



Study of Adaptation Activities at Regional Level in the EU

Final study

Developing a process for stakeholder involvement following the adoption of the EU level strategy for adaptation to climate change: adaptation at the regional level
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The views expressed herein are those of the consultants alone and do not necessarily represent the official views of the European Commission.

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Glossary

Term	Definition
Adaptation	The IPCC defines adaptation as 'adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.' Adaptation can also be thought of as the on-going process of managing changing climate risks.
Adaptation options	Adaptation options are concrete ways in which programmes and projects can build in resilience to climate change. Some options directly target climate change adaptation, some are management actions with adaptation as a complementary or side-objective.
Adaptive capacity	The ability of a system to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.
Climate	Usually defined as the 'average weather', or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time. These quantities are most often surface variables such as temperature, precipitation, and wind.
Climate change	The IPCC defines this generally as '...any change in climate over time, whether due to natural variability or as a result of human activity.' This usage differs from that in the United Nations Framework Convention on Climate Change (UNFCCC), which defines 'climate change' specifically in relation to human influence as: 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods'.
Climate proofing	In contrast to mainstreaming, climate proofing refers to the process of cross-checking that all elements of a programme and its implementation, including specific measures and projects, address climate change issues. This involves ensuring that: <ul style="list-style-type: none"> - Funding is resilient to future climate impacts; and - The carbon intensity of funding is reduced to the extent possible.
Mainstreaming	Mainstreaming of climate change adaptation focuses on the integration of climate concerns and responses into relevant policies, plans and programmes at different levels of governance.
Maladaptation	Planned development policies and measures that deliver short-term gains or economic benefits but lead to exacerbated vulnerability in the medium to long term.
Sensitivity	The degree to which a system, receptor or exposure unit would be affected, either adversely or beneficially, by a particular change in climate or climate-related variable.
Vulnerability	The extent to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. It depends not only on a system's sensitivity but also on its adaptive capacity.

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List of Acronyms

ARPA	Regional Agencies for Environmental Protection (Italy)
CAP	Common Agricultural Policy
CCRA	Climate Change Risk Assessment (United Kingdom)
EEA	European Environment Agency
ERDF	European Regional Development Fund
ESF	European Social Fund
IPCC	Intergovernmental Panel on Climate Change
NAS	National Adaptation Strategy
NGO	Non-Governmental Organisation
NUTS	Nomenclature of territorial units for statistics
OP	Operational Programme
SRCAE	Regional Air, Climate, Energy Schemes (France)
UNFCCC	United Nations Framework Convention on Climate Change
WMO	World Meteorological Organization

Executive Summary

The objective of this study is to complement past work by exploring the role and relevance of the regional level¹ to climate change adaptation in EU Member States. In a nutshell, regions can play an important role and are, in some cases, the most appropriate level of governance to address climate change.

Dedicated research on climate change adaptation in each of the 28 EU Member States has been carried out for this study, consisting of desk research and contacts with key experts and authorities and a review of the current status of adaptation planning and action at the regional level. Detailed results are recorded in the set of Member State matrices contained in Annex 1.

The study is organised as follows:

Chapter 1 introduces the purpose and scope of the study. It further describes the methodology for gathering information and structuring findings. **Chapter 2** provides a comprehensive (although not exhaustive) review of climate change adaptation planning and action at regional level across the EU. It summarises key findings on regional adaptation and reviews the role and relevance of the regional level in climate change adaptation for each of the 28 EU Member States. Further details are available in the Member State matrices in Annex 1. **Chapter 3** provides a critical assessment of the drivers, barriers, opportunities and costs for climate change adaptation at the regional level. Next, based on the findings of the previous sections, **Chapter 4** identifies examples of good practice in regional and transboundary adaptation. Finally, **Chapter 5** provides conclusions and recommendations.

The role of regions in adaptation across the EU

The role of regions in climate change adaptation varies considerably across the EU Member States. There is no one-size-fits-all prescription for the role of adaptation within multi-level governance, as there are many country-specific factors involved. The position of a region within the multi-level governance system forms the basis for its role in adaptation. In order for regions to take a proactive and effective role, they must have legal competence and political support from within the country.

The study reviews the role of regions and progress with adaptation at the regional level for each of the 28 Member States. The countries are grouped into three groups:

Group 1 contains Member States with large regions (mainly at the NUTS I or II level) that possess considerable autonomy and mainly *enable* action at local level through strategic-level planning and coordination. Ten Member States have been included in this group (AT, BE, FR, DE, IT, NL, PL, ES, SE, UK).

Group 2 contains Member States where regions (mainly at the NUTS III level) carry out a mix of *implementing* and/or *enabling* functions. Nine Member States are included in this group (CZ, HR, DK, FI, EL, HU, LT, RO, SK).

Group 3 contains Member States where regions have a very limited role in climate change adaptation and are therefore neither *enabling* nor *implementing* adaptation

¹ For the purposes of this work, we are primarily concerned with the concept of a 'region' as a type of sub-national entity that is larger than a local unit (e.g. a city, town or municipality).

actions; climate change adaptation is mainly carried out at the national and local levels. Nine Member States are included in this group (BG, CY, EE, IE, LV, LU, MT, PT, SI).

Overall in the EU28, in countries where regions have competence for some combination of environmental policy, spatial planning or implementation of adaptation measures, the current extent of progress on adaptation varies considerably. Italy and Poland stand out among the most decentralised countries as Member States that have lagged behind somewhat on adaptation at the national level; not much progress has been made in these countries at the regional level either. Smaller but more advanced Member States such as Denmark or Finland have made considerable progress at the national level, and regions are also starting to include adaptation in key planning documents and develop dedicated adaptation strategies or plans.

There is considerable potential for further adaptation work at the regional level in those Member States where there is competence at the regional level but limited progress. Among these countries are the Czech Republic, Croatia, Greece, Hungary, Lithuania, Romania and Slovakia.

In other Member States, the regional level has very limited competence in adaptation. Typically these are Member States where there is no significant level of administrative competence between the national and local (municipal level). In the smallest Member States, such as Malta, Luxembourg, Cyprus or Slovenia, the national government is able to effectively coordinate or enable adaptation action across the whole territory.

For some of the larger countries within Group 3, such as Bulgaria, Ireland and Portugal, the lack of a regional level to support and coordinate municipal actions may be an obstacle in adaptation. This could be the case if the local authorities are too small and lack a critical mass of funding and expertise to address complexities of adaptation, particularly when they cross local borders.

Critical assessment – drivers, barriers, opportunities and costs

The extent of progress on adaptation in regions is dependent upon many factors. Some factors - such as legal obligations or evidence of climate change impacts (e.g. a flood) drive adaptation action. Others, such as low awareness or lack of funds, are obstacles. The report discusses some of these factors, based upon a review of literature and interviews with officials and experts in the Member States.

Drivers

The development of a national adaptation strategy (NAS) is often the key driver for climate change adaptation action at the regional level. This is particularly the case when the NAS clearly defines the roles and responsibilities of the various sub-national government units for adaptation. The level of autonomy that a region has within the national system of multi-level governance is also an important driver for climate change action. External funding opportunities, mainly from the EU, can be a strong driver for regions to get involved in adaptation action. In countries where government budgets have been very limited in recent years, and awareness about climate impacts and adaptation needs is not very strong, it has been EU funding that has catalysed many adaptation initiatives, including studies, pilot actions and planning efforts. The improved understanding that climate science is bringing to the connection between extreme climate events and the predicted worsening of them due to climate change can be seen as a driver for regions across the EU.

Barriers

Many of the identified barriers relate to the fact that adaptation seems not to be a priority on political or policy agendas; often support for the more established field of climate change mitigation crowds out support for adaptation. Within regions, a lack of funding for research, assessments and planning initiatives was the most commonly cited barrier for adaptation. The responsibility for financing the implementation of major climate adaptation measures is complex and lack of understanding of this hampers action at the regional level. Human capacity, referring to both numbers and expertise has been identified as a barrier both in the Member State research and the literature. Uncertainty surrounding climate change forecasts and deeply held values and beliefs may also act as barriers to climate adaptation, with local level implementers sometimes believing that it is better to opt for traditional methods as opposed to new methods that are designed with climate change impacts in mind.

Opportunities

A key opportunity reported by stakeholders is avoiding potential costs of repairing any damage caused by being unprepared for climate change impacts. Co-benefits such as community development, energy efficiency and markets for new technologies were seen as opportunities in many Member States and regions.

Costs

Costs considered include research and planning costs. To date, very limited work has been done on costing the implementation of adaptation strategies, especially in regions. Therefore implementation costs are not considered. Some regional level cost estimates for adaptation research and planning are available, but much more detailed information is necessary to be able to develop any 'standard' cost estimates or make comparisons across regions. Costs are not negligible, but many regions have found ways to support adaptation research and planning, including through the use of national and EU funds.

Good practices in regional and transboundary adaptation

The report also includes a section on good practices in adaptation at the regional level, including transboundary activities that could be shared among policy makers across the EU Member States and regions. Overall, most of the examples selected cover water management, health, disaster risk reduction, coastal areas and agriculture, as these are priority sectors in most Member States. A large number of these good practices are awareness raising and capacity building activities. These range from capacity building within administrations in countries that lag behind; to awareness raising activities for the general public. Tables with key details (location, type of activity, description, and sectors covered) and further information sources for the good practices are available in Annex 3. Within Chapter 4, good practices are summarised for the following categories:

- Capacity building for different levels of administration
- Coordination and stakeholder involvement
- Awareness Raising and Changing Social Perceptions
- Vulnerable sectors
- Transboundary adaptation to climate change

Study conclusions

The launch of the EU Adaptation Strategy, and associated guidance and support including the Climate-Adapt web portal, combined with the imminent start of the 2014-2020 EU funding period and its increased focus on climate change, are all key opportunities for Member States and regions to make important progress on understanding and planning for the short and long term impacts of climate change. In most Member States, regions are a critical interface between the national and local levels of governance and have a role in both strategic planning and concrete implementation of measures. Political, financial and technical support for progress on adaptation at this level will be needed to build resilience across the EU and ensure long-term development that is compatible with the impacts of a changing climate. The main conclusions stemming from this work are:

- The role that regions play in adaptation can be critical for the success of adaptation policies in a Member State. All Member States should carefully consider the way in which this 'in-between' level can be most effective in adaptation within the specific context of its governance system and administrative capacities.
- Clear communication on the roles and responsibilities for the different levels of governance in adaptation is essential; this should be communicated through strategic policy documents dedicated to adaptation (e.g. national or regional adaptation strategies).
- The experience gained and outputs produced by EU-funded cooperation programmes (e.g. territorial cooperation/Interreg and research projects) should be taken seriously and capitalised within the policymaking communities of the Member States.
- Cohesion Policy is of particular relevance for regions, as many spending programmes target regions directly and are frequently prepared by regional authorities. Member States will need to include adaptation in the Partnership Agreements and Operational Programmes in order to enable regions to use the funds for adaptation.
- The Climate-ADAPT web portal, combined with national and regional web portals for more specific information and data, can be an excellent tool for managing communication and information and raising awareness of the need for better science-policy cooperation.

1 Introduction

1.1 Purpose and structure of this study

Purpose

The national (e.g. Member State) and local (e.g. city, town, municipal) levels of governance have thus far been the focus of research in climate change adaptation in the EU, as explained in a 2013 report by the European Environment Agency (EEA) *Adaptation in Europe*. The objective of this study is to complement past work by exploring the role and relevance of the regional level to climate change adaptation in EU Member States. In a nutshell, regions can play an important role and are, in some cases, the most appropriate level of governance to address climate change. For example, when climate change requires a response from more than one municipality, regions are well-placed to coordinate the approach. Similarly, when strategic documents are drafted at the national level, regions can offer input to make sure that regional and local perspectives are considered.

Use of the term 'region' in this study

There are varying interpretations of the term 'region'. For the purposes of this work, we are primarily concerned with the concept of a 'region' as a type of sub-national entity that is larger than a local unit (e.g. a city, town or municipality). For most EU Member States, such 'regions' correspond to the NUTS II and III levels according to the EU's Nomenclature of Territorial Units for Statistics. Where possible, the regional level is defined using the national language term, with an indication of how it relates to the NUTS division.

The research carried out for this report² has shown that regions engage with climate change adaptation in a number of different ways. In some cases, they resemble the national level and *enable* adaptation through strategic planning and support; in others they directly *implement* adaptation actions. Often regions have a mix of *enabling* and *implementation* functions; and in some Member States, regions have no substantial role at all regarding climate change adaptation.

Structure of the study

Chapter 1 introduces the purpose and scope of the study. It further describes the methodology for gathering information and structuring findings. **Chapter 2** provides a comprehensive (although not exhaustive) review of climate change adaptation planning and action at regional level across the EU. It summarises key findings on regional adaptation and reviews the role and relevance of the regional level in climate change adaptation for each of the 28 EU Member States. Further details are available in the Member State matrices in Annex 1. **Chapter 3** provides a critical assessment of the drivers, barriers, opportunities and costs for climate change adaptation at the regional level. Next, based on the findings of the previous sections, **Chapter 4**

² The distinction between enabling and implementing functions within the multi-level governance of adaptation was set out in the recent EEA publication on adaptation: *Adaptation in Europe: Addressing risks and opportunities from climate change in the context of socio-economic developments*, EEA Report No 3/2013, pp84-85. This approach was corroborated by the Member State research carried out for this study.

identifies examples of good practice in regional and transboundary adaptation. Finally, **Chapter 5** provides conclusions and recommendations.

1.2 Approach to the Member State research

Dedicated research on climate change adaptation in each of the 28 EU Member States has been carried out for this study, consisting of desk research and contacts with key experts and a review of the current status of adaptation planning and action at the regional level. Detailed results are recorded in the set of matrices contained in Annex 1. A list of officials and experts in the Member States contacted via email, phone and personal interviews is included in Annex 2. The research covers studies and assessments of climate impacts and vulnerabilities, and key adaptation policy/planning documents at regional and national levels. A literature review, particularly regarding the drivers, barriers, opportunities and costs assessed in Chapter 3, was carried out to complement the Member State research.

When collecting information for this study, the objective of the project team was to collect as much information as available. In the process, representatives from governmental bodies were contacted informally, and in some cases did not want to be quoted in their official capacity. Thus, it should be kept in mind that the findings do not necessarily reflect the official opinion of the organisation they represent; nevertheless they reflect expert assessment.

Based on the time and resources available for carrying out this study, the Member State research cannot be considered as an exhaustive or definitive account of all adaptation activity in EU regions, but rather a snapshot of the information available through desk study and contacts with officials in the Member States.

2 Overview of research, planning and action at the regional level across the EU Member States

Chapter key points

- The role of regions in climate change adaptation varies considerably across the EU Member States. There is no one-size-fits-all prescription for the role of adaptation within multi-level governance, as there are many country-specific factors involved.
- The position of a region within the multi-level governance system of a region forms the basis for its role in adaptation. In order for regions to take a proactive and effective role, they must have legal competence and political support from within the country.
- In countries where regions (NUTS II or III) have competence for some combination of environmental policy, spatial planning or implementation of adaptation measures, the current extent of progress on adaptation varies considerably. Italy and Poland stand out among the most decentralised countries as Member States that have lagged behind somewhat on adaptation at the national level; not much progress has been made in these countries at the regional level either.
- Smaller but more advanced Member States such as Denmark or Finland have made considerable progress at the national level, and regions are also starting to include adaptation in key planning documents and develop dedicated adaptation strategies or plans.
- There is considerable potential for further adaptation work at the regional level in those Member States where there is competence at the regional level but limited progress. Among these countries are the Czech Republic, Croatia, Greece, Hungary, Lithuania, Romania and Slovakia.
- In other Member States, the regional level has very limited competence in adaptation. Typically these are Member States where there is no significant level of administrative competence between the national and local (municipal level). In the smallest Member States, such as Malta, Luxembourg, Cyprus or Slovenia, this makes sense as the national government is able to coordinate or enable adaptation action effectively across the whole territory.
- For some of the larger countries within this group, such as Bulgaria, Ireland and Portugal, the lack of a regional level to support and coordinate municipal actions may be an obstacle in adaptation. This could be the case if the local authorities are too small and lack a critical mass of funding and expertise to address complexities of adaptation, particularly when they cross local borders.

Across the EU, there are a variety of approaches to multi-level governance, depending upon size, political and historical tradition and a host of other factors. In some Member States responsibilities for policy-making and implementation are clearly defined across levels of governance; in others they are more blurred. Adaptation to climate change is a relatively new policy field in the EU, and a complex one that crosses sectors and geographical boundaries. This complicates the definition and description of how adaptation is handled at the regional level across the EU. Based on the findings of the Member State research, this chapter provides an overview of the various ways in which EU regions are currently dealing with the challenge of climate change adaptation, within the context of their legal and institutional structures, administrative and technical capacities, available resources, and other factors.

2.1 Defining and characterising regional-level adaptation in the EU

The EEA report *Adaptation in Europe* provides a useful breakdown of the types of adaptation actions taken by different levels of government in Europe³. Typically, the national level *enables* adaptation action through strategic planning, support and funding and the local level *implements* adaptation through spatial planning and concrete investment measures. Regions tend to fall in between these levels, carrying out a mixture of these roles, depending upon their level of autonomy within a Member State as well as other factors.

Types of possible regional level functions regarding adaptation to climate change

Enabling action:

- Providing incentives, funding and authorisation to enable local action
- Providing strategic direction through regional level strategies or action plans
- Ensuring regional coherence of local/municipal plans and measures through coordinating activities

Implementing action:

- Developing and implementing regional approaches, for example in river basin management
- Implementing adaptation measures that span across municipalities

To structure and guide the analysis, the EU Member States have been divided into three groups, depending upon how climate change adaptation fits into the system of multi-level governance.

Group 1 contains Member States with large regions (mainly at the NUTS I or II level) that possess considerable autonomy and mainly *enable* action at local level through strategic-level planning and coordination. Ten Member States have been included in this group (see Map 1 below).

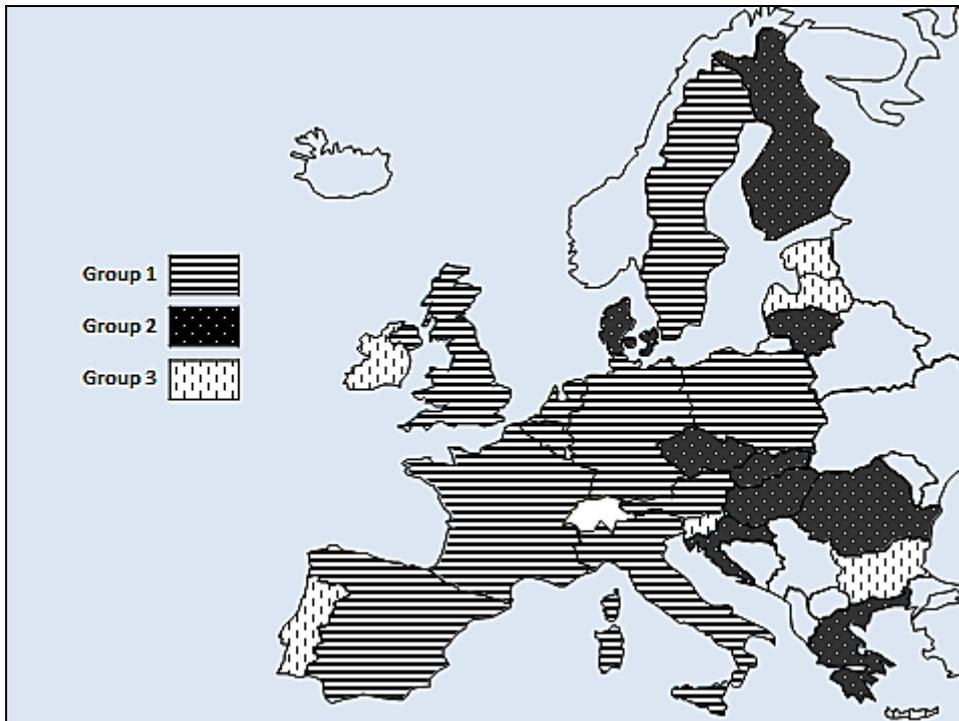
Group 2 contains Member States where regions (mainly at the NUTS III level) carry out a mix of *implementing* and/or *enabling* functions. Nine Member States are included in this group (see Map 1 below).

Group 3 contains Member States where regions have a very limited role in climate change adaptation and are therefore neither *enabling* nor *implementing* adaptation actions; climate change adaptation is mainly carried out at the national and local levels. Nine Member States are included in this group (see Map 1 below).

The map on the next page provides an overview of the Member States assigned to each group. Adaptation action at the regional level for each Member State is then presented in the following three sections of this chapter. Matrices for each Member State, containing detailed information, are available in Annex 1.

³For further considerations on multi-level governance in climate change adaptation, see the 2013 EEA report *Adaptation in Europe, Addressing risks and opportunities from climate change in the context of socio-economic developments* (EEA, No 3/2013), section 4.2.2

Map 1: Groups of EU Member States according to the relevance of the regional level in climate change adaptation



2.2 Group 1: Member States where regions have an enabling role

Table 1: Group 1 Member States at-a-glance

Member State	Key characteristics	Key findings
Austria	<p>Area: 83,870 km² Population: 8.3 million Regional division: 9 <i>Bundesländer</i> (NUTS II); 35 <i>Bezirke</i> (NUTS III) NAS: Adopted in October 2012</p>	<p>Comprehensive Regional Adaptation Strategies (RAS) in 2 of 9 <i>Bundesländer</i> developed; underway in 4 more; the other <i>Bundesland</i> integrate adaptation into overall climate policy. Main sectors: agriculture, forestry, disaster risk prevention, water management, tourism and health. Implementation action mainly awareness raising and capacity building. Focus on climate threats in Alpine regions and on flood risks.</p>
Belgium	<p>Area: 31,000 km² Population: 11.1 million Regional division: 3 <i>gewesten/régions</i> (NUTS I); 11 <i>provincie/provinces</i> (NUTS II); 44 <i>verviert/arrondissements</i> (NUTS III)</p>	<p>Action plans for climate mitigation and adaptation are under preparation at the national level and the Wallonia and Brussels Capital <i>gewesten/régions</i>, based on regional climate change impact studies. The Flanders region adopted an action plan in June 2013. Main sectors: broad coverage including: water management (floods, pollution,</p>

Member State	Key characteristics	Key findings
	NAS: Adopted in 2010	erosion, supply), biodiversity and natural environment, industry and services, transport, buildings, agriculture, fisheries, health. Concrete implementation actions so far deal mainly with flooding.
France	Area: 632,834 km ² Population: 65.6 million Regional division: 27 <i>régions</i> (NUTS II), 96 <i>département métropolitaine</i> and 5 <i>département d'outre-mer</i> (NUTS III) NAS: Adopted in 2006	<i>Régions</i> are required to set up Regional Air, Climate, Energy Schemes (SRCAE), defining mitigation and adaptation measures in the short and medium term. 18 of the 22 mainland <i>régions</i> and 3 of the 5 overseas <i>région</i> have adopted a SRCAE, based on climate scenarios and vulnerability assessments. Main sectors: wide sectoral coverage depending on needs of the <i>région</i> Main focus is on mountainous and coastal areas.
Germany	Area: 356,854 km ² Population: 82 million Regional division: 16 <i>Bundesländer</i> (NUTS I); 39 <i>Regierungsbezirke</i> (NUTS II); 429 <i>Kreise</i> (NUTS III) NAS: Adopted in December 2009	At the time the NAS was adopted, 13 out of the 16 <i>Bundesländer</i> had carried out impact studies; and 9 of these have developed RAS. In the remaining <i>Bundesländer</i> , either sectoral or comprehensive adaptation strategies are under preparation. Main sectors: water management, especially flood prevention, health, agriculture and forestry. Germany has extensive <i>Bundesländer</i> climate change adaptation networks for involvement of various stakeholders and exchange of experiences.
Italy	Area: 301,338 km ² Population: 60.1 million Regional division: 21 <i>regioni</i> (NUTS II); 110 <i>province</i> (NUTS III) NAS: to be adopted in 2014	Thus far, 2 out of 21 <i>regioni</i> have carried out comprehensive vulnerability assessments and intend to develop a RAS. Main sectors: wide spectrum because of diverse geographical and climatic conditions across the country. Focus on water management, tourism, forestry and agriculture. Much of the <i>regioni</i> level activities are EU-funded and promote information sharing and awareness raising.
Netherlands	Area: 41,530 km ² Population: 16.7 million Regional division: 12 <i>provincies</i> (NUTS II) and 40 <i>COROP-gebied</i> (NUTS III) NAS: Adopted in 2007	<i>Provincies</i> are required to carry out adaptation activities according to an agreement with the national government. Ten out of 12 <i>provincies</i> have published key vulnerability assessments; 9 have published key policy or planning documents aimed at adaptation.

Member State	Key characteristics	Key findings
		Main sectors: water management, health, agriculture and forestry, infrastructure, and recreation.
Poland	<p>Area: 312,685 km² Population: 38.2 million Regional division: 16 <i>województwa</i> (NUTS II), 66 <i>podregiony</i> (NUTS III), 379 <i>powiaty</i> NAS: adopted in October 2013</p>	<p>The NAS requires <i>województwa</i> to support the implementation of NAS through activities and measures at the regional level. <i>Województwa</i> can choose whether to prepare own RAS. No comprehensive vulnerability assessments have taken place in the <i>województwa</i>. Sectoral vulnerability studies have been developed in the context of EU funded projects.</p> <p>Main sectors: agriculture and forestry, water management, health, transport, and energy.</p>
Spain	<p>Area: 505,992 km² Population: 47.2 million Regional division: 19 <i>autonomías</i> (NUTS II); 59 <i>provincias</i> and <i>islas</i> (NUTS III) NAS: Adopted in July 2006</p>	<p>The NAS requires all <i>autonomías</i> to develop their own climate change adaptation plans or strategies, either as separate documents or within general climate change programmes. 15 <i>autonomías</i> have done so already; 2 are in the process and for the remaining two no information was found. In June 2013, Spain launched its national climate change adaptation online platform.</p> <p>Main sectors: health, water management, biodiversity, forestry, and tourism.</p> <p>Many <i>autonomías</i> have dedicated climate change websites.</p>
Sweden	<p>Area: 450,000 km² Population: 9.5 million Regional division: 8 <i>Riksområden</i> (NUTS II); 21 <i>Län</i> (NUTS III) NAS: adopted in 2009 (according to EEA)</p>	<p>Climate change impact assessments have been carried out in all 21 <i>Län</i>. Two <i>Län</i> have prepared RAS, several others are preparing their strategies.</p> <p>Main sectors: water management, energy, spatial planning, building</p> <p><i>Län</i> have a mandate to go beyond the national level requirements; there are good coordination mechanisms between <i>Län</i>.</p>
United Kingdom	<p>Area: 243,610km² Population: 62.9 million Regional division: 12 <i>countries</i> (NUTS I); 37 <i>counties</i> (NUTS II); 133 <i>unitary authorities</i> or <i>districts</i> (NUTS III); the study looks at adaptation in the devolved administrations of England, Wales, Scotland</p>	<p>Many UK <i>regions</i> historically developed strategic planning documents directly aimed at adaptation however in 2010 the UK formally abolished the regional planning level (Regional Assemblies). This means it is not clear if these strategies are still being implemented. Regional climate change partnerships still exist in most regions. These partnerships do not have a formal planning role and are more involved in</p>

Member State	Key characteristics	Key findings
	and Northern Ireland NAS: Climate change act in 2008; National adaptation programme in 2013.	advocacy and communication. The UK national Climate Change Risk Assessment included regional (and sector) assessments of risks, which formed the basis for the National Adaptation Programme, adopted in July 2013. Main sectors: as specified in Departmental Action Plans required in the Climate Change Act 2008. <i>Countries</i> of the UK (England, Northern Ireland, Scotland and Wales) have developed guidelines and training tools to support local authorities and communities. As noted, Regional Assemblies, which coordinated climate change policy at a more local level than <i>countries</i> , were closed in 2010.

Group 1: Overview

This group includes Member States where regions have primarily an *enabling* role; they provide the strategic framework and support for action to the lower levels (province, county, municipal). The strategic framework can take the form of an adaptation strategy, guidelines, or an action plan; other support measures include the provision of funding, expertise, capacity building activities, and coordination of local efforts. Regions with an *enabling* role are typically located in more decentralised Member States and tend to be large (NUTS I and II).

This group contains the three EU federal states – Germany, Austria and Belgium – where regions have some equal competences with the central government, and the three countries – Italy, Spain and the UK – where the government has devolved a number of powers to sub-national units. All of the Member States in this group have adopted a National Adaptation Strategy (NAS) with the exception of Italy, where the NAS is currently going through the second round of consultations. Two of the Member States included in this group developed strategic level documents very recently. The UK adopted its National Adaptation Programme in July 2013; Poland adopted a NAS in October 2013.

Group 1: Member State summaries

Austria

In Austria, the *Bundesländer* (NUTS II) have legislative and executive powers with regard to spatial planning, environmental protection, planning law, transport, all of which have relevance to climate change adaptation. *Bundesländer* are also responsible for the administration, implementation and enforcement of certain federal laws at the lower levels of government.

The Austrian NAS, adopted in 2012, includes a chapter describing the activities regarding climate change in the nine *Bundesländer* (NUTS II). The chapter describes work accomplished ranging from research and concrete adaptation measures, to the

development of strategic planning documents. A dedicated climate change adaptation portal and a database on adaptation-related research and adaptation options also specific to the nine *Bundesländer* of Austria are available. The national government has started to develop a monitoring and evaluation approach for the implementation of NAS. Ministries at federal and *Bundesländer* level will be asked to participate in a survey on adaptation progress; the first monitoring report should be available at the end of 2014.

Research on climate change impacts is mainly carried out by national research institutes or associations. At the *Bundesländer* level, assessment studies are mostly sectoral (with disaster risk prevention, water management, transport, tourism and health being the sectors more explored) or developed within the context of EU funded projects (e.g. AdaptAlp). A comprehensive regional adaptation strategy has thus far been developed in two *Bundesländer*; another four are in the process of developing a strategy. The remaining three *Bundesländer* integrate adaptation into its overall climate policy. Since 2009, there is also a portal dedicated to climate change adaptation (*KlimaWandelAnpassung*). Within the portal, a database has been created containing information on about 200 research projects and on about 100 adaptation measures and actions. Examples include national, *Bundesländer* level and local actions. Most activities are aimed at awareness raising and capacity building; they generally concentrate on climate threats in the Alpine regions and on flood risks.

Belgium

Gewesten/régions at the NUTS I level have legislative powers in all the sectors that are relevant to climate change adaptation. There is no hierarchical relationship between the regions and the federal authority. Regional governments direct and supervise provinces and local authorities in the implementation of the upper-level regulations.

The responsibility for adaptation to climate change policy lies with the Working Group Adaptation in the National Climate Commission that gathers representatives from the federal government and the three *gewesten/régions* governments of Wallonia, Flanders and Brussels Capital region. Currently, a national action plan is being developed to guide the implementation of the national adaptation strategy. The federal action plan is expected to be adopted in the first quarter of 2014. In each of the three *gewesten/régions*, a dedicated authority is preparing an Action Plan (Agency for Air and Climate in Wallonia; the department for Environment, Nature and Energy of the Flemish Government in Flanders; and the Brussels Institute for environmental management in Brussels Capital region). The *gewesten/régions* action plans are based on regional climate change impact studies carried out within the last two years. All three plans will have both mitigation and adaptation parts. Currently the Wallonia and Brussels Capital regional plans are in process of approval or under consultation phase, the plan for the Flanders region was adopted in June 2013. The regional level plans complement the National Adaptation Plan (NAP). The content of the NAP is not yet fully determined. Some outstanding issues include whether the NAP will concentrate only on measures at national level or include a broader perspective on *gewesten/régions* measures, and how the *gewesten/régions* plans can be integrated.

Research shows that there is a strong coordination activity between levels of government, where the national and regional levels give assistance to the provincial and municipal levels through technical assistance, training modules, dialogue networks and awareness raising campaigns. Concrete actions implemented so far relate principally to flood prevention and protection plans.

France

Régions at the NUTS II level do not have legislative powers but have administrative autonomy. *Région* develop regulations for some sectors relevant to climate change adaptation (transport, regional planning, environment). *Région* authorities also provide their opinion (consultation) on the definition of the national sustainable development policy. The five overseas *régions* have more autonomy than the 22 mainland *région*.

The Law 'Grenelle II' of June 2010 requires *régions* to set up Regional Air, Climate, Energy Schemes (SRCAE), replacing regional plans for air quality, and defining mitigation and adaptation measures for the short-term (up to 2020) and the medium term (up to 2050). These plans are jointly developed by the state devolved services of the national government (*préfectures*) and the *région* Regional Councils. Most *régions* have already set up or are finalizing their Schemes. In November 2013, only four out of the 22 mainland *régions* had not yet adopted a regional plan. Regarding the remaining four mainland *regions*, in three of them the public consultation phase is over and the document is waiting to be officially endorsed; in one region the public consultations is currently ongoing. Three of the 5 overseas *régions* have adopted a plan. Some overseas territories, such as the *département d'outre-mer* of French Polynesia and New Caledonia do not have such obligations and are free to set up their own climate policy because of higher degree of autonomy.

Climate scenarios and vulnerability assessments specific to a *région* are part of developing a SRCAE. Several regions have also set up local observatories of climate change impacts that complement the research work done at national level. Some have developed sectoral or interregional studies that go beyond the requirements of the *Grenelle II* law. The national Agency for Environment and Energy management (ADEME) and its regional divisions provide technical support to regional climate policy. These bodies have produced a large number of guidelines and tools to help regions develop adaptation strategies. Many of the concrete adaptation options concentrate on challenges faced by the mountainous and coastal areas.

Germany

Bundesländer or regions at the NUTS I exercise legislative powers in all areas which are not exclusive competence of the Federal level. Environmental policy (including climate change adaptation) is a concurrent competence between the federal and *Bundesländer* level. *Bundesländer* also implement legislation at the lower levels of governance.

Climate change adaptation policy in *Bundesländer* is most often the responsibility of the Ministry of Environment. For example in Baden-Württemberg the competent authority is the Ministry of the Environment, Climate Protection and the Energy Sector; for Hessen the responsible authority is Ministry for the Environment, Energy, Agriculture and Consumer Protection.

At the time when the NAS was developed (before 2009), 13 *Bundesländer* had already carried out studies on the impacts of climate change on various sectors. Sectors most commonly covered include water management, forestry, agriculture and health. Studies of the impacts of climate change on biodiversity and soils are less common. The northern German *Bundesländer* have studies on coastal protection. Three *Bundesländer* currently have neither sectoral nor cross-sectoral studies of the impacts of climate change.

Nine *Bundesländer* have already developed climate change adaptation strategies. These relate largely to water management, especially flood prevention, and forestry. There are also adaptation strategies in the health sector; most commonly these are heat warning services. Six *Bundesländer* have neither sectoral nor cross-sectoral adaptation strategies. In most cases, however, these are in preparation, or initial action recommendations exist for individual sectors.

Information regarding climate change in the German *Bundesländer* is compiled on the 'KLIMZUG climate change in regions' web-portal. An additional channel of information is Germany's Regional Climate Atlas, which is made available by the Regional Climate Offices of the Helmholtz Association.

Germany has also created extensive networks for stakeholder involvement in the climate change adaptation process. These are either specific to *Bundesländer*; cover urban areas; or focus on a specific climatic area, for example the RADOST network for adaptation in the Baltic Sea coastline of Germany. The network partners include research institutes and universities, governmental bodies, the industry, and providers of utilities and other services. Usually networks also carry out research projects and implement concrete adaptation measures.

Italy

NUTS II level *regioni* have a varying degree of autonomy with regard to legislative and administrative competences. This is defined by their statutes. The protection of environment, ecosystems and cultural heritage is the exclusive competency of the State. *Regioni* share legislative responsibility with the State in several sectors relevant to climate change adaptation.

The Ministry of Environment, Land and Sea started to prepare the National Strategy for Adaptation in 2012, the key elements of the strategy were published in September 2013. Currently the strategy is going through a second round of consultations, and is expected to be adopted in early 2014. In Italy, *regioni* have planning competencies with regard to climate change adaptation. There are also five *regioni* with special autonomy and two autonomous *province* that have legislative responsibility. The Ministry of Environment, Land and Sea focuses on the integration or mainstreaming of adaptation into sectoral policies at the national level, while governments of *regioni* prepare adaptation plans for actions to be implemented at *regioni* and local levels.

The Regional Agencies for Environmental Protection (ARPA) provide technical, scientific and instrumental support to the governments of *regioni*. Each ARPA documents climate change impacts specific to the *regione* in an annual report; however, these are not comprehensive vulnerability assessments that could form a basis for RAS. So far, only two *regioni* have carried out impact and vulnerability studies and intend to develop a RAS. According to the regional authority of the *provincia autonoma di Trento*, the *provincia* was able to carry out research, planning and action in climate change adaptation because of its fiscal autonomy. Autonomy is an enabling factor for selecting priorities and dedicating funding.

Regioni have been involved in the preparation of the NAS through a questionnaire. The NAS will contain guidelines for adaptation measures in different sectors and for different levels of government, which might drive more focused research and planning at the *regioni* level after the release of the national strategy.

In some *regioni* adaptation measures have been taken, mostly with regard to information sharing and awareness raising; some of these have been carried out in the context of EU-funded Interreg projects. EU funding drives much of the adaptation action at the regional level; but it is too early to assess the impact of these activities on strategic planning in the regions. Capacity building activities on '*Policies for mitigation and adaptation to climate change*' are organised for the convergence *regioni* under the National Operational Programme for Technical Assistance.

Italy is a geographically diverse country where different climate impacts affect different economic sectors. Responding to the most readily visible vulnerabilities, some adaptation actions have been implemented in the mountainous areas, while actions in coastal areas are not as extensive and systematic. Other sectors of particular importance for Italian regions are water management, energy, tourism, forestry and agriculture.

Netherlands

Climate change adaptation is planned at the national and *provincies* (NUTS II) levels; *provincies* are responsible for spatial planning, regional development, transport and the environment. *Provincies* draw up guidelines and endorse plans for spatial development as well as implement environmental protection plans.

The Dutch Government is responsible for the National Programme for Spatial Adaptation to Climate in the national context. The *provincies* are responsible for translating these guidelines into the regional context. Municipal governments are responsible for implementing national and regional policies on the local level. Municipalities have allocated funding and mandate to develop and implement local policy on spatial planning and the environment. Municipalities use *provincie* level spatial planning documents as a basis for more detailed land-use plans.

The historically evident threat of sea level rises, amplified by climate change, has led to an integration of climate change adaptation mainly into current disaster risk reduction plans and projects. The Delta Act on flood safety and freshwater supply was initiated in 2012 as a nationwide adaptation programme providing flood protection. The Delta Programme involves the national government, *provincies* government and *provincies* water boards, municipalities, as well as social organisations, the business community and knowledge institutions. The programme is coordinated by the minister of Infrastructure and Environment.

Authorities at the *provincies* level carry out climate change adaptation activities, according to an agreement with the national level. Ten out of 12 *provincies* have already published key studies/assessments of climate impacts and vulnerabilities affecting the region. Of these ten, eight have collaborated with the Climate Change Spatial Planning research programme to create their 'Climate Impact Sketchbooks' (*Klimaat-effectschetsboek*). These sketchbooks include key assessments of climate impacts and vulnerabilities affecting a *provincies* and provide a base for developing *provincies* level planning documents. Nine of the *provincies* have published key policy/planning documents aimed at climate adaptation. Some of these documents provide a broad overview of adaptation strategies to undertake, whilst a few focus on specific areas such as agricultural or biodiversity adaptation needs. Priority sectors covered are water management, health, agriculture and forestry, recreation and infrastructure.

Poland

In Poland, *województwa* or NUTS II level regions are the main regional level institutions with responsibility for climate change adaptation. There is also a level of devolved administration (state administration) based in the *województwa* that supervise local self-government units (*powiaty*) with regard to compliance with the law. *Województwa* do not have legislative powers but have administrative autonomy and develop regulations for some sectors relevant to climate change adaptation (transport, health, spatial planning, rural development, tourism, environmental protection).

The *województwa* are self-governing authorities responsible for the implementation of public tasks of regional relevance that are not carried out by the central administration (e.g. water management, and in particular flood safety) and have full responsibility for strategic and spatial planning as well as preparation of other environment-related regional plans/programmes. A *województwa* development strategy has to be prepared and adopted in each region.

The NAS was adopted by the Government in October 2013 and constitutes the first strategic document concerning adaptation to climate change in Poland. Sectors covered include water management, agriculture, forestry, biodiversity, health care, construction, transport and NATURA 2020 areas. The strategy explicitly states that adaptation activities developed at the national level should be supported by measures adopted at regional level. In particular, main goals and direction of regional adaptation measures must be contained in *województwa* regional development strategies. The *województwa* executive authorities can choose whether to prepare a dedicated regional adaptation strategy.

Comprehensive studies on the assessment of climate change impacts in Poland have not yet been carried out. Most of the climate change impact and vulnerability studies available at the *województwa* level refer only to sectors or are developed in the context of EU funded projects (e.g. BALTADAPT, ASTRA, BaltCICA). All *województwa* have started to integrate climate change concerns into the regional development strategies, mostly through measures for disaster risk reduction. Such measures are also supported by some of the regional level Operational Programmes for EU Cohesion Policy. According to the NAS, it is expected that all *województwa* will develop a stronger regional framework for research and planning for climate change adaptation activities after 2013. Once adopted, the first phase of the NAP will focus on research of climate change impacts and on the identification of vulnerable sectors; the second phase will focus on the preparation of specific adaptation measures.

Spain

Autonomías or NUTS II level regions have competence for all matters not allocated to the State by the Constitution. This includes environment and climate change adaptation. Autonomías legislate and implement state legislation. The autonomías and the lower levels of governance - the provincias (NUTS III level) and municipios - run their respective affairs autonomously.

Overall responsibility for climate change adaptation in Spain lies with the Ministry of Agriculture, Food and Environment, Directorate General for Coordination of Activities to Combat Climate Change. However, many of the functions regarding environment protection are carried out directly by the *autonomías*, and a strong co-ordination between the national and regional governments in the process of policy development and implementation for climate change is ensured through the work of different bodies

(i.e. the National Climate Council and the Coordination Commission of Climate Change Policies).

The NAS requires all *autonomías* to develop their own climate change adaptation plans or strategies, either as separate documents or within general climate change programmes. Some *autonomías* started addressing adaptation as a work axis within the plans for climate change mitigation. In these cases adaptation is being addressed without building on research (i.e. vulnerability studies and risk assessments). Some other *autonomías*, especially those located in more vulnerable areas, where climate impacts are readily apparent, have begun developing regional scenarios, adaptation strategies and concrete action plans. Many *autonomías* have developed a specific website for climate change issues with the purpose of raising awareness.

Autonomías have also contributed to the creation of the national Climate Change adaptation Platform (launched in June 2013), developed by the Ministry of Environment.

The most systematic approach to socio-economic impact assessments in priority sectors is being developed for coastal areas and the water management sector; some initial estimate of costs and benefits has also been carried out in the biodiversity, forestry and tourism sectors.

Sweden

Län or counties (NUTS III level) are the focus of analysis for Sweden. *Län* are both a level of self-government and of devolved State authority, but do not hold legislative powers. Climate change adaptation policy is developed at the national level, but further strategic action is delegated to the *Län* level. *Län* provide assistance to municipalities in implementation.

The Swedish Commission on Climate and Vulnerability was appointed by the Swedish Government in 2005 to assess regional and local impacts of climate change, including costs. The final report of the Commission was published in 2007; *Sweden Facing Climate Change – threats and opportunities* makes recommendations including increased responsibility for municipalities and *Län* and also facilitates government financial support for large-scale high-cost initiatives. Since 2009, the administrative boards of the *Län* (Country Administrative Board - CAB) are responsible for climate adaptation at regional level. *Län* can go beyond what is required at the national level if they choose to do so. They also coordinate the adaptation work of municipalities. Since 2013, the CABs have additional responsibilities regarding climate change adaptation. CABs are required to assess the municipal climate adaptation efforts in addressing particular vulnerabilities. The CABs are required to develop regional action plans, in cooperation with relevant stakeholders, to guide the local and regional climate adaptation efforts. The work shall be presented to the Ministry of Environment by the end of June 2014. According to the Planning and Building Act, municipalities are required to consider climate change impacts in their spatial development plans.

Climate impacts assessments studies have been carried out for all 21 *Län*; most of them were performed by the Swedish Meteorological and Hydrological Institute. So far two *Län* have developed a RAS; several others are planning to develop RAS in the coming years. There is an elaborated coordination and exchange activity between the 21 *Län*. This has for instance resulted in a report on climate change adaptation and spatial planning that was published jointly by the *Län* administrative boards in 2012. The report provides guidance and recommendations on how municipalities can address

climate change adaptation in spatial planning according to the planning and building act. The National Climate Adaptation Network is the coordination body between the *Län* administrative boards and the national level.

United Kingdom

In the UK NUTS I level countries or regions (England and the three devolved Administrations of Wales, Scotland and Northern Ireland) have legislative powers. These entities hold responsibility for implementation of climate change policy in coordination with the national government.

Climate change adaptation at the national level is the responsibility of the Department of the Environment, Food and Rural Affairs (Defra). It has a coordinating and direction setting role with much of the delivery of adaptation responses being delegated to the Environment Agency in England and to the Devolved Administrations (Wales, Scotland and Northern Ireland).

In 2008 the UK adopted the legally binding Climate Change Act 2008 that creates a long term framework for reducing carbon emissions. It also creates a framework for UK level adaptation to climate change. Under this framework key structures were created such as the National Adaptation Programme, which is an on-going initiative that seeks to co-deliver a sectoral adaptation programme that is based on broad engagement with the sectors and other experts. It aims to bring together all the existing and new adaptation policies and initiatives from across the country – including regional ones - into a single framework that will be reviewed every five years. The first National Adaptation Programme report was published in July 2013 together with an assessment of the economic impacts of the National Adaptation Programme.

The Climate Change Act of 2008 required the Devolved Administrations of the *countries* (NUTS I) to carry out the UK Climate Change Risk Assessment (CCRA). All *countries* have carried out several climate assessment studies, and most of these are produced either as part of or built on the evidence of the CCRA. All *countries* have also developed planning documents directly aimed at adaptation. The majority of these are supported by Climate UK, the national network of climate change partnerships which aims to share information and learning about adaptation across the UK. Some of the *country* planning documents also provide support and training tools to local authorities and communities.

Generally the UK approach to adaptation can be considered sectoral rather than regional: Departmental Adaptation Plans also required by the Act are planning documents that set out the various sectoral Government Departments' adaptation policies and priorities. The abolishment of regional scale planning with the closure in 2010 of Regional Assemblies and Regional Development Agencies (and associated Regional Spatial Strategies) means that there is now limited regional planning in the UK, beyond the NUTS I level *countries* of England, Wales, Scotland and Northern Ireland. Historically many Regional Development Agencies had developed regional climate change adaptation strategies but it is not clear if these are still being implemented. These changes are still at a relatively early stage and it is difficult to assess how climate change is, or is not, integrated into this new arrangement. In the meantime, climate change adaptation is planned at the level of devolved administrations and mainly implemented by local authorities and councils, many of which have been very active in preparing for the impacts of climate change.

2.3 Group 2: Member States where regions can have an implementing and/or an enabling role

Table 2: Group 2 Member States at-a-glance

Member State	Key characteristics	Key findings
Czech Republic	<p>Area: 79,000 km² Population: 10.5 million Regional division: 8 <i>oblasts</i> (NUTS II); 14 <i>kraje</i> (NUTS III) NAS: currently under preparation</p>	<p>At the <i>kraje</i> level, no strategic documents have been developed that are specifically aimed at adaptation. Some consideration for adaptation is available in other documents, such as <i>kraje</i> development strategies. Activities typically cover awareness raising and early warning systems. Main sectors: water management, agriculture, health, energy, and tourism Where activity exists, it is mainly financed through the Operational Programme (OP) for Environment.</p>
Croatia	<p>Area: 56,590 km² Population: 4.41 million Regional division: 2 <i>regije</i> (NUTS II); 21 <i>županije</i> (NUTS III) NAS: currently under preparation</p>	<p>At the <i>županije</i> level one strategic documents has been adopted explicitly targeting adaptation – a regional action strategy for coastal adaptation for Dubrovnik-Neretva. There is a number of scientific papers on main vulnerabilities. The preparation of a National Adaptation Strategy started in 2013. Main sectors: health, droughts, floods, forestry and tourism There is a Network for Climate Change Adaptation.</p>
Denmark	<p>Area: 42,894.8 km² Population: 5.6 million Regional division: 5 <i>regioner</i> (NUTS II); 11 <i>landsdele</i> (NUTS III); 98 <i>kommuner</i> NAS: adopted in 2008</p>	<p>Most <i>regioner</i> have included adaptation measures in their regional development plans. Three of the 5 <i>regioner</i> have included adaptation in their climate change strategies; another one is currently preparing a climate strategy. Main sectors: health, water management, transport, building A coordination forum for adaptation (KoK) has been established to coordinate efforts between different levels of governance.</p>
Finland	<p>Area: 338,000 km² Population: 5.4 million Regional division: 5 <i>suuralueet</i> (NUTS II); 19 <i>maakunta</i> (NUTS III) NAS: adopted in 2005; currently revised</p>	<p>The <i>maakunta</i> are required to prepare climate change strategies that consider adaptation. 13 <i>maakunta</i> have developed climate strategies, while the remaining 6 are currently preparing the documents. Main sectors: transport, agriculture and forestry, tourism Finland's approach is to mainstream adaptation across administrative levels with the help of a coordination group.</p>
Greece	<p>Area: 131,957 km² Population: 10.8 million</p>	<p>Some progress in research, planning and actions towards adaptation in the <i>perifereies</i> has been observed so far. Adaptation is</p>

Member State	Key characteristics	Key findings
	<p>Regional division: 13 <i>perifereies</i> (NUTS II); 51 <i>nomoi</i> (NUTS III)</p> <p>NAS: currently under preparation</p>	<p>mentioned as an objective in some <i>perifereies</i> spatial development plans. Independently from the national level, <i>perifereies</i> have taken part in EU funded projects for climate change adaptation.</p> <p>Main sectors: water management, forestry, agriculture, biodiversity, ecosystems, transport and health.</p>
Hungary	<p>Area: 93,028 km²</p> <p>Population: 10.0 million</p> <p>Regional division: 7 <i>tervezési-statisztikai régiók</i> (NUTS II); 19 <i>megyék</i> and the capital region (NUTS III)</p> <p>NAS: Adopted in 2008, currently revised</p>	<p>Research and planning activities have taken place at the national level. Very little information has been found about any planning or action at the <i>tervezési-statisztikai régiók</i> or the <i>megyék</i> levels.</p> <p>Main sectors: water management</p> <p>Imminent climate change threats are related to floods in river basins, which cut across <i>régiók</i> and <i>megyék</i> level boundaries.</p>
Lithuania	<p>Area: 65,000 km²</p> <p>Population: 3.3 million</p> <p>Regional division: 10 <i>apskritis</i> (NUTS III)</p> <p>NAS: adopted in November 2012</p>	<p>Two of the 10 <i>apskritis</i> have conducted comprehensive vulnerability studies, and no RAS have been adopted yet. Most action has addressed coastal management and flood risk; and has been part of EU funded projects ASTRA and BaltCICA.</p> <p>Main sectors: ecosystems, coastal areas, health, energy, transport, industry, and forestry.</p>
Romania	<p>Area: 238,391 km²</p> <p>Population: 22.2 million</p> <p>Regional division: 8 <i>regiuni</i> (NUTS II); 41 <i>judet</i> and Bucharest (NUTS III)</p> <p>NAS: A National Climate Change Strategy adopted in July 2013</p>	<p>Research, planning and action is not yet addressed at the regiuni level. A number of sectoral studies have been carried out within different organisations and projects. Thus far, one study of climate change impacts and vulnerabilities was found at the local level.</p> <p>Main sectors: coastal issues, agriculture, forestry, water management and human settlements.</p>
Slovakia	<p>Area: 49,000 km²</p> <p>Population: 5.4 million</p> <p>Regional division: 4 <i>oblasti</i> (NUTS II); 8 <i>kraje</i> (NUTS III)</p> <p>NAS: First draft adopted in August 2013.</p>	<p>No vulnerability assessments and planning documents have been yet developed at the <i>kraje</i> level, with the exception of the capital Bratislava. Measures have been implemented at the municipal level through the <i>Landscape Revitalisation and Integrated River Basin Management Programme</i>.</p> <p>Main sectors: water management, agriculture, forestry, biodiversity, and health.</p> <p>The focus in all adaptation activity is on flood risk and water supply management.</p>

Group 2: Overview

This group includes those Member States in which regions can have both an *enabling* and *implementing* role. In these countries regions play a number of roles:

- Regions may act within the strategic framework developed at the national level;
- Regions may develop their own strategies and plans to guide the local level; and
- Regions may implement adaptation activities that cannot be tackled in a single locality (for example river basin management).

The regions considered in this group tend to be smaller than for the first group and typically at the NUTS III level (e.g. counties and provinces). A number of Member States included in this group have recently experienced substantial administrative reforms, where additional planning responsibilities have been transferred to the regional level (for example in Greece and Slovakia); in these cases it is still early to assess the impacts these changes may have on climate change adaptation action.

Some Member States have adopted strategic level documents very recently: Romania adopted a National Climate Change Strategy (with mitigation and adaptation components) in July 2013; Slovakia adopted a first draft of a NAS in August 2013.

Group 2: Member State summaries

Czech Republic

The Czech Republic has three level of governance: central, regional and municipal. *Kraje*, or NUTS III regions have responsibilities regarding environmental protection, especially the protection of fauna and flora. Municipalities are responsible for water management and treatment, environmental protection and urban heating at city level. Implementation at local level is facilitated by the *kraje* level; but is financed by the national level or EU funds.

While the necessity to adapt to negative climate change impacts is mentioned in some regional development strategies and river basin management plans, little has been done so far at the *kraje* level regarding climate change adaptation. Projects including adaptation aspects are currently conducted in some regions, supported via the Cohesion Policy national-level Operational Programme for environment, mostly under the priority axes 'reduction of flood risks', and 'improving the state of nature and landscape'. It is up to the *kraje* and municipalities to submit project proposals for funding through this programme. Research has shown that the forthcoming NAS is lacking the connection with relevant regional (*kraje*) and local authorities that are responsible for implementing adaptation measures on the ground.

Climate change adaptation is included in regional level strategic documents (e.g. development programmes and strategies), but none of the *kraje* has developed a strategic document specifically aimed at climate change adaptation. Concrete actions typically cover awareness raising and early warning systems. The forthcoming NAS identifies water management, agriculture, health, energy, and tourism as the priority sectors.

Croatia

Croatia has three levels of governance: central, *županije* (NUTS III) and municipal (*obcine*). There are also larger regions (NUTS II) which do not have administrative functions. The main responsibility with climate change adaptation planning lies with the Ministry of Environmental and Nature Protection on the central level. *Zupanje* may also develop regional adaptation strategies.

Preparation of a NAS was started in 2013. There is a regional action strategy for coastal zone adaptation to climate change for the Dubrovnik-Neretva *županija*. A draft sectorial adaptation strategy for an integrated coastal management has been prepared for the Šibenik-Knin *županija*.

A number of vulnerability studies and assessments have been carried out at the national level. The main threats studied so far are floods, heat waves and forest fires. The most vulnerable sectors for the country are health, tourism, agriculture and forestry. A few measures have been implemented for the flood protection and coastal zone management.

Croatia has participated in a number of EU-funded projects related to Climate Change adaptation, such as Climate for Culture; Drought Management Centre for Southeastern Europe; Danube Floodrisk; Atopica and MIRTO. The City of Koprivnica and the Meteorological and Hydrological Service participate in the EU-funded Orientgate project, which aims to integrate climate knowledge into policy and planning.

Denmark

Though *kommuner* (municipalities) carry most responsibilities for climate change adaptation, *regioner* (NUTS II regions) include climate adaptation in their regional development policy. *Regioner* also foster cooperation between the region and its *kommuner*; and also among *kommuner*.

The responsibility for climate change adaptation is shared between the national and *kommuner* levels. *Kommuner* have the main planning competences, and they are identified in the NAS as the level of implementation of adaptation policy. The NAS requires all *kommuner* to develop an action plan for climate change by the end of 2013. To support municipalities and local level decision makers in their work, the Danish Nature Agency issued a Guidance document in 2013 .

Regioner have no formal responsibilities in the field of adaptation, but have started tackling adaptation through their regional development plans – for most Danish *regioner* these include adaptation measures. Two of the five Danish *regioner* have carried out studies on the impacts and risks of climate change, as the basis for regional strategic planning for adaptation. Sectors most covered include health, water management, transport, and buildings.

Most strategic-level planning for climate change at the *regioner* level has so far focused on mitigation; three of the five *regioner* have included adaptation in overall climate strategies and one region is currently preparing an overall climate change strategy.

The *regioner* also assist *kommuner* by developing tools for monitoring, assessment and prediction, and facilitate trans-municipal cooperation in the region. The Capital region and the *regioner* of Central and Southern Denmark for instance have taken

initiative to foster dialogue on adaptation solutions between the regions and municipalities.

Both *regioner* and *kommuner* are involved in coordinating mechanisms across Denmark. Following the adoption of the NAS, a horizontal coordination forum on adaptation (KoK) was established to ensure a coordinated effort among the different levels of governance. This forum gathers all relevant state authorities and a representative from each of the municipalities, regions and coordinating bodies for research.

Finland

Management of the climate change adaptation responsibilities in Finland lies with the Ministry of the Environment, and Ministry of Transport and Communications. The regional *maakunta* (NUTS III) level and municipal perspectives are represented by the Association of Finnish Local and Regional Authorities in The Coordination Group for Adaptation to Climate Change, steered by the Ministry. The Coordination Group monitors and supports the implementation of the NAS.

The Finnish NAS was adopted in 2005, the updated version is currently in its final review phase and will be published shortly. Adaptation is also considered in the National Energy and Climate Strategy, last updated in March 2013.

The Regional councils are required to prepare *maakunta* level climate change strategies, including considerations for adaptation to climate change. Municipalities are consulted in this process, and participate in implementation of the strategies. The main goals of the Government are to include adaptation in all policy sectors and to increase the number of measures that are developed and implemented on the regional and local levels. To date, 13 *maakunta* have already developed climate strategies, while the remaining 6 are currently in preparation stages.

Most *maakunta* level strategies include both adaptation and mitigation measures. Some of Finland's main cities notably Helsinki and Tampere, have outpaced their region in the development of their strategy. Municipalities consider regional climate strategies in their strategic planning processes. Municipalities can provide input into regional level planning. This cooperation between the regional and municipal levels varies across the country.

Much of the practical implementation of Finland's NAS takes place in *maakunta* and in particular municipalities. Municipalities' responsibility for climate change adaptation is defined in the national legislation, where the role of municipalities in assessing adaptation needs, and implementing adaptation measures, is emphasised. Many Finnish municipalities have prepared climate strategies which include some consideration for adaptation. There have been several research programmes targeted to climate change adaptation.

Finland is mainstreaming adaptation across administrative levels and sectors. The NAS is implemented in multi-sectoral cooperation, coordinated by the Ministry of Agriculture and Forestry. This is done through sector specific action plans such as the Action Plan for Agriculture and Forestry and for the Administrative Sector of the Ministry of Environment. The environmental and transport authorities have progressed furthest in handling adaptation issues while in other sectors climate change adaptation is still at a research stage.

Greece

Perifereies (NUTS II regions) are self-governing and draft, plan and implement policies at the regional level. There is no hierarchical relationship between *perifereies* and municipalities. The national level is the competent authority for coordinating actions for climate change adaptation and also coordinates the enhancement of mechanisms and institutions for environmental governance.

The Ministry of Environment, Energy and Climate Change (MEECC) is the competent authority for coordinating mitigation and adaptation actions. The NAS is currently being drafted and is expected to be released by 2015. As a part of drafting the NAS, an impact assessment was started in 2013 and is expected to be concluded by 2015. The impact assessment covers among others sectors such as water management, forestry, agriculture, biodiversity, ecosystems, transport and health.

Perifereies have responsibilities in the area of environment and climate change; however, these are mostly confined to management of waste and protected nature areas. No concrete adaptation actions at the *perifereies* level have been observed so far as a result of national policy regarding climate change adaptation. Where adaptation activities have taken place, these have been the result of own initiative or EU-funded projects.

Adaptation to climate change is mentioned as an objective in several *perifereies* level spatial development plans in Greece, including the Attica region and East Macedonia and Thrace. Adaptation has also been addressed by Greek regional authorities through EU funded projects including the Interreg IVC trans-regional initiatives F:ACTS! (Central Macedonia) and RegioClima (Attica). Under the Structural Funds, 'Atmospheric Environment-Adaptation to Climate Change' is a priority axis in the Greek national Operational Programmes for the environment sector, but due to implementation delays no adaptation-relevant projects have been implemented to date; the programme has been extended to 2015.

Hungary

Hungary has a tradition of centralisation in government, and the overall responsibility for adaptation to climate change lies with the Ministry of National Development; however some planning and implementation occurs on the *megyék* (NUTS III) level. The NUTS II regions are mainly responsible for strategic development planning and coordination of EU funds.

A number of vulnerability assessments have been carried out in Hungary since the 1990s. The most comprehensive one to date - the 'Vahava' project - summarised previous work, assessed climate impacts, and proposed possible responses in a number of sectors. It was carried out by the Ministry of Environment and Water, and the Hungarian Academy of Sciences from 2003-2008. The 'Vahava' project team prepared the National Climate Change Strategy 2008-2025, which was adopted in 2008 and covers adaptation as well as mitigation. Hungary has also carried out sectoral studies and strategic planning for adaptation in the tourism sector.

Hungary has ambitious plans to include a revised national adaptation strategic framework into the update of the climate change strategy in 2013, based upon a new and more robust approach to data collection.

However, research found very little information about any adaptation planning or action at the regional level, either in the 7 *tervezési-statisztikai régiók* (NUTS II) or

the 20 *megyék* (NUTS III), which have greater competences in the environmental and planning sectors.

The imminent climate change threats in Hungary are related to floods, particularly within the Danube and Tisza river basins, which both cut across *régiók* and *megyék* level boundaries and require a coordinated approach. There are a number of municipal level adaptation initiatives on-going in Hungary.

Lithuania

Apskritis or counties (NUTS III) and municipalities are the effective level of governance for the implementation of climate adaptation policy in Lithuania. Counties or apskritis consider adaptation in strategic planning documents. Municipalities are identified as the appropriate implementation level in the Action plan for the completion of the NAS.

An Action Plan on the implementation of the goals and objectives of the Strategy of National Climate Change Management Policy 2013-2020 was adopted in April 2013. Municipalities, together with relevant national level ministries, will be responsible for the implementation of the plan. The following priority sectors have been identified: ecosystems, coastal areas, agriculture, health, energy, transport, industry, and forestry.

Activities at *apskritis* level have so far been limited to vulnerability studies in the counties of Panevėžys, and Klaipėda. In Klaipėda, the study was conducted through the EU funded project ASTRA. No *apskritis* level strategies have been adopted yet. The capital city Vilnius is currently developing an Adaptation Action Plan (the first of its kind in Lithuania). Flood risk has received the most attention at the *apskritis* level. The EU funded projects ASTRA and BaltCICA focus on coastal management and flood risks for the city and county of Klaipėda. The counties of Klaipėda and Tauragė have adopted Programmes for preparation of flood threat and removal of flood consequences.

Romania

In Romania, the main responsibility for climate change adaptation rests with the Ministry of Environment and Forests, along with the National Environmental Protection agency, which supervises eight regional agencies and 42 local agencies. *Regiuni* (NUTS II) development regions coordinate regional level development through EU funding, but do not have an administrative status. *Județ* or counties (NUTS III) and municipalities have an administrative status; they liaise with the national authorities and agencies and implement policies.

In Romania, research, planning and action regarding climate change adaptation, have not yet been addressed at the level of *regiuni* and *județ*. There has been some action at the national level. The first National Climate Change Strategy was released in 2005 and covered the period 2005-2007. It included a brief review of climate change adaptation issues and focused on agriculture, forestry, water management, and human settlements. The National Climate Change Strategy 2013-2020 was adopted by the Government in July 2013 and covers both mitigation and adaptation policies. The development of an accompanying Action Plan is expected for 2014.

There is no single comprehensive vulnerability study in Romania, which would discuss the vulnerabilities in sectors or in *regiuni*. A number of studies have been carried out

within different projects. These include studies on impact of climate change on coastal erosion, sea level change, agriculture (wheat production and fruit production) and forestry. For examples of studies have been found at the sub-national level. Some sectoral adaptation activities have taken place within EU-funded projects, for example in agriculture within the Orientgate project.

Slovakia

Kraje (NUTS III regions) are responsible for regional planning and development, but have very few competencies regarding environment and climate change. Adaptation measures are implemented mainly at municipal level. The responsibility for adaptation to climate change lies with the Ministry of Environment, in charge of the implementation and coordination of climate change policy.

A decentralisation process in 2002 transferred new competencies to both *kraje* and municipalities. *Kraje* are responsible for regional planning and development, but have very few competencies regarding strategic level environmental policy, including climate change. The municipalities have decision making powers and budgetary competences regarding local interests. Municipalities are responsible for waste management and sewage, nature conservation and protection of wood species. The management of climate change adaptation takes place at the national level. The first draft of the NAS was adopted in August 2013. A public consultation was concluded in September 2013.

Adaptation measures have been implemented more at municipal level than at *kraje* level, notably through the Landscape Revitalisation and the Integrated River Basin Management Programmes. Cities like Bratislava and Kosice are also active. There have not been any vulnerability assessments or strategic planning documents developed at the *kraje* level, except for the region of Bratislava. Bratislava participated in the EU-funded Interreg IVC project Regioclima (2008-2011) on regional cooperation in adaptation to climate change. An adaptation action plan, with a focus on vulnerability to heat waves, was developed for the city of Bratislava through another Interreg IVC project 'GRaBS' - Green and Blue Space Adaptation for Urban Areas and Eco Towns.

The main issue addressed by adaptation documents at all levels in Slovakia is flood risk management. Water supply is a major issue for Slovakia as a decrease in river runoff is expected, especially in lowlands. Sectoral strategies and action plans have also been adopted in other sectors prone to climate change risks, notably the agriculture, forestry, biodiversity, and health sectors.

2.4 Group 3: Member States where regions have very limited role in climate change adaptation

Table 3: Group 3 Member States at-a-glance

Member State	Key characteristics	Key findings
Bulgaria	<p>Area: 111, 910 km² Population: 7.6 million Regional division: 6 <i>rajoni za planirane</i> (NUTS II); 28 <i>podregiony</i> (NUTS III)</p>	<p>Thus far, no vulnerability assessments or strategic documents addressing climate change adaptation have been developed at the sub-national level. The <i>rajoni za planirane</i> could be an appropriate platform where to include adaptation, given the stronger role of climate change adaptation</p>

Member State	Key characteristics	Key findings
	NAS: currently under preparation	in future Cohesion Policy. The Ministry of Environment has adopted a sectoral rather than a regional approach to climate change adaptation. Main sectors: forestry, agriculture, coastal areas, disaster risk reduction
Cyprus	Area: 9,251 km ² Population: 1 million Regional division: 6 <i>eparchies</i> (LAU I) NAS: currently under preparation	Cyprus recently launched the CYPADAPT project, which will include a comprehensive vulnerability assessment and the drafting of a national adaptation strategy. Activities at the sub-national level mostly focus on awareness raising. Main sectors: coastal areas and biodiversity
Estonia	Area: 45,000 km ² Population: 1.3 million Regional division: 5 <i>groups of maakond</i> (NUTS III); 15 <i>maakond</i> NAS: currently under preparation	No sub-national level adaptation strategies have been developed; but climate change adaptation is considered in the <i>maakond</i> level risk assessment and crisis management plans. Sub-national level vulnerability studies are carried out in most cases as part of EU funded project such as ASTRA and BaltCICA. Other projects address issues according to natural borders (e.g. coastal areas, river banks) rather than administrative borders. Main sectors: water management, coastal areas, disaster risk reduction
Ireland	Area: 70,273 km ² Population: 4.5 million Regional division: 2 <i>regional assemblies</i> (NUTS II); 8 <i>regions</i> (NUTS III) NAS: adopted in 2012	There has been very limited climate change adaptation activity in the <i>regions</i> . The National Framework requires that localities incorporate climate change adaptation strategies into future reviews of their development plans. Some local authorities have undertaken small scale projects and participated in EU funded projects on adaptation. Main sectors: coastal areas
Latvia	Area: 65,000 km ² Population: 2.3 million Regional division: 6 <i>statistiskie reģioni</i> (NUTS III) NAS: currently under preparation	No vulnerability assessments and strategies have been drafted at the <i>statistiskie reģioni</i> level, with the exception of the Riga planning region. Most vulnerability mapping and concrete measures have been developed through participation in EU funded projects such as ASTRA, BaltCICA, BalticClimate and BaltAdapt. Main sectors: coastal areas, disaster risk reduction, water management, agriculture and forestry
Luxembourg	Area: 3,000 km ² Population: 0.53 million	Climate adaptation policy is entirely driven at national level. No sub-national level vulnerability studies and planning

Member State	Key characteristics	Key findings
	Regional division: 13 <i>cantons</i> (LAU I) 106 <i>communes</i> NAS: adopted in May 2011	documents for adaptation have been developed. Main sectors: biodiversity, water management, forestry and agriculture.
Malta	Area: 316 km ² Population: 0.42 million Regional division: 2 <i>gżejjer</i> (NUTS III) NAS: adopted in 2012	Climate adaptation is driven at the national level. A major sector for Malta is water management and in particular flood risks as this sector has historically been vulnerable in Malta. A number of key national strategic planning documents already include consideration for climate change adaptation in water management. Main sectors: water management, disaster risk reduction
Portugal	Area: 92,212 km ² Population: 10.6 million Regional division: 7 <i>regiões autónomas</i> and <i>comissões de coordenação regional</i> (NUTS II); 30 <i>grupos de municípios</i> (NUTS III) NAS: adopted in April 2010	Planning occurs at the national level and implementation at the <i>municípios</i> level. Sub-national research and planning activity has occurred in the autonomous islands of Azores and Madeira, and also the capital region of Lisbon. Sub-national vulnerability studies and concrete activities have been carried out as part of EU funded projects such as CLIMAAT, CLIMARCOST and Adaptclima. Main sectors: coastal areas, forestry, disaster risk reduction and nature conservation
Slovenia	Area: 20,000 km ² Population: 2.1 millions Regional division: 2 <i>kohezijske regije</i> (NUTS II); 12 <i>statistične regije</i> (NUTS III) NAS: currently under preparation	Climate change adaptation is driven at the national level and implemented at the local level. The <i>statistične regije</i> are required to develop regional development plans that should include vulnerability assessments for climate change impacts. Sub-national research and activities have focused on the Alpine regions and have been carried out as part of EU funded projects Aplstar and C3Alps. Main sectors: water management, disaster risk reduction, agriculture and forestry

Group 3: Overview

This group consists of EU Member States where regions have no defined role in climate change adaptation, generally where there is a direct link between the national and the local level, circumventing the regional level. In most of these countries, regional level institutions are either a devolved level of central administration or a level of governance with limited administrative powers. In Bulgaria, Cyprus, Estonia, Latvia, Luxembourg, Malta, and Slovenia, local authorities are the only level of self-

government⁴ or with some autonomy from the central government. Several of these countries are too small to have the need for an intermediary level with a strong role.

In all Member States in Group 3, planning action and vulnerability assessments has been undertaken at national level but action has occurred at local level. Many of the local-level activities have been carried out within EU funded projects.

Group 3: Member State summaries

Bulgaria

Climate Change Adaptation policy is developed at the national level by the Ministry of Environment and Water, and implemented at the local or municipal level. The regional and district levels are historically not executive governance levels and play a minor role in climate change adaptation.

In Bulgaria, the national level is responsible for climate change adaptation. *Rajoni za planirane* (NUTS II) are planning regions for statistical purposes and the planning of EU Cohesion Policy funds. *Podregiony* (NUTS III districts) are devolved levels of the State administration. Implementation of climate adaptation policy occurs at the municipal level, which has administrative competencies and a certain degree of financial autonomy. Similarly, spatial planning takes place at the national and municipal levels.

No vulnerability assessments or strategic documents specifically aimed at climate change adaptation have been developed on the sub-national level. The regional development plans of the *rajoni za planirane* (NUTS II) do not currently include provisions for climate change adaptation but these documents present an appropriate platform where climate change adaptation considerations could be included in the future. Given the stronger role of climate change adaptation in future Cohesion Policy, it may be expected that these regionally-focused development plans will catalyse further consideration of climate change impacts at the regional level in Bulgaria.

The Ministry of Environment has adopted a sectoral rather than a regional perspective when addressing climate change adaptation. The ministry is currently tendering vulnerability assessments by sector with the World Bank (to take place between 2013 and 2014). The assessment will form the basis of a National Climate Change Strategy. The first phase of the strategy will propose concrete sectoral adaptation measures. The few measures that have been implemented focus on flood risks and disaster risk reduction, coastal erosion, and the agricultural sector.

Cyprus

There is no self-governing regional level; municipalities are self-governing entities. Planning and implementation of climate policy occur at national level and are managed by the Ministry of Agriculture, Natural Resources and Environment.

Cyprus is divided into six *eparchies* or districts forming a decentralized level of governance between the national and the local levels. Municipalities and communities (in rural areas) are self-governing, while the *eparchies* are not. Climate change policy

⁴ Here and further, self-government refers to administrative units where the population of that unit elect a government, which is then responsible for managing the unit, according to the functions delegated to that specific level of administration.

is managed solely at the national level. Adaptation measures are implemented through sectoral policies by relevant ministries. Regarding spatial planning and urban policy, responsibilities essentially lies with the Minister of Interior though the Ministry has delegated certain responsibilities to the larger municipalities.

So far only impact assessments and awareness raising actions have been conducted at local level, usually within a national or EU project. Cyprus recently launched the CYPADAPT project (expected to be completed by March 2014) which will include a comprehensive vulnerability assessment and the drafting of a national adaptation strategy. Within the CYTADAPT project, awareness-raising events have also been organised in four of the six *eparchies*.

On a more local level, vulnerability assessments for specific local areas in the district of Larnaca and Limassol have been conducted through EU funded projects (COASTANCE and MAREMED projects) or by the national Research promotion foundation.

The sectors that have been mostly addressed within these activities at local level are coastal management and biodiversity. As part of the Coastal Area Management Programme for Cyprus, a pilot case study at the southern peri-urban coastal area of Larnaca Town has been conducted in cooperation with of Larnaca Municipality and the communities of Pervolia, Meneou and Kiti.

Estonia

In Estonia, there is no self-governing regional level; *omavalitsus* or municipalities are self-governing entities. Climate change adaptation policy is the responsibility of the national level Ministry of Environment. Implementation is done through devolved government offices in the 15 *maakond* or counties (which are a subdivision of the NUTS III level) and at the municipal level.

Estonia has not yet developed a comprehensive national strategy for adaptation to climate change. Under the EEA/Norway grant for developing a NAS (2013-2016) a strategy is currently in a preparatory stage. The process is coordinated by the Climate and Radiation Department in the Ministry of Environment (MoE) and the strategy is expected to be released by 2016. To date, no sub-national level adaptation strategies have been developed. Relevant documents for adaptation are the risk assessments and crisis management plans that the *maakond* have to update regularly. As these are small administrative-only units, they usually do not have their own financing for climate change adaptation projects. So far, the majority of activities in climate change adaptation led at the sub-national level have occurred through EU funded projects such as ASTRA, BaltCICA, BalticClimate and BaltAdapt. Other projects involve *omavalitsus* according to natural borders – water catchment areas, coastal areas, river banks – rather than administrative borders.

At the sub-national level, the sectors that have received the most attention are water management, including flood risks and coastal zones management, especially through the ASTRA and BaltCICA projects. Flood risk is a major issue that some *maakond* and *omavalitsus* are currently addressing through crisis management programmes or water and sewerage system development plans.

Ireland

In Ireland, regions and regional assemblies have limited competencies and a low degree of autonomy, though they are granted regional planning competences, such as the preparation and adoption of regional planning guidelines. Local level authorities – known as city councils or county councils – are identified by the National Climate Change Adaptation Framework as the appropriate implementation level. These authorities are responsible for integrating climate change adaptation measures into their future planning decisions.

Ireland has two NUTS II *regional assemblies*, which were created in 1999 for the purposes of managing EU Cohesion Policy funds. Within these two NUTS II regions there are eight NUTS III *regions*. These *regions* are responsible for the preparation and adoption of regional planning guidelines, with consultation from relevant local authorities. As these guidelines must contain information on the likely significant effects on the environment from implementing the guidelines, it can be expected that they will need to take into account climate change impacts and adaptation measures. There has however, been very limited regional-level activity on adaptation in Ireland.

The National Framework requires that localities incorporate climate change adaptation strategies into future reviews of their development plans; these review processes should be underway by mid-2014. The Climate Action and Low Carbon Development Bill, which includes legislation on climate change adaptation, should be published by the end of 2013. Some local authorities have undertaken small scale projects and participated in EU funded projects on adaptation, such as Cork or Donegal. These initiatives essentially concern coastal management.

Latvia

The responsibility for climate change in Latvia lies with the Ministry of Environment Protection and Regional Development. Planning for regional level climate change adaptation occurs at the national level and implementation at the self-governing municipal level, circumventing the *statistiskie reģioni* (NUTS III) level.

In February 2013 a roadmap for drafting a NAS in Latvia was developed as part of the EU-funded BaltClim project. The adaptation of a NAS is planned for 2015 or 2016. In the 2013-2014 period a comprehensive vulnerability assessment is planned for climate scenarios up to 2100. Some adaptation measures have been taken at the *statistiskie reģioni* level, mostly with regard to information sharing and awareness raising.

Most concrete adaptation options and activities have occurred with regards to coastal and river basin management, where floods, storm surges, coastal erosion and extreme temperatures have been identified as the main risks. Coastal vulnerabilities have been mapped and adaptation activities have been developed mainly through EU funded trans-boundary projects, such as ASTRA, BaltCICA, BalticClimate and BaltAdapt (Interreg IIIB, Baltic Sea Region Programme 2007-2013). Specific to sectors, the national research programme 'Kalme' is focused on climate change impact on water environment in Latvia. Latvian State Forest Research Institute 'Silava' has carried out research on impact of climate change and environmental pollution on forest stand development; and an evaluation of extreme wind speed influence on forest stand stability and the development of decision-making support systems.

Luxembourg

There is no self-governing sub-national level in Luxembourg. Planning and implementation of climate policy occur at national level. *Communes* or municipalities are involved in mitigation policy through a partnership with the government, but no similar mechanism exists for adaptation.

Luxembourg has two levels of governance, central and municipal (*communes*). Other intermediary levels (*districts* and *cantons*) are levels of State administration without own competencies. The *communes* have administrative competences over matters of local interests, notably the management of local infrastructures, water management and protection, and local planning, but are under the District Commissioner's direct supervision. Given the small size and the administrative organisation of the country, climate adaptation policy is entirely driven at national level. *Communes* are involved in the climate policy through a Climate Pact between the State and the *communes*, which entered into force in January 2013. Under this Pact, the national level can financially support *communes* implementing mitigation and energy efficiency measures. No similar initiative exists for adaptation, but the Pact would provide an appropriate platform for this.

The municipal level was involved in the steering group in charge of supervising the elaboration of the NAS (adopted in 2011). In May 2013, the government adopted the second Climate Action Plan, which focuses on mitigation measures, but also refers to the 2011 Adaptation Strategy and includes some adaptation measures.

The national strategy has focuses on four main sectors: biodiversity, water management, forestry, and agriculture. These four sectors received also most attention in vulnerability assessments led at national level, essentially by the Gabriel Lippmann Public Research Centre.

Malta

Planning and implementation of climate policy occur at national level in Malta; the Ministry for Resources and Rural Affairs is the responsible authority.

Given the small size of the country, climate adaptation policy is driven at the national level. At the sub-national level, the *distretti* (district committees) and the *kunsilli* (local councils) have only limited competences mainly related to local public services. According to the NAS (adopted in 2012), the Malta Resources Authority is the main competent authority for climate change policy, and as such will be in charge of monitoring the implementation of adaptation measures, ensuring mainstreaming of adaptation measures. Adaptation measures will be implemented in sectoral policies by the relevant ministries.

A major sector for Malta is water management and in particular flood risks as this sector has historically been vulnerable in Malta. A number of key national strategic planning documents already include consideration for climate change adaptation in water management. Specific to the Gozo island, a study is underway to determine infrastructural requirements for the distribution of more sustainable sewage treatment technology.

Portugal

In Portugal, planning occurs at the national level while implementation occurs at the local level. The two autonomous islands (Azores and Madeira) are exceptions, as they have or are in the process of having their own adaptation strategies.

The regional level, *regiões autónomas* (NUTS II) and *grupos de municípios* (NUTS III), do not have responsibilities for climate change adaptation. Responsibility for spatial planning is shared between the national and the local level. In the same way, *regiões autónomas*, except for the autonomous islands, are not involved in the design of the national adaptation strategy.

Both the *regiões autónomas* and *municípios* levels participated in the process of developing the NAS. The process was coordinated by a group created to tackle cross-sectoral issues. The group gathered representatives from the national level, the National Association of Portuguese Municipalities, and representatives of the autonomous islands. The first Progress Report on National Climate Change Adaptation was published in September 2013.

Because of the division of administrative competencies, activity regarding climate change adaptation has been limited at the *regiões autónomas* and *grupos de municípios* levels, with the exception of the capital region of Lisbon. Most activity occurs in the autonomous islands of Azores and Madeira. Azores has already developed a regional strategy for climate change, which will be published in late 2013 or early 2014. Azores has also created a specific governance structure related to climate change, the Climate Change Commission for the Autonomous Region of the Azores (RAA), gathering entities responsible for health, agriculture, forestry, civil protection, as well as climate experts. Madeira is planning to develop a regional strategy (tentatively expected in 2015). Both islands have led vulnerability studies, mainly through EU funded projects, such as CLIMAAT, CLIMACOST and AdaptClima. The focus of these activities has been on coastal management, forest management, risk prevention and nature conservation.

Slovenia

Climate change adaptation is driven by the central government. Implementation occurs at the local level as municipalities have relevant competencies and are the only level of self-government.

The *kohezijske regije* (NUTS II) and *statistične regije* (NUTS III) regions, created in 2007, are considered statistical units in Slovenia without administrative status. Municipalities are the only level of self-government; they have an extensive role regarding spatial and urban planning, housing, water management, economic development, tourism and environmental protection. Spatial planning competencies are also shared between the national and local levels.

According to the National Spatial Planning Strategy, each *statistične regije* is required to prepare a regional development plan; the accompanying guidelines state that the plans should include vulnerability assessments of climate change impacts.

At the *kohezijske regije* and *statistične regije* level, climate change vulnerability assessments and awareness raising activities have been carried out as part of EU funded projects, such as CLISP, ALPSTAR and C3Apls, with an emphasis on the vulnerabilities of the Alpine regions.

Priority sectors, where national level vulnerability studies have been carried out, are agriculture and forestry. National level adaptation policy guidelines are available for agriculture, forestry, biodiversity, water, health and natural disasters. Flood risks and water management are also important areas of focus; several national and EU funded projects are currently on-going with emphasis on capacity building and strategic planning.

2.5 Synthesis and conclusions on adaptation at the regional level in the EU

The nature and extent of adaptation at the regional level varies across the EU Member States. In the larger, more decentralised Member States, regions can provide strategic direction to the lower levels of governance through developing strategic planning documents as a result of national level requirement (e.g. as in France, Belgium and Spain) or on their own initiative (e.g. in Sweden, Germany and Poland). Group 1 regions also provide assistance to stakeholders through provision of scientific information, funding, guidance, and technical assistance. There is a range of experience across the smaller and less populated countries; here regions often have competence for certain areas of environmental policy but do not have a clear mandate for carrying out or coordinating adaptation activities. Meanwhile in some of the Member States, particularly the smaller ones, there is no clear role for regions in adaptation. In some cases, however, this means that small, fragmented local authorities are left to address adaptation independently. This can be difficult if the national government is not fully equipped to support them, and these local authorities are not equipped for or used to working together on common issues and interventions.

Some Member States - mainly in the EU 15 - have many years of experience in assessment and planning for climate change adaptation; others are just getting started. The larger, more decentralised Member States tend to also be more advanced, whilst the smaller Member States - mainly in the eastern and southern parts of the EU - have less experience overall. There are some exceptions to this, however, and as a general rule, regions in the more advanced Member States have made more progress than in the less advanced ones, regardless of the level of decentralization.

The role of regions in adaptation

In some of the larger and more advanced Member States, regions support and coordinate adaptation across lower-level authorities. For example, in Germany, regions or *Bundesländer* provide a comprehensive climate change adaptation framework, similar to national level arrangements in other Member States. *Bundesländer* carry out region-specific assessments; develop RAS; and have climate change adaptation networks, where stakeholders exchange experiences and share best practices. Similarly, in Spain, most *autonomías* have RAS and dedicated climate change websites, and they have participated in the development of the national level Climate Change Adaptation Platform. The lessons learned and the components of the different multi-level governance approaches to the process of research and planning for adaptation should be exchanged between the EU Member States to promote further adaptation action, especially in Member States that lag behind.

Strategic planning for adaptation

In countries with a greater degree of decentralization – typically larger Member States from the EU 15 group – strategic planning for climate change adaptation is well underway. According to the research, about a third of all the regions in Group 1 countries (all are at NUTS 2 level except for those in Belgium, Sweden and the UK)⁵ already have adaptation strategies in place. These range from a comprehensive strategic document (e.g. RAS in German *Bunderländer*), based on sound vulnerability assessment; to action plans to implement a NAS (e.g. regional action plans in Belgium); to a section about intentions for adaptation within a greater climate change strategy largely focused on mitigation (some regions in Spain). Sometimes the different types of strategic frameworks can be found across regions within the same Member State. For example, some regions in Spain and Austria have a dedicated regional adaptation strategy or plan, whilst others have chosen to integrate adaptation into an overall climate policy or in an overall development strategy.

Another key finding concerns the state of advancement on adaptation issues in the country. With some exceptions, regions generally follow the lead of the national level government, and take directions from national level policies and strategic documents. So in countries where the national level has made considerable progress on adaptation in the past decade, regions also tend to be more advanced in terms of carrying out regional-level studies and assessments and developing comprehensive and detailed adaptation strategies. Eight of the ten most decentralised (Group 1 in Chapter 2) countries⁶ have had NAS adopted some several years already or have otherwise made considerable progress in research and assessment; it is in these countries where regions have competence and a political mandate for adaptation and most of them are quite active in research and planning for adaptation. Conversely, in Italy (NAS expected in 2014) and Poland (NAS adopted in October 2013), where the national level process has been slower, regional work also lags behind. There are also important differences across these countries; some regions are more proactive and advanced than others. This is particularly the case in Italy.

Some of the less populous, more centralised countries are relatively well advanced in climate change adaptation overall. Finland was the first EU Member State to adopt a national adaptation strategy in 2005, and this document requires regions (*maakunta* at the NUTS III level) to consider adaptation in their overall climate change strategies; according to the research around two-thirds have done so, but these are not dedicated adaptation strategies. In the on-going revision of the NAS, one of Finland's goals is to better integrate regional and local level work into the overall strategic plan. In Denmark most NUTS II regions do consider adaptation in regional development plans and climate change strategy and a coordination forum exists for adaptation across the different levels of governance.

Outside of Denmark and Finland, there has been no comprehensive adaptation planning at the regional level in the Group 2 countries (e.g. Czech Republic, Croatia, Greece, Hungary, Lithuania, Romania and Slovakia). This is despite the fact that the regions in these countries all have some degree of competence for environmental planning. In Greece and the Czech Republic, some regions include considerations for climate change adaptation in strategic planning documents such as regional development plans or regional spatial plans. This is done on a voluntary basis, based

⁵ In Belgium and the UK, the regions are at NUTS I level; in Sweden, at the NUTS III level.

⁶ Austria, Belgium, France, Germany, the Netherlands, Spain, Sweden and the United Kingdom. Poland adopted a NAS very recently (October 2013) and Italy will adopt a NAS in the near future.

on the needs and priorities of the region. In many Member States that lag behind in developing a strategic climate change adaptation framework, much of the activity at the sub-national level has taken place as part of EU funded projects. These have mainly concentrated on geographic and thematic areas where climate threats are already evident or are imminent such as coastal areas (e.g. the BalticClimate and ASTRA projects) and mountainous areas (e.g. the Alpstar and C3Alps projects).

In the Group 3 countries, all strategic planning regarding climate change adaptation occurs at the national level. Implementation occurs either at the national level or the local level. Thus far four of the nine countries have adopted a NAS; and all four have done so relatively recently⁷.

The research also showed that adaptation is not always directly dealt with along administrative borders within EU Member States according to strategic plans that cover those administrative units (e.g. national or regional adaptation strategies). While the adaptation strategies are important overall coordination methods, adaptation is often carried out via integration into sectoral policies and plans, across levels of governance. A greater focus on managing adaptation through sectoral planning (as opposed to planning by administrative or geographic unit) has been put forward by the UK, where government offices at the regional level have recently been abolished and more responsibility has been devolved to the county and municipal levels. This was also mentioned in Bulgaria, which has a history of centralisation and regions therefore lack legal competence and administrative capacity to carry out functions related to climate change adaptation. In Bulgaria, several sectoral ministries, such as Ministry for Agriculture, Ministry of Economy, Energy and Tourism and Ministry of Regional Development and Public Works have integrated adaptation into strategic planning documents. These efforts have taken place in the absence of a NAS or a comprehensive adaptation framework at the national level. In Finland, the 2005 NAS follows a sectoral rather than geographical approach for describing climate change impacts, where each ministry was responsible for its own sector-specific review. It also states that the NAS will be first implemented within sectoral ministries in cooperation with relevant stakeholders; autonomous adaptation by the industry and citizens is expected at a later stage and implementation across multiple levels of governance is not considered.

Research and assessment

Regarding research activities, a similar mixed picture emerges. All Group 1 countries have performed vulnerability assessments in the sectors that have been identified as the most vulnerable or the most important for economic activity. Depending on the abilities and administrative structures, these have been financed by regional or national level authorities, or through EU funds. While there are vast geographical and climatic differences between the Group 1 countries, sectors most often identified include water management, disaster risk reduction, health and agriculture. At the regional level, about two thirds of the regions have carried out comprehensive vulnerability assessments. A number of regions expect to undertake studies in the near future. In most countries where regional assessments are carried out, these have been performed in all or almost all regions (e.g. in Austria, Belgium, Germany, Netherlands, Spain, Sweden, and the UK). In some others, no or very few regions have comprehensive vulnerability assessments (e.g. Poland and Italy respectively).

⁷ Portugal in April 2010, Luxembourg in May 2011, Malta in May 2012, and Ireland in December 2012.

Vulnerability studies have been carried out at the national level for most, but not all Group 2 countries. Regions in Denmark, Finland and Lithuania have carried out comprehensive vulnerability assessments. In Romania, one local level vulnerability assessment was identified through the research. In other countries of Group 2, vulnerability assessments have not yet been carried out at the regional level, but regions have the mandate to do so. Similarly to Group 1 countries, concrete adaptation activities address particular vulnerabilities, and are focused on awareness raising. Sectors that have received the most attention are water management and health.

Sub-national vulnerability studies have been carried out in some countries (e.g. Estonia, Latvia, Cyprus, and Portugal) as part of EU-funded projects that address vulnerabilities of coastal areas.

Across the Member States there has been a significant amount of research done through EU-funded projects; often this research addresses climate change adaptation within a specific sector or geographic area (e.g. coasts, mountains, forests, human health). There is a wide range of evidence of such projects across the countries, and transnational exchange of experience is also achieved through this work. These research projects often contribute significantly to the capacity of regional authorities or administrations to address adaptation within their territories. Furthermore, there is not always a direct connection between the maturity of planning processes (at all levels of governance) and the capacities of institutions to conduct scientific research on climate impacts and vulnerabilities. For example, in the matrix for Croatia there is very little evidence of adaptation planning, but a considerable amount of scientific research on historical threats like floods, heat waves, forest fires, etc.

Implementation of adaptation measures

Progress with the implementation of adaptation measures has been less advanced across the EU in comparison to planning, research and assessment. Many of the measures actually implemented so far have focused on awareness raising and education about climate change impacts and adaptation generally. Progress has also been uneven across sectors. For example, in disaster risk management or water and coastal zones, climate change impacts are more evident and more urgent, and adaptation measures have been integrated into ongoing management plans or technical measures. In other sectors there is less urgency and less experience, and concrete measures are often still in the planning, early implementation or pilot stage. Most concrete measures implemented so far have been carried out by a mix of national, regional and local institutions and cannot be considered strictly 'regional', but the section below highlights some examples where there has been substantial involvement from regional level authorities.

Disaster risk reduction from climate related events – such as floods, storms and heat waves – often requires a cross-sectoral and cross-boundary approach. Planning focuses on putting in place frameworks that enable coordinated and immediate response, and on minimising the chance of a disaster. The latter can be supported by concrete adaptation options in related sectors such as health, coastal areas and water management. For example, in Dorset, a county in the South West of England, several municipalities are jointly addressing the risk of heathland fires. Reduced rainfall and increases in average summer temperatures will increase the likelihood of heathland fires, which can cause loss of life and assets, and damage the natural environment. The *Joint Interim Planning Framework* will shift residential development away from at-risk areas whilst improving the management of the heaths. The framework is supported by activities to reduce the frequency of fires.

In the **water management** sector, climate change is expected to influence precipitation patterns and intensity (making some places drier, some wetter), increase flood risks, and possibly increase the pollution levels of water sources. Adaptation options in water management include technical measures as well as managerial solutions and behavioural change. For example, a project in the Tisza river basin in Hungary tests adaptation options to reduce water use in agriculture. Proposed options include use of smaller hoses and re-use of water from fish ponds. In Malta, water scarcity is already a challenge. Climate change, in combination with population growth, is expected to further reduce water availability. A review of the water management network by Malta's Water Services Corporation proposes a number of measures to increase water use efficiency. Here an extensive leak reduction programme will reduce total water leakage by 50% over a period of five years.

Adaptation options are underway in the sector of **agriculture and forestry**. These include measures to secure water availability, to manage new diseases or pests, or to introduce new crops or technical sequences that can minimise vulnerability to known climate risks. A successful example in designing and delivering adaptation options for the agricultural sector is the Extremadura region in Spain. The region supports options that are adapted to local conditions and crop requirements and which minimise erosion or soil degradation. Options that deliver side benefits, such as crop varieties that are resistant to droughts and high temperatures are encouraged. The region is helping practitioners by providing strategic direction through the *Plan for Climate Change Adaptation in the Agricultural Sector* and by providing funding through the EU-funded *Rural Development Programme* for the 2007-2013 period.

The adaptation actions carried out in the Czech Republic's Šumava and Krkonoše National Parks are another example. The parks are considered vulnerable to climate change impacts, which are expected to bring increases in pests and diseases. As a response, reforestation and rehabilitation activities were undertaken in areas affected by climate change, for example by wind storms and bark beetle population booms. Specific actions included replanting regimes to diversify tree species and to stabilise degraded ecosystems whilst storing carbon – providing both mitigation and adaptation functions. These actions – specifically, replanting trees and closing gaps in the forest canopy – will also provide more habitats, increasing the resilience of forests. It will also improve the health of individual trees so that they are more resistant to pests and disease and other likely climate change impacts.

In some cases, the initiative for concrete adaptation options comes from a national or regional research institution working together with local end-users. For example, in Romania, the National Meteorological Administration and the Environmental Protection Agency (EPA) of Covasna *judet* (county) are working together with local farmers to test technical and managerial solutions to climate impacts on certain crop varieties. Support is provided by the local authorities, but the adaptation actions are delivered mainly by the scientific community and practitioners. This work is carried out within the EU-funded OrientGate project.

The **biodiversity** sector includes the diversity of genetic resources, species and ecosystems. The concrete adaptation actions required in response to threats depend on a complex set of interdependent factors that affect the sector. For example, to respond to drier conditions that threatened the wetland habitats of Poland's Biebrze National park; the authority of the national park introduced a range of managerial adaptation actions: switching from mechanical mowing to grazing (to reduce soil compaction); using measures to prevent water run-off in winter; and stopping

activities at certain times of the year to avoid disturbance to birds. The work was carried out within the EU-funded HABIT-CHANGE project.

In the German region of Brandenburg, climate change is expected to result in reduced level of ground water, which can dry out habitats and increase the risk of uncontrolled fires. The region has responded with a range of options – a planning ‘landscape framework’ to integrate climate change considerations into biodiversity management plans; and the re-introduction of an owl species to strengthen the natural cycles and functions of the pine-oak forests and heath landscapes. Another German region, Bavaria, is implementing the following options to help the acutely endangered spruce and to improve the conditions in surrounding habitats – introduction of tree varieties climate-tolerant mixed forest; preservation and restoration floodplains and marshlands; and the promotion of climate-friendly use of moorlands, for example through re-conversion of arable land into waterlogged grasslands.

Coastal areas are also important for adaptation. Across Europe, coastal erosion already costs several tens of millions of Euros per year through property losses, damage to infrastructure, and the need for beach restoration. Concrete adaptation actions in coastal areas focus predominantly on the development of physical measures to reduce the effects of coastal erosion and sea level rise. Such measures include the restoration of sand barriers, beach nourishment strategies and the construction of beach protection structures. For example, in the French region of Languedoc-Roussillon, a sand barrier was constructed between Sète and Marseillanin to help reduce the impact of storm surges.

Friesland Province in the Netherlands has employed an innovative approach to improving coastal defences against sea level rise. The ‘soft sand engine’ technique involves the deposit of a large volume of sand near the shore, which, over a period of years, is brought onshore naturally through winds and waves. This helps to minimise the impacts of sea level rise and coastal erosion by ensuring maintenance of sand levels on beaches along the targeted area of coastline. This use of natural coastal cycles is a cost-effective and long-term solution to beach erosion.

The Shabla municipality in Bulgaria has developed a project for coastal areas ‘Protecting the coast from erosion using hard rock measures’; it includes concrete measures like the construction of rock embankment dykes, a high pier and a concrete wall.

Concrete options for climate change adaptation in coastal areas have also been put forward by a range of FP6, FP7, Interreg and Life + projects. The most recent and relevant projects for the coastal areas, also providing a comprehensive overview of the adaptation options proposed by earlier projects are BaltAdapt (Interreg Baltic Sea Region Programme 2007-2013), BLAST (Interreg IVB North Sea Region Programme 2007-2013), CoastAdapt (Northern Periphery Programme 2007-2013) among others.

Adaptation options in the **health sector** address four main areas of concern: increases in the frequency and intensity of extreme weather events; changes in the distribution of infectious diseases; changes in air quality; and impacts on food and water security. Similarly to the disaster risk reduction sector, the main adaptation option in health is detailed and careful planning of responses. Another important type of adaptation action is awareness raising activities. Extreme events and heat waves that can have immediate negative health effects require a fast and effective response; and awareness raising helps individuals and the society to be more responsive (know how to act and where to find help). The Stockholm Län (county) in Sweden, for example, has developed a publication to raise awareness of climate change and

related impacts in the region. The publication, *Health Effects of Climate Change – risks and actions in Stockholm County*, from Sweden’s Meteorological and Hydrological Institute, outlines appropriate human health-related actions based on climate scenarios for the region until the year 2100. The plan clearly outlines management and coordination mechanisms for an effective response, and recognises the need for additional measures for vulnerable areas and social groups (e.g. children and persons above a certain age). In the Spanish region of Catalonia, the Catalan Office for Climate Change (OCCC) has carried out a five phase *Participation Strategy for Adaptation to Climate Change 2013-2020*. The process engaged members of the public to raise their awareness of climate change and to encourage them to consider possible climate change adaptation measures. This was done across several sectors, including health. It began with mapping stakeholders, presenting climate information to the public and encouraging public debate on each sector. As part of this participation strategy, a day was dedicated to briefings and contact with health experts for the general public.

A review of good examples of implemented measures in the priority and other sectors is also included in Chapter 4 and a more comprehensive list is in Annex 3.

3 Critical assessment of adaptation at regional level in the EU

Chapter key points

Drivers

- The development of a national adaptation strategy (NAS) is often the key driver for climate change adaptation action at the regional level. This is particularly the case when the NAS clearly defines the roles and responsibilities of the various sub-national government units for adaptation.
- The level of autonomy that a region has within the national system of multi-level governance is also an important driver for climate change action.
- External funding opportunities, mainly from the EU, can be a strong driver for regions to get involved in adaptation action. In countries where government budgets have been very limited in recent years, and awareness about climate impacts and adaptation needs is not very strong, it has been EU funding that has catalysed many adaptation initiatives, including studies, pilot actions and planning efforts.
- The improved understanding that climate science is bringing to the connection between extreme climate events and the predicted worsening of them due to climate change can be seen as a driver for regions across the EU.

Barriers

- Many of the identified barriers relate to the fact that adaptation seems not to be a priority on political or policy agendas; often support for the more established field of climate change mitigation crowds out support for adaptation.
- Within regions, a lack of funding for research, assessments and planning initiatives was the most commonly cited barrier for adaptation.
- The responsibility for financing the implementation of major climate adaptation measures is complex and lack of understanding of this hampers action at the regional level.
- Human capacity, referring to both numbers and expertise has been identified as a barrier both in the Member State research and the literature.
- Uncertainty surrounding climate change forecasts and deeply held values and beliefs may also act as barriers to climate adaptation, with local level implementers sometimes believing that it is better to opt for traditional methods as opposed to new methods that are designed with climate change impacts in mind.

Opportunities

- A key opportunity reported was – avoid potential costs of repairing any damage caused by being unprepared for climate change impacts.
- Co-benefits such as community development, energy efficiency and markets for new technologies were seen as opportunities in many Member States and regions.

Costs

- Costs considered include research and planning costs. To date, very limited work has been done on costing the implementation of adaptation strategies, especially in regions. Therefore implementation costs are not considered.
- Some regional level cost estimates for adaptation research and planning are available, but much more detailed information is necessary to be able to develop any 'standard' cost estimates or make comparisons across regions.
- Costs are not negligible, but many regions have found ways to support

adaptation research and planning, including through the use of national and EU funds.

As Chapter 2 has demonstrated, there is a wide range of models and approaches to adaptation within multi-level governance systems across the EU, depending upon factors such as the size of the Member State, institutional and legal structures, political and historical traditions, perceived urgency of the need to adapt, and others. Likewise, the individual regions within the Member States are quite diverse with regard to the amount of progress made on adaptation: some have done comprehensive vulnerability assessments, regional strategies and action plans while others have difficulty to get started.

This chapter will investigate and attempt to explain some of the underlying causes and factors that have so far shaped adaptation at the regional level across the EU. The Member State research has included a reflection on the drivers, barriers, opportunities and costs associated with climate change adaptation at the regional (and in some cases national) levels. These reflections were then collated and thematically organised and analysed to support this critical assessment of adaptation at the regional level in the EU. In addition to this, a wider literature review was undertaken to help contextualise the findings surrounding the regional level.

The analysis considers 'drivers' and 'barriers' as factors that either encourage regions to take action on adaptation or prevent regions from doing so. 'Barriers' are not considered in the sense of absolute limitations, but as obstacles that may be overcome. 'Opportunities' and 'costs' are positive and negative factors that may occur as a consequence of regions taking action on adaptation. 'Opportunities' are therefore considered as the direct and indirect benefits of adaptation planning and action for regions; 'costs' in this study are those that regions incur for research and planning for adaptation. As lack of funds to get started is a major obstacle in many regions, these costs are considered 'harmful' to achieving the objective in the sense that funding must be secured before regions can take action.

Figure 1 below illustrates this; the objective is effective adaptation planning and action at the regional level in the EU.

Figure 1: Illustration of the approach to drivers, barriers, opportunities and costs

	Helpful to achieving the objective	Harmful to achieving the objective
For regions to address adaptation	Drivers	Barriers
As a consequence of addressing adaptation in regions	Opportunities	Costs

These factors concern adaptation generally and have relevance at all levels of governance. The discussion and examples illustrate more directly how these issues impact regions.

3.1 Drivers

For adaptation, drivers are defined as factors that promote further action for climate change adaptation strategies or actions. They may be social or economic (e.g. threats to tourism income and jobs) or stem from policies and legislative requirements. Threats to environmental quality may also be drivers. Advancements in climate science⁸, which tell us more about potential climate impacts and vulnerabilities, can also be considered adaptation drivers, especially when they lead to increased public awareness about climate change.

3.1.1 Policy and legislation

Global, EU and national policy and legislation are important adaptation drivers for regions: from policy and legislation come objectives, targets and in some cases specific requirements for regions to take action on climate change adaptation. For the EU Member States, national adaptation strategies (NAS) are the recommended instruments to achieve coordination and coherence across the various levels of planning and management. EU countries have submitted information on their adaptation plans in their 5th National Communication to the United Framework Convention on Climate Change in 2010. The 2009 EU Adaptation White Paper⁹ and the 2013 EU Strategy on Adaptation to Climate Change¹⁰ have reinforced the mainstreaming of climate change adaptation into all policy areas and also strongly recommended NAS. The EU also provides financial support for adaptation through a number of instruments, including the LIFE programme, Cohesion Policy and the Rural Development Policy; each of these instruments has an important focus on climate change for the 2014-2020 period.

The development of a NAS is often the key driver for climate change adaptation action at the regional level. This is particularly the case when the NAS clearly defines the roles and responsibilities of the various sub-national government units for adaptation. When this happens, it is generally accompanied by positive cooperation between the different levels of governance, so that ideas, knowledge, guidance are shared. This is also an important driver. A number of good examples of clear designation of roles are given in the box below.

Examples of NAS designating roles and responsibilities of sub-national units in adaptation

In **Belgium**, the NAS defines the roles and responsibilities for two adaptation working groups at the national level, and for committees and contact groups at the regional level. The role of local authorities is not defined. Coordinating groups at the regional level are required to exchange data and information and to develop goals and action plans.

⁸ Climate science refers to research institutes, programmes, knowledge transfers, scenarios, projections and tools that relate to climate change and, by association, climate change adaptation.

⁹ EC COM 2009/0147 final

¹⁰ EC COM 2013/216 final

In **France**, the NAS states that *'The National Climate Change Adaptation Plan only deals with measures on a national scale. Regional responsibility for adaptation lies with Regional Climate, Air and Energy Programmes (SRCAE) and Regional Climate-Energy Plans (PCET) which are currently being developed at a local level. Consistency between national actions and regional guidelines and actions for adaptation will be examined as part of the mid-term review in 2013'*¹¹.

In **Germany**, the NAS acknowledges the commitment of the federal government to continue and extend cooperation with the *Bundesländer*. The NAS also discusses activities undertaken by the *Bundesländer*. It does not direct the regions to take certain actions because the *Bundesländer* have autonomy regarding climate change adaptation.

In **Ireland**, the National Climate Change Adaptation Framework requires local administrations to include climate change adaptation in their city and county development plans. The Framework provides details on:

- A timeframe (by mid-2014);
- Requirements for the revised development plans;
- Stakeholder engagement;
- The review process (in accordance with legislative code);
- Support mechanisms (through the Department of the Environment, Community and Local Government).

In the **Netherlands**, the memorandum for policy discussion¹² states that *'Promoting an integrated and area-oriented approach, readjusting investment projects and implementing projects that contribute to the climate-proof spatial planning of an area shall mainly take place at a regional level. The regional level is the perfect platform for linking up knowledge and experience and for bringing together parties that wish to take an innovative approach to specific projects'*. Further, the NAS acknowledges that the provinces (*provincies*), municipalities and water boards will be closely involved in shaping and implementing climate change adaptation activities. The exact roles and functions are to be determined in further consultation with these institutions.

In **Spain**, the National Action Plan (NAP) defines the roles and responsibilities of authorities and coordinating bodies at the national level. The NAP requires all *autonomías* to develop their own climate change adaptation plans or strategies, either as separate documents or within general climate change programmes.

In addition to specific directions through NAS or other national level policy documents, the level of autonomy that a region has within the national system of multi-level governance is also an important driver for climate change action. In the federal states of Austria, Belgium and Germany the regions have clear competence for strategic planning within their territory and there is less ambiguity about responsibility for adaptation. This extends to other highly decentralised systems such as those of Spain and Italy where regions have devolved powers. In Italy the autonomy of the province of Trentino has allowed for legislative initiation that other Italian regions lack; it is one of the few Italian regions that has made significant progress on adaptation planning.

¹¹ French National Climate Change Impact Adaptation Plan (2011-2015), pp15-16

¹² The memorandum was developed as part of the National Programme for Spatial Adaptation to Climate Change (ARK). A NAS was subsequently also developed as part of the ARK. The memorandum was the first output of ARK and it mapped out the main goals of a national strategy for adapting to the consequences of climate change in the Netherlands. Already at this early stage issues related to multi-level governance were acknowledged.

In Austria, the research found that European and international initiatives have been drivers for elevating adaptation issues onto the political agenda both at the national and the regional levels. Legislation also acts as a driver in the United Kingdom, with the Climate Change Act 2008 enacted at the Member State level, but also driving much of the regional work (in particular with a regional, as well as sectoral, approach to the national Climate Change Risk Assessment). The IPCC 'Climate Change 2007' report was also cited as a driver for stimulating interest on climate change in the autonomous province of Trentino.

Finally, the research found that integration of climate change impacts and adaptation measures into sectoral policies and plans has also been a driver for dedicated adaptation planning. At the regional level, regional development plans often include adaptation, despite lack of regional or even national level dedicated adaptation strategy or plan.

3.1.2 External funding

External funding opportunities, mainly from the EU, can be a strong driver for regions to get involved in adaptation action. In countries where government budgets have been very limited in recent years, and awareness about climate impacts and adaptation needs is not very strong, it has been EU funding that has catalysed many adaptation initiatives, including studies, pilot actions and planning efforts.

The Member State research found that this has been a factor in many of the countries of southern and eastern Europe, where overall less progress has been made on adaptation. In these countries, most of the climate change actions at the regional level were co-financed with EU funds, mainly through Cohesion Policy, and its territorial cooperation instrument (Interreg), but also the research framework programmes and ESPON. EU funding also offers the chance for regions for cross-border and transnational cooperation, which can result in learning through experience exchange; this in turn drives further action on climate change.

Planning for climate change adaptation brings costs. With the continued effects of the economic crisis across the EU, it can be expected that external funding will be necessary for regions to support studies and planning efforts. The textbox below provides examples of how EU-funded projects have helped regions in advancing climate change adaptation.

Climate Change Adaptation Experience Sharing among Regions through EU funded Projects

RegioClima¹³ - Regional cooperation towards Adaptation to Climate Change

RegioClima project's objective is to enhance cooperation among EU regions towards avoiding risk and reaping the benefits from a changing climate. More specifically, the project aims to assist societies in adapting to the new climate conditions both by minimising the risk of damage and exploiting the new opportunities arising from a changing climate. The project was specifically aimed at development capacity of involved regional institutions, set up of regional cooperation mechanisms and support of the public debate on adaptation strategies and good practices.

F:ACTS!¹⁴ - Adapting to Climate change through Territorial Strategies

¹³ RegioClima website : <http://www.regioclimate.eu/>

¹⁴ F :ACTS ! website : <http://www.factsproject.eu/home/Pages/INTERREG.aspx>

F:ACTS! aims to close the gap between the increasing amount of scientific research and concrete and necessary actions on a regional and local level. It intends to increase the capacity of European regions to deal with the effects of climate change, inspiring local policy makers, sharing ideas by scientists, policy makers and experts from different countries, developing best practices and demonstrating that solutions are possible by implementing them directly in pilot areas. All these actions contributed to improved regional policies for climate change adaptation. Some of the themes that the project addressed are: multifunctional land use, stakeholder involvement, governance and economic viability.

GRaBS¹⁵ - Green and Blue Space Adaptation for Urban Areas and Eco Towns

Within the GRaBS project, a network of leading organisations involved in integrating climate change adaptation into regional planning and development has been established across Europe. The project facilitated the exchange of knowledge and experience and transfer of good practice on climate change adaptation strategies to local and regional authorities.

Orientgate¹⁶ – A structured network for integration of climate knowledge into policy and territorial planning

The main objective of the project is to communicate up-to-date climate knowledge for the benefit of policy makers, including regional and local development agencies, urban planners, nature protection authorities, and territorial and public works authorities. It aims at developing a comprehensive and consistent methodology for assessing the risks arising as a result of climate variability and change; encouraging the use of acquired climate adaptation knowledge and experience in territorial planning and development; and enhancing capacity to reconcile the risks and opportunities inherent in environmental changes, including rising temperatures.

3.1.3 Extreme events and climate science

Climate change is predicted to increase the intensity and frequency of extreme climate events such as flooding, drought, heat waves and cold weather events; many of these events are already occurring with increased frequency over the past 10 – 20 years. Projected longer term impacts of climate change on a community's social, economic and environmental resources and welfare are more difficult to understand for the public and also policymakers and other stakeholders. Improvements in climate science bring better understanding about the connection between current extreme climate events and the outlook for the future. This is driving public awareness and subsequently action on climate change adaptation in many places.

There are many examples of cases where extreme events that are connected with climate change have brought about a public reaction and policy response. An example is in the Capital Region of Denmark, which experienced heavy rain and subsequent flooding in August 2010 and July 2011. These extreme events have increased the perceived risk from heavy rain and flooding events, which now acts as a key driver for planning for climate change adaptation and for implementing adaptation measures. In France, heat waves are considered a major vulnerability, mainly as a consequence of the health impacts experienced during the 2003 heat wave. In the Czech Republic, which has experienced several incidents of severe flooding in the past decade, this has been cited as a driver for adaptation, beginning with integration into the water management sector. In Pärnu, Estonia, a heavy storm and associated flooding in

¹⁵ GRaBS website : <http://www.grabs-eu.org/>

¹⁶ ORIENTGATE website: <http://www.orientgateproject.org/>

2005 led to the development of a crisis programme with practical instructions for the general public. The visibility of impacts and first-hand experience or knowledge of the costs arising from climate events facilitates the strategic planning and implementation of adaptation measures.

Bringing a longer-term perspective to such reactive policy-making remains a challenge. Climate science, when clearly communicated through sound and credible data, can be an important driver for regional action on climate change as it gives an indication of the economic, social and environmental costs of inaction. What is critical here is the availability of information that can be digested by policy makers and society. For example, in Austria, an active scientific community (such as AustroClim¹⁷) elevates adaptation issues onto the political agenda. In Lithuania, the participation of Lithuanian science research institutes and universities in various research programmes and projects such as Baltadapt¹⁸ and BaltCICA¹⁹ facilitates adaptation work. In France, the information and tools such as include ONERC²⁰ reports and the Drias web portal²¹ are important drivers for adaptation policy-making.

3.1.4 Targeted awareness initiatives

In addition to spontaneous public awareness of climate change brought about by climate change events, targeted awareness-raising can also act as a driver for climate change action. When there are no (or low) incentives from risk perception, civil society organisations can act as a driver for climate adaptation by gathering supporters and running awareness-raising activities. The involvement of NGOs can raise awareness of climate adaptation as evidence in Poland with the 'Koalicja Klimatyczna' ('Coalition for Climate'). In Norrbotten, Sweden, an increase in climate adaptation activities is increasing people's awareness and knowledge of climate change impacts, which is consequently resulting in calls for more climate adaptation activities.

Climate adaptation actions that promote other goals, such as economic goals, are generally more accepted by policymakers and can be drivers for adaptation action (EEA, 2013). These are discussed in more detail in the opportunities section below.

3.2 Barriers

Adaptation is relatively new policy field in the EU, and a complex one that requires implementation across all levels of government and sectors. It therefore presents many challenges for societies and in particular planners and policymakers. The Member State research uncovered a wide range of 'barriers' that regions face in their efforts to address adaptation to climate change. These barriers are often common to all levels of governance, rather than strictly the regional level. The discussion below focuses on those barriers that specifically affect regions, and considers them obstacles to be overcome rather than absolute limits that would prevent adaptation action from taking place at the regional level²².

¹⁷<http://www.austroclim.at/>

¹⁸<http://www.baltadapt.eu/>

¹⁹<http://www.baltcica.org/>

²⁰ France's National Observatory on the effects of global warming (ONERC)

²¹<http://www.drias-climat.fr/>

²² In some of the Member States where there is no effective 'regional' level of governance, this may be seen as a limit to adaptation at the regional level. See Chapter 2.

3.2.1 Governance

Coordination and support across governance levels

Political, financial and technical support from the national level has been discussed above as one of the most important drivers for adaptation in regions. Conversely, a lack of support and coordination from the national level has been identified in some Member States as a barrier. One concern is the risk of overlap and inefficiency in work caused by a lack of coordination between levels of government. When resources are scarce, regional administrations are unlikely to dedicate resources to policy areas if they are not certain they have competence in this area or that the issues will not be somehow resolved at another level of governance.

In Poland, for example, the fact that the national strategy has not yet been finalised or adopted was cited (at the time of research²³) as one of the reasons behind the lack of initiatives at regional level. In some cases regions also state that the lack of clear legal regulations governing climate adaptation policy, including a clear legal obligation for adapting to climate change is a barrier.

Another complication is inadequate cooperation between different levels of government, and between regional and local authorities, which was reported by many of the authorities contacted for this study. Lack of certainty regarding institutional responsibility is another common barrier for regions. Poor communication across (or even within) institutions, particularly those with different sectoral responsibilities is also problematic.

Prioritisation of adaptation

Many of the identified barriers relate to the fact that adaptation seems not to be a priority on political or policy agendas; this is linked to a number of issues. Often this was attributed to an overall lack of urgency regarding climate change, particularly in places where immediate, visible impacts have not been experienced. Limited or absent political commitment can lead to inertia and risk denial on the need for climate adaptation in the face of climate change. This can be due to no, or low, awareness among policymakers of climate change adaptation and through disputed prioritisation of climate change adaptation (Clar et al., 2012). Disputed priorities can also arise from their being no adequate technological option available (Clar et al., 2012; EEA, 2013).

The long term objectives of climate change adaptation plans may be difficult to put into the short term agenda of political mandates. The long-term nature of climate change adaptation is also a complication in Member States where an unstable political and/or economic situation does not create incentives for long-term thinking.

Finally, there is a tendency, particularly at the regional and local levels, to treat 'climate change' overall as a policy field, meaning that both mitigation and adaptation are addressed in a single policy or planning document. Since mitigation is typically a more established and easily understandable area of policy, this can mean that adaptation is a lower priority within the planning document. The consideration of adaptation with mitigation as a single climate change policy topic is not a barrier in itself; in some cases this can be a driver for getting climate change adaptation onto the policy agenda at the start. It can, however, be a barrier to effective adaptation planning if it is allowed to serve as a substitute for rigorous, evidenced-based

²³ Since the time of research, Poland has adopted the National Adaptation Strategy (in November 2013). The strategy is expected to promote further initiatives at the regional level.

assessment of vulnerabilities and planning of concrete adaptation responses. It can also be a resource barrier if mitigation crowds out a limited or fixed amount of financial and other resources dedicated to climate change overall.

As seen in Chapter 2, in many of the regions that have reported the existence of an adaptation strategy or action plan, this is something that has been combined with climate change mitigation. However, thanks at least in part to visibility on global and EU agendas, and improvements in availability of information and projections about climate change impacts, this is changing. For example the research found that several of the Spanish regions (e.g. Canary Islands, Catalonia, Extremadura, La Rioja) are currently undertaking the preparation of a more detailed dedicated climate change adaptation strategy or plan, based on the adaptation section of the original (required) comprehensive climate change plan.

3.2.2 Resources

Funding for research and planning

Within regions, a lack of funding for research, assessments and planning initiatives was the most commonly cited barrier for adaptation. This is seen as distinct from financing for the actual implementation of adaptation measures, which is discussed below. Adaptation is new in most EU regions, and requires considerable up front region-specific research and assessment of impacts and vulnerabilities in order to be effectively managed through strategic planning. This is expensive and often not planned for in regional administrative budgets. This means the funds for adaptation assessment and planning either need to be earmarked in advance within national or regional budgets or supplemented by external funds. As seen in Chapter 2 and the drivers section of this chapter, the availability and accessibility of such funds for adaptation research and planning is critical.

In Denmark the lack of funding was blamed on the structure of existing funding schemes and access to them. In other Member States however, the barrier has been described simply as a 'lack of public funds'. This could be related to prioritisation of adaptation on political agendas within authorities. In periods of economic downturn national and regional budgets become tighter and the competition for funds across different priorities increases. In some cases, regions noted that decision-makers were likely to want to see concrete evidence of climate change impacts before allocating budgetary funds for adaptation.

The reasons for lack of funding are complex and inter-linked with other barriers and drivers. Earmarking of budgetary funds requires prioritisation of adaptation, which is in turn linked to awareness of the science and political commitment. This factor extends to the use of EU funds, as they are linked to political priorities in Member States and regions, based on programming documents. There is more flexibility within the territorial cooperation programmes (Interreg), and the relatively prominent use of these funds for regional activities on adaptation found in the Member State research corroborates this.

It should also be noted that climate change, including both adaptation and mitigation, is expected to have stronger prioritisation within EU funds for the 2014-2020 funding period, in line with EU strategic development policies. It is yet to be seen, however, if Member States and regions will prioritise climate change adaptation within the programming documents for 2014-2020 programming period. This is further discussed in Chapter 5.

Financing for implementation of adaptation measures

Financing for the implementation of adaptation measures, ranging from emergency planning to large scale infrastructure such as flood defences is another complex issue that can hamper regional planning and action. Effective adaptation planning should consider financing issues and cost estimates should be prepared to the extent possible for proposed measures – but for many regions this difficult to address comprehensively. There is not clear consensus within the policy-making community on how the costs of adaptation should be borne by the public and private sectors. Clearly public budgets will not be sufficient to cover the costs of adaptation, but the impacts of climate change are complex and affect stakeholders in different ways. It is usually difficult to clearly attribute costs and benefits to different parties. Some innovative examples exist in the banking and insurance sectors, but there remains much to be done to ensure sufficient financing for pro-active climate change adaptation measures.

The research found that poor understanding of the economics of climate change adaptation is a barrier for effective regional planning in this area. In some cases authorities noted it was easier for them to claim disaster relief funds than to invest in long-term climate resilience. The potential conflict between short term economic needs and long-term thinking about investments in climate change adaptation was also raised in this context.

Lack of clarity on financial responsibilities and a clear source of financing for future costs impedes effective planning and limits the effectiveness of adaptation strategies. If regions feel powerless to address these issues, they are less likely to take action on adaptation.

Who's responsible? Ambiguity over flood management costs in Finland

Authorities in Finland pointed out the ambiguity regarding responsibility for the costs of climate adaptation measures. Here the example of flood control was given. This is typically considered the responsibility of property owners, rather than national or local government. However, in a law currently under development on flood risk management, it is regional centres responsible for economic development, transport and the environment that will be given responsibility for the use and management of water resources, including taking measures to improve flood risk management. Currently, the national government finances flood control measures under a government decree on rural activities. Municipalities are responsible for rescue services. As flood risk increases and with it investment costs in protective measures, the public sector needs to find a new approach to covering these costs. Public-private partnerships have been suggested as one way to do this and ensure that municipalities have greater capacity to act. There is however an inherent risk that the costs mentioned will largely remain the responsibility of municipalities. Thus the creation of a well-functioning system of insuring and financing flood damage is vital, as is clarification of preparation and compensation responsibilities.

Based on *Responsibilities and costs of adaptation*, authored by Aalto University – YTK on the Finnish climate change information portal [Climateguide/.fi](http://Climateguide.fi)

Capacity and expertise within institutions

Many regions struggle to find the staff and expertise to deal effectively with adaptation. Human capacity, referring to both numbers and expertise has been identified as a barrier both in the Member State research and the literature (Moser and

Ekstrom, 2010; Clar et al., 2012). Barriers also relate to the leadership, authority and skill to guide and coordinate (as also identified by Moser and Ekstrom, 2010).

A lack of staff can mean that some adaptation activities cannot be completed and that they have to be delayed or cancelled. High staff turnover and resulting loss of institutional memory is another challenge. Too few staff may also result in administrative obstacles that delay adaptation activities.

It is not only a lack of staff that can serve as a barrier to adaptation activities as staff that are present need to have the right expertise. Climate change adaptation is a relatively new subject and very few local and regional level officials are experts in the topic, even if they have backgrounds in related fields such as environment or water management.

The science-policy interface: information and studies

The regional application of existing knowledge on climate change impacts suffers from a lack of useable data along with a lack of climate change impact projections for smaller scales (Moser and Ekstrom, 2010). The downscaling of global climate models and projections for smaller territorial levels is problematic due to a lack of knowledge about local impacts of climate change and can also increase the uncertainty of data outputs (EEA, 2013). The uncertainty factor, and long time horizon embedded in climate change projections, can consequently make it difficult to plan for and prioritise measures.

Lack of existing data and information, or free access to existing data, is a commonly cited problem in EU regions. In some cases global climate scenarios are not useful at regional scales. In addition to a lack of climate change data and projections specific to local and regional levels, the research also found a general lack of application-oriented scientific results, extending in particular to socio-economic impacts of climate change. This lack of practical, application information has led to difficulties in planning and decision-making, particularly with regard to prioritising adaptation versus other policy areas, and identifying priority sectors within adaptation planning.

The responsiveness of policymakers to climate science is also dependent upon the existing institutional flexibility and the extent that their adaptive capacity allows the incorporation of new knowledge to change existing systems. The interaction between scientific experts, research facilities, meteorological institutions and other sources of information and policy-makers was frequently cited as a problem in the Member State research.

To improve the knowledge base on adaptation, the European Climate Adaptation Platform (Climate-ADAPT) was established in 2012. It is a clearinghouse mechanism for adaptation that aims at facilitating the collection and dissemination of information on adaptation with the aim of assisting the uptake of such knowledge by regional, local and national decision makers, and contributing to better coordination across sectoral policies and relevant institutions.

3.2.3 Social perceptions and awareness

Just as popular acknowledgement of climate risks brought on by climate events can be a driver for adaptation planning and action, low popular awareness of climate change can be a barrier. People may not believe in the risks from climate change (Jones, 2010) or they may underestimate the risks that climate change poses to themselves

(Grothmann and Patt, 2005; Adger et al., 2007; Blennow and Persson, 2009). Some people have knowledge of climate change impacts, but not of climate change adaptation, which results in deficiencies in their appraisals of the climate adaptation options available to them (Berkhout, 2005; Grothmann and Patt, 2005; Adger et al., 2007).

Uncertainty surrounding climate change forecasts and deeply held values and beliefs may also act as barriers to climate adaptation, with local level implementers sometimes believing that it is better to opt for traditional methods as opposed to new methods that are designed with climate change impacts in mind (Berkhout, 2005; Moser and Ekstrom, 2010). The strength of people's beliefs in (or against) climate change can be an additional climate adaptation barrier, as can their deeply held values and beliefs (Blennow and Persson, 2009; Moser and Ekstrom, 2010). For example, in Estonia was stated that climate change is not felt like a 'real' problem as it has been a historically cold country, which may reduce the willingness to implement adaptation activities.

3.3 Opportunities

The section explores how climate change adaptation actions can lead to other benefits or opportunities for beneficial outcomes. It looks at the social, economic and environmental opportunities, before moving on to the opportunities for climate science in the form of increased research and knowledge transfers; lastly, governance is explored. Depending on the perspective, some of these opportunities are also acting as drivers for climate change across the EU Member States.

Less evidence on perceived opportunities was uncovered through the Member State research for this study, which is consistent with the findings regarding limited adaptation awareness across stakeholders.

3.3.1 Economic, social and environmental opportunities

Economic opportunities

The landmark Stern Review (2006) evaluated the economic costs associated with climate change. One key message from this was that many adaptation options will provide benefits in excess of the costs, especially in climate-sensitive sectors. In this vein, economic opportunities centre on the potential cost savings in reducing assets exposed to the future effects of climate change. It has been estimated that the benefits of adaptation action to reduce increases in river flood risk could reach up to US \$20 million²⁴/year by 2050 in the Netherlands (Adger et al., 2007).

Some of the authorities contacted reported that climate change adaptation would bring opportunities for the development of new regional infrastructure and technological innovation, as well as possible new business opportunities. In particular the research on Belgium, Denmark and Finland found that experts there saw green technology development and eco-innovation as opportunities that might be related to climate change adaptation.

²⁴ Approximately €15 million

Co-benefits: indirect opportunities

There is the potential for adaptation activities to be implemented with dual purposes. For example, in Finland flood protection structures and fields used for storm water infiltration, also act as recreational areas. The Island of Gotland, Sweden, plans on using adaptation activities to revitalize rural and sparsely populated areas. There is great interest for new housing construction and investments, which provides possibilities to establish both research activities and the implementation of adaptation measures.

Adaptation can also bring opportunities to make nature more accessible to both tourists and those living in a particular region. This can include the creation of 'greener' areas through, for example, more efficient treatment of storm water and covering of passes in urban areas. For example, in Luxembourg, forests cover approximately a third of the country and halting the loss of biodiversity is considered an important co-benefit of climate adaptation activities. Luxembourg is planning a study on the economic value of biodiversity and ecosystems to inform the adaptation strategy.

3.3.2 Opportunities to improve knowledge and the science-policy interface

Climate adaptation activities can result in the development of new climate science knowledge that can lead to opportunities to improve the overall understanding of climate change impacts and vulnerabilities, and to improvements for future adaptation measures. A critical factor for maximising such opportunities is effective cooperation between stakeholders, including the scientific community, authorities and policymakers and those involved in implementation of adaptation measures.

At a regional level, climate adaptation measures in Donegal, Ireland, have involved the local authority and members of a university located in the region. This working relationship has created stronger ties between the local authority and the university and has led to a knowledge transfer between the two. In implementing climate adaptation activities, Lithuania has found that there has been improved knowledge and understanding between national and municipal public authorities, regional communities and industry.

In Lithuania it has been suggested that the implementation of climate adaptation activities will improve the competence and coordination between national and municipal public authorities, regional communities and the private sector, including scientific research institutes. It is also hoped that the need for interdisciplinary solutions will start a new way of inter-sectoral thinking and cooperation at the local level in Denmark.

3.4 Costs

Adaptation costs come in many forms and are understood, calculated and perceived in many ways. There are the potential future costs of not taking action in the short-term. There are the potential costs of taking the wrong steps in adaptation, which can 'lock in' larger, unanticipated costs in the future. There are the costs of implementation of adaptation activities, but these are difficult to specify as they are often part of

investments taken for other objectives, such as water management or disaster risk management.

But all administrative entities (national, regional and local entities) must incur the costs of carrying out the research and planning necessary to prepare for climate change adaptation in their territories. Most regions are currently at this stage of development and facing these costs now. This section therefore focuses on the costs, in monetary terms, which a region must incur to carry out adaptation research, planning and no/low cost measures typically funded by the public sector, such as education and awareness raising²⁵.

The cost of the research and planning activities required to develop a strategic planning document (e.g. regional adaptation strategy and/or action plan) is dependent on several factors, including:

- The starting point: existing data and vulnerability studies on climate change
- Existing sectoral work (e.g. flood management studies, disaster response, etc)
- The degree and complexity of vulnerability to climate change
- The scope of the planning work to be carried out (e.g. broad strategic directions vs detailed action planning, sometimes dependent on national requirements)
- The involvement and support from interested stakeholders (civil society and the private sectors)
- The size of the territory to be considered

The Member State research attempted to define, broadly, these costs of carrying out the studies and planning required to prepare adaptation strategies (or other planning documents for adaptation) in EU regions. Very few concrete estimates of these costs were available from national and/or regional administrations. This can partly be explained by the fact that as a cross-sectoral field, adaptation work is naturally combined with other sectoral policy-making and planning and therefore separate cost records are not maintained by administrations. When estimates were provided, they frequently lacked the necessary contextual information (e.g. on the scope, quality and time-frame of assessments and other relevant documents) to enable conclusions. Furthermore, adaptation strategies themselves are often part of larger climate change plans that include a mitigation component.

Unless otherwise specified, the cost estimates that are discussed here were collected through interviews and questionnaire responses from regional level officials. The examples found come from a small number of EU Member States and are typically from regions that are relatively more advanced in adaptation – Flanders and Wallonia regions in Belgium; the Lombardy region in Italy; and from the Norrbotten *Län* (county) in Sweden.

Reference: average national and city adaption strategy costs

The impact assessment carried out for the preparation of the EU Adaptation Strategy gives a rough cost estimate of around EUR 3 million for the development of a national adaptation strategy; this does not include the preparation of implementation action plans. Considered within these costs are some three full-time employees on average

²⁵ A range of items can be required to carry out adaptation research and planning, such as cost of scientific projections, cost of modelling, administrative cost of policy development, cost of technical adaptation measures, and the opportunity cost to the society from application of adaptation measures, as recognized by the OECD (2006), *Adaptation to Climate Change: Key Terms*, available at: <http://www.oecd.org/env/cc/36736773.pdf,m>, accessed 4 December 2013

over the course of two years or more, supported by consultants for carrying out vulnerability and risk assessments.²⁶ For reference, at the city level, costs were found to be around EUR 50,000 for adaptation strategies.²⁷

Flanders, Belgium

In the Flanders region of Belgium, the cost for a preparation study for the Flemish Adaptation Plan was estimated at EUR 100,000. The study consisted of a vulnerability assessment and a roadmap towards the adaptation plan. The research and drafting were carried out internally by relevant government departments. A large part of the costs consisted of collaboration and coordination activities such as meetings with sectoral departments and other relevant stakeholders. The Flemish Adaptation Plan was subsequently also prepared by government officials, as part of a broader Climate Change Strategy for the Flemish region. Cost estimates for the Adaptation Plan or the Climate Change Strategy were not available.

Wallonia, Belgium

In the Wallonia region of Belgium, the cost of a climate change vulnerability assessment was approximately EUR 200,000. The budget included all labour costs (including consultations with external experts), at a rate of EUR 700 per day for a total of 231 working days, as well as administrative costs and overheads. Two consulting firms and three Belgian universities were involved in assessing the impacts, vulnerabilities and adaptation actions; the study was coordinated by the Walloon Agency for Air and Climate.

Further, the Wallonia Region is currently in the process of developing a regional adaptation plan, within the overall framework of the forthcoming Walloon Air-Climate-Energy plan (PACE). Three studies have been conducted to assess the potential impacts of the PACE: on environmental impacts, on cost of measures, and on socio-economic aspects of implementation. The study on environmental impacts was carried out over a period of four months with a budget of EUR 30,000. The study on the cost of measures²⁸ had a budget of EUR 56,000 and was carried out over the period of one month. The third study on the socio-economic impacts of implementation had a budget of EUR 65,000 and also lasted one month. The scope of the three studies went beyond adaptation, and included other topics such as air quality, energy, climate change mitigation. The regional adaptation plan is prepared by members of the regional government, in collaboration with regional sectoral departments, adaptation experts and colleagues from other regions. No costs were estimated for this collaboration and coordination work.

²⁶ EC, Commission Staff Working Document *Impact Assessment – Part I* accompanying the Communication *An EU Strategy on adaptation to climate change*, April 2013. This study further notes that the cost of developing an adaptation strategy was found to range between EUR 1 million – 48 million based on experience across EU Member States and regions.

²⁷ Based on the EC study on Adaptation Strategies for Cities, as quoted in the Impact Assessment study referenced above.

²⁸ The measures considered here include adaptation measures, but also measures for improving air quality, for energy efficiency, and for climate change mitigation.

Lombardy, Italy

In 2012, the Lombardy region of Italy also issued a preparatory study on climate change adaptation in the region²⁹. Similar to the Flanders example, the study included a vulnerability assessment and a roadmap towards the adaptation strategy. The cost for the study was EUR 40,000, which includes the full-time employment of two external scientific experts. The regional adaptation strategy for the Lombardy region is currently under preparation. The regional government has contracted this work to the external experts involved in the preparatory study. The value of the two-year contract is EUR 160,000.

Two employees in the relevant administration of Lombardy are involved in the coordination process between all sectoral departments for the preparation of the regional adaptation strategy. In addition to this, for an overall supervision, a scientific board (with representative of the main research institutes, universities and environmental agencies of the region) and an administrative board (with representative of the main sectoral authorities and administrative bodies of the region) have been involved in the participation process. The costs associated with the collaboration and coordination were not assessed and are not included in the above estimates.

Norbotten, Sweden

The Norbotten *Län* (county corresponding to the NUTS 3 level) in Sweden carried out a vulnerability assessment. The assessment looked at climate impacts for the biodiversity and agriculture sectors. The cost of the assessment was SEK 5.5 million or approximately EUR 610,000.

Conclusions

The case examples reviewed are diverse and not comparable. This is clearly illustrated by the fact that the costs cited in the Swedish example are considerably higher than the others, despite the fact the region in consideration is relatively smaller than some of the other examples. Most likely the case in Sweden involved started from an earlier point in the process and required raw data collection and more scientific analysis.

Nevertheless, the research shows that whilst adaptation research and planning costs are not negligible, they are affordable for regions. For many regions, these costs can be supported by national funds as well as external funds, such as those from EU programmes. One of the key actions under the EU Adaptation Strategy is to promote the use of LIFE funding to support capacity building and step up adaptation action in Europe. This includes the preparation of vulnerability assessments and adaptation strategies, including those with a cross-border nature³⁰.

²⁹ This example is included as a case study in the publication '*Climate change adaptation practice across the EU: understanding the challenges and ways forward in the context of multi-level governance*' carried out as part of this service contract.

³⁰ This is Action 2 of the EU Adaptation Strategy.

4 Good practices in regional and transboundary adaptation

Chapter key points

- This section discusses good practices in adaptation at the regional level, including transboundary activities that could be shared among policy makers in across the EU Member States and regions.
- Overall, most of the examples selected cover water management, health, disaster risk reduction, coastal areas and agriculture, as these are priority sectors in most Member States. Only a few good practices were found for relatively new sectors such as social adaptation and governance.
- A large number of these good practices are awareness raising and capacity building activities. These range from capacity building within administrations in countries that lag behind; to awareness raising activities for the general public.

This chapter discusses good practices in adaptation at the regional level, including transboundary activities that could be shared among policy makers in and across the EU Member States and regions. This section of the chapter briefly explains the factors considered when selecting the examples of good practices. The next part discusses good practice examples in regional adaptation covering key vulnerability sectors. It also discusses how these good practices can address some of the barriers and costs described in chapter 3 of this study. Some of the examples discussed here have been included as case studies in the publication '*Climate change adaptation practice across the EU, Understanding the challenges and ways forward in the context of multi-level governance*', part of this service contract. Finally, the third part reflects on good practices in transboundary adaptation, and how these can be used to address challenges that are specific to transboundary adaptation. Tables with key details (location, type of activity, description, and sectors covered) and further information sources for the good practices are in Annex 3.

Some Member States - mainly in the EU 15 - have many years of experience in assessment and planning for climate change adaptation; others are just getting started. In selecting good practice examples, the overall approach has been to highlight the most advanced and innovative approaches in Member States, where adaptation in regions is in a fairly advanced state; and to find suitable examples in the Member States that are lagging behind in addressing climate change impacts or where adaptation has not been considered as a priority. For Member States where regions have no defined role in climate change adaptation (Group 3 countries), the examples selected are either at the national level, or at the municipal (local) level. The emphasis is on concrete actions, specifically designed for adaptation purposes. The overall objective has been to showcase a range of options representing a variety of climate impacts, climatic conditions, geographic locations and sectors; and that can be helpful to Member States and regions that lag behind in climate change adaptation.

In selecting good practices, at least one example per Member State was selected to have a large geographical coverage. Countries have been divided by geographical area (North, North-West, Central and Eastern Europe, Mediterranean), with about the same number of examples per area. This collection of examples is not exhaustive.

Regarding transboundary adaptation, examples discussed in this chapter are from EU funded Interreg IVB projects on transboundary cooperation and Interreg IVC projects on interregional cooperation. The good practices selected address the particular

challenges of transboundary adaptation, such as differences in management and administrative arrangements.

4.1 List of good practices in regional adaptation to climate change

Overall, most of the examples selected cover water management, health, disaster risk reduction, coastal areas and agriculture, as these are priority sectors in most Member States. Only a few good practices were found for relatively new sectors such as social adaptation and governance. Regarding governance, examples in Sweden show how a policy framework and administrative arrangements are being set up to address climate change adaptation. A large number of these good practices are awareness raising and capacity building activities. These range from capacity building within administrations in countries that lag behind; to awareness raising activities for the general public. Where concrete actions occur, it mainly concerns flood prevention and coastal erosion, especially as vulnerable countries already have experience in these areas to build on. The list presents essentially public actions, funded either by regional or national governments. Many of these actions have been co-funded by EU programmes (mostly Interreg, LIFE+, Baltic and Alpine Space programmes). This is especially the case for countries in groups 2 and 3 (see the classification in Chapter 2).

Capacity building for different levels of administration

Low capacity and expertise within institutions is a common barrier to addressing climate change adaptation in the regions and Member States, as described in Chapter 3. The examples below provide some ideas of how capacity can be increased at different levels of governance.

Table 4: Examples of Good Practices in Capacity building for different levels of administration

Member State	Location	Title and description of activity
Germany	Brandenburg Bundesland (NUTS I)	<u>Practical management guidelines for practitioners and decision makers</u> : These have been developed as part of the 'Adaptation of governmental nature conservation management to climate change in Brandenburg' project. Project outputs include a publication on climate change-adaptive target selection and goal setting (published summer 2012); and a publication on adaptation of protected area management to climate change (due 2013)
Italy	Basilicata, Puglia, Campania, Calabria, Sicilia regioni	<u>Capacity Building activities</u> : The capacity building programme 'Policies for mitigation and adaptation to climate change' is carried out in the convergence regions of Italy and is financed through Cohesion funds. The programme aims to increase the capacity of the regional governments through provision of information, establishment of communication channels among stakeholder, training and exchange of best practice aimed at increasing the capacities of the governments in the convergence regions. The activities were launched in 2011 and are planned to continue until 2015.
Poland	Various	<u>Capacity building for powiaty administrations</u> : the main

Member State	Location	Title and description of activity
	powiaty or counties	goal of the 'Good climate for the Counties' project is to raise awareness of climate change among leaders at county level and to stimulate initiatives in support of practical local measures to protect the climate and adapt to any changes. Activities include training courses; a pilot low-carbon development programme; and the creation of a network. (from September 2010 till August 2015, LIFE+ funding)
Romania	Member State level	<u>Capacity building for national level governing bodies:</u> In 2010, the Ministry of Environment and Forestry and the National Agency for Environmental Protection launched a series of conferences, seminars and other awareness raising activities under the title 'Adaptation to the effects of the climate change'. The events are aimed at raising awareness and building capacity within these institutions.
Slovakia	Member State level	<u>Manual for local governments:</u> The Carpathian Development Institute published in 2012 a manual for local governments to tackle climate change impacts at local level. This guide describes the main impacts of climate change in Slovakia, and proposes measures municipalities can implement to address them including examples of best practices.

Coordination and stakeholder involvement

For regions that are more advanced in climate change adaptation (many of the Group 1 and some of the Group 2 countries) good practices selected include examples of coordination and stakeholder involvement mechanisms for implementation of adaptation action. Many regions, particularly in Group 2 countries can benefit from these examples as they are in early stages of policy development (carrying out vulnerability assessments, data gathering and the selection of priority sectors and measures). These examples can also be useful for some of the Group 3 Member States that can potentially apply the examples to coordinate action between the national and local levels.

Table 5: Examples of good practices for coordination and stakeholder involvement

Member State	Location	Title and description of activity
Germany	Various Bundesländer (NUTS I)	<u>Stakeholder networks:</u> coordination networks have been set up in several German Bundesländer or stakeholder involvement in the climate change adaptation process. Each network is maintained by project partners that typically include research institutions, municipal administrations, regional planners, Bundesländer authorities, associations and representatives from the industry and priority sectors (e.g. agriculture and forestry). Networks typically carry out projects and hold conferences for exchange of experiences.
Spain	Castilla-La Mancha	<u>Partnerships:</u> The autonomía of Castilla-La Mancha has created a Regional Pact on Climate Change. The Pact

Member State	Location	Title and description of activity
	autonomía (NUTS II)	includes a set of 10 commitments of regional actors to act against climate change. All interested stakeholders (civil society, private sectors, political parties, environmental associations, universities, individuals etc.) are encouraged to join the Pact.
Sweden	Jönköping Län (NUTS III)	<u>Climate Council and Focus Groups</u> : The Län of Jönköping has set up a Climate Council gathering representatives and representatives of regional councils' and municipalities. Jönköping has also set up focus groups, including one on adaptation. These focus groups are in charge of developing proposals for the implementation of the climate and energy strategy and propose concrete measures for the period 2015-2020.

Awareness Raising and Changing Social Perceptions

As discussed in Chapter 3, low awareness and misconceptions about climate change are a major barrier to further advancing research, planning and action. Equally, high levels of awareness are a driver for action. Consequently, awareness raising activities are frequently the starting point in concrete action for further adaptation action. In many Member States, particularly those that lag behind in climate change adaptation, concrete adaptation options still only include awareness raising³¹. The importance of awareness and the multitude of examples at the regional level are the two reasons why many of the good practice examples selected in this study include measures for awareness raising. Some of the more innovative and interesting examples are listed below in Table 6.

Table 6: Examples of good practices in awareness raising and changing social perceptions

Member State	Location	Title and description of activity
Belgium	Wallonia région (NUTS I)	<u>Tool for the assessment of vulnerability to climate change at the municipal level</u> : This tool, developed by the region, takes the form of a questionnaire, aiming at guiding local representatives to evaluate the vulnerability of their locality. The tool could be disseminated to other regions of Belgium and the EU.
Denmark	Zealand region (NUTS II)	<u>Climate Song to the Covenant of Mayors</u> : The Climate Song was composed by Seren Eppler for Region Zealand in order to provide optimism and enthusiasm on addressing issues related to climate change. It is intended to be sung at meetings, in schools, and other places that are concerned with climate questions. This particular song mostly concerns mitigation; but raising awareness on climate change adaptation through singing could be an engaging technique.
Estonia	Pärnu maakond	<u>Practical instructions</u> : Following severe flooding in September 2005, Pärnu maakond developed a crisis

³¹ While the more advanced regions and Member States still put resources into awareness raising, other adaptation measures such as concrete investments in climate-proofing infrastructure are also implemented.

Member State	Location	Title and description of activity
		programme for disaster risk reduction. The programme includes practical instructions for the general public on how to behave in case of flooding.
Netherlands	Gelderland provincie (NUTS II)	<u>Sustainable park</u> : The province of Gelderland is working with C-Change to develop Park Lingezen into a sustainable area between two of the province's main cities. This includes increase climate awareness amongst children and young adults with summer schools, educational days and cultural activities C-Change is funded under priority 4 of the Interreg IVB Programme.
Sweden	Stockholm Län	<u>Exhibition 'Venice of the North'</u> : the travelling exhibition was organised in 2012. It contained information about climate change impacts in the regions and how these will affect the society at large.

Vulnerable sectors

The following table outline how regions have dealt with climate change impacts in key vulnerability sectors: water management, health, disaster risk reduction, coastal areas and agriculture. Where a measure simultaneously addresses multiple sectors, this is indicated in the table. Please see Annex 3 for good practice examples in other sectors.

Table 7: Good practice examples in vulnerable sectors

Member State	Location	Title and description of activity	Sectors covered
Croatia	Zagreb županije	<u>Atopica project</u> : Children's Hospital Srebrnjak Croatia University is the Croatian partner in the project involving eight academic institutions and two SMEs from seven European countries. The project tries to understand how global and regional climate, land use and air quality changes will impact human health.	Health
Denmark	Syddanmark region	<u>Groundwater model concept</u> : The Region of Southern Denmark is developing a groundwater model concept to predict future rise of the ground water table. A model on ground water for the municipality of Kolding has been set up. The model has been presented at meetings for elected members and technical experts. A brochure on this initiative has been published. A model for the Municipality of Billund is being set up at present.	Water management
France	Rhône Alpes region	<u>Development of scenarios</u> : Associated costs for fodder systems in medium mountain farming are shown for various climate scenarios. The project is developed by the Chamber of Agriculture of Rhône Alpes, with the objective to adapt the agricultural sector to rising temperatures.	Agriculture and forestry

Member State	Location	Title and description of activity	Sectors covered
Hungary	Tatabanya municipality	<u>Heat and UV-alert plan:</u> As a part of the local climate change strategy a Heat and UV-alert plan for the city was drafted. Representatives of 22 different social, health care institutions and public utility companies of the city were involved. This is the first plan of this kind in Hungary.	Health
Luxembourg	Member State level	<u>A process proof test for model concepts:</u> Modelling the meso-scale (2010), developed by the Delft University of Technology, University of Trier and the Gabriel Lippmann Institute within the Forestclim project (Interreg IVC). The hydrological modelling methodology was tested for 15 meso-scale river basins located in Luxembourg.	Water management, agriculture and forestry
Malta	Member State level	<u>National Flood Relief Project:</u> The objective of the project is to address both flood risks and water shortages. The project would relieve the flooding vulnerabilities of the central part of Malta, while also topping up the national water reserve with a further 700,000 m ³ of water. The project has four phases; it spans over 11 km of underground tunnels and will be completed in 2014. The estimated cost is €56 million	Water management, disaster risk reduction
Netherlands	Freisland Provincie	<u>The Soft Sand Engine:</u> Started in 2012 along the Friesian IJsselmeer coast. Three pilot areas along this coastline; Workumerwaard, Hindeloopen and Oudemirdumerklif. The technique includes forming a natural buffer against climate change effects such as sea level rise through the raising of banks taking into consideration wind direction and sediment flow	Disaster risk reduction, coastal areas
Portugal	Madeira	<u>MOSQIMAC - Integrated management of Aedes vector:</u> The project aimed to propose measures for the integrated management of vector Aedes aegypti and to generate risk maps of diseases transmitted by mosquito in cooperation with Madeira. MOSQIMAC is an Interreg IVC project.	Health
Portugal	Alentejo	<u>Irrigation and multipurpose project of Alqueva:</u> The project allows regularization of water cycle and water availability in a scenario of increasing irregularity of precipitation	Water management

4.2 List of good practices in transboundary adaptation to climate change

Transboundary adaptation presents a range of particular challenges. There can be technical challenges (e.g. use of different climate scenarios, incompatibility of data, language barriers), procedural challenges (different legal, administrative and management arrangements); and behavioural challenges (e.g. different levels of urgency or priority). In transboundary adaptation activities, and specifically for Interreg IVB and IVC projects, regional and municipal authorities are the main collaborating parties (rather than national administrations).

The examples found in the research mostly deal with the first two types of challenges that are specific to transboundary adaptation³². Table 8 below highlights good examples in transboundary adaptation and specifies the challenges addressed in the process. For the full list of examples, please see Annex 3.

Table 8: Good practices in transboundary adaptation to climate change

Partners	Description	Sectors covered
Challenge addressed: Heterogeneity of data across borders		
Baltic Sea Region: Tallin and Pärnu (EE); West-Estonian Archipelago (EE); City of Kokkola (FL); City of Espoo (FL); Kokemäenjoki (FL); Uusimaa (FL) ; Odra estuary (DE); River Salaca Basin (LV); City of Riga (LV); City of Klaipeda and the Curonian Spit (LT); Gulf of Gdansk (PL)	<u>ASTRA: Developing Polices & Adaptation Strategies to Climate Change in the Baltic Sea Region</u> . The ASTRA project uses climate change models and climate impact research studies to develop regional and local impact scenarios. In the development of adaptation strategies it concentrates on risk awareness and the formulation of policy recommendations. The project focuses on practical applications (winterstorm web-application), and several stakeholders are directly involved in all project activities. ASTRA is an Interreg IVB project	Coastal areas, Disaster Risk Reduction
Baltic Sea Region	<u>Baltadapt - Development of a Baltic Sea Region-wide climate change adaptation strategy</u> . Baltadapt is reviewing state-of-the-art knowledge on climate change in the Baltic Sea Region. BaltAdapt is identifying the information needed for designing appropriate adaptation measures. As a result of the project, the Baltic Window will be developed. It is a one-stop-shop information portal providing all available information on climate change adaptation in the Baltic Sea Region. Baltadapt is an Interreg IVB project.	Coastal areas, biodiversity, marine and fisheries, water management

³² The examples listed here provide a multitude of benefits to the involved partners and stakeholders such as awareness raising and capacity building; new technical knowledge; vulnerability assessments and strategic planning documents. The emphasis here, however, is not on the general challenges in advancing climate change adaptation, but on the specific challenges of cross-border cooperation.

Partners	Description	Sectors covered
Atlantic Area: Galicia (ES), Navarra (ES), Basque Country (ES), Aquitaine (FR), PT, UK	<u>REINFFORCE - REsource INFrastructure for monitoring and adapting European Atlantic FORests under Changing climate.</u> The aim for the project is to review the existing field trials, species and available knowledge in the Atlantic Forests, and to define the protocols for setting up the trials and collecting the data. It will compare current silvicultural practices with other climate change adaptation techniques. The project also aims to create a data collection system and shared database to monitor Atlantic forest growth, health, and biological life cycles. REINFORCE is an Interreg IVB project.	Agriculture and forestry, water management
Challenge addressed: different administrative and management arrangements		
Alpine Space: Autonomous Region of Valle D'Aosta (IT); Autonomous Province of Bolzano (IT); Bayern (DE); Innsbruck (AT); Rhône-Alpes (FR); SL	<u>ClimAlpTour - Climate Change and its Impact on Tourism in the Alpine Space.</u> The project aims at dealing with the issue of the effects of climate change on Alpine tourism, with reference both to winter tourism and sports and to Alpine all-seasons tourism. The issue of providing appropriate strategies to ensure a balanced development of Alpine tourism, the preparation of appropriate adaptation policies at the national, regional and local level and the assessment of the economic and social effects of climate change on tourism was a central issue in several studies. ClimAlpTour is an Interreg IVB project.	Agriculture and forestry, infrastructure, tourism
Central Europe: Danube Delta Biosphere Reserve and Bucegi Nature Park (RO); Triglav National Park and Secovlje Salina Nature Park (SL); Balaton Uplands National Park and Körös-Maros National Park (HU)	<u>HABIT-CHANGE - Adaptive Management of Climate-induced Changes of Habitat Diversity in Protected Areas.</u> The project aims to evaluate, enhance and adapt existing management and conservation strategies in protected areas to pro-actively respond on likely influences of climate change as a threat to habitat integrity and diversity. HABIT-CHANGE is an Interreg IVB project.	Biodiversity, water management, agriculture and forestry

5 Conclusions and recommendations

This chapter ties together the evidence on current regional level adaptation activity across the EU with the critical assessment in order to provide some conclusions and recommendations for the way forward. 2013 is a critical point in time for climate change adaptation in the EU. The launch of the EU Adaptation Strategy, and associated guidance and support including the Climate-Adapt web portal, combined with the imminent start of the 2014-2020 EU funding period and its increased focus on climate change, are all key opportunities for Member States and regions to make important progress on understanding and planning for the short and long term impacts of climate change. In most Member States, regions are a critical interface between the national and local levels of governance and have a role in both strategic planning and concrete implementation of measures. Political, financial and technical support for progress on adaptation at this level will be needed to build resilience across the EU and ensure long-term development that is compatible with the impacts of a changing climate.

A number of conclusions and recommendations for the adaptation policymaking and stakeholder communities have emerged from the research and analysis carried out for this study.

5.1 Governance

The role that regions play in adaptation can be critical for the success of adaptation policies in a Member State. All Member States should carefully consider the way in which this 'in-between' level can be most effective in adaptation within the specific context of its governance system and administrative capacities. As the Member States are so diverse, it is not possible to prescribe concrete recommendations on the role regions should play in adaptation. This study has found, however, that for most Member States, there is value to the role that a level of governance situated between the national and local (municipal) can play in adaptation. This role can vary from an enabling function, focused on strategic planning and support, to coordination of local level action, to the actual implementation of larger-scale adaptation measures.

While the principle of subsidiarity dictates that government functions should take place at the level closest to where they occur, for many environmental and territorial policies this is challenging to determine as the needs are defined by geographical rather than administrative borders. In water policy, the Water Framework Directive has created river basin management districts and associated administrative units to effectively address this issue. A similar approach has been taken by the Habitats Directive and the creation of Natura 2000 conservation sites. Climate change adaptation cuts across sectors and borders, meaning that some adaptation measures should be dealt with at the local level and other will cut across levels of governance and administrative borders. To some extent this is already happening across national borders, for transboundary regions like the Alpine Space.

Clear communication and roles and responsibilities for the roles of different levels of governance in adaptation is essential; this should be communicated through strategic policy documents dedicated to adaptation (e.g. national or regional adaptation strategies). One of the barriers identified in many of the Member States was a lack of clear competence and political mandate at the regional

level. Without this, it is very difficult for regions to command the technical, financial and human resources required to undertake adaptation studies and strategic planning. The research found that often the NAS is the place where competence and responsibilities for adaptation are clearly allocated to sub-national levels of government. The comparison of Spain and Italy is useful in this regard; both are larger Member States that have devolved some powers to the regions. In Spain, a NAS was adopted in 2006, and it requires all regions to develop their own climate change adaptation plans or strategies, either as separate documents or within general climate change programmes. Currently 13 of the 19 regions have developed such documents and the rest are underway. In Italy, where the NAS has been drafted but not yet adopted, and less clear direction on regional level roles and responsibilities has been given, only two of the 21 regions have so far carried out comprehensive vulnerability assessments and have announced intentions to develop an adaptation strategy. Devolved competence alone is not a sufficient driver for regional level adaptation; roles and responsibilities need to be clearly articulated.

National level support should ensure financial and technical resources. In France, for example, the national government provides regions with information stemming from climate observatories through web portals, and the regional branches of the national agency for environment and energy management (ADEME) play an important role in helping regions develop their adaptation strategies. Combined with a wide range of relevant national research institutions, in sectors including agriculture and water management, there is a critical mass of information made available to regional planners and experts. There are also well-functioning coordination mechanisms between NUTS III and municipal level institutions within the larger regions.

Stakeholder involvement in the development of adaptation policies is critical to their success. Policies that are legitimised through involvement of and recognition by key actors – including regional and local authorities and other institutions will have greater buy-in from those that are required to implement them.

5.2 Funding support: EU funds

Access to funding – whether from regional or national budgets, or external funds – was cited as a barrier for adaptation in regions in most of the Member States, particularly in those that have been less advanced in adaptation. Regions will need to continue to access EU funds for support on adaptation work, particularly in countries where less progress has been made so far. It also provides excellent opportunities to cooperate with and learn from other regions.

The experience gained and outputs produced by EU-funded cooperation programmes (e.g. territorial cooperation/Interreg and research projects) should be taken seriously and capitalised within the policymaking communities of the Member States. Under conditions of very tight public budgets, many of the adaptation studies and actions found in the regions were part of EU-funded projects, and most of these were through the European territorial cooperation (Interreg) programmes. The Interreg projects have the advantage of focus on the regional (and local) levels, and enable study and development of adaptation solutions that are specific to these levels. However, in some cases the research and conclusions are not taken up into policies and planning with Member States, often due to disconnect between the institutions (or individuals) participating in the projects and key decision-makers.

EU regions are poised to make much more use of Cohesion Policy funds through their national and regional OPs in the 2014-2020 period. For a start, the proposed Regulations for Cohesion Policy 2014-2020³³ contain a dedicated thematic objective for climate change adaptation, which was not the case for 2007-2013. Furthermore, the Common Provisions Regulation requires that, *inter alia*, climate change adaptation, disaster resilience and risk prevention and management are promoted in the preparation and implementation of the funding programmes³⁴. The EU Adaptation Strategy also states that Member States and regions can draw on the 2014-2020 Cohesion Policy and CAP to address the knowledge gaps and invest in the needed analyses, risk assessments and tools and also build up capacities for adaptation.

Cohesion Policy is of particular relevance for regions, as many spending programmes target regions directly and are frequently prepared by regional authorities. In many Member States, especially those where Cohesion Policy funding represents a large portion of public investment funds, the regional development plans prepared as a basis for the spending programmes constitute key planning documents. The Member State research has found that the integration of climate change adaptation into these documents constitutes an important first step for regions in beginning to approach adaptation from a strategic perspective. With the increased importance of climate change – both mitigation and adaptation – in Cohesion Policy 2014-2020, it can be expected that this trend will increase, and adaptation will be addressed at the regional level through the Operational Programmes for Cohesion Policy spending. In rural areas, the Rural Development Programmes funded under Pillar II of the CAP also provide many opportunities for supporting adaptation measures.

Member States will need to include adaptation in the Partnership Agreements and Operational Programmes in order to enable regions to use the funds for adaptation. Climate change (both mitigation and adaptation) are among the key priorities for the EU budget in 2014-2020; the EU has agreed to commit at least 20 per cent of the entire budget to climate change during this period. In general, there is a stronger focus on mitigation than adaptation to climate change, as Member States and regions are required to earmark funds for the thematic objective supporting the shift to a low-carbon economy. For many Member States and regions, one risk is that all 'climate change' funding goes to mitigation at the expense of adaptation³⁵. However, climate change adaptation cuts across all sectors, and there are opportunities for funding adaptation measures in nearly all the Cohesion Policy thematic objectives. The EU Adaptation Strategy advocates 'mainstreaming' of adaptation into key EU policy areas, including Cohesion Policy. To this end, the Commission has issued guidance as part of the Strategy on how to further integrate adaptation under the Cohesion Policy. This and other tools, such as Strategic

³³ Proposal for a Regulation on specific provisions concerning the European Regional Development Fund and the Investment for growth and jobs goal and repealing Regulation (EC) No 1080/2006, COM(2011)614,6.10.2011, Brussels. The Cohesion Policy legislative package was to be adopted in December 2013 at the time of writing.

³⁴ Article 8 on Sustainable Development contains this requirement.

³⁵ Hjerp, P., Volkery, A., Lückge, A., Medhurst, J., Hart, K., Medarova-Bergstrom, K., Tröltzsch, J., McGuinn, J., Skinner, I., Desbarats, J., Slater, C., Bartel, A., and ten Brink, P., (2012), Methodologies for Climate Proofing Investments and Measures under Cohesion and Regional Policy and the Common Agricultural Policy, A report for DG Climate Action, August 2012. Guidance is also available for the Rural Development Programmes of the CAP. See http://ec.europa.eu/clima/policies/adaptation/what/documentation_en.htm

Environmental Assessment³⁶ can be used to help ensure that development plans and programmes like the OPs integrate climate change adaptation effectively.

Other EU funds can also assist regions in making progress on adaptation. The LIFE programme, the EU's instrument targeting the environment, can be used to support capacity building and demonstration projects in key sectors including flooding, coastal management, desertification and fighting forest fires. The EU Adaptation Strategy states that the Commission will support the use of this instrument for the establishment of vulnerability assessments and adaptation strategies, including those with a cross-border nature.

Within regions, an important opportunity for promoting bottom-up climate change adaptation actions could be implemented under the new initiative for 'community-led local development' schemes. As these are meant to be bottom-up integrated local development strategies, they could support the development of adaptation strategies at the regional level and/or serve as a basis for their implementation.

5.3 Technical support: capacity and information

The Member State research found that many regions lack the technical support required to effectively address climate change adaptation. This refers to mainly to expertise within human resource capacity and also to access to relevant information including climate change research, data and assessments. Often, where information is available, staff lack the expertise to understand and use it effectively.

Once the needs are recognised, there is support available from EU technical assistance funds and potentially also the European Social Fund for training staff. EU funds that can be applied for vulnerability assessments and adaptation strategies will supplement regions with external expertise (see 5.2). With adequate funding, regions can both train existing staff, hire additional staff with the desired qualifications, and access consultants and other short-term, targeted experts. To access funding for these things, adaptation must first become a clear priority within a region – this is related to governance and awareness issues.

Solid cooperation between policymakers and scientific research institutions is critical. It has been recognised that scientific research needs to be more applicable for policymaking, and also confirm to the needs and knowledge gaps of policymakers. At the same time, better communication from the policy side to the scientific community is also required to allow for better acceptance and incorporate of their work into practice.

The Climate-ADAPT web portal, combined with national web portals for more specific information and data, can be an excellent tool for managing communication and information and raising awareness of the need for better science-policy cooperation. Climate-ADAPT (as well as existing national portals) has already played a large role in building capacities and providing policymakers with capacity building and tools on how to understand and apply the scientific information. More of this is desperately needed, especially for regional and local authorities where there is less capacity and experience on adaptation.

³⁶ DG Environment has recently released Guidance on Integrating Climate Change and Biodiversity into Strategic Environmental Impact Assessment, which includes adaptation.

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Annexes (in separate files)

Annex 1: Member State matrixes

Annex 2: List of officials and experts contacted in the Member States

Annex 3: Good practices in regional and transboundary adaptation

