linked to climate change but have existed long before it was brought to public attention, probably as lower probabilities and less intense occurrences. Manifestations of climate change in Greece seem to be anticipated to resemble the old and known hazards which will, however, be

characterised by greater extent and higher intensity and frequency. Even though climate change is rarely mentioned, there are several provisions in statutory plans, such as the FSPSD, which focus e.g. on an environmental and countryside protection, territorial sustainability, land use and urban development and have all the ingredients of an adaptation policy.

## **Conclusions**

In the last years the country has been preoccupied with other urgent and probably more crucial problems and priorities. For historical and other reasons the Greek society does not prefer long-term planning policies. What is missing is a systematic effort, with a simultaneous sectoral and territorial approach, to bring together the present loose threads of an adaptation strategy (Sapountzaki, Wassenhoven 2010).

### **3.2.2 Poland**

#### **National Adaptation Strategy**

The current situation in Poland is quite similar to Greece since there is no adaptation strategy in place. The Ministry of the Environment (Department of Climate Change and Protection of the Atmosphere) prepared in response to the White paper the position of the Polish Government which was accepted on 3 July 2009 by the European Committee of the Council of Ministers. KERM simultaneously pointed out the need for governmental sectoral adaptation strategies with an evaluation of costs and benefits. The Ministry of Environment started actions to develop the national adaptation strategies for the respective sectors and areas. It is aimed to finalise the governmental project concerning the sectoral strategies by end of 2012.

#### **Role of spatial planning**

The problem of climate change is regarded as important by spatial planning only in an indirect way, as it is not highlighted by the Planning and Development Act. One of the most important expertises is the document "The consequences of climate change on changes in spatial planning for Poland - Recommendations to the Committee for National Spatial Planning" (Karaczun et al. 2009). This document highlights the necessity of some (proactive and reactive) adaptation strategies for Poland, because of climate change and the related risks. It emphasised the need for spatial planning adaptation (structural and non-structural mitigation measures) concerning flood risk, an adaptation of existing building regulations to ensure the climate change resistance for long-term structures to strengthen the protection against natural hazards, early warning systems for floods as well as forest fires.

This document was taken into account during the elaboration of the 'draft version' of the new National Spatial Development Concept 2008 – 2033 (as one of a multitude of expert documents concerning different topics like transportation, water management, health protection etc. with focus on spatial planning). As a result of the substantive work on this topic and a preparatory work for the new National

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Spatial Development Concept 2008 – 2033, the document "*Expert-Project for National Spatial Planning Concept until the year 2033*" was elaborated.

According to this, the spatial plans on the regional as well as on the local level try to adapt to the existing risks. Even if the terminology 'climate change' or 'climate change adaptation' is not mentioned in the regional spatial plan, it is visible that the adaptation concerning the (climatic) dynamics is taken into account. This starts with the consideration of floods in spatial plans.

### **Conclusions**

Many experts in science and practice highlighted that until now the problem of climate change and adaptation is not on the agenda; it exists only in a field of a theoretical discussion among the scientific audience in Poland. The reason is that the Polish government as well as the regions and municipalities set the priorities to other – from their point of view – more urgent topics like economy, transport, employment etc. Climate change (and the appropriate adaptation strategies) is/are seen as a kind of by-product: If the climate change adaptation causes additional costs, it is probable that these climate change efforts will be abandoned. The problem of adapting the Polish spatial planning to climate change is quite new and accordingly the local level as well as the appropriate local plans (preparatory and detailed/legally binding land use plans) do not address it (Wanczura 2010).

### **3.2.3 Finland**

#### **National Adaptation Strategy**

The "National Strategy for Adaptation to Climate Change" was adopted by the Finnish Parliament after it had submitted the National Climate Strategy in March 2001. It is implemented as a part of the new Energy and Climate Strategy of Finland that was revised in 2005. The five-year Climate Change Adaptation Research Program enhances the search for solutions that support planning of adaptation measures. An evaluation of the implementation of the Adaptation Strategy was conducted in winter 2008–2009. The most advanced sector in the implementation of the Adaptation Strategy is the water resources management. A precondition for launching the financing for adaptation measures is the recognition of the precise adaptation needs in different sectors. The overall conclusion thus far is that an implementation of the Adaptation Strategy should be enhanced by increasing the resources allocated to adaptation research and awareness of special climate issues in decision-making at all levels. The Finnish Ministry of Environment has identified a list of activities concerning the climate change adaptation activities in the environment sector. The identified tasks include the proper management of natural hazards as well as ensuring future use of vital goods, e.g. water, all in connection with future land use strategies (Schmidt-Thomé, P., Schmidt-Thomé, K. 2010).

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## **Role of spatial planning**

Concerning the spatial planning, the National Land Use Guidelines are seen as a key instrument at the national level. The document requires that land use shall create the prerequisites for adaptation. More detailed requirements related to extreme weather conditions and resulting hazards have also been added to the revised guidelines. Measures and obligations related to a flood protection and flood prevention are specified in various Finnish statutes. The Land Use and Building Act stipulates that possible flood risks must be considered during all planning and construction. Flood risks must also be considered when any building permits are granted.

A review of the regional development documents concluded that most Finnish regions have explicitly addressed many climate change issues. Some regions have chosen to prepare a separate strategic document, i.e. an explicit regional climate strategy, some others have decided to incorporate the climate change considerations when reviewing the existing regional development programs and the regional land use plans. Many of these local adaptation measures have emerged in the wake of the FINADAPT program, but there are also many other examples of regional and local decision makers that have either taken own initiatives on fostering potential adaptation needs and developing subsequent programs.

## **Conclusions**

From a spatial planning point of view, one of the most critical issues is if the changes in planning and building regulations decided upon at national or regional levels will be implemented in local detailed planning ((Schmidt-Thomé. P., Schmidt-Thomé, K. 2010).

### **3.2.4 France**

#### **National Adaptation Strategy**

The French National Adaptation to climate change Strategy was adopted in 2006. It has been developed with the help and participation of several ministries and organisations. The main actor of climate change adaptation is the Ministry for Environment, Energy, Sustainable Development and Seas. The French NAS is a preliminary document which is not legally binding. A law, enforced in August 2009, states that a real National Adaptation Plan will be realised before 2011. In this perspective, a public consultation started in December 2009. An encouraging and developing sharing and exchange of information between decisions makers, involving also other relevant stakeholders is regarded as important. The NAS is structured along the context: climate change, risks, adaptation and mitigation, short and long term scales of action, but also along a milieu approach: the specific case of four milieu (cities, coasts, mountains, forests), sectors, strategies and implementation issues.

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## **Role of spatial planning**

Spatial planning itself is mentioned in the French NAS, especially under the axis "promoting a territorial adapted approach" stating that it is indispensable to make sure that "the question of climate change is taken into account in all documents of regional planning".

In the report about an expert consultation held in 2007, the group focusing on climate change proposed the creation of a new document, the "territorial climate-energy plans", which would define for large agglomerations a strategy of adaptation to climate change as well as a strategy of competitiveness and social cohesion, integrating the changes in society raised by climate and energy issues (Grenelle 2007, 5).

Up to now, the question of adaptation to climate change has been considered in spatial planning mainly via the tools for natural hazards and risk prevention. There is no explicit mention of climate change in the official guidelines for developing territorial plans. Nevertheless, locally some plans already take into account, either as a general conceptual aim or with specific goals and measures.

## **Conclusions**

After summer 2003 and the heat wave that caused an important increase in death rate and critical situations for society and industry, the question of climate change became a major concern in France. Several focused decisions have been made to limit the impact of heat waves. Unfortunately, as it is usually the case concerning disasters, policies only consider cases that have already been experienced. The problem of heat waves is now addressed, but other problems that might arise due to climate change are not considered yet. A real problem is posed by the uncertainty related to the intensity and the consequences of climate change, as well as the difficulty to apprehend it spatially (Angignard 2010).

### **3.2.5 Spain**

#### **National Adaptation Strategy**

The Spanish National Adaptation Strategy, prepared by experts of the Ministry of the Environment, was presented and officially approved in 2006. A monitoring report of the first Working Programme was issued in 2008, and a second Working Programme was adapted in 2009. All Autonomous Communities have established or are elaborating Plans and Strategies for climate change mitigation and adaptation, and have created Climate Changes Offices or interdepartmental committees regarding Climate Change.

Besides this spatial dimension, the Spanish NAP also includes a temporal framework for planning which may be effective for up to 100 years in cases such as the different environmental vectors (biodiversity, water, soils), some geographical areas (coasts, mountains) and socioeconomic activities (urbanism). That means, regional strategies also follow the 2008-2012 temporal frameworks and establish special actions for the

same sectors defined by the National Strategy. Likewise, the monitoring of the plan is organized through a number of indicators also to be followed by the regional strategies.

The orientation of the Spanish adaptation strategy differs from the already described strategies because it covers also different sectors but emphasise the vulnerability and adaptive capacity of these sectors. Above all, the adaptation strategy develops a long-term perspective of about 100 years with statements to certain environmental aspects (soils, water, biodiversity) as well as regional types (coastal and mountainous areas) and socio-economic activities like urbanisation.

### **Role of spatial planning**

The Spanish NAS includes urban planning (and building) as one of the main 15 sectors to be addressed by the Plan. According to the Spanish NAS this potential vulnerability needs to be evaluated and the potential synergies and interdependencies with other vulnerable sectors (tourism, mountain and coastal areas, etc.) explored in detail. In the first Working Report of the NAS (2008) the spatial planning does not belong to any priorities.

Most regional strategies declare that climate change must be considered explicitly in the environmental assessments of urban and territorial planning.

Climate change is addressed in territorial and urban planning in indirect ways especially as part of a broader concern for special environmental issues. Adaptation is less present at least formally as mitigation although new plans recommend taking into account the climatic variables when designing new urban development areas.

Adaptation may not figure prominently in any planning instruments (or not at least in the same way that mitigation does), but rather it may appear in the more specific details (orientation of buildings, species to be planted in public gardens, etc.).

Public participation occupies a central place in the Spanish NAP. Essentially the approach to public participation and the incorporation of actors into the debate follows the model, set by the United Kingdom Climate Impacts Programme.

Any specific mechanisms to implement adaptation measures are not mentioned. Nothing is said regarding this point either in the review report of the First Working Programme.

Most of the criticisms of the Spanish Strategy on Climate Change already pointed out the lack of an action plan with a corresponding economic budget. In response to these comments, the Spanish government approved a number of urgent actions involving more than 65 percent of all actions (all related to mitigation) in the National Strategy. (Sauri 2010).

### **Conclusions**

Spatial planning represents at least in theory, a fundamental part of Spanish mitigation and adaptation policies to climate change. In fact adaptation only appears explicitly in some regional strategies. The initiatives at the local level, particularly

local plans against climate change as developed in the Spanish Network of Cities for Climate, will probably use spatial planning tools to accomplish their objectives. However, until now there have been very few initiatives using planning tools to adapt to climate change. The national and regional adaptation strategies (the latter when existing) do not propose new planning instruments specifically addressed to climate change. Rather, they tend to take advantage of the existing planning regulatory framework incorporating environmental criteria that may be also useful for climate change policies under a strategy of looking for synergies between policies (Sauri 2010).

### **3.2.6 Germany**

#### **National Adaptation Strategy**

On 17 December 2008 the Federal Cabinet adopted the German Strategy for Adaptation to Climate Change ("Deutsche Anpassungsstrategie", DAS). This characterises the DAS as a national policy document without any direct legally binding effects. The DAS primarily describes the contribution of the federal government, thus acting as a guide for other actors at the regional (i.e. the "Länder") and local levels and lays the foundation for a medium-term, step-by-step process. In an important next step in the further development and specification of the Strategy, an Action Plan on Adaptation will be drawn up in cooperation with the "Länder" and NGOs. The "cross-sectional topics" are explicitly mentioned as an own sector, addressing spatial, regional and physical development planning and civil protection.

#### **Role of spatial planning**

The DAS contains a section which is about "Spatial, regional and physical development planning". Spatial planning is seen as an important tool which can support both mitigation and adaptation by developing strategies for resilient spatial structures. The instruments of spatial planning are potentially of great importance for adaptation, especially for the implementation of the integrated approaches, but are less applied in planning practice: Providing for risks by adapting to the expected increase in the intensity and frequency of extreme weather situations as well as by adaptation to landscape change and possible restrictions on the usability of natural resources.

There is growing consensus that spatial planning on regional as well as local level has an important role in addressing climate change and its effects. To foster the reflection of climate change in regional planning, a research agenda for Demonstration Projects of Spatial Planning (MORO). But up to now, the aspect of climate adaptation is almost disregarded in the regional plans – mainly just due to the fact that most of them came into force previous to the DAS. Merely declarations on flood protection on rivers and in coastal zones consider possible prospective risks in formal plans. The same is almost true for local land-use planning.

Generally speaking, regional planning as well as land-use planning have suitable instruments at hand which could be used for integrating adaptation needs into spatial planning. Adaptation to climate change is explicitly regarded as an important issue by section 2 § 2 No. 6 FRPA.

The Conference of German Urban Development Ministers (ArgeBAU) argued that mitigation as well as adaptation of climate change and demographic change have to be seen as core challenges for an integrated, sustainable urban development.

### **Conclusions**

Spatial planning is still seen as a sector while the adaptation strategies are carried out by the Ministries for Environment. Traditional spatial planning which is very much zoning-oriented, possesses considerable strength regarding climate-proved and disaster resilient new developments. However, the use of risk and impact assessment methodologies encourages a more informed approach to planning and regional development. It can help to identify the need for action and assist in the choice of effective adaptation responses. By identification of cumulative impacts, the regions where spatial planning needs to focus on adaptation measures can be highlighted. In these regions adaptation measures need to be designed that deal with several impacts at the same time. This opens the context for further research on the inter-relationships between adaptation options focusing on their combined impacts and on potential conflicts. Adapting the existing settlement structures can be seen as the main challenge for spatial planning due to the given private property rights. Some incentives are necessary, but also more inclusive, discourse-based approaches (Greiving 2010).

## **3.2.7 Hungary**

### **National Adaptation Strategy**

The National Climate Change Strategy was adopted by the Parliament in 2007. The NCCS identifies three major directions of action for the long term climate change policy: mitigation, adaptation and the need for social awareness raising in relation to the climate change. The NCCS is explicitly inter-sectoral and addresses the whole society, i.e. each economic sector and every social group. Therefore, it declares that the relevant strategic objectives and tasks should be integrated into the activities of all sectors (and ministries). The Strategy emphasizes that in Hungary the consequences of climate change will affect the whole national territory and the whole society, though at varying rates. The following areas are pointed out as the most sensitive to the impact of climate change: ecosystems, protection and management of the natural heritage, human environment, human health, water management, agriculture, forestry, spatial and urban planning and development.

### **Role of spatial planning**

The aspects of spatial planning, urban and regional development are discussed in short under a separate heading, but broadly in relation to the various policy areas of

the National Climate Change Strategy. The territorial dimension of most of the policy areas is recognized and acknowledged, especially of water management, agriculture and rural development, construction, transport and nature protection.

Spatial planning and development are responsible for adjusting the objectives to those of climate policy and for identifying the appropriate settlement networks and clusters and land uses.

There are new elements, amendments of planning zones and zoning regulations, such as: Area of highly sensitive subsurface water reserves, protected catchment areas of surface waters, areas prone to ground water inundation, flood basins, areas exposed to water or wind erosion.

For the assessment of territorial sensitivity, a detailed analysis has been carried out to the Commission of the Ministry of Development and Regional Policy. The scale of the analysis is the micro region. The indicators thus obtained can be used in detailed regional as well as local planning. The analysis considered the following dimensions of sensitivity:

- Agricultural systems to aridity and rising temperature
- Arable land to erosion
- Farming and built up areas to flood and ground water inundation
- Ecosystems to aridity and rising temperature
- Human health in high density urban areas.

The sensitivity indicators are rated (high, medium, low vulnerability etc.) and mapped, so that assessments have been made for both the location and the territorial extension of each indicator.

## **Conclusions**

Adaptation strategies tend to serve for the preparation for extreme events, which have been experienced recently as well as in the past. Future events may be exceptional and of greater dimension, so aridity may grow into desertification, rainfall into thunderstorm, and flood into deluge. The role of spatial planning is acknowledged in the adaptation process and in the prevention of its worst effects.

The Tisza Region Programme was the first spatial planning exercise, where the regulatory and developmental functions of spatial planning have been consistently integrated, and where a broad range of stakeholders cooperate in devising rules, regulations as well as some pro-active measures. This integrative role of spatial planning tends to be acknowledged both by the National Climate Change Strategy and in the follow up procedures.

This concern has led to efforts to elaborate and apply ex ante territorial impact assessments. Ex ante territorial impact assessments have become obligatory in the elaboration of spatial plans, and their presentation at public forums has contributed to the credibility of the planning solutions, rules and measures (Vajdovich 2010).

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### **3.2.8 United Kingdom**

#### **National Adaptation Strategy**

The UK Climate Impacts Programme (UKCIP) was established in 1997. The UKCIP is funded mainly by the Department of Environment, Food and Rural Affairs. It is an advisory service and takes a stakeholder-led approach to adaptation. The UKCIP technical reports 2003 and 2005 have provided a few progress reports and decision-making tools for public and private organisations. The most significant response to the call for government's action was the passage of the Climate Change Act in 2008. The Climate Change Act binds the government to regularly carry out or initiate the following steps for climate change adaptation:

- assess climate change risk for the UK at least every five years, with the first Climate Change Risk Assessment due in 2011.
- publish and regularly update a national adaptation programme to address those risks. The Programme is expected for 2012.
- ask public authorities, utilities and telecommunications companies to assess the risks of climate change to their work and set out a plan of action.
- produce a guidance on how to undertake a climate risk assessment and draw up an adaptation action plan.
- establish an Adaptation Sub-Committee of the independent Committee on Climate Change in order to oversee any progress on the Programme.

In 2008, the government set up the Adapting to Climate Change Programme, in order to bring together the work already being led by government and the public sector on adaptation in England. An indicator for all English local authorities on embedding adaptation in the full range of their work has been set out (Defra 2010, LRAP 2010).

#### **Role of spatial planning**

Contrary to many other European countries, the UK does not have a national land use or spatial plan. Instead, national planning policy is conveyed through a number of national Planning Policy Statements, formulated by the Department of Communities and Local Government which is responsible for planning. PPS1: (Delivering Sustainable Development) addresses causes and potential impacts of climate change: "Regional planning bodies and local planning authorities should ensure that development plans contribute to global sustainability by addressing the causes and potential impacts of climate change" (CLG 2007).

In 2004, the Government published the Planning Response to Climate Change: Advice on Better Practice (Office of the Deputy Prime Minister 2004). The Advice identified a longer list of actions for planning. Topics that are covered include: infrastructure, flooding, coasts, water resources, biodiversity, land and landscape, economy and tourism, transport, waste and resources, energy supply, and built

environment. Furthermore, a climate-sensitive development checklist is provided. Planning can not only use its regulatory tools to protect 'at risk' areas. It can also use its collaborative practices to provide arenas for discussing different sides of the arguments, and negotiating the terms upon which trade-offs need to be made.

Four areas of climate risk have been at the centre of adaptation efforts. These are related to risks of flooding, coastal erosion, heat waves, and drought. The role of spatial planning has been mainly related to a) the location of new development away from the areas of risk, b) the design and layout of buildings and urban areas which are resilient, and c) the promotion of sustainable water management in new developments.

## **Conclusions**

Developing resilience to the inevitable impacts of climate change is an area in which spatial planning has a significant role to play. To this aim, integrated scenarios and models are being developed to assist complex decisions on the right course of action. Now there is a clear governmental expectation from the planning system with regard to adaptation. Furthermore, responding to climate change, planners are faced with a number of challenges which are arising from the inherent complexity of dealing with climate change issues, not least the potential conflicts between adaptation and mitigation measures. Such complexities coupled with climate change uncertainties require a portfolio of policy responses and not just planning (Davoudi 2010).

### **3.2.9 The Netherlands**

#### **National Adaptation Strategy**

The Dutch National Adaptation Strategy (NAS) entitled "Make Space for Climate!" was agreed upon in 2007. It consists of a short political document agreed upon by all relevant ministries and other governmental bodies, and a more detailed background document. These documents can be seen as the starting points to formulate more concrete climate adaptation policy in the Netherlands. The NAS was developed on the basis of the National Programme for Spatial Adaptation to Climate Change and followed by the National Adaptation Agenda and the Inter Provincial Accord. The Ministry of Housing, Spatial Planning and the Environment (VROM) is the responsible actor for communicating and disseminating the programme. The programme will be implemented in three phases. Phase 1 aimed at drawing up the National Adaptation Strategy and the National Adaptation Agenda which can be seen as the main outputs of the programme.

#### **Role of spatial planning**

The main goal of the National Programme for Spatial Adaptation to Climate Change is to make spatial planning in the Netherlands climate proof. Sometimes it is mentioned that the Netherlands in general shall be made climate proof. This is always seen in connection with water management, which is not surprising as spatial planning has in the Dutch context always been related to the question of how to deal

with water. Spatial planning and water management always go hand in hand in the Netherlands. Apart from the water sector, however, other sectors are also addressed in the Netherlands.

The whole National Adaptation Strategy has been developed from the perspective of spatial planning. Nevertheless, the ARK also regards the effects of climate change for various sectors individually.

The following selected projects have a rather strong relation to spatial planning:

- Development of a framework to judge choices for spatial development,
- Integration of the climate objectives in the Dutch Water Vision,
- Integration of climate adaptation into regional plans, on the basis of climate atlases,
- Integrated spatial development of the Eemdelta region, where climate adaptation is combined with redevelopment of urban functions in order to deal with a shrinking population,
- Research on the possibilities to design climate proof at a local level.

At present there is no indication that climate change adaptation is already legally integrated into spatial planning instruments. Nevertheless it is planned to test the spatial plans for climate-proofing and, if necessary, adapt them or create some new instruments.

Furthermore, the instruments of urban renewal will be used to implement measures to make Dutch cities climate proof. A working group has been working on making the EIA (both for projects and plans) climate proof.

Five focal points have been identified for a climate-proof spatial strategy on a national scale:

- long-term safety from flooding,
- ensuring freshwater supply – linked to its use by agriculture and nature,
- more climate-proof nature development,
- increasing climate resilience in urban areas, and
- reducing the vulnerability of transport networks and energy supply.

## **Conclusions**

The Dutch National Adaptation Strategy and Agenda is very much focused on initiating developments and processes. In this respect it is in line with the new National Spatial Strategy as there is an emphasis on the cooperation between several partners. The adaptation strategy – as well as the spatial strategy – does not follow a top-down approach, but the central government rather gives some directions and stimulates other actors such as other governments, scientists and businesses to integrate the adaptation into their policies and to realise special climate proof projects. The most interesting approaches to be transferred to the European level and/or other member states would be the general concept that is

behind the adaptation strategy as well as the already mentioned climate proofing instrument (Fleischhauer 2010).

### **3.2.10 Synopsis**

Spatial planning is recognised as a cross-cutting issue by several national adaptation strategies. Its over-sectoral nature is of particular importance for adaptation due to the relevance of cumulative impacts and interdependences between the sectors that are potentially affected by climate change. Some strategies such as the Dutch and the Hungarian offer concrete tools for a vulnerability assessment or comprehensive performance indicators regarding adaptation at the local level. Others are still vague with respect to the concrete contribution of spatial planning to adaptation. In almost all countries climate change adaptation has still not been translated and integrated into planning practise.

Table 5 summarises key characteristics of those countries (France, Germany, Hungary, The Netherlands and United Kingdom) which spend particular attention to spatial planning within their adaptation strategies. When looking at this table it becomes obvious that there are only a few integrative concepts which link adaptation and other key challenges of spatial development such as demographic change, settlement development and economic growth. This is a particular weakness of the existing strategies because in planning practise it is necessary to weigh adaptation measures against other relevant issues and interests. Therefore those adaptation measures will be preferred that embody synergies, but not conflicts with other interests. It is also astonishing that synergies as well conflicts between adaptation and mitigation are rarely discussed by the strategies (i.e. dense settlement patterns that on the one hand lower CO<sup>2</sup> emissions by stimulating public transport but on the other hand also increase exposure to urban heat-island effect). What is widely missing is an operationalisation of commonly accepted strategies (like the “no-regret” strategy) for concrete application in practice (see also section 4.2).

**Table 9: Statements of national adaptation strategies relevant for spatial planning**

Country	Addressed tasks	Integrative concepts	Concrete measures
Germany	<p>Providing for risks by adapting to the expected increase in the intensity and frequency of extreme weather situations (e.g. by keeping hazard prone areas as well as those who play a role for fresh air and cool air formation and outflow free of further settlement development).</p> <p>Adaptation to landscape change and possible restrictions on the usability of natural resources. Examples, given by the DAS refer e.g. to regional water shortages that need increased regional planning safeguards for water resources and planning or a forward-looking participation in spatial adaptation measures in the tourism sector, especially in coastal and mountain areas.</p>	<p>The Conference of German Urban Development Ministers (ArgeBAU) argues that mitigation as well adaptation of climate change and demographic change have to be seen as core challenges for an integrated, sustainable urban development.</p> <p>The Conference of German Regional Planning Ministers (MKRO) took decisions on a strategy for avoiding, minimising and adapting to the different spatial consequences of climate change.</p>	
France	<p>Climate change adaptation has to be considered by any plan on each spatial level and each action area.</p> <p>Urban planning is considered to be relevant for mitigating urban heat-island effects.</p> <p>All climate-influenced natural hazards have to be considered for granting building permissions and rebuilding existing buildings.</p> <p>Urban areas, coastal zones, mountain areas and forests are identified as particularly vulnerable types of regions.</p>	<p>A "territorial climate-energy plan" is proposed by Grenele which encompasses a climate change mitigation as well as adaptation strategy, anticipating the consequences of climate change as well as a strategy of competitiveness and social cohesion, integrating the changes in society raised by climate and energy issues. This plan would consider two time-scales, with time horizons set to 2020 and 2050. They should be created as a priority in agglomerations, and they could be included in the Planning Contracts between the State and its regions on planning and financing of important projects.</p>	
Netherlands	<p>Spatial planning is considered as a tool for integrating water-related requirements into spatially relevant decisions.</p> <p>Building standards on local level for climate adapted (to heavy rainfall as well as heat) urban design.</p>	<p>Integration of climate change adaptation and urban consolidation in order to cope with demographic change.</p>	<p>Urban and regional plans shall be proofed for their climate fitness („climate proofing“).</p> <p>Harmonised standards for the assessment of climate proof locations of important projects.</p>

Country	Addressed tasks	Integrative concepts	Concrete measures
Hungary	<p>Tasks of spatial planning at national and regional level:</p> <ul style="list-style-type: none"> <li>• Restriction of development by the riverside belt, flood basins and areas of high ground water level</li> <li>• Restriction of development in areas prone to landslide or other geological risks</li> <li>• Designation of areas for afforestation, delimitation of areas less suitable for intensive farming</li> </ul> <p>Tasks of local urban physical planning and development:</p> <ul style="list-style-type: none"> <li>• Promoting sustainable development by determining appropriate land uses, avoiding too high or too low density built-up areas</li> <li>• Protection, maintenance and appropriate management of green spaces and open spaces</li> <li>• Promoting the division of large, contiguous urban land, development of green corridors and links to the surrounding natural environment, thereby mitigating the urban heat island effect</li> <li>• Promoting compact cities by means of mixed land uses and the provision of appropriate transport routes, but mitigation the increase of compelled motor traffic</li> </ul> <p>Tasks of the management of the built environment:</p> <ul style="list-style-type: none"> <li>• Promoting low energy consumption in architectural solutions</li> <li>• Promoting climate awareness in building design and layout</li> <li>• Risks assessment of critical infrastructures</li> </ul>	<p>Elaboration of coordinated physical (land use) plans of interconnected settlements (urban agglomerations, metropolitan areas) threatened by environmental conflicts (excessive pressure on natural environment, urban heat island, damage of ecological systems)</p> <p>Tisza /Tisa Catchment Area Development (TICAD) project as integrated spatial planning adaptation strategy on transnational level. It addresses climate change, flood risk, regional and economic development perspectives and ecological recreation.</p>	<p>Ex-ante Territorial Impact Assessment, which addresses the potential impacts of development strategies on the full range of spatial functions and land-uses including climate proofing.</p>
United Kingdom	<p>The guide „Planning Response to Climate Change: Advice on Better Practice“ identified a longer list of actions for planning including infrastructure, flooding, coasts, water resources, biodiversity, land and landscape, economy and tourism, transport, waste and resources, energy supply, and built environment.</p>	<p>There are no particular integrative concepts in place, but the local development plans are the primary means of reconciling conflicts between the need for development and the need for mitigation of and adaptation to climate change.</p>	<p>The guide „Planning Response to Climate Change: Advice on Better Practice“, contains a climate-sensitive development checklist which covers the considerations that could be used as a filter for assessing whether new developments: a) are adapted to current and potential future climate impacts and b) mitigate greenhouse gas emissions.</p> <p>A new performance indicator on adaptation in the core Local Government Performance Framework has raised the profile of adaptation.</p>

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### **3.3 Conclusions**

The following section summaries and structures the main conclusions derived from the country report and ends with a comparative assessment.

#### **Information basis**

##### Assessment basis

The debate on national adaptation strategies and related action plans is in most cases based on the results of a climate impact assessment.

##### Uncertainty as main problem

The uncertainty about future climatic conditions is seen as the main challenge for designing strategies and concrete measures for climate change adaptation. This is particularly relevant for spatial planning. For weighing-up the different interests, detailed, spatially highly resolved information is requested by planners about the impact of climate change.

#### **Implementation**

##### Perception of climate change

Adaptation activities are still very much disaster driven, because extreme events influence the perception of climate change while less obvious, creeping changes are often disregarded by the public. Examples, also pointed out by the country reports, are the 2003 heat wave which had major repercussions in France, floods in Germany, Greece, Poland and the U.K. and forest fires in Greece.

##### Local level most important for implementation

The local level is regarded as the most important level for implementing national and regional adaptation strategies and related amendments to planning laws. This is due to local responsibilities for urban development and building permissions, but also to the fact that the population has more trust in local authorities.

##### Existing barriers and hindrances for implementation

There are some aspects that are relevant in all analysed countries such as budget constraints and lack of coordination among the respective actors. However, in some countries like Greece and Poland cultural beliefs and historical experiences (with communism) play a relevant role for the existing aversion against any kind of long-term planning - including adaptation planning.

##### Prevention principle

Adaptation strategies are partly about coping with extreme events that are triggered by climate change such as floods, forest fires and landslides. Decisions in the area of these so called "traditional" risks, taken mainly on the basis of engineering expertise, are normally based on probabilities informed by statistics on past events. Climate change

related effects on temperature and precipitation, however, will certainly lead to new uncertainties, because past events might not be representative anymore. Therefore, strategies should build on the prevention principle in order to mitigate the potential consequences of potentially more frequent and more severe events.

### **Specific role of spatial planning**

#### Potentials not fully used

Almost all adaptation strategies recognise the need for a cross-sectoral coordination and relate this task with spatial planning. Nonetheless, hardly any strategy (with the exception of the Dutch) was coordinated and developed by spatial planning agencies. In most cases, planning is just seen as a sector among others while environmental planning took over the coordinating role.

#### Cumulative effects

Particularly local land-use planning is able to deal with cumulative effects of climate change affecting different sectors and concerns. Interactions between different effects and related land-use conflicts can best be considered by land-use planning which functions as a cross-sectoral actor. The coordinating role of planning is also regarded as important for dealing with those climate effects (i.e. floods) which touch upon the responsibilities of many different authorities.

#### Main tasks

In regard to climate change adaptation all country reports foresee similar tasks for spatial planning:

- Keeping areas free from further development, which are already prone to natural disasters and might even be more endangered in the future;
- Developing building guidelines that are adapted to the changing climate;
- Planning settlement patterns which are characterised by sufficient density, but also include open spaces for limiting the effects of urban heat islands;
- Managing urban water resources in a sustainable way which considers the consequences of heavy rainfall but also potential water shortcomings during summers.

Regulatory planning is able to address these tasks when developing new settlement plans. However, Europe is dominated by persistent settlement structures, cultural landscapes and infrastructures which have been developed over centuries and which are most sensitive to climate impacts. Preventive actions, carried out by spatial planning, are under these circumstances less effective than in countries which are still growing rapidly in terms of population and the built environment. Regulatory planning is not well suited to enforce adaptation in already built-up areas due to private property rights and obligatory compensation payments for using land for public purposes. Thus, all strategies regard financial incentives and communication as relevant measures because private property owners need to be accepted for implementing climate change

strategies. Under these conditions climate governance becomes crucial for the success of any adaptation strategy.

#### Adaptation to climate change as guiding principle for all spatially relevant decisions

Depending on the stage of implementation of the national adaptation strategies, adaptation to climate change gradually becomes a guiding principle for all spatially relevant decisions. While several countries are on clearly on this way (Germany, France, Finland) the U. K. has already reached a stage where the climate change adaptation principle became binding by law (Climate Change Act, 2008) and has been implemented as NI188 performance indicator into the Local Government Performance Frameworks. This indicator aims at

- Comprehensively assessing the risks and opportunities;
- Taking action in any identified priority areas;
- Developing an adaptation strategy and action plan that lay out what the priority areas are and – where necessary in consultation with partners - what action is taken to address these areas and how they are to be assessed and monitored in the future; and
- Implementing, assessing and monitoring the actions on an ongoing basis.

In the Netherlands, all programmes, plans and projects have to be developed in such a way that they are climate-proof, i.e. that they are resilient to changing conditions that they might be confronted with in the future. This climate-proofing is part of the Strategic Environmental Assessment (for programmes and plans) and the Environmental Impact Assessment (for projects).

A broader concept has been implemented in Hungary: an ex-ante Territorial Impact Assessment, which addresses the potential impacts of development strategies across the full range of spatial functions and land uses, including but not exclusively dealing with climate proofing.

#### **Further aspects**

##### Adaptation through disaster management

Issues which are related to climate change adaptation are in many cases communicated through disaster management, which is usually better established than spatial planning. Therefore, adaptation is at least indirectly addressed in those countries that do not yet have an adaptation strategy such as Greece and Poland.

##### Relation between adaptation and other spatially relevant challenges

The existing interactions between adaptation and other change processes like demographic change and economic transition are often disregarded by the national adaptation strategies. However, on the ground these challenges are often considered as much more relevant for local development strategies. Thus, any successful adaptation

strategy has to consider synergies and conflicts between the different issues. Moreover, adaptation has to be communicated as a new issue for planning and not as an issue which dominates all other existing issues. Starting points have to be identified in order to illustrate connections to already established planning principles like compact settlement structures that can be seen as a multifunctional principle useful for mitigation and adaptation but also for avoiding urban sprawl and improving the competitiveness of an urban area.

#### Performing instead of conforming planning

Main challenges which are related with climate change such as the inherent uncertainty of future climate, but also the persistent existing settlement and infrastructure patterns call for flexible strategies and therefore more for a performing rather than conforming type of planning. This was outlined by several adaptation strategies which focus on a programmatic framework on the one hand and stakeholder involvement, discourse-based processes and empowering regional and local communities to cope with climate change on the other hand.

Summary: In the assessed countries a very differentiated picture emerges concerning the adoption of national adaptation strategies. Finland (2005) has to be seen as a pioneer whereas the large majority of countries has developed national adaptation strategies only after 2006: France and Spain in 2006, Germany, the Netherlands, Hungary and the United Kingdom in 2008. Greece and Poland have not yet developed any national climate change adaptation strategy. No significant correlation can be observed between the speediness of developing a national adaptation strategy and the degree of climate change exposure or sensitivity. Thus, hypothesis 1 which constituted such a correlation, was not fully approved. Moreover, there is no visible connection between the attention paid to spatial planning and the type of planning system of the respective country as constituted by hypothesis 2. With respect to the role of spatial planning the adaptation strategies can be grouped as follows:

- Greece, Poland: A national adaptation strategy does not exist. The role of spatial planning is officially not yet defined. Nonetheless, a preliminary judgement of the current situation is possible based on scientific literature and informal documents;
- Finland, Spain: The existing national adaptation strategies acknowledge spatial planning as a sector and/or relevant actor. A detailed description of its role is missing;
- France, Germany, Hungary: The existing national adaptation strategies acknowledge spatial planning as a sector and relevant actor. The particular role of planning is described, but not translated into planning practice yet;
- The Netherlands, United Kingdom: The existing national adaptation strategies as well as actions plans acknowledge spatial planning as a key sector and relevant actor. The particular role of planning is described and (partly) implemented in planning law and practice.

## 4 Recommendations

The following chapter discusses recommendations for the implementation of the Territorial Agenda of the EU (BMVBS 2007) as well as for adaptation to climate change by regional and local planning authorities. The relevance of the various recommendations for the different spatial levels is outlined in Table 6.

However, not all observations relevant for policy considerations, which were outlined by the section "Risk Management in Relation to Climate Change" of the background document "The Territorial State and Perspectives of the European Union" (BMVBS 2007a, 36) have been considered by the analysed national adaptation strategies. This is particularly valid for the proposed improved coordination between disaster risk and climate adaptation strategies, for sequential strategies like the proposed triangle "resistance – resilience – retreat", but also for the principle of a polycentric spatial development which according to the Territorial Agenda can balance patterns of vulnerability in Europe. Other elements such as integrated vulnerability assessments and stakeholder involvement concepts have been widely applied in national adaptation strategies.

The following section 4.1 is about recommendations which are based on the analysed strategies while section 4.2 discusses further policy considerations for the Territorial Agenda.

### **4.1 Role of spatial planning for adapting to climate change**

The PEER-Report on Climate Policy Integration, Coherence and Governance came to the following conclusion: „While the need for co-ordination and integration across sectors, scales and levels is growing, the capacities to respond are frequently shrinking because of the rigidity of administrative and political borders, the stability of departmentalism and the strength of sectoral interests and preferences for small-scale solutions. While it is generally recognised that the role of spatial planning for climate mitigation and adaptation should be strengthened, the practice is not very well developed as yet.“ (Mickwitz et al. 2009, 60). This statement can be backed up by our report. Only in the Netherlands the national government considers spatial planning a key player. Nevertheless, even there planning practice has not fully adapted yet to the needs of climate change adaptation.

In view of the weak performance of current planning practices the key question is how to strengthen the role of spatial planning. This is important for the implementation of the Territorial Agenda but also national, regional and local adaptation strategies.

Table 6 summarises a set of recommendations and also indicates on which spatial level a particular issue is relevant. The different recommendations are described in more detail in the following section.

**Table 10: Overview of recommendations for strengthening the role of spatial planning in climate change adaptation**

No.	Recommendation	Territorial Agenda	Regional/ local planning
1	Particular emphasis on the cross-sectoral character of adaptation as multi-level-governance	X	
2	Integration of climate change adaptation into spatial visions	X	X
3	Climate-proofing as relevant criterion for distribution of spatially relevant funds		X
4	Integrative concepts, addressing adaptation together with other spatially relevant challenges	X	X
5	Parametric governance		X
6	Spatial planning as relevant actor for strengthening adaptive capacities	X	X
7	Climate proofing	X	X
8	Operationalisation of the no-regret principle	X	X

#### **4.1.1 Cross-sectoral character of adaptation as multi-level-governance**

Climate change adaptation calls for a cross-sectoral approach because of the variety of impacts on different sectors and the interdependences between impacts and response strategies. Mickwitz (2009) argues for a prominent role for comprehensive spatial planning in this regard, but this has not been implemented yet. This has to be prominently addressed and outlined by the Territorial Agenda. Moreover, following the example of the Netherlands, the role of the ministries responsible for spatial planning has to be strengthened for co-ordinating the implementation of the national adaptation strategies.

The implementation of adaptation strategies calls for a broad involvement of all societal groups in order to guarantee the legitimacy of actions. In particular, quantitative goals have to be justified because they are of a normative character.

Adapting the existing settlement patterns to the challenges of climate change can be seen as the main challenge for spatial planning operating in the context of existing private property rights. Incentives and more inclusive discourse-based approaches are needed, which can be characterised as 'climate governance'. This aspect is regarded as an important success factor by recent literature on adaptation strategies (see EC 2009, Ribeiro et al 2009, Swart et al. 2009, Meister et al. 2009).

Table 7 summarises to what extent spatial planning is able to cope with climate change. It is divided into three main areas: assessment of long-term consequences, climate proofing and prevention of disasters triggered by climate change:

**Table 11: Strength and weaknesses of spatial planning in the context of climate change adaptation**

<i>Task</i>	<i>Milestones</i>	<i>Potential of spatial planning</i>	<i>Description</i>
<b>Assessment of long-term consequences</b>	Assessment and appraisal of climate change impacts on the human-environmental-system	fair	This is possible based on regional impact studies, that planning has to have at hand. A strength of comprehensive planning is the traditionally integrated view of different change processes (demography, economy, environment, climate)
	Identification of interaction between land-uses and the changing climate	good	Such assessments can easily be integrated in the strategic environmental assessment which is obligatory for any spatial plan or programme.
<b>Climate proofing</b>	New guiding principles (such as "resilience")	good	The concept of resilience is almost in line with existing planning principles like decentralised concentration and could therefore easily be adopted by planning practice
	Avoiding non-adapted developments	good	This is within the focus of planning which is very much about future developments. The effectiveness of actions depends partly on the existing regulatory framework (zoning instruments)
	Adaptation of existing spatial structures (settlements, infrastructure)	poor	Any adaptation of existing structures is hardly possible through regulatory planning due to the given private property rights. What is needed are incentives and good practices aiming at convincing the private landowners.
	Assessment of frequency and magnitude of extreme events (exposure)	poor	That is clearly a task for specialised authorities like water management where spatial planning usually does not have any competence.
<b>Disaster prevention</b>	Keeping disaster prone areas free of further development	good	At least conforming planning systems have regulatory zoning instruments at hand. Keeping free of areas prone to extreme events is thereby possible.
	Differentiated land-use according to the given risk	fair	Almost possible, but not effective with regard to existing settlement structures
	Adaptation of existing building structures	fair	Almost impossible through regulatory measures due to property rights. Suitable approaches are based on incentives and communication with all stakeholders.
	Relocation/retreat from threatened areas	poor	Again, this is in conflict with property rights. Full recompensation is normally needed, which is mostly impossible due to the lack of public financial resources. It is possible in areas with shrinking population where the existing building stock will be (partly) deconstructed based on planning strategies (see e.g. Eastern Germany)

Source: authors' own construct

For communicating adaptation needs to decision-makers as well as the public, good practices are of particular help:

- KLARA-Net („Netzwerk zur Klimaadaptation in der Region Starkenburg“) is a successfully applied Climate Adaptation Governance concept, which has been coordinated by spatial planning: Based on a broad stakeholder involvement this regional network in the German state of Hesse agreed on a set of strategies for adapting several sectors such as agriculture, forestry, water management, tourism, construction industry and health to climate change. Moreover, certain adaptation measures have already been implemented (Buchholz & Riechel 2009).
- The guide „Planning Response to Climate Change: Advice on Better Practice“, recognised that planning practice on adaptation to climate change impacts was still at a developmental stage and only a handful of developments have been attempted to take adaptation to climate change impacts into account. Hence, an entire section of the document is devoted to advising local planning authorities on how to put in place policies that deal with adaptation to climate impacts while taking account of the uncertainty of these impacts. The advice put forward for an adapted version of the decision-making framework for spatial planning decisions on adaptation includes seven key stages (ODPM 2004, 22-23):
  - Stage 1: Identify the scope of the policy
  - Stage 2: Establish criteria for the policy making and exposure unit
  - Stage 3: Assess risks
  - Stage 4: Identify options
  - Stage 5: Appraise options
  - Stage 6: Formulate a policy
  - Stage 7: Implement, monitor and review

Furthermore, a climate-sensitive development checklist is provided, which could be used as a filter for assessing whether new developments are a) adapted to current and potential future climate impacts and b) mitigate greenhouse gas emissions (ODPM 2004).

- Das Tisza Catchment Area Development (TICAD) project may be a promising way forward in consistent transnational cooperation in the area of integrated spatial planning that addresses climate change issues. It is mutually recognised by the planning teams of the participating countries sharing the Tisza river catchment area that a viable development strategy, a spatial plan and joint policy recommendations are indispensable for addressing the climate change issues, especially in the areas of water management, sustainable economic development, optimal use of pooled natural and cultural resources, a balanced distribution of competitive growth areas and enhancement of internal and external functional relations within the settlement system (Vajdovich 2010).

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### **4.1.2 Integration of adaptation to climate change into spatial visions**

Spatial planning could contribute to adaptation by providing visions for resilient spatial structures as argued by the German Adaptation Strategy (DAS). However, spatial planning is requested to coordinate different spatial functions, land-uses and related interests. Therefore, any spatial vision has to consider a broad range of issues. However, uncertainty characterises all types of planning processes which face grand challenges like demographic change and globalisation. Hence, there is a general need for resilience - not only in regard to climate change adaptation. Consequently, planners should together with civil society organisations agree on spatial visions that are characterised by the following elements:

- **Efficiency:** Efficient spatial structures produce and deliver products and services on less space with fewer resources (energy, natural resources). This mitigates greenhouse gas emissions and minimises the exposition of sensitive land-uses against extreme events. In doing so, protected resources could be used only if needed in case of unpredicted or unpredictable developments.
- **Diversity:** Diverse settlement structures (mixture of infrastructures, buildings, open spaces) contribute to sensitivity reduction because different land-uses have different sensitivities in regard to a particular extreme event or creeping changes in temperature and precipitation.
- **Redundancy:** The functionality of an urban system could be better ensured if its main elements are redundant and could replace each other. Therefore, the traditional planning principle of bundled infrastructure (roads, telecommunication, water supply etc. using the same space or development corridors) becomes questionable.
- **Robustness:** The level of robustness of infrastructure, buildings and vegetation against the impacts of extreme weather events but also creeping changes.

An updated Territorial Agenda should communicate resilience in such a way in order to make it more illustrative and understandable for planning practice.

### **4.1.3 Climate-proofing as relevant criterion for distribution of spatially relevant funds**

Spatial development is to a large extent influenced by financial incentives, e.g. coming from European structural funds as well as national and regional funds. The disbursement of these funds are based on different criteria for the selection of projects for funding. However, until now these criteria relate mainly to economic and partly social and environmental aspects while climate proofing does not play a considerable role (see section 4.1.7 for climate proofing). As argued by the European Commission (European Commission 2009a, 131f), adaptation should be considered when updating existing funding schemes:

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- The member states should mainstream adaptation when they revise their current Operational Programmes.
  - Rural Development Funds could support agriculture's contribution to protection and enhancement of green infrastructure, such as developing green corridors that facilitate species migration in response to climate change, involving wider land use planning, including trans-boundary collaboration and supporting the development and adoption of more resilient crops.
  - A climate impact assessment could become a mandatory condition for projects receiving significant EU funding (for instance tourism investments should avoid spending money for projects that are unsustainable in the longer term (e.g. ski facilities in low land Alpine areas)).
  - Energy efficiency and the use of renewable energies for housing projects should become an important factor for funding - like implemented in the respective German national funding scheme.

Another issue relates to synergies between adaptation and urban consolidation programmes. As already outlined, the adaptation of existing settlements is the major challenge for Europe. There are several programmes, which aim at consolidating cities in industrial transition or with a shrinking and ageing population (i.e. in Germany the programme "Stadtumbau" funded by the federal Ministry for Transport, Housing and Urban Development). These programmes should consider adaptation needs as a selection criterion for funding: decisions about consolidation measures should be based not only on economic tools such as cost-benefit analysis, but also on a climate impact assessment. In doing so, even retreating from built-up land becomes a realistic option for reducing the vulnerability to extreme events (e.g. floods but also heat waves).

Within the scope of post-disaster recovery and relief, instigated by the large number of recent disastrous natural hazards such as dramatic floods, the Commission set up the Community Solidarity Fund (EUSF) in 2002 to help regions recover from such catastrophic events. According to the EUSF provisions, a natural disaster is considered as 'major' if, within a single country, the damage caused exceeds EUR 3 billion (2002 prices), or more than 0,6% of the gross national income. This fund is up to now only reactive as eligible costs only include:

- Immediate restoration of infrastructure;
- Providing temporary accommodation and funding rescue services to meet the immediate needs of the affected population;
- Immediate securing of preventive infrastructures and measures of immediate protection of the cultural heritage, and
- Immediate cleaning up of disaster-stricken areas.  
(<http://europa.eu.int/scadplus/leg/en/lvb/g24217.htm>).

In order to foster adaptation, the solidarity fund should become more proactive: measures which aim at lowering the given vulnerability to disasters triggered by climate change should become eligible for funding.

#### **4.1.4 Integrative concepts, addressing adaptation together with other spatially relevant challenges**

The Conference of German Urban Development Ministers (ArgeBAU) at its 116th meeting on 14 March 2008 took decisions on climate mitigation and adaptation in regard to building, housing and urban development. The conference argued that mitigation as well adaptation of climate change and demographic change have to be seen as core challenges for an integrated, sustainable urban development. As a consequence, urban development must concentrate on stabilising existing, historically grown settlement structures. For that purpose, the existing funding schemes and instruments, that land-use planning authorities can utilise, have to be coordinated.

For Germany demographic change, characterised by an ageing and shrinking of its population (due to the low fertility rate of 1.34 children per women and for some regions mainly in Eastern Germany a negative migration balance) is particularly relevant and poses challenges as well as opportunities for mitigation and adaptation strategies, such as:

- Elderly people are much more vulnerable to heat waves which calls e. g. for a better insulation of nursing homes, hospitals, but also private apartments,
- A shrinking population leads to opportunities for a renaturation of hazard prone areas or cold/fresh air corridors. Built-up areas might be abandoned within the framework of urban consolidation activities ("Stadtumbaumaßnahmen"). An example would be the programme "Stadtumbau Ost", a German federal funding programme, which makes funds available for demolishing or upgrading vacant housing units mainly in order to consolidate the local real estate market.

The main challenge for planning is to identify synergies and conflicts between the different challenges a city is confronted with. On this basis an integrated development strategy has to be developed and implemented. This integrative approach is widely missing in the analysed adaptation strategies and related documents. However, the comprehensive, cross-sectoral competences of spatial planning clearly enable planners to tackle the different challenges altogether. By integrating and connecting adaptation with other spatially relevant issues, it could be much better communicated to the public. In such a way acceptance of necessary adaptation measures can be fostered. This communication on the local level is about concrete adaptation measures, whose suitability is based on the local circumstances and cannot be generalised. This becomes quite clear when looking at the potential conflict between compact settlement structures on the one hand and the urban heat island problem on the other hand: if further densification of an existing settlement might intensify the heat island problem then this

calls for detailed knowledge about the urban climate. Furthermore, other interests come into play: even if the heat island problem would be intensified, other arguments might still justify this densification, for example avoiding further traffic or keeping open space free of further settlement development.

Consequently, the suitability of any adaptation measure has to be clarified in each single case individually. This also explains why integrative concepts are missing in the national adaptation strategies, while calling for concrete local and regional information on which kind of synergies and conflicts might be related with a particular set of adaptation options. Spatial development more than ever requires integration of the manifold social, ecological and economic aspects. In addition, the increasing complexity and uncertainty confront decision makers with particular difficulties. Until today only few and mostly large cities developed concepts for facing climate change. Particularly medium and small sized municipalities lack (human) resources and capacities for developing appropriate adaptation strategies. Advice could be given by a decision-support-system (DSS) which

- systematically compiles information about synergies and conflicts which could be related with a particular combination of measures;
- thereby supports the development of an integrated, almost conflict free strategy
- and offers good practices and background documents about adaptation options.

Interesting examples for such a DSS are the UK Adaptation Wizard, ([http://www.ukcip.org.uk/index.php?Itemid=273&id=147&option=com\\_content&task=view](http://www.ukcip.org.uk/index.php?Itemid=273&id=147&option=com_content&task=view)) and the German Stadtklimatse ([www.stadtklimatse.net](http://www.stadtklimatse.net)).

#### **4.1.5 Parametric governance**

During the last years, the understanding of government has changed from a traditional approach where the state itself provides all kinds of public services to a model which is characterised mainly by private service providers, while the state only guarantees the quality of the services which are of public interest (Johnson 1991, Neary 2001).

One important reason can be seen in the lack of financial resources and the alteration of the classical hierarchical government: The addressees have control over important resources (e.g. information, creativity, knowledge etc.) not only in connection to risk related issues. Furthermore, less and less standardised solutions can be purported to manage the given situation (e.g. of existing risk etc.). Therefore the state switches to bilateral or multilateral forms of cooperative governance, where the addressees concentrate on new, appropriate solutions and targets as well as output-oriented governance (summarised under the term "Agreement on Objectives" or "parametric governance"). This approach aims at governance via parameters or requirements. The modality of achieving the objectives remains in the hands of the addressees (Cools et al. 2003).

To sum it up, the "Agreement on Objectives" approach is characterised by flexibility and a variety of solutions that lead to a greater motivation and implementation of all involved actors (Cools et al. 2003). Furthermore, it offers a margin to the addressees and lead to the following aspects:

- The governance authority disposes of instruments for the implementation of the objectives (opportunities for sanctions, stimulations etc.);
- the targeted objectives are not too complex and can be operationalised by one or more parameters;
- the overall objectives will be transferred into the objectives of the addressees, or the communication between the governance authority and the addressee is designed in a such a way, that allows a consensus on common objectives;
- the "Agreement on Objectives" can be applied (in principle) at all levels of the planning system.

In comparison to traditional input oriented decision-making, the "Agreement on Objectives" approach offers more flexibility, which is needed for coping with climate change where conclusions cannot necessarily be drawn on the basis of past events.

The concept of "Agreement on Objectives" focuses on the output, i.e. to the objectives, achievements and effects and is linked with continuous monitoring. Therefore, there is no need for detailed regulations regarding individual adaptation measures. Based on agreed upon objectives the modality of the achievement of objectives remains in the hands of the given addressees. Furthermore, since agreements concerning the output are made, the regional and local participants receive more scope of action both on the level of their strategies and on the level of concrete mitigation measures.

The U. K. National Indicator N 188 for Local Authorities and Local Authority Partnerships (Defra 2010, LRAP 2010) can be seen as a good practice example in this context. The following steps characterise such a concept of parametric governance:

1. Setting the scene: Undertake a climate vulnerability assessment as information basis every five years. This assessment should be integrated into the Strategic Environmental Assessment (see also section 4.1.7);
2. Agreement on quantitative objectives for vulnerability reduction by lowering the current sensitivity and/or building adaptive capacities;
3. Implementation of these objectives through an action plan, which has to be updated based on repeated vulnerability assessments,
4. Monitoring of success through qualitative process indicators that are part of annual self-assessments (classes e.g. from 0 to 4 expressing the performance of the actor with regard to the following aspects):
  - Definition of responsibilities,

- 
- Identification of relevant actors,
  - Assessment of current status of the environment,
  - Assessment of vulnerability to climate change,
  - Development of an adaptation strategy,
  - Setting-up of an action plan,
  - Implementation of adaptation measures,
  - Monitoring and update of the strategy.
5. Connecting the agreement on objectives with spatially relevant funds (see Angignard 2010): The allocation of funds should be based on an agreement on objectives between regional/local actors.

#### **4.1.6 Spatial planning as relevant actor for strengthening adaptive capacities**

The relevance of adaptive capacity was recognised by most of the analysed studies and all national adaptation strategies. However, the role of spatial planning in this context remains widely open.

The IPCC defines adaptive capacity as follows (IPCC 2007a): "Adaptive capacity is defined as the ability or potential of a system to respond successfully to climate variability and change, and includes adjustments in both behaviour and in resources and technologies."

This study, along the lines of previous research of the ATEAM project (Schröter et al. 2004) considers adaptive capacity to consist of three parts: awareness, ability and action. Knowledge and awareness as determinants of adaptive capacity play an important role for identifying vulnerabilities in relation to climate change and suitable adaptation measures. In order to move from awareness to action, ability is necessary, which consists of technology and infrastructure within a given society. Finally, the ability to achieve action is supported by economic resources and institutions that enable a society to carry out the adaptation measures that have been defined.

Although this is up to now not really translated into practice, spatial planning is in principle very relevant for all three parts of adaptive capacity:

- **Awareness:** Awareness building particularly among private landowners calls for trust in those public authorities that are conducting communication campaigns. In most cases, the population trusts most in local authorities that they have direct contacts with. These are typically the municipal planning departments, which regularly involve the public in the setting-up of plans and programmes.
- **Ability:** Due to its cross-sectoral nature, spatial planning is able to coordinate and weigh different adaptation options against each other. This is obvious when

looking for technology based adaptation options (e.g. improvement of coastal defence systems) which often imply conflicts with other land-uses.

- Ability: Resilient settlement structures are considered important for improving adaptive capacities to deal with extreme events (e.g. resistant infrastructure and building stock) as well as creeping changes (e.g. through improved storage capacity of a sewage system).
- Action: Spatial planning is relevant for the allocation of facilities related to coping capacity such as fire brigade stations, hospitals etc.

These potential contributions of spatial planning to adaptive capacity building should be highlighted by a revised Territorial Agenda.

#### **4.1.7 Climate-Proofing**

Climate Proofing is a concept that aims at integrating principles of climate change adaptation into spatial planning. A first definition was offered by Kabat et al. (2005, 283): „Climate proofing does not mean reducing climate-based risks to zero – an unrealistic goal for any country. The idea is to use hard infrastructure to reduce risks to a quantified level, accepted by the society or economy. This risk can be further combated by 'softer' measures, such as insurance schemes or, as a last resort, evacuation plans. Such climate proofing should be driven by opportunities for technological, institutional and societal innovations, rather than purely by fear of the negative effects of climate change“.

Birkmann and Fleischhauer (2009, 118) defined climate proofing in a broader sense as „[m]ethods, instruments and procedures which take care of the resilience of plans, programmes, strategies and related investments, against the impact of recent and future climate“. In addition, climate proofing pays attention to mitigation. Climate proofing should be integrated into the Strategic Environmental Assessment.

The conceptual frame of climate proofing was originally created in the Netherlands (Kabat et al. 2005) and has been implemented into the National Adaptation Strategy and related policy documents (Fleischhauer 2010). However, similar concepts are part of the U.K. adaptation strategy (see Planning Policy Statement 1, Davoudi 2010).

The main elements of an ideal climate proofing are described in the following (Birkmann & Fleischhauer 2009):

##### Objectives

Climate proofing aims at resilient spatial structures. This is the main focus of the Dutch adaptation strategy, which has been developed from a spatial planning perspective. Thus, spatial planning in the Netherlands should be „climate proof“. In the U. K. all national planning documents and investments as well as regional and local planning have to regard adaptation in order to lower the existing vulnerability to climate change and to build up climate change resilience. In practice this means, that all spatial goals

for new developments, but also existing spatial structures have to be adapted to the needs of adaptation to climate change. Consequently, not only the instruments of spatial planning, but also other spatially relevant policies such as infrastructure investments and energy have to be considered as outlined particularly in the U. K. For that purpose, a climate-sensitive development checklist was developed (Davoudi 2010).

#### Criteria for proofing the climate fitness of planning

Criteria for proofing can be divided into those which are related to the

- *planning process*: How should climate-proof planning and decision making processes look like? Related criteria address the exposure and vulnerability assessment, in particular the methods and indicators used for such assessments.
- *planning actors*: how to empower those actors, which are responsible for the planning process and/or are involved as stakeholders? Here, criteria give advice on the role of the different actors, participation and communication efforts etc.
- *planning objects*: how should climate-proof spatial structures, settlements and buildings look like? Relevant criteria are particularly about affected sectors, projects etc.

Up to now, a climate vulnerability assessment is required on all spatial levels only in the U. K. and is to be repeated every five years (see Climate Change Act). In Hungary, the scope of the so called "Territorial Impact Assessment" is much broader and includes not only a vulnerability assessment, but also all other spatially relevant potential impacts of programmes and plans.

#### Climate-Proofing-Report

The climate-proof report should be integrated into the environmental report according to the Strategic Environmental Assessment Directive. The climate-proof report contains

- results of regionalised climatic models,
- results of impact and vulnerability assessments
- statements on how the responsible actor is going to respond to the predicted vulnerability
- discussion of planning alternatives
- results of cost-benefit assessments of adaptation measures (as already established in the Netherlands)
- concrete steps for improving the resilience of the objectives of the plan or programme (e.g. new settlements) including a discussion of conflicts and synergies between adaptation and mitigation.

#### Monitoring

Continuous monitoring is needed for the implementation of climate proofing, in particular for controlling the impacts of plans or programmes. In case of deviations from

the objectives, counter measures have to be taken. In the U. K., the process oriented performance indicator on adaptation (NI 188) aims at monitoring the progress of local governments in regard to adaptation to climate change (see section 3.3).

## ***4.2 Operationalisation of the no-regret principle***

When looking at the different national adaptation strategies and related documents, it becomes obvious that “no-regret” is widely accepted as a principle for adaptation. The definition of “no regret” is based on the 4th Assessment Report of the IPCC (IPCC 2007a): “A policy that would generate net social and/or economic benefits irrespective of whether or not anthropogenic climate change occurs.”

However, what is completely missing in the analysed documents is concrete advice on what is really meant by “no-regret” and how to integrate this principle into planning practice. For a successful communication of an adaptation strategy which is based on the no-regret principle, synergies with other spatial development interests have to be optimised and conflicts to be avoided as much as possible.

This is quite important, because simply ‘no-regret’ could be understood as meaning that that only those spatial structures and building designs are climate-proof that generate net social and/or economic benefits irrespective of whether or not anthropogenic climate change occurs. What does this mean in practice: Any further settlement development in an area that might be affected by extreme events in the future has to be avoided as well as a building design or vegetation which is not adapted to future climatic conditions. Consequently, spatial planning would lose many contemporary alternatives which so far have been suitable, but would possibly not be acceptable anymore in the future. This is presumably the consequence of the persistence of the existing building and infrastructure stock. This problem will intervene any advanced adaptation strategy because hard conflicts with economic interest come to the fore.

However, when carefully thinking about the temporal dimension of climate change, it becomes clear that many of the potential consequences will become manifest in the far future (i.e. in the period 2071-2100 and later). A reasonable interpretation of the no-regret principle offers a window of time: Strategies that allow making use of given development perspectives and that still generate net social and/or economic benefits irrespective of whether or not anthropogenic climate change occurs. Some elements of such a strategy will be discussed in the following:

### Backcasting

Backcasting is a useful tool in this context. Backcasting starts with defining a desirable future and then works backwards to identify policies and programs that will connect the future to the present. The fundamental question of backcasting is: If we want to attain a certain goal, what actions must be taken to get there? Backcasting is therefore a method in which the future desired conditions are envisioned and steps are then defined to attain those conditions, rather than taking steps that are merely a continuation of

present methods extrapolated into the future (Holmberg & Robèrt 2000). Consequently, backcasting can also be used for opening up a delta that might exist between agreed long-term objectives (e.g. a climate-proof planning) and concrete short-term planning goals (e.g. further settlement development in hazard prone areas)

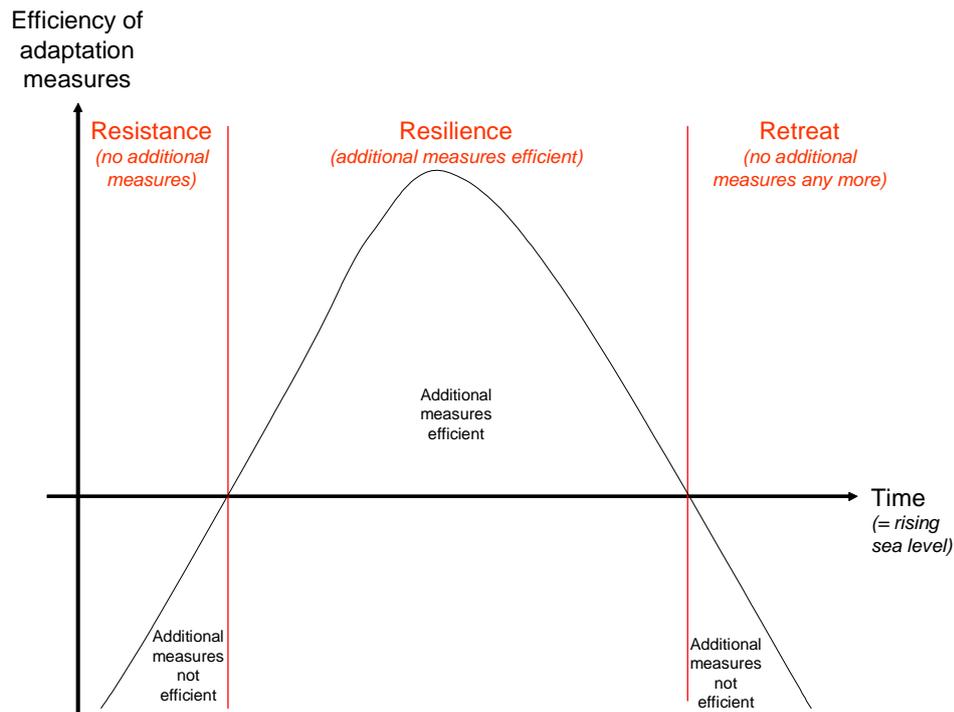
### Sequential strategies

According to the section "Risk Management in Relation to Climate Change" of the background document "The Territorial State and Perspectives of the European Union" (BMVBS 2007a, 36), sequential strategies are needed for considering the temporal dimension of climate change.

At present it might be most efficient to carry on as before, without taking any measures. In case of an event, the society just resists the damages (resistance). Over time, however, and, for example, with a rising sea level, it may become more efficient to protect areas with certain measures, as illustrated by Figure 3. At a turning point, the share between marginal costs and marginal benefits becomes lower and efficiency decreases (resilience). Eventually, further protection measures are no longer efficient (retreat). Certain scenarios could justify a change of "efficiency curves." For example, the different emission scenarios used by the IPCC will influence efficiency to a different extent, but the message remains the same: The turning point moves to the left; resilience and retreat become more efficient—even before a disaster strikes. This implies the following changes for present practices in spatial planning (Greiving & Schmidt-Thomé 2008):

- Phase of resistance: Low risk. Plan A (unnecessary to consider hazards and vulnerability except emergency response).
- Phase of resilience: Medium to high risk. Improve Plan A to consider hazards and vulnerability due to climate change impacts. Improve protection for highly vulnerable areas depending on given risks. In parallel planning should start to think about new spatial structures for when further protection measures are no longer efficient (Plan B). Relocate highly vulnerable land-uses and adapt protections (e.g. improve structures for those land-uses that are still beneficial in threatened areas). In this way, society would be better prepared for recovery after a disaster, understood as a window of opportunity: A completely new settlement structure would already be available to replace destroyed facilities.
- Phase of retreat: Very high risk due to ongoing climate change impacts. Leave the area completely once additional measures (resilience) are no longer efficient (Plan C).

These phases are shown in the following figure that expresses the changing appropriateness of resilient measures using the example of coastal areas affected by sea level rise:



**Figure 3: Change of efficiency of adaptation measures over time (rising sea level).**  
**Source: Greiving, S. & Schmidt-Thomé, P. (2008).**

Such a strategy calls for temporally limiting building rights in the area that settlements are currently located in as well as in the area that they would be relocated to.

#### Sequential realisation of planning goals

Uncertainty is considered one of the main characteristics of climate change. Under this condition strategies for spatial planning are needed, which anticipate uncertainty. A suitable way would be based on the so called "robustness principle": Uncertainty would be tackled by avoiding one optimal final state as planning objective, but seeking a set of suboptimal achievable final states. Planning decisions on the way to these states will only be taken if they are indispensable, while further steps remain open as long as possible. Decisions will be taken as soon as the given uncertainty is tackled by more precise information (in this case about future climatic conditions and the related vulnerability) (Friend & Jessop 1973). An application for planning purposes would be based on so called „if-then-relations“ (Greiving 1998): Designations for further settlement development have to be prioritised:

- Only those projects can be immediately realised that are not in question due to existing uncertainty about future (climatic) conditions.
- Other projects have to be checked for their implementability from time to time considering new knowledge about future (climatic) conditions. They can only be realised if a net social and economic benefit becomes clearly visible.

Such a strategy depends on continuous monitoring of the environment, which is, however, already required according to article 10 § 1 SEA directive.

Summary: In view of the weak performance of current planning practices the key question is how to strengthen the role of spatial planning. This is important for the implementation of the Territorial Agenda but also national, regional and local adaptation strategies.

The following set of recommendations was discussed in this context:

- Particular emphasis on the cross-sectoral character of adaptation as multi-level-governance
- Integration of climate change adaptation into spatial visions
- Climate-proofing as relevant criterion for distribution of spatially relevant funds
- Integrative concepts, addressing adaptation together with other spatially relevant challenges
- Parametric governance
- Spatial planning as relevant actor for strengthening adaptive capacities
- Climate proofing
- Operationalisation of the no-regret principle

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