MEDIATION Delivery Report

Title	Report on perceived policy needs and decision contexts
WP Number	1
WP Leader	SEI
Delivery number	1.1
Relative task(s)	1.1, 1.2
Involved beneficiaries	IIASA, SEI, UPM
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Related to deliverable number(s)	1.2, 1.4
Date of completion	30 June 2010
Submission Date	1 July 2010
Approved by the WP Leader[1]	

To complete by the Coordinator

Approved by the Coordinator[1]	
Listed[1]	

[1] Date and signature / initials

Abstract

Adaptation to climate change is a new challenge for existing institutions and decision-making processes. In order to assess what form this challenge takes for decision-makers, we conducted interviews and a policy review to determine the perceived policy needs in Austria, Finland, France, Italy, Poland, Romania, Spain and the United Kingdom. In each country, interviews are conducted at the national level and the sub-national (state) level if the national level is not sufficiently active in adaptation planning yet. We focus on general adaptation policy as well as specific sectors for each country, in line with the distribution of MEDIATION case studies. Different countries are at different stages of developing adaptation policy, but the underlying needs are similar across them. We group the needs into nine categories: inter-agency coordination, multi-level governance, mainstreaming, awareness-raising, coping with uncertainty, research needs, tools and information access, financial and human resources, and political commitment. We also look at suggestions for the EU's role in coordinating adaptation policy.

Note on authors' contributions

Stefan Pfenninger, Susanne Hanger, Magali Dreyfus and Anthony Patt, from the International Institute for Applied Systems Analysis (IIASA) scoped and planned this report. Stefan Pfenninger wrote the UK and Finland sections. Susanne Hanger wrote the Romania and Austria sections. Magali Dreyfus wrote the Italy, France and EU sections. Anna Dubel, also from IIASA, wrote the Poland section. Nuria Hernández-Mora, Paloma Esteve and Consuelo Varela-Ortega, from the Polytechnical University of Madrid, wrote the Spain section. Paul Watkiss, from the Stockholm Environment Institute, contributed substantially to the UK section. Anthony Patt edited the final draft. The conclusions and opinions expressed in this report represent those of the authors, based on the data they evaluated, and do not represent those of their respective institutes or the European Union. Any factual errors are those of the authors.

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1 Introduction

Adaptation to climate change is increasingly on the policy agenda in Europe. The research project MEDIATION is intended to support adaptation decision-making in the EU by providing a toolbox and common platform for decision-makers.

In order to support the development of such a system, the needs of its users have to be addressed. This report is an attempt to scope out the problems and needs that decision-makers are faced with when developing adaptation policies. It aims primarily at the national and regional levels of policy-making, as that is where legislation and the distribution of competencies stem from in most countries.

In the European Union, there are wide differences in existing climates and in projected future impacts. Not all impacts are felt in all countries, but similarly, countries have different political climates too. The administrative and legal landscapes vary across Europe, and so does the commitment to deal with adaptation. To study this, we have taken a national case study approach, focusing on Austria, France, Finland, Italy, Poland, Romania, Spain, and the United Kingdom.

After a brief section on the analytical framework and methods used, the rest of the report lays out the current state of adaptation policies, particularly at the national level, as well as the needs that constrain the development of adaptation policy in Europe. It is structured as follows:

- **EU Adaptation Policy**. First, the policies within the EU that directly or indirectly affect adaptation in its member countries are summarized, and the role of the EU in national-level adaptation policy-making is explored.

- **Countries.** For each of the countries we examine, two main sections frame the results: (1) an overview of the policies and activities taking place in that country with regards to adaptation which serves as the basis for (2), the perceived policy needs based on insights from interviews as well as literature and policy documents.

- **Synthesis.** This final section combines insights from the individual countries and presents an overview of the types of problems that can be generalized across Europe.

2 Analytical framework

Adaptation policy in Europe is still at its beginning. Although a wide range of academic studies on impacts, vulnerability and adaptation have been conducted over the last decade, there is still much to learn. In particular, the question of the governance level at which adaptation should be best tackled is still open. Different levels of government play a varied but equally important role in shaping adaptation. Some stress the need for adaptation at a global scale (Burton 2008), while others underscore the importance of local institutions (Agrawal 2008).

To look at the national level of policy is thus a good starting point for exploration of the key policy issues. Looking up towards international collaboration, and looking down towards regional and local implementation of adaptation, the national level is currently the main arena where adaptation is planned and coordinated as evidenced by the national adaptation strategies that have been coming out of various European countries as well as, UNFCCC-coordinated, in developing countries. This reflects the sovereignty of the nation state in the world today.

The concept of adaptation itself is very general and can encompass a wide range of concrete actions and problems. Based on lessons learnt during the ADAM project, Hinkel et al (2010) offer a perspective on adaptation as "a process of social learning involving scientific, policy and practitioner communities", instead of looking at it merely from an impact modeling or decision analysis viewpoint. Hinkel (2010) conceptualizes adaptation problems with the concept of action situations from the Institutional Analysis and Development framework developed by Ostrom (2005). This results in a very open definition of an adaptation problem – shaped by the physical world and physical climate impacts, it is primarily a problem of deciding on the right action given the rules, uncertainty and that usually more than one actor is involved in the situation.

There is a body of work on the factors that make national adaptation planning successful. Adger et al (2005) investigate key elements of successful adaptation policy, as well as review classification of adaptation activities and different spatial scales. The four broad types of key elements are effectiveness, efficiency, equity and legitimacy. The National Adaptive Capacity Framework developed by the World Resources Institute (McGray 2009) presents core functions which indicate a functioning adaptation system at the national scale, and provides sets of questions to ask and elements to look for when assessing these functions. The core functions are: Assessment, Prioritization, Coordination, Information Management and Climate Risk Reduction. A comparative study of EU national adaptation strategies identified key drivers and key facilitating factors for adaptation policy (Figure 1). The report especially highlights five areas of importance for successful adaptation policy: the science-policy nexus, communication and awareness-raising, multi-level governance, policy integration and review and implementation (Swart et al. 2009).

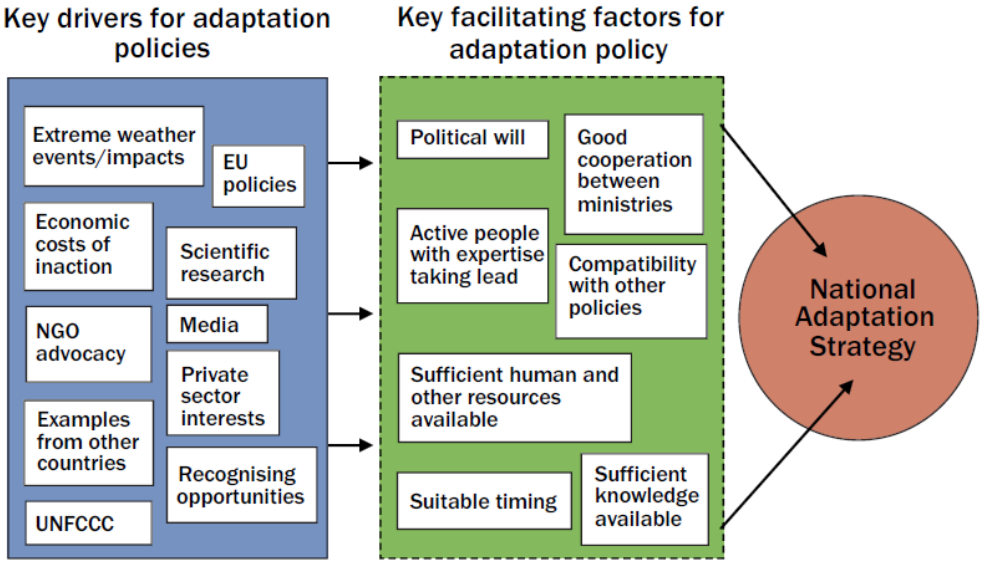

Figure 1: Key drivers and facilitating factors for NAS development (Source: Swart et al. 2009)

Adger et al (2009) argue how adaptation is most likely to be constrained by factors endogenous to a society, such as ethics, knowledge and attitudes to risk or culture. Comparing across a range of countries where such factors are different could thus reveal useful insights.

3 Methods

Although the analytical framework outlined above guides the analysis, the approach within the case studies is as inductive as possible: the analysis is kept as open as possible in order to ascertain any and all potential policy needs.

We chose a set of country-level case studies to represent the diversity of European governance systems as well as the diversity of the European natural environment. Table 1 gives an overview of the selected cases. For each region, we focus on a particular sector (or a set of closely interconnected sectors). The primary unit of analysis is the national-level adaptation policy process; however, as countries differ in their governance structures, subnational-level and local-level policies and actions are taken into account as necessary to extend and contextualize the national-level narrative. In addition, EU adaptation policy is assessed both in general and in a number of key sectors: agriculture, floods, forest fires, water and coastal zone management, and health.

Table 1: Case study countries

Region	Sector	Country	Key features
Central and Eastern	Water management (floods) and agriculture	Austria	Extensive elaboration process of a national adaptation process ongoing. Strategy to be expected in 2011. Policy paper on adaptation published in 2009.
		Poland	No national adaptation strategy.
		Romania	Adaptation strategy as part of the Climate Change Strategy 2010-2012 expected (2010). Guide on adaptation published in 2009.
Northern	Forestry and biodiversity	Finland	First national adaptation strategy (2005), assessment of strategy (2009)
Southern	Water management (droughts), health (heat waves), cities, tourism	Italy	No national strategy has been adopted so far, nor is there any project to do so.
		Spain	National Climate Change Adaptation Plan adopted in 2006, with subsequent work programmes to address the issues.
Western	Coastal zone management and sea level rise	France	National Strategy on Adaptation (2006) National Plan on Adaptation (in process, should be completed by 2011)
		United Kingdom	Wide range of activities since late 90s in absence of a national strategy until most recently (ACC programme, 2008, departmental plans, 2010)

For each case study country, we have analyzed policy documents (national strategies, national legislation, research reports, assessment reports, government websites, etc) through a set of guiding questions. Because the case study countries are at very different stages in their planning and implementation of adaptation policy, the extent to which documents play into the analysis varies. For instance, in the UK a wide range of research and policy documents exist to be drawn upon, while in Romania, few documents are available beyond a brief guide on adaptation.

We conducted semi-structured interviews between April and June 2010 to complement the results from the document analysis, first to fill in information gaps not clearly addressed by documents, depending on the country context, and second to get direct insights into the types

of problems faced in current and future adaptation policy — insights that are difficult to extract from policy documents. A selection of decision-makers was interviewed[2] (see table in Annex 2). The selection of interviewees was based on covering the country's key policy processes both on the 'general' adaptation level and the sectoral level. It constituted a key informant selection. During the interviews, a focus was put on decisions to be taken within a 20-year horizon, with two distinctive classes of problems: (1) problems that are a concern in the short-term, and (2) long-term problems that already need to be addressed now or in the near future.

4 EU adaptation policy

4.1 Policy framework

Since 1991, the European Commission has had several initiatives concerning climate change, starting with strategies aiming at reducing greenhouse gas (GHG) emissions and improving energy efficiency (a directive to promote electricity from renewable energy, voluntary commitments by car makers to reduce CO2 emissions by 25% and proposals on the taxation of energy products). In 2000, encouraged by the European Council, the Commission established a list of priorities and actions in order to implement the Kyoto protocol. This constituted the first European Climate Change Programme (ECCP), which was revised in 2005 with the 2nd ECCP. This second programme includes a working group dedicated to the issue of impacts and adaptation.

4.1.1 Adaptation competencies

The EU is competent to draft environmental policies on the basis of article 175 of the EC Treaty. In that area, the competency is shared with the member states by virtue of the subsidiarity principle, which means that the EU should legislate only where its action will be more efficient than at the level of the member states. However the EU can also legislate on environmental matters through sectoral policies such as agriculture and fisheries (art. 32), transports (art. 71), approximation of laws (art. 95) or commercial policy (art. 133). In addition, the new Treaty on the functioning of the European Union adds among the objectives of the environmental policy, the promotion in the international context of measures combating climate change (art.191 parag.1).

Until 2010 the Directorate-General for Environment was responsible for dealing with issues regarding climate change and adaptation. Since February 2010 however a special DG dedicated to "climate action" is in charge of those questions. This creation corresponds to a trend observed in different member states to set up a special government department to deal with climate change issues. The European Environment Agency (EEA) based in Copenhagen assist the DGs by providing information on environmental matters.

4.1.2 General adaptation policies

The current European policy regarding adaptation to climate change is outlined in the White Paper on adaptation published, in 2009[3]. This document is the follow up of the Green Paper[4,]

[2] For Spain and Poland, the information is more heavily based on existing experience of the local partner, and the interviews focus more on the regional rather than national level.

[3] European Commission White Paper, „*Adapting to Climate Change: Towards a European framework for action*", 1 April 2009, COM (2009) 147 final

[4] European Commission Green Paper of 29 June 2007 on „*Adapting to climate change in Europe - options for EU action*", COM(2007) 354 final

adopted in 2007, which launched a consultation on the future direction of EU policy as regards to Europe's adaptation to climate change. The Green Paper stated why action had to be taken by the European institutions, and laid down the relevant guidelines. Individuals, organisations and governments departments sent written or electronic comments to the Commission. In total the Commission received 216 answers. The White Paper built on the answers to the consultation and set a framework for action for the EU. The objective of the EU action is to reduce its vulnerability. It is based on the principle of subsidiarity and supports overarching EU objectives such as sustainable development. The action is organised in two phases. The first one, from 2009 to 2012 shall "lay the ground work for preparing a comprehensive EU adaptation strategy to be implemented during phase 2". Phase 2 starts in 2013. Phase one is based on four 'pillars'. The first one is the constitution of a solid knowledge base on the impact and consequences of climate change for the EU. The second one is the integration of adaptation into key EU policy areas. The third one is the combination of policy instruments to ensure effective delivery of adaptation. Finally, the fourth one is the intensification of international cooperation.

Action is foreseen around seven major topics out of which five are sectoral matters. To begin, the EU wishes to base its action on sound knowledge in order to take the most effective decisions on how to adapt. The core of this strategy is the Clearing House Mechanism, which shall be set up by 2011. This is a common initiative of the Commission and the EEA. It aims at sharing information on impacts and adaptation in the different member states. Other tools such as databases, methods, models to better monitor the impact of climate change, the vulnerability and the adaptation process shall also be developed by 2011. The costs and benefits of adaptation have to be studied. The second area of action is the mainstreaming of adaptation in EU policies in five sectors. The increasing resilience of health and social policies is a first objective. The EU and the member states should establish surveillance systems of disease and health impacts of climate change. The second objective deals with the resilience of agriculture and forests (see below). The third area concerns biodiversity, ecosystems and water (see also below 'floods'). Policies should be improved to address biodiversity loss. By the end of 2009, guidance and exchange of best-practices were supposed to have facilitated the elaboration of climate-proofed River Basin Management Plans. Measures to enhance water efficiency in agriculture, households and buildings shall also be taken as well as measures to boost ecosystem storage capacity for water. Finally guidelines on the impact of climate change on the management of Natura 2000[5] sites must be drafted by 2010. The fourth area deals with the resilience of coastal and marine areas. The action here consists in ensuring that adaptation considerations are taken into account in the Integrated Maritime Policy, in the implementation of the Marine Strategy framework Directive and in the reform of the Common Fisheries policy. European guidelines on coastal adaptation should be drafted.

The fifth and last sector mentioned is the production systems and physical infrastructure. The Strategic Energy review process should take climate change impacts into consideration. Methodologies for climate-proofing infrastructure projects should be developed and if possible incorporated into the trans-European transport network (TEN-T) and trans-European energy network (TEN-E) guidelines and guidance on investments under Cohesion policy.

[5] The Natura 2000 is an initiative of the European Union seeking to ensure biodiversity by conserving natural habitats and wild fauna and flora in the territory of the Member States. An ecological network of special protected areas, known as "Natura 2000", is been set up for this purpose. As a rule, the member states are responsible for determining which areas should be protected. However areas of a special interest for the European Union may result in the intervention of the Commission. The activities of the network involve monitoring and surveillance, reintroduction of native species, introduction of non-native species, research and education.

Also the possibility to make climate impact assessment a condition for public and private investment and to integrate it into construction standards such as Eurocodes, should be explored. Guidelines ensuring that climate impacts are taken into accounts in the EIA (Environmental Impact Assessment) and SEA (strategic Environmental Assessment) Directives should by all means be developed by 2011.

In addition to the strategies for these five sectors, instruments for the financing of adaptation should be developed. The assessment of costs and potential benefits is highlighted as a crucial issue. The potential for insurance and other financial products to complement adaptation measures and to function as risk sharing instruments is another mechanism that should be further studied. Member states should be encouraged to use EU ETS revenues for adaptation purposes.

The cooperation and coordination between member states is essential for the good implementation of the adaptation policy and to that end, the White Paper suggested the creation of an Impact and Adaptation Steering Group (IASG) before the 1 September 2009. This group met for a preparatory meeting in October 2009, after which no noticeable activity took place. The first official IASG meeting should be held in September 2010 and will gather representatives of the different member states. National strategies on adaptation are also promoted and may become mandatory from 2012 onwards. Finally the Commission wishes to mainstream adaptation in all EU external policies and to strengthen dialogue with partner countries and bring the White Paper forward in the UNFCCC.

The White Paper was accompanied by several Commission staff working documents: on agriculture, on health, and on water, coasts and marine issues.

4.1.3 Sectors

4.1.3.1 Agriculture

Regarding agriculture, the White Paper recommends that measures for adaptation and water management are embedded in rural development national strategies and programmes for 2007-2013. It also advises to integrate adaptation into the three strands of rural development (competitiveness, environment, quality of life of citizens) to study how the Common Agricultural Policy (CAP) may contribute to the efficient use of water in agriculture. The capacity of the Farm Advisory system should be improved to reinforce training, knowledge and adoption of new technologies that facilitate adaptation.

The working document accompanying the White Paper goes into further details[6]. In the short run, the Commission suggests to foster adaptation measures at the farm-level and sectoral level. In the long run, the European adaptation strategy in the agricultural sector should be based on several principles: prioritising 'no regrets' measures, strengthening the role of agriculture as a provider of ecosystem services, enhancing resilience of agricultural infrastructure, developing synergies between adaptation and mitigation, improving the adaptive capacity of farmers, facilitating co-operation between Member States, enhancing research on climate and agriculture, developing vulnerability indicators.

[6] Commission Staff Working Document on Adapting to climate change: the challenge for European agriculture and rural areas, SEC(2009) 417,
http://ec.europa.eu/agriculture/climate_change/workdoc2009_en.pdf

4.1.3.2 Floods

The White Paper recommends that climate change is taken into account in the implementation of the Floods directive. In that framework, the Commission staff working document on Climate Change and Water, Coasts and Maine Issues[7] recalls that the Floods Directive establishes a framework for the assessment and management of flood Risks. The Directive requires Member States to assess if all water courses and coast lines are at risk from flooding, to map the flood hazards and identify assets and humans at risk in these areas and to take adequate and coordinated measures to reduce the flood risk. The Directive also requires Member States to coordinate their flood risk management practices in shared river basins, including with third countries, and to avoid taking measures that would increase the flood risk in neighboring countries. Co-ordination with the implementation of the Water Framework Directive is also necessary. The Floods Directive therefore provides a comprehensive mechanism for assessing and monitoring increased risks of flooding due to climate change and for developing appropriate adaptation approaches. The coordinated approach with the river basin management plans will ensure an overall effective approach and help avoid maladaptation measures.

4.1.3.3 Forest Fires

The White Paper recommends that a debate on options for an EU approach on forest protection and forest information systems is launched. It states that the forest strategy could be updated on climate-related aspects. The Community mechanism for civil protection aims at enhancing cooperation of civil protection services in the event or threat of disasters and emergencies. If a country requires it, it can get through the Community mechanism the technical assistance of other member states. The Community mechanism for civil protection also consists of information tools and training on preparedness and responses. Interventions can also be made outside of the EU in the framework of its humanitarian action.

4.1.3.4 Water, coastal and marine issues

Regarding water, coasts and marine issues, the Working Paper recommends that the Commission develop an integrated approach to both water management and to the management of marine and coastal zones, including measures to mainstream adaptation into sectoral policies. Short-term adaptation measures would consist of the good implementation of existing EU water legislation and policies, in particular, the development of river basin management plans under the Water Framework Directive as well as assessing the need for further measures to enhance the efficiency of water use and exploring the potential for policies and measures to boost ecosystem storage capacity for water in Europe. The Commission shall also ensure that adaptation in coastal and marine areas is taken into account in the framework of the Integrated Maritime Policy, in the implementation of the Marine Strategy Framework Directive and in the reform of the Common Fisheries Policy. In particular, the Integrated Maritime Policy facilitates the integration of coastal and marine adaptation needs, supporting adaptation related in maritime activities, marine environment, coastal zones and islands. Hence according to the Commission, it provides the needed cross-cutting tools to better address climate change in an integrated manner: Maritime Spatial Planning, Maritime Knowledge, exchange of good practices, integrated approach at a sea basin level.

4.1.3.5 Health

In the health sector, the White Paper provides very broad guidelines. The major

[7] Commission Staff Working Document on Climate Change and Water, Coasts and Marine Issues, SEC(2009) 386/2, http://ec.europa.eu/environment/climat/adaptation/pdf/sec_2009_386.pdf

recommendations are to develop guidelines and surveillance mechanisms on the health impacts of climate change by 2012 and to step up existing animal disease surveillance and control systems. It also recalls that the Health Programme of 2007 already considers the issue of climate change[8] and recommends the study of its impacts on health as well as the development of mechanisms of surveillance and responses to health threats. The working document accompanying the Health Programme also states that the Commission is preparing a document on "Health aspects of adaptation to climate change". It has not been published yet. It shall be based on the scientific data collected regarding the effects from extreme weather and events on health and how to respond to them. The implementation of surveillance systems for the main effects of climate change such as heat-waves and flooding will be examined. The capacity of EU health systems and infrastructure to cope with different levels of climate-related health threats will be estimated, with the aim of supporting contingency planning for hypothetically dangerous situations as necessary.

The Commission staff working document[9] accompanied the White Paper to go further into details on existing regulatory measures and actions to be taken. It is structured around three issues: human health, animal health and plant health. On these issues, the Commission has identified a series of action to be integrated in the EU Health Programme, in the Community Animal Health Strategy and in the existing legislation on Communicable Diseases, animal disease control and on plant health as well as in the work plans of relevant agencies. These actions are the development of guidance on surveillance; the development of extreme weather health action plans ; the strengthening of close co-operation between human animal and plant health services ; the reinforcement of public health policies and training ; the identification of efficient health measures and public health response ; the reinforcement of international collaboration, in particular with agencies and international bodies such as the WHO, OIE and FAO; the improvement of surveillance networks for animal diseases, especially as the Community Animal Health Strategy already envisaged it; the improvement of data collection ; the enhancing of co-operation with neighbouring countries and a better coordinated approach in responding to animal disease outbreaks ; the continuation of co-financing for surveillance, eradication and emergency vaccination ; the evaluation and improvement of the existing Community Plant Health legislative framework.

4.2 Perceived Policy Needs

The EU is faced with two major issues: multi-level governance and uncertainty. Some other policy needs can however be identified. The perceived policy needs where identified through an interview and the review of EU documents and the literature.

4.2.1.1 Multi-level governance

Subsidiarity is the underpinning principle of EU action on adaptation. One of the sections of the White Paper is called "working in partnership with the member states". However, it is hard to manage in practice. The ISAG is an important tool for that. It gathers representatives of the member states and policy officers of the Commission. It is composed of different technical groups to deal with the particular issues arising in the sectors. The group will help national and regional authorities defining their adaptation strategies.

The EU could contribute to the of regional and local authorities action especially through the

[8] Commission White Paper of 23 October 2007 'Together for Health: A Strategic Approach for the EU 2008-2013' [COM(2007) 630 final]

[9] Commission Staff Working Document on Human, Animal and Plant Health impacts of Climate Change, SEC(2009) 416, http://ec.europa.eu/health/ph_threats/climate/docs/com_2009-147_en.pdf

cohesion and regional funds. The EU also acts as a source of information and exchange of best practices. It acts as a coordinator and the clear house mechanism is meant to gather all local and regional initiatives in Europe and to make them known to other authorities.

4.2.1.2 Coping with uncertainty

As the member states, the EU is faced, in the definition of its strategy, with the uncertainty of scientific data regarding climate change. To reduce the uncertainty that impedes decision-making, the EU funds research projects. One objective is to be able to map territorial vulnerabilities on the whole European territory, including at the regional level. This would allow establishing a list of prioritised adaptive actions. Research is therefore a priority of the EU approach.

4.2.1.3 Resources

The financing of climate change actions and adaptation is also an issue for the EU. Costs assessments for adaptation should be made for any relevant policy. Budgets in the sectors could be revised in order to provide more funds to climate action. Hence in the agriculture policy it could be useful to balance the budget between the pillars in order to give more weight to the second one, which deals with rural development including environmental matters.

4.2.1.4 Coordination

Coordination between the different DGs is ensured by the recently created DG climate action. An inter-departmental group meets regularly to discuss adaptation measures in the sectors. The situation is quite different in the sectors. In the Environment DG, topics such as water or biodiversity are already tackled efficiently and adaptive actions are taken (see for instance the river basin management plans). But in other areas the lack of information on impacts and uncertainty are still hindering any move towards adaptation (as for the instance the costs and benefits of adaptation actions or the frequency of disasters).

4.3 Synthesis

In the short run the priority of the EU respect to adaptation seems to be the good implementation of existing environmental norms. In the long run, its major strategy is to integrate adaptation measures in sectoral policies. There are no formal binding measures for the member states regarding adaptation in general but sectoral policies may allow the Commission to create new legal obligations for the states.

The EU‘s major objectives appear therefore to be:

- The development of knowledge, methods and tools regarding adaptation in Europe
- The development of platforms/bodies allowing cooperation, coordination and exchange of information and best practices between the members states
- The mainstreaming of adaptation in sectoral policies: a lot of sectoral programme actually constitute a solid basis for the collection of information and could well be the frame of adaptation measures

The added value of EU action appears to be particularly noticeable in member states where action has lagged behind so far. It raises awareness and the different research programmes funded by the EU allows to increase knowledge on the effects of climate change and to exchange information and best practices. However for member states which have already an advanced strategy on adaptation, the role of the EU may be improved, especially in the

sharing of information and best practices. These are therefore some the challenges that the EU should tackle in the future.

5 Central and Eastern Europe

The case study region Central and Eastern Europe comprises a comparably large number of countries, from the Baltic States in the North to the Balkans in the South. Agriculture and flood management were defined as common key sectors in terms of adaptation needs. While the affected sectors are similar, the diverse governance structures in these countries are the reason for the very different implementation stages of adaptation policies. Romania and Poland were picked for being new EU Member States with a centralized planning structure and comparably little adaptive capacity. By contrast, Austria has a highly decentralized administration, transparent planning procedures and a high adaptive capacity.

5.1 Austria

5.1.1 Policy framework

5.1.1.1 Policy and institutional context

Austria is a Federal Republic and consists of nine federal states (Länder, NUTS II). Legislative competencies are divided between the national and the regional level. Therefore, the national government has limited possibilities to put comprehensive nation-wide policies and laws into force. The Länder act independently of each other and use different approaches to address similar problems. On the national level the Ministry of Agriculture, Forestry, Environment and Water Management (BMFLUW[10]) holds all competencies concerning the environment. The Environment Agency Austria (UBA) is an expert organization that provides interdisciplinary expertise in all environmental disciplines and relevant data and analyses. UBA is an enterprise owned by the Federal Republic of Austria and directly subordinated to the BMFLUW. Other integral competencies (e.g. land allotment) relating to climate change, the environment and planning can be found on the community level (Gemeinden, LAU). The county level (Bezirke, NUTS III are aggregated counties) constitutes a political entity between the communes and the federal states, but do not have any relevant competencies concerning the environment or other relevant domains. Such a multi-level system requires well-coordinated communication between the different decision making bodies. Article 15a. of the federal constitutional law is an important tool for cooperation. It states that *„The Federation and the Länder may conclude agreements among themselves about matters within their respective sphere of competence.… (2) Agreements between the Länder can only be made about matters pertaining to their autonomous sphere of competence"*

5.1.1.2 General adaptation policies

Evolution of adaptation policy

Austria does not have a national adaptation strategy (NAS) yet. Implicit adaptation activities, especially in tourism, water management, agriculture and forestry started already in the 90s. Until 2007 the strong focus on mitigative measures and political reluctance impeded formalized adaptation. Mitigation (Klimaschutz) is still seen as the more important aim and is handled strictly separated from adaptation. However, the adaptation strategy will consider aspects of mitigation. The intensified EU efforts on the topic (Green Paper on Adaptation),

[10] In the text the German Acronym BMLFUW (Bundesministerium fuer Landwirtschaft, Forstwirtschaft, Umwelt und Wasserwirtschaft) will be used.

the obligation according to the UNFCCC, a pushing scientific community and the ongoing risk dialogues were important incentives for the comprehensive participation and elaboration process that started in 2007. A study assessing the current state ("Ist-Stands-Erhebung") on climate change adaptation was developed following a first expert workshop in the fall of 2007. In 2008, a study on the identification of first adaptation measures was published ("Identifikation von Handlungsempfehlungen zur Anpassung an den Klimawandel in Österreich")[11]. The study highlighted further research needs that also served as an impulse for the StartClim program (cf. science policy interaction). In the same year, the development of a national strategy was included into the Austrian government program (Republik Österreich 2008). Another step was the elaboration of a database containing information on adaptation projects (research as well as applied projects) collected all over Austria. It takes account of the fact that in Austria many implicit adaptation measures have taken place on different levels and several sectors without national coordination and without the official label of adaptation. On the basis of the 2008 report and two more informal workshops a policy paper was written and published in 2009: "Towards a National Adaptation Strategy" ("Auf dem Weg zu einer nationalen Anpassungsstrategie"). The national strategy can only be a framework for coordination of adaptation measures. In the end a careful selection process has to divide up the competencies between the different decision-making levels in order to avoid overlapping competencies and cross-planning.

The participation process (Begleitprozess) is coordinated by the BMLFUW and financed by the ACRP (Austrian Climate Research Program; cf. science policy interaction). The process is an important instrument aiming to involve all relevant decision-makers, scientists and stakeholders on the national level[12]. It ensures that nobody feels left out and has an active part in shaping the strategy; thereby misunderstandings and disapproval can be largely avoided and a common commitment is made. The broad participation ensures that all relevant sectors are represented and potential side effects on existing planning processes and instruments can be detected in advance. There are two main audiences the "organized public" and the "general public": The "organized public", 43 institutions, most federal and provincial ministries, interest groups (e.g. chamber of labor/agriculture), NGOs (e.g. The Austrian Alpine Association, the platform and interest group for Austrian environmental and alpine NGOs). The "organized public" was involved through several workshops with different foci, e.g. defining research needs through science-policy interaction. The "general public" was provided with an information platform (www.klimawandelanpassung.at) and survey that enabled interested individuals to answer specific questions and give general input on the topic.

[11] The second volume of this study is currently work in progress.
[12] Representatives of the Länder are also involved, though the process is oriented mainly towards the national level.

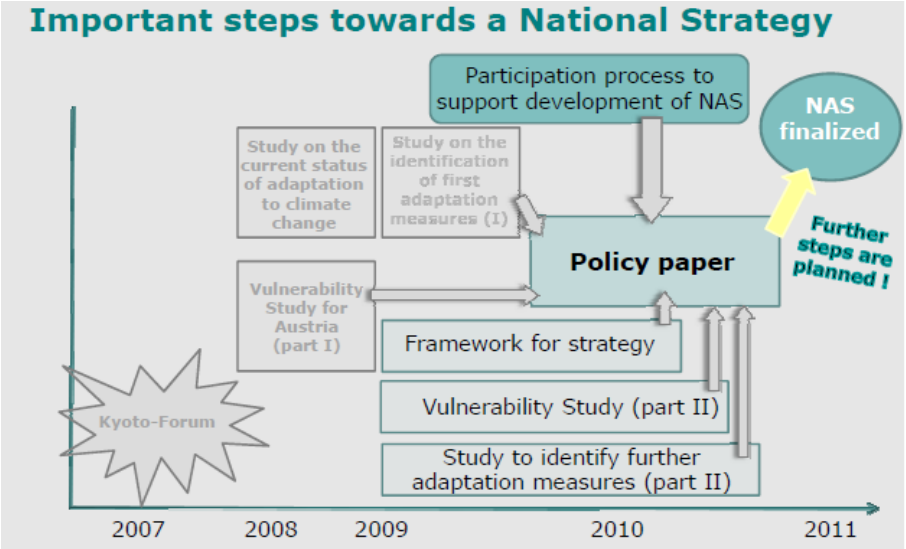

Figure 2: Evolution of the Austrian NAS (Environment Agency Austria, 2009)

Adaptation competencies

Adaptation on the national level is in the hands of the BMLFUW (department 5/ 4 Emission and Climate Protection[13]), which manages the elaboration and implementation processes of the NAS in close cooperation with the Austrian Federal Environmental Agency (UBA). The Länder governments have their own environmental departments and delegated representatives who engage in the participation process. Some have also initiated regional activities in terms of research and strategic planning (e.g. The State of Carinthia started a working group on adaptation and Upper Austria set up an expert network on adaptation). The process around the national adaptation strategy was initiated with the Kyoto Forum, which is one .of the two bodies, central to climate change policy in Austria. It coordinates all activities regarding climate change between the national government and the governments of the Länder. The second important body is the inter-ministerial commission on climate change.

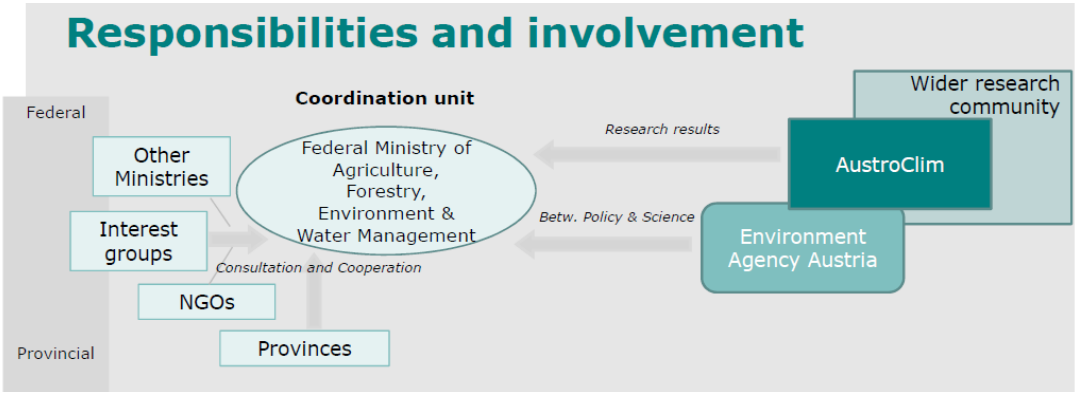

Figure 3: Responsibilities and involvement in the elaboration of the Austrian NAS (Environment Agency Austria, 2009)

[13] Department 5/4 is part of the Division 5 General Environmental Policy

The policy paper "Auf dem Weg zu einer nationalen Anpassungsstrategie"

The policy paper was the last step taken on the way to a national adaptation strategy. The first part is about the status quo of adaptation in Austria (e.g. activities of the Länder), climate change impacts and vulnerability in Austria. The second part recommends adaptation measures for a first set of sectors: Agriculture, forestry, water management, tourism and energy. It describes the aim and relevance of the respective measure, highlights the link to existing policies, especially funding instruments and indicates a time frame and potential actors. In summer 2009 a draft of the policy paper was sent out for feedback to the "organized public". The comments were discussed and included in the document. In the next iteration further sectors such as construction and housing, health, natural ecosystems/biodiversity, natural hazards/disaster management/planning and infrastructure/transport/spatial planning etc. The current policy paper will then be split into two parts: a more general introduction to adaptation and a catalogue of measures according to sector. The aim is to have a strategy ready for adoption by the parliament in the second half of 2011.

Science-policy interaction

AustroClim is an initiative of Austrian climate change scientists, who started an interdisciplinary cooperation in 2002, with the aim to address the challenges of climate change and to support decision-makers and stakeholders. AustroClim is deeply involved in the elaboration process of the NAS.

The Climate and Energy Funds are a financing instrument that is directed foremost to support the development and use of new technologies in the renewable energy sector and other mitigation efforts. With the introduction of the Austrian Climate Research Program (ACRP) a special funding line addressing specifically adaptation[14] was created.

The StartClim program was initiated in 2002, after catastrophic floods in large parts of Austria. This research program works on a year to year basis, intending to support research on new and acute topics related to climate change. Since 2008 there is a strong focus on all topics concerning adaptation. The program's financial source is an open consortium of donors consisting of public institutions and enterprises.

Between 2000 and 2006, the Federal Ministry of Science and Research funded a program with the focus on climate change impact and adaptation (proVISION[15]). The Austrian Academy of Sciences' Global Change Program started an ongoing research project in 1990, on climate change impacts.

5.1.1.3 Agriculture

Agriculture has lost a lot of its former economic importance; still this traditional sector has comparably high political influence and power. Due to the size of the country and its topography the agricultural sector is characterized by a small structure. In the last two decades Austria's farmers took the international lead in organic and sustainable farming[16], a highly relevant factor, when talking about adapting agriculture to climate change.

Agriculture is a competency of the BMLFUW and is split in many specialized departments

[14] www.klimafonds.gv.at
[15] www.provision-research.at
[16] Austria is the leading country in terms of certified land under organic management (13.4%) according to www.organic-world.net (last retrieved on 20 June 2010).

dealing with different aspects of the sector. Depending on the area competencies are also on the Länder level. Two state-owned enterprises support their work and decisions: the Federal Institute for Agricultural Economics and the Austrian Agency for Health and Food Safety. Concerning adaptation, there are different delegates from these departments representing their field in the participation process on the National Adaptation Strategy of Department 5/4 of the same ministry, which also coordinates all intra-ministerial departments. They all have the possibility to contribute to the national adaptation strategy and generate measures for the agricultural sector. As in the other sectors a sector-specific strategy does not exist. Many measures that could be labeled adaptation are already implemented in the context of other programs (e.g. sustainable development). Consulting services for farmers also consider climatic changes, they are coordinated by the ministry and implemented the chambers of agriculture and forestry and the Länder. The Austrian NAS will include all existing measures and instruments that are relevant to adaptation in the agricultural sector. www.landnet.at is the public information platform on agriculture of the BMLFU; so far it provides no explicit information on adaptation.

The *Rural Development Strategy 2007-2013* is the most important strategy in the agricultural sector, while it acknowledges the impacts of climate change and the need to address them, it suggests no concrete adaptation strategy. Based on the incentives of the national adaptation strategy the upcoming strategy for rural development 2014-2020, is likely to give clear indications also for adaptation.

ÖPUL[17] is a funding instrument for environmental protection measures in agriculture. The name is Austrian Program for the Support of environmentally compliant and extensive agriculture protecting the natural living space. It is currently being reviewed for its potential to integrate mitigation. The policy paper on climate change adaptation also refers to the program; however, a detailed appraisal has not been undertaken so far.

5.1.1.4 Floods

Austria is a country rich in water; however, especially in the eastern parts of the country, the changing climate causes ground water levels to fall and dry periods are becoming longer. Many Austrian regions are not yet affected by droughts; however, recently floods have caused considerable damages in the entire country. The project FLOOD Risk II financed by the BMLFUW did not find changes in flood risk for rivers with medium and large catchment areas; however, smaller catchments show a need for increased care. Nevertheless, the existing climate models do not have the necessary spatial resolution to provide results for regional and local prognoses (BMLFUW 2010a).

All issues concerning water management are also within the competency of the BMLFUW on the national level and the Bundesländer on the regional level. The Austrian water law (Wasserrechtsgesetz, WRG 1959), which will also be the framework for the integration of the EU Flood Directive, is a national law. Other relevant laws, however, are on the Länder level (e.g. planning, construction, housing). The water section of the ministry is supported by the Federal Agency for Water Management (Bundesamt für Wasserwirtschaft). Another important non-governmental actor is the Austrian Water and Waste Management Association (ÖWAV)[18].

There is no sector-specific adaptation strategy for the water management department. The

[17] Österreichisches Programm zur Förderung einer umweltgerechten, extensiven und den natürlichen Lebensraum schützenden Landwirtschaft.
[18] www.oewav.at

sector is however represented in the participatory process on the national adaptation strategy and considers climate change in its other planning documents, though with low priority.

Interviews reveal that due to Austria's exemplary flood-management, representatives have been involved in the elaboration and development of the EU Flood Directive since 2002. The coordination of the implementation of the Flood directive, providing guidelines for flood risk maps and management plans etc. lies with the ministry, while the implementation itself is competency of the Länder. Due to insufficient proof of the increased frequency of floods and their cause, passive measures to avoid damages are currently the prevailing choice (e.g. room for rivers concept). In order to prevent the use of floodplains, farmers are compensated for not using these endangered areas. An important priority is also to inform stakeholders of the possibilities to reduce risk by taking actions themselves (e.g. adapting houses). Such measures are usually taken on the regional level; some information material is also available from the BMLFUW[19]. On the national level the following measures to adapt to floods are coordinated; the implementation is a combined effort of the Länder and the communes:

- Hazard risk maps, the BMLFUW provides guidelines and provisions for the maps, based on which the Länder produce the respective material.
- The Katastrophenschutzfonds (*Disaster Protection Fund*; Ministry of Finances), this funding line also contributes to
- the "Förderung der Schutzwasserwirtschaft", a funding line for water protection measures that includes flood protection measures (80 Million Euros per year), BMLFUW.

Flood issues are not limited by political borders; therefore the Austrian government set up contracts (Gewässerverträge) with its neighboring countries and established a bi- and multi-lateral commission on water bodies, which addresses cross-border issues together with the respective neighbor authority (e.g. Austrian-Slovenian Cooperation at the Mur River, Gemeinsame Zukunft Alpenrhein, International Danube Flood Action Program) (BMLFUW 2010b).

5.1.2 Perceived policy needs

5.1.2.1 Multi-level governance

Currently, during the elaboration of the NAS, the **coordination of different decision-making levels** works out well. The implementation of the strategy will, however, require even more coordination, depending on different measures. For example the flood sector, while the water protection law is a national law, spatial planning is a competence of the Länder with different laws and terminologies in each one of them. Land allotment (Flächenwidmung) is even a competence of the communes. Even passive measures, such as the "room for rivers" approach need a lot of coordination work in order to be implemented effectively and comprehensively.

In some cases the Länder will be responsible to implement measures, which are competency of the federation. This is already the case in the handling of certain funds e.g. the Katastrophenfonds: The major of the respective commune assesses the damages and reports them to the Länder, which get the money from the federation and distribute it to the households or enterprises. In areas that are entirely in the hands of the Länder, **coordination**

[19] Water Information System: wisa.lebensministerium.at and for the broad public at www.wasseraktiv.at.

among the regions will be essential to achieve the best and sustainable results (cf. article 15a of the Federal Constitutional Law). Another potential issue that might soon arise will be **the financial responsibilities** for different measures. Who will allocate the resources for the implementation of the new measures listed in the NAS?

Also **regional strategies** that are now in their start holes will have to make sure not to overlap with what has been covered on the national level.

In the future Climate Alliance Austria and regional managements need to be involved in order to ensure enough representation of the local level (cf. awareness-raising).

5.1.2.2 Mainstreaming

In Austria many sectors (e.g. forestry, agriculture, tourism, and water management) undertake activities that have adaptive effects without the official label of adaptation. **In those sectors it is not necessary to invent new adaptation measures, but to identify those with potential and optimize them**. The fact that so many strategies exist in the various sectors needs to be taken into account when trying to mainstream adaptation, the NAS will provide the opportunity to harmonize the cross-cutting topic of adaptation with existing plans and practices. In the course of such a process it is important to increase the efficiency of existing and new funding instruments. The cooperation potential and synergies are currently not fully seized and conflicts of interest not adequately identified and addressed (BMLFUW 2009).

It is further important not to **force the adaptation label** onto existing processes, if it is easier to keep them evolving under their original title, be it sustainable development, organic farming or nature conservation. It is however essential to register all areas, which take such measures to have an overview on what is being done and to intervene if potential is not used or the thought of adaptation is not sufficiently mainstreamed.

In several sectors adaptation needs yet to be mainstreamed, however, it seems very likely that with the integration in the national adaptation strategy this will happen in the foreseeable future. Sectors that do not yet feel the impacts of climate change do not act (BMLFUW 2009). The energy strategy does not consider adaptation so far. For the management of catastrophes interregional cooperation will be necessary in this sector. In terms of biodiversity the measures do not go beyond traditional *Naturschutz* (nature conservation), radical activities such as the movement of species is not a topic. The health sector also needs to emphasize adaptation measures in the future.

5.1.2.3 Planning

Long-term thinking and **long-term planning** have to replace the short-term measures that are on the agendas nowadays. Reactive, spontaneous reactions to climate impacts, especially extreme weather events often have more negative than positive effects. The policy paper (BMLFUW 2009) also highlights the fact that existing measures have been mostly reactive (flood protection/-prevention) and that proactive measures are comparably rarely implemented. Practical experience shows that there are many adaptation measures that increase CO2 emissions (e.g. snow-making and energy intensive cooling of buildings). Decision makers have to consider that the time spans until a measure becomes effective vary (BMLFUW 2009).

Spatial planning in general, due to its cross-cutting role, needs to play a more central role in planning and implementing adaptation. There is no national spatial planning law, but nine different laws in each of the Länder. The ÖREK 2011, the upcoming update of the Austrian Spatial Development Concept of 2001, will address some core adaptation issues (flood

management and infrastructure as well as energy). The concept is however only an indicative document without any legally binding force. Nevertheless it is widely accepted due to its broad participatory elaboration process. The coordinators of the NAS are not involved in that process.

Infrastructure, especially construction guidelines (e.g. climate compatibility of buildings) and especially urban planning are important factors in successful adaptation. Provisions to mainstream adaptation into the respective policies need to be taken as soon as possible. In the housing sector measures are being taken that are not officially labeled adaptation; however, more will be needed.

5.1.2.4 Awareness-raising

Even though awareness-raising efforts have been already quite successful especially among the organized public (politicians, civil servants, NGOs, interest groups, etc.), more is needed. Serious, objective and realistic information as well as bottom-up initiatives may be helpful to counter the often one-sided and sensational reporting of mass media. A national information point for the economy and other stakeholders that provides comprehensive harmonized information would be very important.

Raising awareness in the population and the communes on the effects of building in flood risk areas needs to be enhanced, also the fact that no absolute protection is possible. In areas where it is difficult for decision-makers to act fast, private initiatives of households and enterprises need to be supported (e.g. Klimarettung.at in Upper Austria).

Sensibility for cascading effects and intra- and potential inter sectoral side effects on other planned and existing instruments will be essential in the implementation of the NAS (cf. coordination, planning).

5.1.2.5 Research needs

Limited downscaled climate change models (e.g. for small catchment areas) and the uncertainty in existing projections, challenge the willingness to invest in concrete measures. Also research concerning vulnerability is yet incomplete (BMLFUW 2009).

The costs of adaptation measures are difficult to calculate, due to missing research and a lack of experience.

The need is felt for harmonized scientific transfer, integration/networking of knowledge and research databases. There are too many projects with too many results and it is difficult to keep an overview and decide what is relevant.

Research in natural sciences is not enough; the socio-economic context of adaptation has to be assessed as well.

5.1.2.6 Tools and information needs

Over 70% of the Austrian territory is covered by mountains, mainly the Eastern Alps. This creates a very specific setting for climate impacts and adaptation needs. "*Just any best practice won't do.*"

Decision makers get their information from research projects mostly in their own country and semi-formal and informal contacts with colleagues from similar institutions in other countries. The participation in EU projects enhances the international exchange of experiences a lot.

This implies that no relevant comprehensive knowledge and information bases are available/known on the EU level.

5.1.2.7 Political commitment

Stronger political support needed: The Austrian Climate Protection Law on mitigation is an ambitious process that did not yet succeed in being adopted by the relevant bodies. In adaptation a law is not necessarily the aim. A strategy with strong commitment should suffice. The adoption process of the strategy in the Austrian Parliament will show whether politicians will back the topic.

The involvement of all relevant decision-makers from the beginning is an important method to gain the necessary commitment for a strategy. It is however important to keep decision makers constantly alert and involved to keep the implementation process going. Despite the participation process, it will be challenging to consider all interests in the development of the strategy and the action plan. It is after all a political document.

The big multi-level federal administration that is inefficiently structured in many aspects, might lead to compromises, which then again result in half-hearted adaptation measures.

5.1.2.8 The role of the EU

European incentives in adaptation were relevant to secure political acceptance for the topic in Austria. Strengthening the topic further on the international level will very likely increase the political commitment also on lower decisions-making levels. International incentives are relevant, however, new member states, which probably haven't been active in areas such as climate change adaptation, profit more than old ones which already manage their adaptation planning well. However, a certain competition and international comparison and exchange benefit all.

It is important that experiences and results from international projects are made available and easy to access (cf. tools and information needs).

5.1.3 Synthesis

The policy paper (BMLFUW 2009) defines general needs that include:

- extending and complementing existing administrative frameworks with aspects of adaptation, e.g. through directives and funding guidelines (cf. mainstreaming);
- increasing the exchange of knowledge and experience (cf. research/information);
- including adequate contents into education programs in all schools; the use and connection of existing instruments and for a common understanding of relevant climate changes;
- fostering the general exchange between decision makers, administration, science and stakeholders;
- a holistic approach to minimize conflicts, and
- improved data bases.

The elaboration process of the Austrian national adaptation strategy comprises all relevant

sectors and decision makers from all relevant institutions are involved. The strategy will draw on existing measures that are (potentially) valuable for adaptation, but will also suggest new measures for the different sectors. It will therefore provide a comprehensive catalogue of adaptation measures. Other sectors do not intend to elaborate separate adaptation measures but in the course of the existing participation process use the incentives to mainstream adaptation in the respective existing strategies.

After analyzing the relevant documents and talking to key actors in the policy-making process the key challenges for the implementation of adaptation policies seem to be efficient mainstreaming and the effective coordination across different levels of governance. However, it is difficult to judge Austrian adaptation policy since it is not yet being officially implemented. The identified needs are based on the experiences from elaborating the strategy and will have to be re-assessed after the adoption of the NAS and when implementation is well on its way.

5.2 Poland

5.2.1 Policy framework

5.2.1.1 Policy and Institutional context

Poland has 4 governance levels: The national level and three regional governance levels where decision power is delegated to the smaller territorial units. The territory of the country is divided into 16 regions (NUTS 2 regions). Each region (voivodship) contains several sub-regions (*powiat*) (379 in Poland altogether), which in turn are divided into communes (*gmina*) (2478 in Poland altogether). The lowest administration level (a commune) may include one city or several villages. Regions and sub-regions are presented in Figure 4.

Figure 4: Regions (16 NUTS2 level) and sub-regions (379) in Poland (Source: http://pl.wikipedia.org/wiki/Powiaty_w_Polsce)

Legislative competencies are at the national level, whereas far-reaching executive capacities are the domain of the communes and local communities. The regional, sub-regional and local levels hold its own sovereignty in terms of the establishment of taxes (within a certain frame),

budget spending, participation in national and cross-border development programs, decisions about environmental protection and more. The administration system as we know it today was implemented finally after an administration reform in 1999. There are two independent authorities in charge of decision-making at the regional level (NUTS 2): a government body and a self-governance authority. The Voivod [*Wojewoda*] is delegated from the national level (central government) and is in charge of coordinating implementation of national law at the regional level. The Voivod is nominated by the central government and represents its views and political option. The administrative staff, however, is mostly politically independent, its workers belong to the civil service corps and they are specialists that ensure competence and quality of the government. The other entity that has decision-making power over the region is the Marshal [*Marszałek*]. His administration belongs to the self-governance system of the region as it is chosen by its inhabitants in elections taking place every 4 years. To the responsibilities of the Marshal belong: - development of technical and social infrastructure at the regional level – public security, - land management planning and environmental protection. To the responsibilities of the government at the provincial level, in scope of the interest of this article, belong: - development of technical and social infrastructure at the provincial level – local security (fire, flood, crisis management), - landscape management and planning as well as water management, agriculture, forest management and environmental protection. The responsibilities of the government at the local administration (communes) level, in scope of the interest of this article, are: - development of technical and social infrastructure at the local level – local security (fire), - land management, planning and environmental protection. The governance structure is presented in Figure 5.

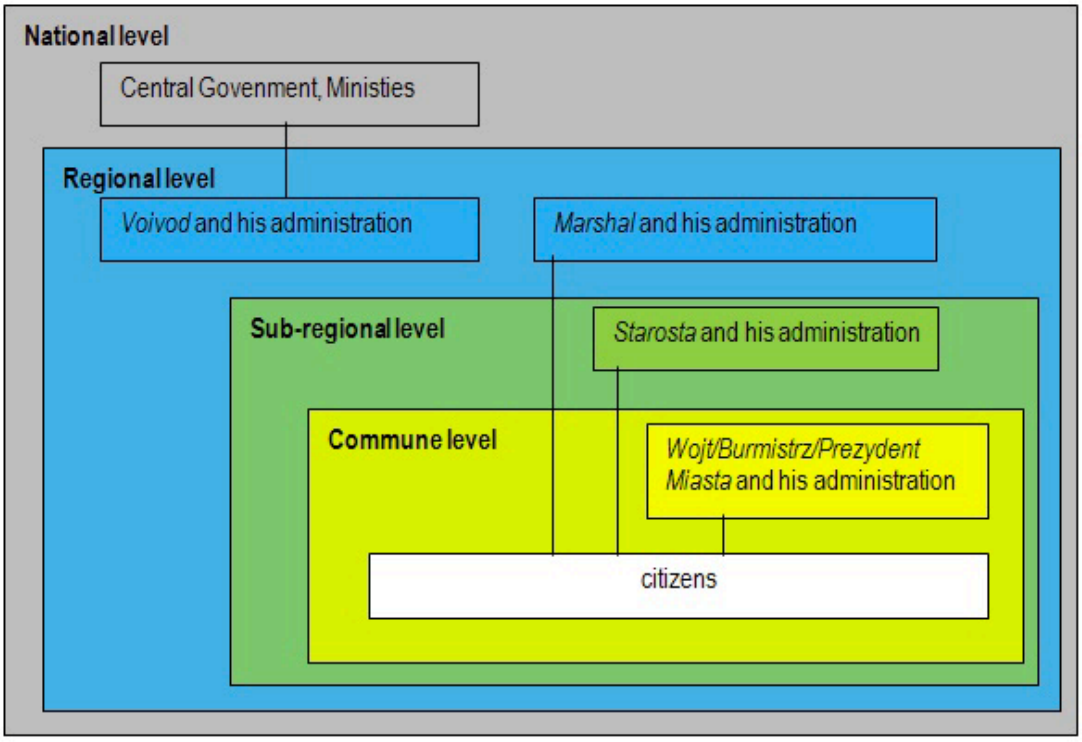

Figure 5: Administrative structure in Poland (Source: own elaboration)

Next to the government entities, also research institutions and NGOs take a more and more active role in the creation of policies. The fields of their interests are very different but many are involved in environmental protection. NGOs play an important role in the education of society, promoting dialog and funding ecological projects. It is safe to say that the EU policies as well as the activities of NGOs have the vital influence on adaptation policy in Poland.

5.2.1.2 General adaptation policies

Evolution of adaptation policy making

In Poland climate change began to be recognized in policy development during the preparations for EU accession, which started in 1994. It was further strengthened with the ratification of the Kyoto protocol in 2001 and the accession to the European Union in 2004. The accession negotiations (1998-2002) concerned in large parts environmental policy. It must be said that the main driving force of Polish efforts against climate change are obligations to comply with EU directives. The directives are transposed to Polish laws and adequate enforcement acts. There are several documents addressing adaptation issues, however, the specific single adaptation strategy or policy act has not been elaborated yet. A parliament briefing from December 2007 states that a program of adaptation to climate change should be elaborated in Poland (it cites the Green Paper (European Commission 2007).

Relevant policies in the absence of a NAS

Water Law[20] *[Ustawa prawo wodne]* – the law sets rules, regulations and responsibilities of entities that are in charge of water management. In particular the act states that water management should be executed according to the sustainable development principles. Management of waters should be rational and integral for surface and ground waters to achieve their good quality and sufficient quantity. Water management incorporates the rule of common interests and it is realized through cooperation of public authorities, water users and representatives of local communities (NGOs) in order to achieve maximum economic benefits.

Crisis Management Law[21] [*Ustawa o zarządzaniu kryzysowym*] – the law defines rules and responsibilities of entities that are in charge of crises management at all administrative levels.

Emergency plan in case of flood or drought crisis – procedures to be followed by stakeholders involved in the operational management of these disasters.

Law on a state of natural disasters[22] [*Ustawa o stanie klęski żywiołowej*] – the document sets criteria for declaring a state of natural disaster in Poland and defines rules and responsibilities for all actors (including) citizens in case of a natural catastrophe. The state must be declared by the Prime Minister and can be restricted to one or several commune(s), sub-regions, regions or the whole country, depending on the scope of the disaster (flood, drought, or other).

Strategy of Water Management for Poland [*Strategia Gospodarki Wodnej*] and the *Project of National Strategy for Water Management 2030*[23] [*Projekt Narodowej Strategii Gospodarowania Wodami 2030 (z uwzględnieniem etapu 2015)*] - a new strategy has not been implemented as Polish law yet. It is experts' document prepared by the National Water Management Board. It describes the most important directions of development of water management in Poland. It incorporates goals and recommendations of EU policy documents

[20] Water Law [Ustawa prawo wodne Dz.U. 2001 Nr 115 poz. 1229, USTAWA z dnia 18 lipca 2001 r.]
[21] Crisis Management Law [Ustawa o zarządzaniu kryzysowym: USTAWA z dnia 17 lipca 2009 r. o zmianie ustawy o zarządzaniu kryzysowym Dz. U. z dnia 19 sierpnia 2009 r.]
[22] Law on a state of natural disasters [Ustawa o stanie klęski żywiołowej z dnia 18.04.2002 r. - rozdz. 2 - Dz.U. Nr 62, poz.558 ze zm.]
[23] Project of National Strategy for Water Management 2030 [Projekt Narodowej Strategii Gospodarowania Wodami 2030 (z uwzględnieniem etapu 2015)], PROECO CDM Sp. z o.o., 2009.

such as: Water Framework Directive, Flood Directive and associated guidelines documents (PROECO CDM Sp. z o.o. 2009, Polish Ministry of Environment 2005).

Document on methods for flood risk primary identification [*Metodyka wstępnej oceny ryzyka powodziowego*] – strategic document on how the Flood Directive shall be implemented in Poland. Specific tasks, methods and means for their achievement are described and planned and responsible entities are mentioned (IMGW 2009).

Policy research interactions

With the EU structural and research funds new projects concerning adaptation to climate change in Poland appear, i.e.:

- The project KLIMAT led by the Institute for Meteorology and Water Management researches future climate change influence on environment, economy and society in Poland (2009-2011);
- project ASTRA - *Developing Policies & Adaptation Strategies to Climate Change in the Baltic Sea Region* (finished). The analysis conducted during the project highlights the existence of a few national adaptation initiatives (Finland and Germany) or programmes in sectors such as coastal protection, flood protection or forest management (www.astra-project.org).

Poland like some other EU countries has advanced impact assessments, but slow development of adaptation responses. On the impacts side Poland has conducted in-depth sectoral impact and vulnerability assessments. Poland has assessed changes in agricultural production as a result of climate change. It has also developed scenarios for variability of wind, wave field and sea-level along the Baltic coast as a result of climate change. Poland identified adaptation options, but discusses them at a fairly generic level, e.g., measures such as crop switching, coastal protection, without reference to their specific contexts. (OECD, 2006, "Progress on adaptation to climate change in developed countries an analysis of broad trends")

5.2.1.3 Floods

There is a wide range of stakeholders involved in adaptation to floods and droughts in Poland. The government at the national level is responsible for planning, policy development and implementation of environmental protection measures. For example, for a few years now Ministry of Internal Affairs and Administration established a group of experts that work on an optimal flood insurance solution for Poland. The best solution could be later on passed as a law through the parliament establishing public private partnerships with insurers as well as stating the responsibilities of involved government bodies and means for their financing. The Ministry of Environment and the Ministry of Agriculture are both involved in planning and policy development within their competences. They can set up guidelines and incentives supporting the best practices for adaptation within the scope of nature and agriculture management. The National Water Management Board and seven Regional Water Management Boards attend to the management of water resources and implementation of selected flood and drought measures. The Management Body for Melioration and Water Appliances is responsible for amelioration. Considered one of the most important adaptation measures - land use planning – is in the hands of several authorities at the regional, sub-regional and local levels as well as of Regional Directorate of Environmental Protection, which is responsible for protecting the interests of nature by evaluating local land use plans. The regional, sub-regional and local authorities have also competences in planning, policy development and its implementation. At each of these levels operates a Center for Crisis Management, which is the government organization that coordinates and executes actions in

case of a natural disasters. Research support to the decision makers is given by the Institute of Meteorology and Water Management providing weather forecasts and rainfall-outflow analyses for decision makers as well as by other research institutes and universities specializing in agriculture, water, nature as well as tools and methods for decision making, to name but a few. There are also other business and non-governmental organizations that are involved in adaptation to floods and droughts, such as: the Polish Insurance Chamber, the Regional Industry and Commerce Chamber (protecting interests of industries and companies), the Farmers Associations (protecting interests of farmers), local or regional ecological NGOs (providing opinions for policy development, activating and educating society, organizing information campaigns, etc.).

Existing measures of flood risk management

The measures for flood risk management in Poland can be classified as technical and non-technical measures. Channeling water form one basin to another, dikes, dams, water reservoirs and polders building and maintenance as well as small retention and forest management are the technical measures that are in operation in Poland right now. Non-technical measures that are considered to be most effective are local land use plans, which are, however, usually non-existent or very fragmented. The other measure is education of selected stakeholders, which, in its current form, is recognized as insufficient with the recommendation to include greater range of stakeholders.

Flood and drought losses are financed from the following sources[24]:

- state budget,
- EU Solidarity Fund,
- own/private financial means, and
- a small percentage from insurance.

However, the existing solutions are not efficient due to several problems such as:

- too little reservoirs are planned and built and when they are, they are built too slow,
- land ownership structure near the rivers is fragmented what hinders efficient flood management,
- there are no deadlines for putting flood-prone areas into the local landuse plans.

5.2.1.4 Agriculture

The employment rate in agriculture in Poland reaches 15% whereas agriculture generates about 4% of the Polish GDP. The area for agricultural production covers 19.1 Million ha which accounts for 51.7% of the Polish territory (GUS, 2008a). The agricultural sector has been and still is very important for the Polish economy.

The problems related to the agricultural sector are the following: - fragmentation of agricultural plots in hands of individual farmers (see Figure 6) (land is usually divided and split between children), - relatively low profits discourage investments, which in turn affects technology. The advantage of the processes that have been going on in agriculture is that it is suitable for extensive, ecological food production. Limiting are the high costs, gaining capital and still low demand for such products.

[24] The measures and problems were indicated based on interviews with Crisis Management Authorities at the local level, Institute for Meteorology and Water Management as well as Regional Water Management Board.

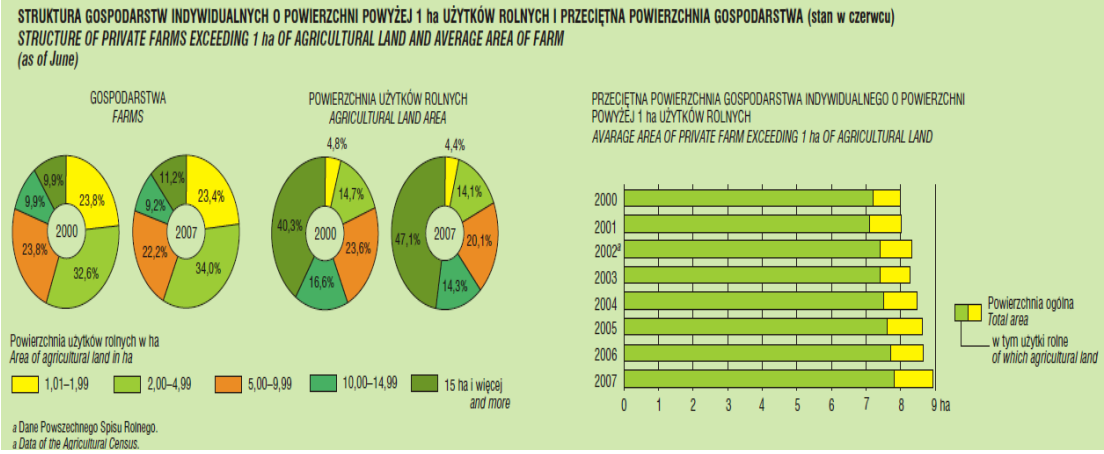

Figure 6: Structure of private farms (Source: GUS 2008b)

Data on historical losses show that agriculture is one of the most important sectors that need adaptation. The flood directive being cross-sectoral provides also concrete indications for agriculture as it is highly vulnerable to floods. While there is no specific strategic documents how the Ministry of Agriculture and Rural Development is going to address adaptation practices, many research studies have been conducted with regard to such practices as are amelioration systems, 'Shelter Belts' tree-line borders of agricultural fields, storage ponds, soil tilling and river naturalization in agricultural areas. Farmers have to insure at least 50% of agricultural production against floods and droughts if they apply for EU agricultural subsidies and the premiums are in 50% subsidized form the central budget under the Law on insurance of agricultural production and farm animals 2008[25].

5.2.2 Perceived policy needs

5.2.2.1 Role of EU

Very important is the role of the EU in providing resources and policy guidelines as well as the role of EU Member States in setting up benchmarks forbest practices.

5.2.2.2 Coordination

Integration of sectoral policies for adaption and inclusion of an adaptation program into a long term development strategy for Poland is needed.

5.2.2.3 Political commitment

Past disaster experiences teach us that political commitment is very strong only right after a disaster, however strategies, especially those requiring long-term financial commitments, are not implemented. Usually lower decision making levels are awaiting resources and decisions from the higher levels. Resources and decisions are postponed and finally never come to meet the needs.

[25] *Law on insurance of agricultural production and farm animals [Ustawa z dnia 25 lipca 2008 r. o zmianie ustawy o ubezpieczeniach upraw rolnych i zwierząt gospodarskich oraz ustawy o krajowym systemie ewidencji producentów, ewidencji gospodarstw rolnych oraz ewidencji wniosków o przyznanie płatności* (Dz. U. Nr 145, poz. 918)]

5.2.2.4 Multi-level governance

Better division of competences between authorities is desirable. Management of e.g. dikes should be in the hands of one authority, while currently they are managed by several ones.

Cooperation between stakeholders is needed and a trans-sectoral approach to the floods and drought problems.

5.2.2.5 Mainstreaming

Flood and drought risk assessment, land use planning, cost effectiveness of measures and education should be mainstreamed.

An effective adaptation program should include technical measures (i.e. flood protection infrastructure and coast protection infrastructure), changes in legislation (i.e. landuse planning restrictions for flood-prone areas, more flexible procedures for quicker reaction in case of natural disaster). The adaptation program should affect investment planning and regional land use planning from its earliest stage. Procedures for reaction in case of natural climatic disasters (floods, droughts, heat waves) for public institution should be elaborated and included in the adaptation program. Cost effectiveness for planned measures and policies should be conducted in order to prioritize actions. Special prevention measures should be taken with regard to assets or unique ecosystems.

There should be more space for polders and more polders should be created. Fewer dikes should be built, but their quality should be better.

No capital should be pumped to the flood-prone areas for rebuilding the infrastructure that with great probability will be flooded in several years (people should just leave this area) or the state should buy the area and propose other plot for settlements building.

Flood losses could be financed from the following sources: insurance, bonds and other financial tools for financing public infrastructure; CAT-bonds, weather derivatives; insurance premiums should mirror flood risk (with government support in some cases).

5.2.2.6 Awareness-raising

Education on practices i.e. agrotechnical practices, awareness-rising on benefits from adaptation, not only mitigation at all government level and education campaigns on adaptation measures in local communities are needed.

5.2.2.7 Coping with Uncertainty

Assessment of floods and droughts risks as well as costs and benefits of different adaptation measures should be estimated.

5.2.2.8 Research

The analysis shows that climate change is likely to have most impacts on water and coastal management, agriculture and health. So the identification of strategic, most important objects to be protected should be the very first step together with identification of flood/drought risk areas.

There is a need for research on risk as well as costs and benefits of different adaptation measures. Research projects on climate change influence on environment, economy and

society are in progress.

5.2.2.9 Tools and information needs

Better organization of public consultations and implementation of tools for involving SHs into decision processes is needed.

5.2.3 Synthesis

The spring floods taking place this year in Poland brought back again vivid discussions on flood adaptation strategies. They also reminded people of similar tragic events taking place not so long ago in 1997, thus raising the question: what has been done since then to avoid such disasters? Although some, mostly technical mitigation measures, have been taken in the areas destroyed by the 1997 flood, this year's floods revealed weaknesses of the Polish flood adaptation measures and very strongly made a point about urgency in developing a coherent strategy in that respect.

The main identified problem concerning adaptation is not enough financial resources for the implementation of adaptation measures. Past disaster experiences teach us that political commitment is very strong only right after a disaster, however strategies, especially those requiring long-term financial commitments, are not implemented. Usually lower decision making levels are awaiting resources and decisions from the higher levels. Resources and decisions are postponed and finally never come to meet the needs. Other key problems for the country concerning adaptation are a lack of concise adaptation strategies for floods and droughts including all economic sectors with stating clear responsibilities of involved stakeholders as well as a lack of education in adaptation practices. the lack of education and financial resources are the reasons why some of the practices have not been implemented.

The integration of adaption into sectoral policies and the inclusion of an adaptation program into a long-term development strategy is a key need concerning adaptation in Poland. Research and economic analyses conducted by interdisciplinary groups as well as local assessments of potential climate change should be performed in order to inform policy makers on the best selection of measures and policies. As mitigation measures are mostly in focus, adaptation strategies should be promoted. Finally, information campaigns and processes of increasing social involvement need to follow.

5.3 Romania

5.3.1 Policy framework

5.3.1.1 Policy and institutional framework

Romania consists of eight development regions (NUTS 2), which were created to comply with the EU territorial structures and for the planning and programming of EU Regional Policy. On this level intermediary bodies contracted by the national government operate, which are responsible for the implementation of different EU regulations (e.g. regional development and environment). The development regions have no other administrative functions and no decision-making competencies. The regional administrative level are the 42 counties [județi], including the city of Bucharest. The counties are governed by a county council, which is headed by a president (elected by popular vote for a four year term) and a prefect (representative of the national government). The 2686 communes (groups of villages in rural areas) and 265 cities and municipalities are lead by mayors or community councilors, respectively. Legislative competencies are gathered at the national level, whereas far reaching executive capacities lie with the counties and local communities and have been extended in

1994, 1998 and 2001: within the respective scope e.g. sovereignty in terms of budget, participation in national and cross-border development programs; the establishment of taxes (within a certain frame), public services, subsidized housing, environmental protection and more (Benedek and Jordan 2007, 93).The size of the counties is relatively small compared to other European countries. Indeed, they are too small to stand a chance against the strong centralized government.

Before 1989, Romania had no civil society. From the early 90s, when foreign funds started flowing into the country, the first NGOs developed. By now the landscape of active groups also in the environmental sector is lively and growing rapidly. Relevant NGOs who also work with climate change are Terra Mileniul III, Alma.ro and the Romanian Climate Action Network (RAC-RO). The organizations play an important role, because their knowledge base is deeper and dates back longer than in public administration. RAC-RO (together with the Ministry of Environment) was appointed focal point on Education, Training and Awareness Raising of the UNFCCC.

5.3.1.2 General adaptation policies

The evolution of adaptation policy

Romanian efforts in terms of climate change started in 2001, with the ratification of the Kyoto protocol. In 2005, a strategy and an action plan on climate change for the period 2005 to 2007, were formulated; however, without addressing adaptation issues[26]. In 2006, the National Commission on Climate Change was officially installed[27]. The Commission is organized like an inter-ministerial working group with representatives from relevant ministries, government agencies and NGOs. For adaptation planning an inter-ministerial working group on adaptation was installed. In 2008, a "guide on adaptation to the effects of climate change" was approved. Other than the climate change strategy, which was authorized by government regulation, the adaptation guide's legal basis is a ministerial order[28]. It is an indicative document for the new climate change strategy 2010-2012, which is currently being prepared and planned to be officially adopted in the end of 2010. It will be divided in two major parts, one on adaptation and one on mitigation.

"The purpose of the „Guide" is represented by the identification of the necessary measures according to the existing economic resources in order to limit the negative effects forecasted by the climate scenarios, estimate for a medium and long term (decades) The identified measures shall be implemented through the cooperation with the local authorities and by providing the appropriate technical assistance." (GASC 2008)

The "guide on the adaptation to the climate change effects"[29] is about 40 pages long and deals with the impacts of climate change that Romania faces. It gives recommendations on possible measures for different sectors: agriculture, biodiversity, water, forests, infrastructure/construction/urban planning, transportation, tourism, energy, industry, health, recreational activities and insurance. According to the introduction it was elaborated as an answer to the EU Green Paper on Adaptation. As it is an indicative document no implications

[26] The update of the strategy is in process.
[27] The legislation dates back to 1996 "Guvernul României - Hotărâre nr. 1275 din 22/11/1996 - Published in M.O., Partea I nr. 326 din 06/12/1996 privind înfiinţarea şi funcţionarea Comisiei Naţionale pentru Schimbări Climatice" and it was modified by "Hotararea Guvernului nr. 658/2006 privind reorganizarea Comisiei Nationale privind Schimbarile Climatice.
[28] Ordinul Ministrului nr. 1170 din 29.09.2008 published in M.O. nr. 711/20.10.2008.
[29] Ghid privind Adaptarea la efectele schimbărilor climatice (GASC)

for the division of the responsibilities are made.

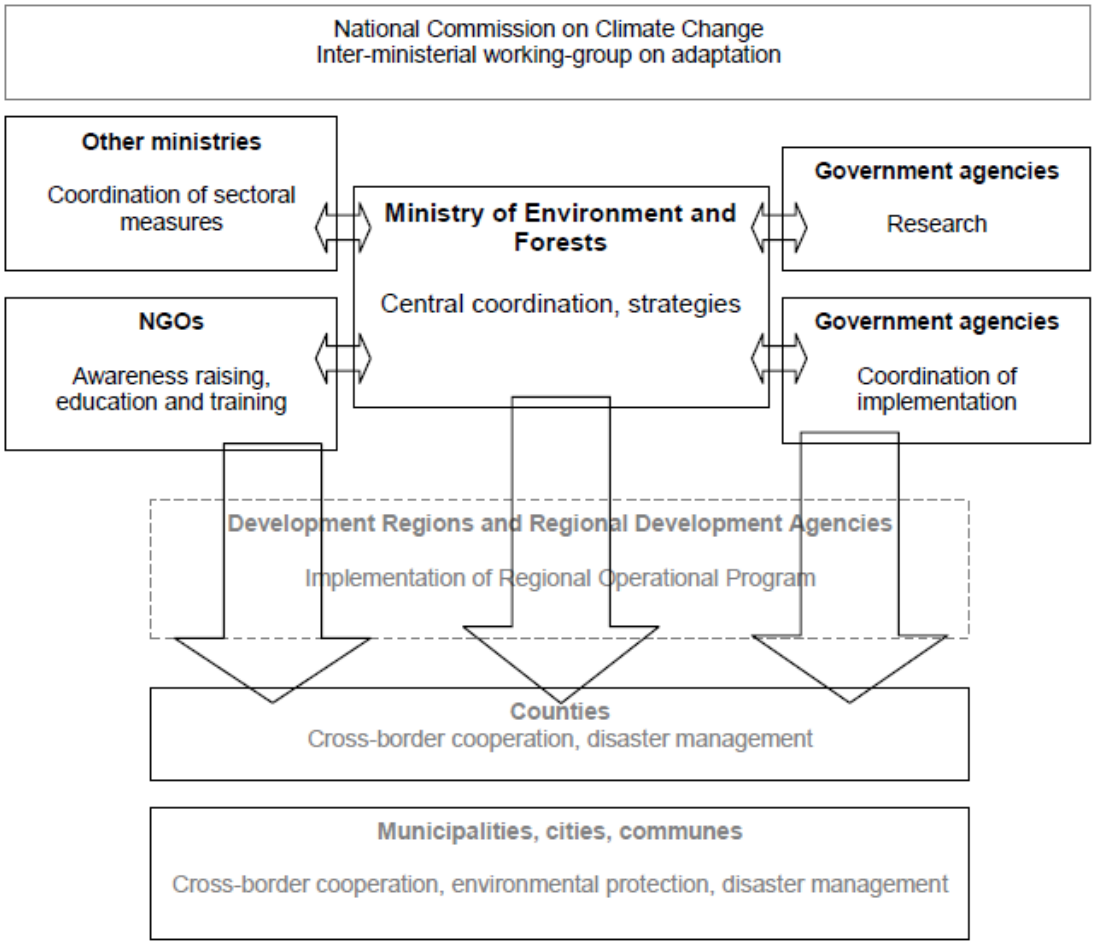

Figure 7: Romania – Responsibilities and involvement in mitigation and adaptation policy. Source: own elaboration

Adaptation competencies

The central competency for climate change adaptation lies with the Romanian Ministry of the Environment[30] in the Climate Change Unit, which is part of the General Directorate on Environmental Protection and Sustainable Development. The National Environmental Protection Agency[31] (EPA) is the technical institution supporting the ministry. They implement environmental legislation and coordinate the implementation of the respective strategies on all levels. The national EPA fulfills representative duties under the mandate of the ministry and gives out permits for activities with impacts on the environment. There are eight regional intermediary bodies on the level of the planning regions, which are responsible for the implementation of the Operational Program Environment[32]. There are also EPAs on the county level, however, they are not yet considered in national adaptation planning and do not deal with the topic explicitly. The counties, municipalities and cities have competencies

[30] The Romanian name is Ministerul Mediului şi Pădurilor, Ministry of the Environment and Forests.
[31] The Romanian name is Agenția Națională pentru Protecția Mediului (ANPM)
[32] The Sectoral Operational Program Environment specifies the implications of the Strategic National Reference Framework (SNRF). The SNRF has to be developed by all EU Member States, it is document laying out the funding priorities for the EU Cohesion and Structural Funds.

in terms of disaster management and have the possibility to apply for EU funding under the Regional Operational Program, which supports flood and coastal management measures (MMEDIU 2007) and is supported by national funds.

The Romanian Association of Municipalities (AMR) takes more independent steps on the local level. AMR works towards the decentralization of local public administration and is therefore an important interest group for the local level in terms of communication, consulting, networking and awareness-raising, also in the area of climate change adaptation and mitigation. AMR initiated a consultation process starting with "The Romanian Municipalities Association Commitment for Climate Change Effects Prevention", which has been signed by 35 out of 107 municipalities so far. One axis of this commitment concerns the assessment of climate change risk and implications for the public services and local communities and their respective adaptation.

Policy-research interactions

Romania is involved in several research projects concerning climate change both on the national and on the international level. However, there is no structured national research program on climate change and/or adaptation in particular. Furthermore, most projects still deal with mitigation and climate change impacts, not yet with adaptation. Relevant research institutes are the National Meteorology Administration, the National Institute for Hydrology and Water Management, The Romanian Academy of Sciences. Important projects were e.g. CLAVIER and CECILIA.

5.3.1.3 Floods

The Romanian Ministry of the Environment is also the main decision-making body for all issues related to water management and floods. The ministry's executive agency is the National Administration of Romanian Waters (NARW). Eleven regional branches, called Water Directorates are responsible for implementing the national water strategy and policy, quantitative and qualitative water management as well as for the operation of water infrastructure, both for flood protection and water treatment (Policy Research Cooperation 2009).

Several Romanian regions are regularly confronted with heavy floods, especially in spring (e.g. February until April 2005 river Siret with tributaries Buzau, Trotus, Putna; 2005 April until May river Timis; 2006 the Romanian section of the Danube, 2008 rivers Viseu, Suceava, Moldova). The catastrophic floods in 2005 and later on EU requirements were the incentives for the elaboration of the National Strategy for Flood Risk Management in the Medium and Long Term, which is yet to be completed. Indeed, the strategy is directly related to the Flood Directive (2007/60/CE), which is part of the Water Framework Directive. It will be the road map to implement the directive and it refers directly to the principles and measures addressed in the Flood Directive. Coordinated by the Ministry for the Environment it is still a cross-sectoral and multi-level directive that is also, but not exclusively, an adaptive response to climate change impacts. In the context of the elaboration process a prefect and a mayor handbook for "the management of emergency situations in case of floods" were introduced for regional and local flood management.

The strategy is, compared to the adaptation guide, quite concrete and defines the responsibilities for the different ministries and agencies. On the basis of the Committee for Emergencies, responsibilities for all levels down to the local and even the individual are defined. It provides an action plan containing clear activities and has a clear planning horizon (2035) with specified costs. The strategy contains concrete preventive and operational measures as well as actions to be taken in case of a flood. It lists the social, economic and

environmental objectives of the strategy (MMEDIU 2010).

The main financial contributors are the Ministries of the Environment, Agriculture and Rural Development, Transport and Infrastructure, Economics and Trade and the Regional Development Funds via the Sectoral Operational Program on environmental protection. Another important role lies with the regional and local administrations, which can contribute with own funds (MMEDIU 2010, p 26).

A core research project on flood risk was the Danube Flood Risk Project, which was funded by the South East Europe Transnational Cooperation Program. The project was initiated during the Romanian presidency of the ICPDR and aimed at developing a common flood risk management for the Danube states.

Initiatives such as the project "Room for the River and People in Cat's Bend, Romania – Applying interactive spatial design for land- and water management solutions" are very important for the involvement of local and regional actors. This specific project was based on a best practice project tested in the Netherlands and was implemented with support from Dutch institutions and the Romanian government.

5.3.1.4 Agriculture

Romania is one of the European Member States with the highest employment rate in agriculture. Also the area for agricultural production is among the largest. The agricultural sector is still integral to the Romanian GDP though not as efficient as it could be due to several reasons, most of which rooted in the restitution process of the early 90s. Since before its EU accession, Romania started to modernize its agricultural sector, a task that has still not been finished.

All competencies concerning agriculture are in the hands of the Ministry of Agriculture and Rural Development (MADR). The National Administration for Land Improvements[33] is the government agency dealing with those aspects that are relevant for adaptation in agriculture. It deals with research, administration and coordination of irrigation, droughts, soil erosion, flood prevention and extreme weather events.

Romania's adaptation guide identifies agriculture as one of the sectors with the most need for adaptation. Representatives from the ministry were involved in the elaboration of the guide. There is no separate adaptation strategy for the sector itself. Currently the most central planning document for this sector is the National Plan on Rural Development (Planul National de Dezvoltarea Rurala), which does refer to climate change as a challenge of agricultural production, but does not explicitly refer to adaptation. The flood directive (being cross-sectoral) also provides concrete indications for agriculture, as it is highly vulnerable to floods.

A document prepared directly by MADR and independently from the activities on adaptation is the national strategy on droughts, which was developed in 2008 (*Strategia nationala privind reducerea efectelor secetei, prevenirea si combaterea degradarii terenurilor si desertificarii, pe termen scurt, mediu si lung*). It followed a first drought strategy from 2000, which was not satisfactory implemented (MADR 2008, p. 4).

A relevant research project for agriculture was ACCRETe – "Agriculture and Climate Change: how to Reduce Human Effects and Threats"[34] This European project was an

[33] Administrația Națională a Îmbunătățirilor Funciare (ANIF), www.anif.ro.
[34] www.accrete.eu

INTERREG IIIB CADSES initiative co-financed by the EU. Romania was represented by the National Administration of Meteorology. The project elaborated a "Code of Action for Reducing the Impact of Climate Change in Agriculture", which is also known as "The European Farmer Handbook". The document includes recommendations on the adaptation of the agricultural technologies and of all the activities specific to the agricultural production process to the climate change, as well as examples of best practices that lead to the decrease of greenhouse gas emissions (MMEDIU 2008). The project delivered important results for Romanian adaptation planning in the agricultural sector.

5.3.2 Perceived policy needs

5.3.2.1 Coordination

Coordination between ministries will be of major concern in the near future in order to guarantee the successful implementation of adaptation measures. While the Commission on Climate Change works well, the inter-ministerial working group on adaptation does not receive the attention necessary for it to become a communication and coordination body. Comprehensive and consistent communication on actions taken will be necessary to ensure cross-sectoral implementation of adaptation measures. So far it seems that the cooperation between ministries has a comparably low priority.

Especially the coordination between the water and the agriculture sector will be essential when it comes to the implementation of cross-cutting strategies such as the flood directive and the strategy on droughts. The cooperation with relevant government agencies (e.g. the National Administration of Meteorology) is regarded very important and supported more than the inter-ministerial cooperation.

5.3.2.2 Mainstreaming

In several highly important sectors adaptation is not yet a topic. Mainstreaming adaptation into the energy and health sectors as well as the infrastructure endeavors of Romania's ministries is however very important. Infrastructure, especially for energy is not planned considering climate change impacts. Heat and cold waves that are already challenging Romanian urban areas are also not taken into account enough both in national and municipal planning. Furthermore, all planning strategies will have to be updated considering adaption.

5.3.2.3 Awareness-raising

Awareness is missing on two essential levels: Among the broad public – the population is still not informed enough about the impacts of a changing climate as well as possibilities to adapt and within public institutions outside the respective department of MMEDIU. Relevant ministries, although working with adaptation related issues, do not yet consider mainstreaming adaptation a priority. All ministries need to have representatives responsible for adaptation.

5.3.2.4 Multi-level governance

Due to the small administrative structures and the centralized government the Romanian local and regional levels have very limited competencies and little financial resources in general and particularly in terms of climate change policy. National strategies rarely relate directly to lover levels of administration. An exception is, for example, the flood management strategy. However for a successful implementation of adaptation strategies incentives for bottom-up initiatives will be crucial. Romanian centralized administration that dates back to communist times did not support such initiatives. With EU funding instruments (particularly the

Cohesion Fund and the ERDF), first potential in that direction has been created.

Communist-era ideas of centralized government are still predominant, thus, it is difficult to give up competencies to the regional and local levels and that consider instruction from the national levels a must. International projects that involve local stakeholders for awareness raising and better understanding in combination with the EU's regional funding system may lay the path for bottom-up initiatives.

The document analysis and the internet research have shown that it is very difficult to identify bottom-up initiatives. Many relevant projects that happen on the local level have been initiated by foreign institutions or representatives from the Romanian national level.

5.3.2.5 Research needs

In Romania there is a consensus that more research on climate change impacts and adaptation is needed. Especially a structured research program as exists in many other countries is missing, but would be very important to inform national policies.

Research results (on the national and international levels) are diverging and not reliable enough. There are enough scenarios; a synthesis of what has been done is required, consisting of harmonized models and scenarios and integrated results for easier understanding. A few good consistent scenarios would be helpful.

Basic assessments needed for informed policy making are not available for Romania, e.g. there are not enough studies on vulnerability and no socio-economic scenarios.

5.3.2.6 Human and financial resources

The human resources assigned to climate change in general and to adaptation in particular are very limited and not sufficient for creating a long-term strategy and action plan, which requires a certain amount of coordination. There are justified doubts whether the financial resources will allow for the actual implementation of adaptation measures in general and also in sectors.

5.3.2.7 Political Commitment

To some extent the lacking resources are the result of little political commitment. This lack of will is very likely unintentional, having so many other priorities on the way to comply with all EU requirements. Furthermore, in the environmental sector issues such as waste management, pollution and to some extent climate change mitigation have much higher priority on the political agenda – all issues that are anchored stronger in EU law than adaptation (cf. MMEDIU 2007).

5.3.2.8 The role of the EU

All adaptation related documents and the timing of their elaboration suggest that EU policies are core drivers for Romanian adaptation policies. Romanian government agencies and research institutes are active in several EU projects related to climate change mitigation and impacts, national projects are limited, highlighting the need for more research underlines also the importance of international and EU research projects.

The EU could play a key role in supporting the implementation of tested best practice projects in Romania; Such projects could be a key element of successful awareness-raising on the local and regional level, and this. Successful projects should not only be pilots, but be used in

different locations and with different stakeholders.

5.3.3 Synthesis

Romania started its work on climate change adaptation in 2008, inspired by the EU Green Book on Adaptation. So far the work happened exclusively on the national level and also for the near future the role of regional and local levels will be at most one of implementation. Very little human and financial resources are allocated to climate change in general and adaptation in particular, which hinders the efficient development of strategies and their implementation. Additionally, little awareness and consideration in more powerful sectors and ministries (agriculture, economy, etc.) create a difficult context for integrated and cross-sectoral coordination and planning. Though Romanian institutions are actively involved in national and international relevant research, also these projects underlie no structured research program and results are difficult to compare.

Romania is, together with Bulgaria, the youngest EU member. In economic and institutional terms it shows large discrepancies with older member states. Since the late nineties the government has been working hard to incorporate the entire Acquis Communautaire into their legislation and to lessen the gap that separates it from the rest of the EU. Concerning the environment, issues such as waste-management and pollution (soil and water) have the highest priorities. The operational programs for the Cohesion and Structural Funds show that clearly.

From today's point of view most environmental measures are inspired by the EU. Therefore, it seems that also in terms of adaptation to climate change the extent and quality of the work in Romania relies to some extent on the incentives and support provided by EU institutions and more experienced EU Members.

6 Northern Europe

The Northern European region consists of Finland, Sweden and the non-EU member country Norway. Because of the importance of the forestry sector in these countries and their vast, delicate natural environment, the focus is on the forestry and biodiversity sectors. Finland in particular is an interesting case as it has adopted a national adaptation strategy in 2005 with measures for the period of 2005-2015, becoming the first country in the world to adopt such a strategy. In 2009, the strategy was evaluated and a report from that evaluation is available. This already long-running adaptation planning process means that there is insight available.

6.1 Finland

6.1.1 Policy framework

6.1.1.1 Policy and institutional context

Finland is administratively divided into 342 municipalities. The municipalities are organized into 72 sub-regions (NUTS 4) within 20 regions (NUTS 3). They have directly elected officials, collect municipal taxes, and many decisions are made on the municipal level. Overall, governance predominantly takes place on either the national or on the municipal level[35]. Finland's constitution expressly states that the protection of the environment and

[35] One of the regions, the Åland Islands in the south-west of Finland, is granted provincial autonomy by international treaties. They have their own political and administrative bodies responsible for decision-making. The Finnish constitution also guarantees an extended regional autonomy to Lapland,

biodiversity is the responsibility of everyone, which reflects the importance placed on sound environmental stewardship. Finland's environmental administration is led by the Ministry of the Environment. The administrative sphere of the Ministry includes the Housing, Finance and Development Centre of Finland (ARA) and the Finnish Environment Institute (SYKE). The Ministry also supervises environment-related work of the regional state administrative agencies and 15 centres for economic development, transport and the environment. These centres operate in close collaboration with the 20 Regional Councils. They foster regional development by implementing government activities in the regions in a variety of areas[36] including the environment. In addition, the Ministry supervises the nature conservation work of the Natural Heritage Services unit of Metsähallitus (the state-owned forestry enterprise). However, some issues related to natural resources and water resource management fall under the responsibility of the Ministry of Agriculture and Forestry.

6.1.1.2 General adaptation policies

Evolution of adaptation policy

Finland was the first country to develop a national adaptation strategy, adopting it in 2005. Swart et al. (2009) conclude that there is no particular reason for the early adoption of such a strategy in Finland, rather, it was a timely coincidence of events. The adoption of the strategy followed a process that had started in 2001, when the parliament realized the necessity for adaptation planning in addition to mitigation in the wake of the first National Climate Strategy (Marttila et al. 2005). The fact that the strategy is relatively general can be attributed to its rapid development (Swart et al. 2009); nevertheless, a broad range of experts and researchers were involved in its preparation. The development of the strategy was coordinated by the Ministry of Agriculture and Forestry. A working group was set up, including representatives of the former Ministry of Trade and Industry, the Ministries of Transport and Communication, Social Affairs and Health, Foreign Affairs, the Finnish Meteorological Institute and the Finnish Environment Institute. Each ministry was responsible for assessing adaptation from the point of view of its own areas of competency. During the preparation, process seminars were organized in different sectors to identify the projected impacts of climate change and potential adaptation measures in a given sector (Marttila et al. 2005).

In winter 2008-2009, the first evaluation of the national strategy was carried out by the Coordination Group for Adaptation to Climate Change. This group, headed by the Ministry of Agriculture and Forestry, was formed as an inter-ministerial body of experts including all relevant ministries and agencies. It concluded that some progress was made. Some understanding of climate change impacts and adaptation needs is found among decision-makers, and some initial measures have been identified and in some cases implementation has started. Not all sectors have performed equally well. Of the two sectors assessed specifically for this work, forestry has seen some implementation of the strategy, while in biodiversity little has been done. Of all sectors, water management was the most advanced, with adaptation already well integrated into decision-making (Ministry of Agriculture and Forestry 2009).

In 2009, the Government Foresight Report on Climate and Energy Policy was released (Prime Minister's Office 2009). It contains recommendations up to mid-century, and covers both mitigation and adaptation. Its chapter on adaptation moves along similar lines to what the national strategy has set forth to do, and states what the strategy has achieved so far. Since the

concerning cultural and language issues of the indigenous Sami people.

[36] Their areas of responsibility include economic development and labour force in the region, competitiveness, cultural activities, transport, infrastructure, environment and natural resources.

purpose of the Foresight Report is to present possible pathways towards a sustainable Finland, some consideration is given to how preparations should be made for extreme warming of up to 6ºC by the end of the century, demonstrating that potential worst-case scenarios are being thought about.

The adaptation strategy is scheduled for review from 2011 to 2013. The evaluation report already gives some pointers for improvements and advancements for that review.

The national adaptation strategy

The strategy itself follows a division according to sectors. A range of general scenarios is followed by a section on the expected impacts for each sector. Adaptation is then treated sectorally as well, with each sector assessed according to (1) the adaptive capacity of actors, and (2) possible adaptation measures. Adaptation measures are listed in a structured manner. They are categorized according to (1) whether public or private sector organizations are involved, (2) whether measures are anticipatory or reactive, and (3) whether they are immediate (2005–2010), short-term (2010–2030), or long-term (2030–2080).

Thanks to clear provisions for evaluation in the strategy, it seems that with the evaluation taken place in 2009 and the review to be started in 2011, a close cycle of iterations allows for sufficient flexibility. One part of the follow-up to the strategy has been the beginning of indicator development to measure process in adaptation (Ministry of Agriculture 2009).

The strategy was published two years before the EU green paper on adaptation (completed in 2007). There are thus no explicit references to the EU adaptation policy process in the strategy, and it does not follow EU guidance. However, the evaluation of the strategy makes clear references to the EU white paper and ongoing EU processes and notes that they will be taken into consideration for the review of the national strategy in 2011-2013 (Ministry of Agriculture 2009).

Adaptation competencies

For the 2005 national adaptation strategy, each ministry was responsible for the review of the sectors under its authority (Marttila et al. 2005), resulting in the clear structuring by sectors. Accordingly, adaptation in some sectors is further along, if the ministry in question has taken the initiative to push measures through.

A key ministry is the Ministry of Agriculture and Forestry, which is the lead member of the adaptation coordination group. Adaptation activities so far have been centralized and focused on the national policy level. This is also reflected in the membership of the coordination group: most members are from ministries and research centres, with only one representative from the association of local and regional authorities. However, there are a few examples of municipalities that have prepared adaptation plans or included adaptation aspects in their climate strategies. These include the municipalities of Espoo and Kuopio and the Tampere region (Soini 2007, Kuopion kaupunki 2009, Tampereen kaupunkiseutu 2010). The strategies propose measures for taking the impacts of climate change into account in different sectors that are relevant for urban environments, such as construction, land use planning, water management, transport and infrastructure. The Helsinki metropolitan region is currently preparing a climate change adaptation strategy.

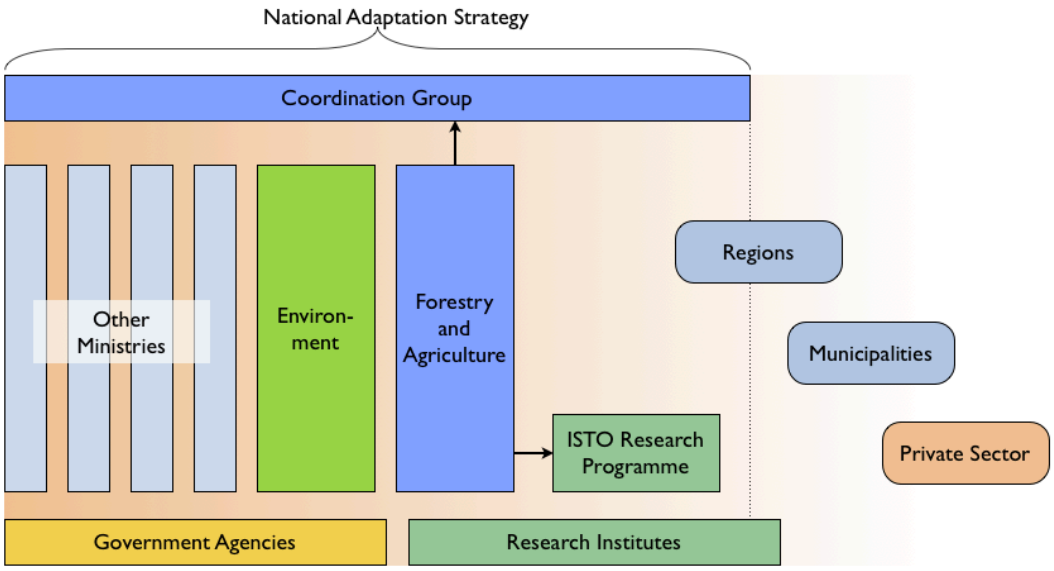

Figure 8: Structure of climate change adaptation governance under the national strategy (Source: Own analysis & Ministry of Agriculture and Forestry 2009)

Science-policy interactions

There are several research projects that support the adaptation policy process in Finland. Two stand out as particularly influential. FINADAPT started just before the national adaptation strategy was developed, and therefore provided input for that process (Swart et al. 2009). Completed in 2005, its aim was to assess the adaptive capacity of both the Finnish environment and society. It also scoped out the need for further policy-relevant research (Carter 2007).

The Climate Change Adaptation Research Programme ISTO, running from 2006 to 2010, is designed to support the implementation of the adaptation strategy by providing research and information for planning measures, thus increasing the adaptive capacity of Finland. According to its evaluation, it has succeeded in raising awareness on required action, but little actual measures have come from it (Ministry of Agriculture 2009). To address this, for the 2009-2010 research period, the intention was to focus more on direct support of policy.

There is a broad range of other research programmes, which are listed in Annex 1 of the national strategy's evaluation report.

6.1.1.3 Forestry

Finland is the most forested European country: three-quarters of the land area are covered with forests. As of 2008, about 52% of forestry land is owned by private individuals or families, 35% by the state, 7.5% by companies, and 5.5% by other entities (communes, parishes, communities) (Peltola 2009).

The 1996 Forest Act is the current legislative basis of forestry in Finland. Its purpose is "to promote economically, ecologically and socially sustainable management and utilisation of forests in order that the forests produce a good output in a sustainable way while their biological diversity is being maintained" (Ministry of Agriculture and Forestry 2004). Among other principles, it builds on the concept of sustainable development popularized at the 1992 Rio summit. In addition to the 1996 Forest Act, there is more specialized legislation dealing with issues such as the prevention of forest damage. Of potential importance for adaptation is

the 1996 Act on the Financing of Sustainable Forestry, which lays out how government funding shall be allocated for measures to ensure sustainable timber production, protection of biodiversity, forest ecosystem management and other relevant activities (Ministry of Agriculture and Forestry 2003).

This legislation does not yet contain references to climate change or adaptation. However, amendments to incorporate climate change adaptation into the 1996 Forest Act are under preparation through a revision initiated in 2008, which aims to assess whether legislation needs to be updated to take account of adaptation concerns. Forests are long-term resources, and their management requires planning ahead to a great degree. Thus, it is a sector where it is particularly important to plan appropriate adaptation measures as soon as possible. This is recognized in the national adaptation strategy (Marttila et al. 2005, p.176).

The National Adaptation Strategy identifies the National Forest Programme and the Regional Forest Programmes as two avenues for implementing climate change adaptation in forestry (Marttila et al. 2005). The National Forest Programmes are the central component of Finland's forest policy. They have been prepared since 1993, and incorporate the principles adopted at the Rio conference (Ministry of Agriculture and Forestry 2008). Work on revising the National Forest Programme (NFP) was started in 2005. The revised NFP 2015 contains a section on climate change which includes the recognition of the need to prepare for climate change impacts. However, only a few general measures are listed, much less than compared with the National Strategy.

For Southern Finland, there is an additional programme which links forestry and biodiversity: the Forest Biodiversity Programme for Southern Finland 2008–2016 (METSO programme), which is in place to stabilize forest habitats and establish favourable trends for forest biodiversity by 2016. It is not aimed at tackling climate change adaptation specifically. However, it works in conjunction with the National Forest Programme 2015 and as such plays a role in the efforts to tackle sustainable forest management in a changing climate. An important part of METSO are voluntary actions by forest owners, which marks a different approach to traditional top-down regulation efforts and has been successful in the initial programme phase from 2003-2007.

Finland has 13 regional forestry centres, which are governmental authorities for forestry in each region. The centres are responsible for preparing the Regional Forest Programmes, and are assisted in this by regional forestry councils consisting of various civil society and private sector members. The Regional Forest Programmes are development plans for the forestry sector in each region. They define the needs, objectives, measures and funding for the management, use and protection of forests (Ministry of the Environment 2009).

The current programmes are made for the period 2006-2010. They were revised in 2008, to comply with the objectives of the National Forest Programme 2015 and the METSO programme 2008-2016. The operational environment of the forestry sector has changed considerably since the Regional Forest Programmes were prepared in 2005. The most important changes include structural changes in the industry, the growing need for domestic raw timber and the growing importance of biodiversity as a result of the METSO programme. Thus, in the revisions of the Regional Forest programmes the target amount of yearly fellings has been increased. At the same time a target of approximately 20,000 hectares of yearly protected areas was introduced, while the 2005 programmes did not set quantitative conservation targets (Weckroth, 2008). The programmes do not yet, however, take into account the impacts of climate change and what kind of measures would be needed to adapt to them, even though they are identified in the National Adaptation Strategy as one potential avenue to implement adaptation.

6.1.1.4 Biodiversity

The conservation of biodiversity is closely linked to activities in various sectors, particularly forestry. Its importance is underlined by giving it a section of its own in the National Adaptation Strategy.

The Ministry of the Environment has prepared an action plan to implement the national strategy in its administrative sector, released in 2008. It lays out the planned measures in detail, including the area of 'Biodiversity and the Recreational Use of Natural Areas' while also acknowledging the need for coordination with other ministries, particularly the Ministry of Agriculture and Forestry to tackle biodiversity (Ministry of the Environment 2008). The action plan is planned to be updated at the end of 2010, incorporating the newest information on expected impacts from ongoing research and the government foresight report on climate and energy policy.

The 80-page document lays out the types of proposed measures to implement the national adaptation strategy. In biodiversity, measures include administrative/planning (e.g. protected areas), legislative (preparation of new and review of existing legislation), and research areas. It also maps common interests that the Ministry of the Environment shares with other agencies to provide entry points for coordination and collaboration. The importance of central to local collaboration, as well as coordination amongst local governments, is noted without concrete ways to address it. Many of the measures are not exclusively climate-driven, but are brought under a common theme.

The National Adaptation Strategy highlights a special focus on forestry and water habitats, alongside other natural protection areas. Biodiversity in forestry is tackled through the METSO programme, the National Forestry Programme 2015 (which contains a section on "Protecting the biological diversity and environmental benefits of forests"), as well as the 1996 Forest Act (Section 10, "Preserving of diversity and habitats of special importance"). Metsähallitus, the state-owned forest enterprise, has a Natural Heritage Services branch. Its remit is, amongst others, to manage national parks and other conservation areas and to protect species and habitats.

The 1996 Nature Conservation Act covers various aspects of nature conservation, including the establishment and management of protected areas and national parks, as well as the protection of endangered species.

Biodiversity conservation also leaves its mark in various other areas. The National Land Use Guidelines were updated in 2008 to include a provision promoting the preservation of ecological corridors between protected areas and 'other valuable nature areas' (Ministry of Agriculture 2009). There is a National Strategy for Invasive Alien Species under preparation by the Ministry of Agriculture and Forestry and a steering group including a broad range of ministries, agencies and other relevant organisations. This follows the requirement of the UN Convention on Biological Diversity (CBD) for a national strategy, and should be completed by the end of 2010.

Furthermore, a National Strategy for Mires and Peatlands is under preparation by the Ministry of Agriculture and Forestry and should also be completed by the end of 2010. About a third of Finland's total land area, 100,000 km^2, was originally covered by mires, of which only about 40,000 km^2 of undrained mires remain (Putkuri et al. 2008). The strategy under preparation will define needs and goals for the use of mires and peatlands over the coming decades.

6.1.2 Perceived policy needs

To determine perceived policy needs, interviews with policy-makers were supplemented with information from documents, such as the report on the evaluation of the national adaptation strategy. The insights within this section, if not otherwise attributed, come from interviews (see Annex for list of interviewees).

Climate change is already being felt in Finland. However, the impacts are not yet severe and most projections suggest that the coming decades will not herald as dramatic changes as in other countries. Mitigation is much more a concern right now.

The 2009 evaluation has stated the need to look at synergies and contradictions between adaptation and mitigation more closely (Ministry of Agriculture and Forestry 2009). In practice, civil servants may deal with both adaptation and mitigation as the relevant groups are often small. Integrating with mitigation will be beneficial for adaptation as mitigation is currently more important and is prioritized. Overall cuts in government spending and personnel also impact resources for adaptation.

Particularly in the forestry sector, the use of wood for energy is an important aspect for mitigation and carries an economic potential, so finding the right balance between resource extraction and adaptation issues or biodiversity is a challenge. In biodiversity conservation, many needs are known: a better network of protected areas (corridors) and the extension of protection in some areas. But, to a certain extent it is too early to plan concrete measures for adaptation.

Nevertheless, there is high-level support to advance adaptation. The development of a national adaptation strategy has set the government firmly on the path to be confronted with adaptation questions – indeed, this was likely part of the reason to adopt the strategy. Yet with the ISTO programme ending and no clear plans for a replacement, it is not yet entirely apparent how updating the national adaptation strategy 2011-2013 will take place.

6.1.2.1 Awareness-raising

One of the main outcomes of the national adaptation strategy and the research programme ISTO is that awareness has increased. Beyond awareness-raising, policy relevance has not always been given, however – mainstreaming is still a further need.

6.1.2.2 Mainstreaming

The evaluation states that there has been some mainstreaming and learning, but not enough has happened yet. The Ministry of the Environment's action plan also underscores the need for "the detailed evaluation of the impacts of climate change and the definition of adaptation measures [to] be integrated into the operations of various administrative sectors." (Ministry of the Environment 2008, p.25).

But mainstreaming could mean different things in different sectors. The 2009 evaluation asks what should be considered as adaptation in a sector where adapting to the prevailing climatic conditions has always been a concern (Ministry of Agriculture and Forestry 2009). Particularly in biodiversity and forest management, it is still difficult to determine what climate change adaptation would mean in addition to the needs that already exist to increase the strength of protection. Pressures on forest are strong, which is an issue independent of climate change. The pursuit of no-regret options such as disease prevention and minimizing storm damage is already taking place. Similarly, the expansion of protected areas and establishment of ecological corridors would be beneficial in any case. How much the flora

and fauna will change in response to further changes in climate is hard to predict, and even harder to prevent.

6.1.2.3 Coordination

A major challenge is the coordination of various ministries and agencies, and the collaboration across different levels of government (Ministry of Agriculture and Forestry 2009). The national adaptation strategy followed a strictly sectoral approach, but in 2005 the priorities were different and concentrating on coordination would have been difficult. The primary challenge at that point, awareness-raising, was met by the strategy and the problem has now moved on to coordination, which is an issue for the next iteration. The need for coordination is also underscored by the Ministry of the Enviroment's action plan (Ministry of the Environment 2008, p. 68). The action plan in fact builds on the issues laid out in the national strategy, and goes more in depth into the necessary tasks.

A central coordinating body will be useful for the next strategy, to foster communication and exchange between all the actors involved. It is necessary to have people that can think broadly and are not too caught up in their daily routine. UKCIP (the UK Climate Impacts Programme, see section on the UK) could be a potential blueprint for that. In the forestry sector, the NFP is also a good vehicle for developing the important questions and measures, and for improving coordination.

There is still a lack of clarity on competencies and responsibilities. For instance, building on the coast is currently a municipal responsibility. Because coastal properties are attractive and prices are high, municipalities are eager to zone land near the shore for construction. There is no legislation for the responsibility for costs in case of damages – and nobody wants to take on the costs voluntarily.

The national strategy doesn't assign clear responsibilities, since it is on a very strategic level. For some areas this is no problem because ministries claim their areas, as for instance the Ministry of the Environment has done with its action plan to implement the strategy. Such a forerunner can also push action in other areas, by being an 'enabling sector', but for other areas such as buildings, zoning and land use planning, the strategy does not deliver much. Thus, the sectoral coverage of the strategy should be expanded.

6.1.2.4 Multi-level governance

The 2009 evaluation notes that adaptation measures are frequently implemented at the local and regional level but that this is not well reflected in the national strategy. Indeed, the link to the local level is one of the key issues raised both at the national level and from a regional perspective. It is expected however that the revised strategy will focus more explicitly on the local and regional levels. Even though, the strategy may not be the right place to deal with detailed measures in any case. Because initiatives are starting to appear in various local and regional settings, there will already be something to build upon for the next strategy.

The strategy can be seen as a handbook, highlighting important issues that are relevant independent of which level one is on. Furthermore, the civil servants involved in the development of the national strategy are often involved in sharing experience with local authorities starting work on their own plans.

Concrete treatment of adaptation has not yet permeated into regional forestry programmes – they are more focussed on wood as a resource and forests as carbon sinks. The discussion at the regional level about changes in species composition in response to climate change is only done informally at the moment. Nevertheless, early planning would be useful, given the long

time (from 60 years upward) it takes to establish seed production and plant new species. Establishing a plantation for large-scale seed production alone can take 15-20 years.

Preparation for new types of extreme events affecting the natural environment also requires new forms of collaboration between local-level authorities and public service organisations such as fire departments – this sort of planning still needs more work. Particularly for biodiversity and nature conservation, the possibilities to react and progress at the local level are not so good. Because they have little legal competency, training and guidance for municipalities is all the more important so that small steps can be taken. Because the focus for regional or local strategies may be more infrastructure-focussed, the natural environment and resources focussed national strategy may be of limited use. Prior to 2005, few studies relevant for urban areas existed. The Helsinki metropolitan strategy is being developed without extensively using the national strategy for guidance.

The private sector should be involved more, too. For instance, private forest owners (52% of forests) need to be informed and nudged towards incorporating adaptation concerns. Here the focus on benefits and integration with mitigation may be useful. Good forest management is beneficial both for mitigation (carbon storage) and adaptation (through diverse, resilient forests and ecosystems). Similarly, selecting the regeneration material for forests will be influenced both by mitigation concerns (using forests as fuel) and adaptation concerns (selecting species with resilience to projected climate changes).

6.1.2.5 Research

There is a need for further research in several areas. On the one hand, interviews suggest that more impacts research is needed for forestry and biodiversity (control of pests and diseases in the future, inventorisation of forests, types of regeneration material and tree breeding system, etc). On the other hand, the 2009 evaluation notes that the current national strategy focuses on impacts taking place in the natural environment, while socio-economic impacts don't receive enough attention (Ministry of Agriculture and Forestry 2009). The interviews confirm this: particularly broader scenarios incorporating socio-economic effects and policy choices would be useful. Some physical systems are also not sufficiently modelled, such as forest soil, which is important also for mitigation. More work is also needed on basic ecological studies about habitats and species, to get background information about how the environment reacts to climate change. The evaluation also states that more detailed regional and local information on climate impacts, as well as inventories of vulnerable areas are needed. This includes monitoring systems to follow impacts such as the spread of invasive species (Ministry of Agriculture and Forestry 2009).

6.1.2.6 Coping with uncertainty

Of course, there is still uncertainty about future climate regimes, and this is also an issue. For instance, some private forest owners are already contacting government agencies with questions about what changes to make – but such questions are currently not answered. Producing more detailed research is therefore one challenge, but also preparing to put the results of such research into practice as soon as possible, so that when the picture becomes clearer, action can immediately follow.

The 2009 evaluation further notes that so far, a focus on projected average changes was often justified, but that an acceptable risk level approach should be considered particularly for long-term and critical infrastructure (Ministry of Agriculture and Forestry 2009). How to deal with scenarios and pathways that give a wide range of outcomes is difficult. If a planner asks for a number, but scientists can only give a range, there is a mismatch. The discussion on dealing with this type of uncertainty still needs to be further developed in Finland. Otherwise there is

a danger that research is tailored to the demands of users by hiding underlying uncertainty, rather than helping them embrace it.

6.1.2.7 Tools and information access

The Finnish Meteorological Institute provides scenarios to users in Finland through their climate service hotline, primarily for future climates and sea level rise. The impacts are modelled by institutes in the specific sectors, such as the Forestry Institute. In addition, SYKE is a key institute providing research and information to stakeholders, gathering many kinds of data. The Finnish Meteorological Institute has recently performed a survey to ask stakeholders what kind of climate information the institute should provide. There is a need for information that is more user-oriented and easy to digest (Ministry of Agriculture and Forestry 2009). In addition, the speed of communicating new results is important, as is a clear plan to ensure sufficient access to information and adaptation implementation resources in the future (Ministry of Agriculture and Forestry 2009).

Costs are another problem. There is the need for cost-benefit and cost efficiency assessments of adaptation measures (Ministry of Agriculture and Forestry 2009). The awareness of its importance is given, and research into appropriate tools is conducted, but there is little knowledge on how to do it at the moment. Questions of environmental and ecological sustainability have to be supplanted with questions of economical sustainability.

When accessing basic climate information, existing contact networks within the civil service may play a role. There seem to be few technical tools or methods that are used for adaptation planning at the national level. Expert assessment is used as a way forward to get new ideas for governmental action and for vulnerability assessments, for instance through seminars with scientists and administrative experts, planners, etc. This also enables knowledge exchange amongst stakeholders. For cost assessment expert elicitation is also used for the Helsinki Metropolitan Region strategy. The problem is that a civil servants do not have the time and resources to look for other methods if they are not easily accessible. Therefore, a UKCIP tool (LCLIP, local climate impacts profile) was used for local interviews. But using tools developed in other countries may not always be possible or make sense due to different administrative systems. The Helsinki strategy's steering group consists of higher level civil servants from different sectors from the cities of the region. They know their sectors pretty well and can give rough assessments of what types of changes are needed, partially obviating the need for tools.

Often, adaptation planning is still 'learning by doing'. This underscores the need for easily accessible, well-documented experiences and best-practice examples from various countries. Currently finding such examples is not easy. A portal for climate change information (Climateguide.fi) that will go online in 2011 is expected to solve some of the information and methods problems particularly for regional and local decision-makers. It will hopefully also help making the available data clearer and explain it better to users.

6.1.2.8 The role of the EU

Exchange of best-practice at the European level would be useful. Tools, strategies, so that one does not have to start from scratch, as well as lessons learnt from mistakes are other aspects that could be shared. The EU adaptation policy process is seen as a potential source for ideas and guidance, particularly for countries that have performed less domestic research activities. It draws the whole of the EU to think about adaptation and building cooperation.

A clearinghouse mechanism could provide good scientific summaries, as there is a wide range of projects on adaptation across Europe. Another area where the EU could be involved are

impacts on countries that originate from outside the EU, or from other areas within the EU. This involves questions such as food supply or migration.

Because legislation is very country-specific when dealing with concrete measures, a focus on national-level initiatives may be more useful overall. It is difficult to sum up the whole of the EU adaptation-wise since adaptation is such a local issue. Using resources at the national scale may be more valuable than investing in EU-wide activities. Making EU policymakers more aware of local issues may be useful.

In the forestry sector particularly, the EU could coordinate forestry inventory systems across countries and establish a more formal EU forestry policy to benefit adaptation. The white paper is very general and has little impact at the national level, while directives such as the flood directive are more important. Within biodiversity and nature conservation, EU policy serves as guidance to adaptation planning.

There is, however, uncertainty about the progress and future direction of adaptation activities at the EU level, and the amount of resources that will go into it.

6.1.3 Synthesis

Finland started incorporating adaptation at the national policy level with a national strategy in 2005. The initial years were mostly used for awareness-raising and research. It is not clear how big a priority adaptation will be in the near future, however. The government will change in 2011, and the new government may decide to focus more exclusively on mitigation. Finland is not overly threatened by climate change at the moment, and adaptation may often involve no-regret options that increase resilience in the face of current drivers of vulnerability. In biodiversity protection and nature conservation, for instance, the expansion of protected areas will be useful in any case.

More coordination between departments and agencies is a need, as is more involvement of the local level. The 2005 strategy was not very strong in that regard, but more is planned for its next iteration. Meanwhile, local-level activities are already happening and lessons are being learnt about what information, tools and support they need.

Information access is expected to improve with the launch of the Finnish climate change portal in 2011. At the moment, expert consultations and workshops are mentioned as the primary way to elicit the necessary information, in addition to scenarios provided by Finnish research institutes. Civil servants are busy with their day-to-day work so appropriate tools with a shallow learning curve could be useful for them.

The role of the EU is seen ambivalently. There is little need for help from the EU, but exchange of information would be valued. Scarce resources are rather used for national projects.

7 Southern Europe

The Southern European region includes Greece, Italy, Portugal and Spain. The Mediterranean region is particularly concerned by the issue of water management (droughts), health (heat waves) and tourism.

In that region, Italy is particularly vulnerable. However, it has not adopted a national adaptation strategy yet nor does it appear to be discussed. Hence, action is mostly in the hands of regional and local actors. Nevertheless, in areas such as droughts and heat wave, national responses have been adopted.

Spain has adopted a national adaptation strategy early (in 2006), followed up by national work programmes. However, regions also play a major role in adaptation by taking into account the local circumstances in regional adaptation plans. As in the case of Italy, a special look at droughts and heat waves show that some sectoral adaptation measures have already been implemented.

7.1 Italy

7.1.1 Policy framework

7.1.1.1 General Adaptation Policy

Italy has not adopted any particular public policy regarding adaptation yet.

Adaptation Competencies

Italy is a unitary state. The three levels of decentralized administration are regions, provinces and municipalities. However, the decentralization is very strong and regions are autonomous. It means that in spite of a formal centralized organization, the regions have far reaching legislative powers to rule their own affairs, much like in federal states. Five regions[37] have an extraordinary status, which gives them a stronger autonomy, while fifteen other regions have a normal status. The division of the legislative power between the state and the regions is provided for by article 117 of the Italian Constitution. There are three categories of competencies: the exclusive legislative competency of the state, the shared legislative competency between the state and the regions and the residual legislative competency of the regions. In the particular case of the protection of the environment, the State has formally exclusive legislative and regulatory powers. As for pure administrative functions, they are vested in the municipalities. Provinces and municipalities are also responsible for environmental services located on their territories such as waste management, water management, parks, hunting, etc. The state also conferred administrative functions to the regions, for instance: issuing environmental authorizations for installation and infrastructures of regional relevance, preparing and implementing waste management plans, air quality plans, soil and coast defence plans, enforcing measures for the implementation of river basin plans. In spite of that exclusive legislative competency of the state, several decisions of the Constitutional Court have said that the repartition of powers should be appreciated according to the principles of flexibility and subsidiarity, in particular where environmental issues actually deal with other matters which are indeed a formal regional legislative competency (healthcare, land management, civil protection, energy, transport). Therefore regions play an important role and can adopt legislative measures as long as it does not affect the powers of the state.

Special regional agencies for the protection of the environment have been created by the Act n.61 of 1994. They now act under the supervision of the Institute for Environmental Protection and Research (ISPRA- *Istituto superiore per la protezione e la ricerca ambientale*). Their major responsibility is to monitor the activities of local entities in environmental matters. They check that environmental norms are properly implemented, offer technical support to smaller local authorities and promote environmental information.

In the national government, the Italian Ministry for the Environment, the Land and the Sea (IMELS) is the department in charge of environmental matters. Within the ministry, a general

[37] Aosta valley, Friuli – Venezia Giulia, Sardinia, Sicily, Trentino-Alto Adige/Südtirol.

directorate is dedicated to sustainable development. It includes a division dealing with climate change and international cooperation[38]. It supervises in particular the good implementation of international conventions as the UNFCCC and the Kyoto protocol. IMELS is hence responsible for the adoption of a national strategy on adaptation. Other departments are also concerned by the issue of climate change such as the Ministry of Infrastructures and Transports for mitigation actions, the Ministry of Agriculture, Food and Forestry or the Ministry of Health. However this concern is not institutionalised in the ministries and no particular unit deals with the issue.

The lack of a national strategy on adaptation

Italy has no adaptation plan. Nor is it in the process of adopting such a plan. Debates were held in the Parliament at various occasions following the international agenda and the adoption of the European Green and White Paper but it never led to the elaboration of a national strategy. The need for a plan was claimed early on, however. In fact after the 2007 Conference on Climate Change (Conferenza Nazionale Cambiamenti Climatici) the participants to the meeting declared that Italy should adopt a plan on adaptation immediately. This plan should involve the central government, the local governments as well as civil society actors. The participants also recommended that the plan be coherent with the National Plan on Biodiversity adopted at first in 1998 and the National Plan of Action to fight draught and desertification adopted in 1999. These still need to be properly implemented though, as the conference stakeholders commented[39] (Conference on Climate Change 2007).

The idea of a national plan on adaptation now seems completely put aside, however. But civil society is pressuring the government to act. The WWF regularly updates guidelines which were first adopted in 2007. Their aim is to guide public authorities in the definition and adoption of a national adaptation plan. The paper is carefully structured and follows a sectoral approach (biodiversity, water resources, forests, agriculture, humid areas, mountain areas, hunt and fisheries, coastal areas, hydrogeological system plan for the territory, maritime resources, health, transports, tourism, industry and energy, buildings and urbanism). For each sector, impacts of climate change and potential adaptation actions are listed. However the major issue according to WWF is the protection of the natural system in order to reduce vulnerability[40](WWF 2007).

In the forthcoming years[41], the Italian Ministry for the Environment, the Land and the Sea is planning to adopt a national adaptation strategy. However there is no information on a possible date. Its elaboration will involve all the ministries concerned by adaptation as well as regional and local governments. This strategy would then be the basis of a future national adaptation plan of programme. It should strengthen and mainstream adaptation actions in sectoral and territorial policies. It should also foster research on climate change impacts and vulnerability.

Research

The Strategic Programme "Sustainable development and climate change" is a document

[38] The 5th division of the general directorate for sustainable development, climate and energy.

[39] Manifesto per il clima – Un new deal per l'adattamento sostenibile e la sicurezza ambientale - conclusioni conferenza nazionale cambiamenti climatici – Roma, 12 e 13 settembre 2007

[40] WWF, *Per un Piano di adattamento al cambiamento climatico in Italia*, Prime Indicazioni, 2007.

[41] This paragraph is based on the answers to our interview-questionnaire provided by an IMELS officer.

written by the UNESCO National Italian Commission to raise awareness among the population regarding climate change. It describes causes and impacts of climate change in Italy. The Strategic Programme "Sustainable development and climate change" was the funding basis for several multi-annual projects (through Directorate Decree 31st December 2004).

There are also quite a few research activities related to Climate change but they mostly focus on mitigation.

The Strategic Programme "Sustainable development and climate change" also created the (Centro Euro-Mediterraneo per i Cambiamenti Climatici - CMCC) Euro-Mediterranean Centre for Climate Change, located in Italy which aims at "*creating an international level centre for research on climate change*" and focus on: "*development and in-depth examination of knowledge on climate variability: study of causes and consequences through high resolution simulations*".

Other institutions dedicate al lot of their research activities to Climate Change. The International Centre for Theoretical Physics (ICTP), the National Research Council, the National Institute of Health, the system of Regional Agencies for Environment Protection (ARPA), the Italian National Agency for New Technologies, Energy and Environment (ENEA), ISPRA (Istituto Superiore per la Protezione e la Ricerca Ambientale) (ex-APAT) and FEEM (Fondazione Eni Enrico Mattei) (Climate change modelling and policy) are among them.

The major funding bodies in the field of Climate Change Impacts and Adaptation are: ISPRA, the Italian Ministry of Environment, Land and Sea (Ministero dell'Ambiente e della Tutela del Territorio e del Mare - MATTM), the Ministry of Education, University and Research, (MIUR - Ministero dell'Istruzione, dell'Università e della Ricerca), the Ministry of Economy and Finance, (MEF - Ministero dell'Economia e delle Finanze) and the Ministry of Agriculture Food and Forestry Policies, (MIPAAF- Ministero delle Politiche Agricole Alimentari e Forestali) (Italian Ministry of Environment, Land and Sea, 2008 ; CMCC 2010).

7.1.1.2 Drought

In 1994, Italy signed the United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification (UNCCD). It was later ratified in 1997 by Act nr. 117, of 4 June 1997. Italy is considered to be a country affected by desertification. As such, in conformity with article 5 of the Convention[42], Italy had to prepare and implement a national action programme. The first Italian step had been to settle the National Committee to Fight Desertification and Drought (CNLSD-*Comitato Nazionale di Lotta* alla *Siccità* e *Desertificazione*) by decree of the Prime Minister (DPCM 16 September 1997) which is in charge of the good implementation of the UNCCD Convention and of the National Action Programme regarding Droughts. The Committee defines guidelines for the National Action Programme (PAN– *Programma di Azione Nazionale*) and for the Regional Programmes. In 1999, the Committee presented its guidelines, which where approved by vote. They provide that the existing norms regarding land use and water resources should be carefully implemented. They encourage the coordination between state authorities to prevent and mitigate risks. They also ask for the mapping of vulnerable areas. Four sectors should be paid particular attention according to the Committee: soil protection, sustainable water resources management, reduction of the impact of industrial activities, restoring territorial balance.

[42] Art. 5, Annex IV, UNCCD on Preparation and implementation of national action programmes

On the basis of the four sectors mentioned, Regions and Basin authorities[43] are responsible for the identification of the vulnerable areas to droughts and desertification as well as necessary measures to fight these phenomena. They must elaborate Local Action Programmes (PAL – *Programmi di Azione Locale*). Actions consist, among others, of preventive and mitigating measures, in better cohesion with the national economic policy, in the development of information and training activities, in the inclusion of actors of different sectors such as agriculture, social services, forestry or civil protection. (PANLD 1999 ; Bissoli, 2009). Emilia-Romagna, Tuscany, Liguria and Campania have already adopted a PAL. These PALs identify areas which are particularly vulnerable and suggest measures to take action. Although most of the measures are labelled under "mitigation" ("mitigazione"), some adaptation solutions are presented to respond to the increasing drought phenomenon. This is in particular the case in Emilia-Romagna where the term "adaptation" ("adattamento") is expressly used.

The Emilia-Romagna PAL studies the potential benefits of three kinds of actions in the area selected: Pure Adaptation measures, Adaptation and Mitigation measures as well as measures leading to a repartition of the social and environmental value of the resources. Mitigation measures mainly focus on limiting the use of water resources while adaptation measures are usually mechanisms of water storage. The underpinning idea of the programme is that pure adaptation measures are not sustainable and are mere temporary solutions. The PAL therefore focuses on mixed adaptation and mitigation solutions. Hence, pure adaptation measures in the PAL are limited. They consist mainly in the creation of stock water basins. The adaptive-mitigation measures are essentially the adoption of agricultural techniques allowing a limited use of water resources and the use of cultures which need less water. Other solutions aiming at sharing the value of resources consist in internalising the cost of water through tariffs for instance, or the limitation of parcel areas where heavily water-dependent crops are cultivated (Botarelli 2009).

7.1.1.3 Heat Waves

Since 2004 the Ministry of Health and the National Centre for Disease Prevention and Control (*Centro nazionale per la prevenzione e il controllo delle malattie*) have developed a working plan in order to limit the impact of heat waves on citizens' health. On the one hand, the method consists of improving systems of prevention. On the other hand, it aims at protecting particularly vulnerable groups of the population and at spreading information. Elderly persons are the major target of this policy. It appeared also necessary to coordinate the actions of health and social services. The underpinning principles of the national strategy are: predict the heat waves, identify categories of population particularly vulnerable, designate centres managing alert systems and coordination of interventions, organise social services, communicate efficiently with local actors and inform citizens on safety measures. The National Operating Plan of 2006 is based on these principles (CMCC 2006). It is the complement of the National Surveillance, Forecast and Alert System on impacts of heat waves on health, of the Civil Protection department.

Following the guidelines of the World Health Organisation, some Italian cities have also tested "Heat Health Watch Warning Systems". The purpose of such systems is to publish daily heat and risk forecasts. Some cities also participate in the warning national system

[43] Basin authorities were created by Act 183/89 on measures for the organizational and functional planning of the soil protection (*Norme per il riassetto organizzativo e funzionale della difesa del suolo*). These authorities gather the state and the region and are responsible for the management of the water catchment area (*bacino idrografico*). These catchments basins are considered to be the optimum area for the protection of the soil and subsoil, the waters rehabilitation and various other environmental issues, regardless of administrative divisions.

taking inventory of deaths due to heat waves, on a daily basis. A yearly inventory of actions taken to respond to heat waves is also done in member cities of the national system.

Generally, measures adopted regarding heat waves are rather scattered and often local. Municipalities often publish the identified risks in the local newspapers and the media. In the national context, the civil protection department monitors big cities and publishes forecasts regarding the temperatures. Recommendations regarding times to go out, food, ventilation of the houses, etc are also provided.

7.1.2 Perceived policy needs

The perceived policy needs where identified through an interview and the review of policy documents and the literature.

7.1.2.1 Multi-level governance

One policy need relates to a lack of formal competency for some local authorities. Hence the current repartition of competencies between the state and the regions has raised some problems where regions feel they could adopt a proper environmental policy more elaborated than the state's. In September 2009, the President of the Lombardy region, Roberto Formigoni, asked the state authority to delegate the environmental legislative competency to his region[44]. Article 116 of the Italian Constitution provides that "*Additional special forms and conditions of autonomy, related to the areas specified in art. 117, […] and paragraph two, letter […] and s), may be attributed to other Regions by State Law, upon the initiative of the Region concerned, after consultation with the local authorities, in compliance with the principles set forth in art. 119".* Yet, article 117, paragraph 2, letter s refers to "*s) protection of the environment, the ecosystem and cultural heritage*". The delegation is controlled by the state since it needs approval from both chambers. The President Formigoni argues that his region has always been very proactive and progressive on these matters and that it is therefore time to formally delegate the power of action to the regional authorities. There is however no precedent for such a delegation of competencies.

Coordination between the various levels of government appears therefore to be a crucial issue. This is true as the Lombard example shows for the issue of the legislative competency.

Against this background, the Italian Ministry for the Environment, the Land and the Sea plans to adopt a multi-level governance approach in the future national adaptation strategy. It should specified the responsibilities and authority of the different stakeholders, and especially of the regional and local authorities. It should also refer to top-down actions implemented by the national government and bottom-up local measures in vulnerable sectors. The objective of this multi-level governance approach is also to identify the most appropriate level of action.

7.1.2.2 Mainstreaming

Mainstreaming is already taking place in various sectors to face the effects of climate change. According to the Italian Ministry for the Environment, the Land and the Sea (IMELS), measures which could be beneficial to adaptation have already been implemented in the fields of land planning, coastal areas management, environment protection, natural hazards prevention, sustainable management of natural resources and health protection. However this remains an important issue and mainstreaming should be enhanced. IMELS plans to focus its

[44] http://www.diariodelweb.it/Articolo/Italia/?d=20090925&id=105849

strategy and action on that topic. If a future national strategy is to be adopted, it should mainly concentrate on the mainstreaming of adaptation actions in sectoral and territorial policies.

7.1.2.3 Research needs

This is another crucial issue mentioned by IMELS. Although the government finances several research institutions (e.g. the CMCC- Euro-Mediterranean Centre for Climate Change), there are still research gaps to fill. The national strategy on adaptation should focus on supporting research on climate change impacts and vulnerability.

7.1.2.4 Tools and information access

Updated climate information is not always available to policy-makers who are faced with a great variety of adaptation policy options. Tools such as a webportals for information or databases dedicated to adaptation for different climate change scenarios, would be necessary. More information on national and regional impacts and vulnerabilities as well as on costs of adaptation are also essential. The report and exchange of best practices would be a good tool to support policy-makers.

7.1.2.5 Political commitment

The Italian government has not shown much interest in the issue of adaptation so far. Apart from the national conference in 2007, not much has been done apart in some areas such as heat waves or droughts. It shows a very low level of commitment from the Italian authorities and there is still no time scale established concerning a potential adoption of a national adaptation strategy.

7.1.2.6 The role of the EU

In Italy, where there is little action on adaptation, the EU could play a catalytic role. The White Paper raised a discussion in the Italian Parliament and hence put adaptation on the political agenda. If the EU engages in financing adaptation projects through the structural or cohesion funds, then it may become a major incentive for public authorities to act, in spite of the absence of a national strategy. Specific measures such as the White Paper Clearing House Mechanism will be very beneficial for Italian authorities. The settlement of the Impact and Adaptation Steering Group which will enable member states to truly cooperate in the development of national adaptation strategies is another positive measure which will enable policy makers to get political guidance. The EU should therefore ensure that these measures are actually enforced.

7.1.3 Synthesis

Italy lags behind some other member states regarding its policy towards adaptation. Currently there is no evidence of a national political commitment on that issue. Against this background, the EU could play a role in raising awareness of the policy makers and the citizens. In fact, after 2007, the only debate raised in the Parliament on the question of adaptation was the discussion following the adoption of the White paper. At the same time, a major problem may be the lack of competency of the regions to adopt a proper regional act on Climate Change issues. The lack of a national initiative can therefore hardly be compensated by local actors. Nevertheless action is taken through sectors such as heat waves or droughts. There national public bodies as well as regional and local decision-makers have regulatory powers and the capacity to act.

The major challenge for Italy is therefore to adopt a national strategy regarding adaptation.

There is no formal binding provision for that by now but the EU White Paper suggests that by 2012 the adoption of national or regional strategies could be mandatory[45]. It leaves little time to the Italian authorities.

7.2 Spain

7.2.1 Policy framework

7.2.1.1 Institutional context for climate change decision making in Spain

Following the political and administrative changes of the 1970's Spain is organized in 17 autonomous communities (see figure 1) with significant (and progressively increasing) devolved powers in matters related to health, education, social policies, land use planning, transportation, agricultural policy, industrial development, environmental and natural resources policy. For the most part, the central government plays a coordinating role in these areas, setting common national standards, priorities and goals, and establishing funding priorities with EU and national funds. Climate change policy is no exception, with the Ministry of Environmental, Rural and Marine Affairs (MERMA) (which in 2008 combined the previous Ministries of the Environment and of Agriculture, Fisheries and Food) setting national goals and coordinating the plans and programmes of regional autonomous governments.

Figure 9: Map of autonomous regions in Spain

Within MERMA, Climate change Policy at the national level is determined by the Spanish Office for Climate Change (SOCC), which sets national policy, collaborates and advises regional autonomous governments, and coordinates the work of the participatory bodies working on climate change within the Ministry.

The first official climate-change related activities in Spain started with the creation, in 1992, of the National Climate Commission (*Comisión Nacional del Clima)*, with the goal of promoting climate change related research and assess the socioeconomic impacts and vulnerability to climate change. It was made up of representatives from different

[45] European Commission, *White Paper on "Adapting to climate change: Towards a European framework for action"*, COM(2009) 147 final, 1 April 2009, p15.

governmental ministries and was charged with collaborating with the elaboration of the National Program for Climate *(Programa Nacional del Clima)* and asist the government on climate change policies. However the structure of the Commission was soon deemed insufficient to deal with climate change concerns and, in 2001, coinciding with the creation of the Spanish Office for Climate Change, the Commission became the National Climate Council, a more open and participatory body where representatives from autonomous regions, municipalities, scientists, and a wide range of stakeholders were present.

The growing importance climate change concerns have achieved in Spain's political agenda is reflected in the progression of the SOCC within the ranks of the Ministry of the Environment. Created in 2001 as a sub-directorate general, it became a Directorate General in 2006. After the 2008 elections, the government created the MERMA, and within it a General Secretariat for Climate Change, that includes the Directorate General of the Spanish Office for Climate Change, where adaptation appears as a sub-directorate for the first time. Figure 9 shows a schematic representation of the institutional framework for climate change policy in Spain.

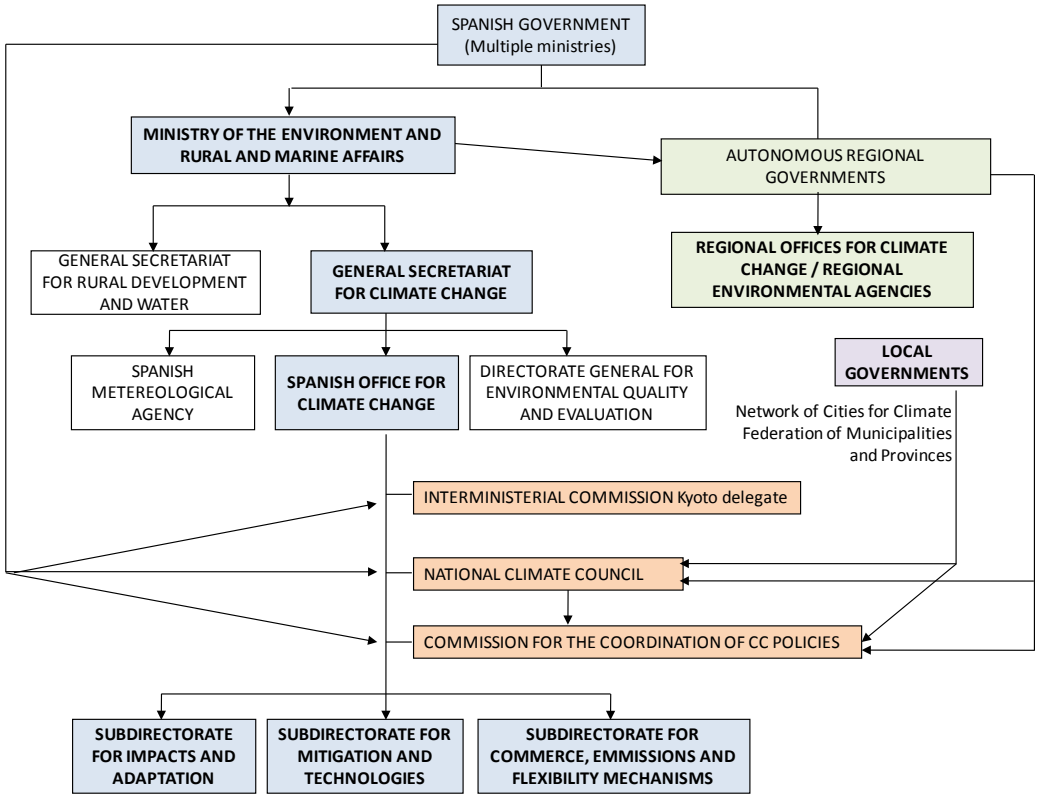

Figure 10: Institutional framework for climate change policy in Spain

As stated previously, the decentralized nature of Spain's public administration implies that Autonomous Communities' Regional Governments, and to a lesser extent local authorities, exercise significant powers in climate change-related areas. Over 75% of operating expenses and up to 70% of public investments carried out by the public sector are made by regional autonomous governments and local administrations (municipalities and regional-based leagues of municipalities or *Diputaciones*) (MARM, 2009a). In this context, the existence of Institutional arrangements that foster co-ordination, co-operation and participation are particularly important. Within the MERMA, the primary coordinating organisms include:

- The Interministerial Climate Change Group (*Grupo Interministerial de Cambio Climático),* created in 2004, which coordinates the work on climate change among the different national ministries and is the Designated National Authority for the Kyoto Protocol. The Autonomous Communities have a representative in the Commission that acts as a liaison.
- The Commission for the Coordination of Climate Change Policies (*Comisión de Coordinación de Políticas de Cambio Climático* - CCPCC), created in 2004 as a coordinating and collaborative body between the central government and the autonomous regions, in which representatives of the central government, autonomous regional governments, municipal governments through the Spanish Federation of Municipalities and Provinces (*Federación Española de Municipios y Provincias* – FEMP) and the National Climate Council participate. The CCPCC has working groups that meet regularly. One of them deals specifically with climate change adaptation.
- The National Climate Council (*Consejo Nacional del Clima* or CNC), created in 2001 with the original goal of developing the Spanish strategy against climate change. It is a participatory body where national, regional and local governments are represented along with key stakeholder groups and research institutions, and responsible for debating and approving climate-change related programs, policies and plans.

7.2.1.2 Adaptation in general

In line with international initiatives, the initial focus of climate change policies in Spain was on mitigation. In 2002 the Spanish Parliament ratified the Kyoto Protocol, and its commitment to reductions in CO2 as part of the EU. In February 2004 the National Climate Council approved the Spanish Strategy for the fulfillment of the objectives under the Kyoto Protocol (*Estrategia Española para el cumplimiento del Protocolo de Kyoto),* and in 2005 passed the Law 1/2005 that regulates emissions trading of greenhouse gases.

Spain has implemented an emissions trading scheme (affecting over 1000 facilities responsible for 45% of greenhouse gas emissions) through two National Allocation Plans of Emissions Allowance (*Plan Nacional de Asignación*): the 2005-2007 plan, with a goal of stabilizing emissions at +40% which was not met; and the 2008-2012 plan, which revised and strengthened previous objectives and goals. However, the primary increases in emissions until 2007 came from sectors not included in the 2005 law, the so-called "diffuse" sources, such as transportation and residential emissions. In order to meet the challenge of diffuse emissions, and based on the projections and goals of the Emissions Allocation Plans, the Spanish government approved in 2005 the Strategy for Energy Saving and Efficiency Action Plan (*Plan de Acción de la Estrategia de Ahorro y Eficiencia Energética en España* - PAE4) for 2005-2007 (MITC, 2005). A new Action Plan was approved in 2007 for 2008-2012 (MITC, 2007). The plans work through collaborative and cost-sharing agreements with the autonomous regions and aim to reduce energy consumption by improving processes efficiency (MMA, 2007).

In addition, in 2007 the government approved the Spanish Strategy for Climate Change and Clean Energy *(Estrategia Española de Cambio Climático y Energía Limpia)* for the 2007-2012-2020 horizon, an overarching document with the objective of: "gathering all the necessary actions to fulfill the commitments under the Kyoto Protocol and the United Nations Framework Convention on Climate Change and to establish the foundations for sustainable development" (MMA, 2007, p.18). Among its various goals and actions, it explicitly integrates mitigation and adaptation policies, and aims to promote the integration of adaptation measures into sectoral policies.

In terms of adaptation specifically, the Spanish Office for Climate Change promoted in 2003-

2005 a wide ranging study of the state of the art in the knowledge of climate change impacts in Spain (*Efectos del Cambio Climático en España or ECCE)*. With the participation of over 400 experts from various disciplines, the study used different future climate scenarios to predict their impact on different ecosystems and economic sectors. The results of the study were published by the Ministry of the Environment in a report in 2005: Preliminary General Evaluation of the Impacts of Climate Change in Spain (*Evaluación Preliminar General de los Impactos en España por Efecto del Cambio Climático*) (MMA, 2005) and served as the basis for the National Plan on Adaptation to Climate Change, approved in 2006. From that point on, the Spanish government introduced the assessment of impacts, vulnerability and adaptation measures into the policy agenda. Adaptation is considered as relevant as mitigation, and significant efforts are being made to carry out impact and vulnerability assessments and to develop adaptation plans at the National, regional, and even local levels (MARM, 2009b).

The basic regulation regarding climate change adaptation in Spain is the Spanish National Climate Change Adaptation Plan (PNACC) (OECC, 2006). The plan was subject to public consultation and received input from autonomous regions, public agencies, NGOs and other stakeholders. The final version was approved by the CCPCC, the CNC and the Spanish Council of Ministers in October 2006. It is currently the framework for the assessment of impacts, vulnerability and adaptation to climate change. It provides support for the coordination and cooperation among different ministries and administrations (national, regional and local) and guidelines for the mainstreaming of adaptation into sectoral policies. Specifically the plan aims at (OECC, 2008):

- Developing regional climate scenarios for Spain.
- Performing assessments of impacts, vulnerability and adaptation to climate change in every relevant socio-economic sector and ecosystems, through the development of appropriate methods and tools.
- Introducing the needs for climate change impact assessment into the R&D&i programs.
- Improving information and communication about the projects carried out.
- Enhancing stakeholder participation to facilitate the inclusion of adaptation in sectoral policies.

The plan is structured in six main parts to finally achieve an overall adaptation strategy:

1. Technical aspects: the need for definition of regional climate change scenarios for impact modelling purposes.
2. Sectors and systems to be addressed (15) by the plan and main lines of action: biodiversity, water resources, forests, agriculture, coastal areas, inland hunting and fishing, mountain areas, soils, fishing and marine ecosystems, transport, human health, industry and energy, tourism, finance and insurance policies, and urban planning and construction.
3. Coordination and management: institutions involved and plan's development.
4. Participation: definition of actor groups that must be involved in the development and implementation of the plan.
5. Communication, education and public awareness: activities related to public information, communication and education intended to raise awareness.
6. Monitoring and Evaluation of the plan: the plan is going to be developed by means of work programs and their subsequent monitoring and evaluation reports.

While mitigation initiatives have to be global in scale, evaluation of impacts and vulnerability and determination of adaptation strategies are necessarily regional or local in scale. It is for this reason that the CCPCC, the primary institution for coordination between the central government, autonomous regions, and local governments, is responsible for adopting the National Adaptation Plan and the specific lines of work for each period through consecutive Work Programmes that are elaborated by the Spanish Office for Climate Change (OECC). The OECC acts as the administrative and executive secretariat for the plan, presenting working documents to the CCPCC for their approval.

The First Work Programme, adopted in 2006, focused on four elements of the PNACC which were considered particularly relevant for the future development of the plan:

1. Generation of **regional climate change scenarios** by the Spanish Meteorological Agency, which are essential for the successful development and implementation of the plan. The results of this first activity were to feed the subsequent phases of the programme.
2. Assessment of **climate change impacts on water resources**, given their relevance on other sectors such as agriculture, tourism, industry, forest resources. Knowledge of the impacts of climate change on water resources availability will affect impact evaluation in other sectors. This work should be developed in the framework of the implementation of the Water Framework Directive (WFD).
3. Assessment of **climate change impacts on biodiversity**, given that Spain concentrates a large proportion of the EU's biodiversity.
4. Assessment of **climate change impacts on coastal areas**.

As established within the PNACC, in 2008 the OECC published its first follow-up report on the implementation of the First Work Programme. Advances had been made in the four lines of work: specific programs were underway and timetables had been established by the different institutions responsible for each of the lines of work (Spanish Meteorological Agency – task 1; Directorate General of Water – task 2; Directorate General of the Natural Environment and Forest Policy – task 3; and the Directorate General of Coasts – task 4). Most significantly, regional climate change scenarios for the XXIst century have been developed and made available through the Agency's website[46] , and more detailed and accurate models are being developed. In the water resources arena (task 2) the Directorate General of Water produced in 2007 a Technical Instruction for Water Resources Planning, in essence a technical guide for the development of the River Basin Management Plans that explicitly requires planners to account for the impact of climate change on both resources availability and sectoral demands. To this effect, the MARM commissioned the Center for Hydrographic Studies (*Centro de Estudios Hidrográficos – CEDEX)* to study the potential impacts of climate change on water demand, water availability and aquatic ecosystems.

Given Spain´s vulnerability to the effects of climate change processes, the country developed an adaptation strategy early on. The EU's 2007 Green Paper and the White Paper of 2009 were approved after the First Work Programme of Spain's PNACC policy was well underway. The Second Work Programme, adopted in July 2009 for the 2009-2012 period, incorporates the contents and goals of the EU's White Paper on adaptation. Building on the lines of work of the first programme, the second work programme presents an ambitious and comprehensive agenda that deals with a wide range of sectors vulnerable to climate change and of particular significance in Spain, and seeks to advance in integration and coordination.

[46] http://www.aemet.es/

Specifically it is based in two main pillars: (i) to boost research, development and innovation in climate-change and adaptation related concerns, and (ii) to promote coordination between national and regional autonomous governments and among different ministries and institutions. This second work programme is structured in four axes:

1. **Assessment** of impacts, vulnerability and adaptation to climate change in different economic sectors and systems: sectors and systems addressed in the first work programme (water resources, biodiversity and coastal areas) + tourism, agriculture, health, forests and soils/desertification.
2. **Integration** of adaptation to climate change in sectoral regulations.
3. Mobilization of key actors that should actively **participate** in identifying adaptation measures.
4. Establishment of a system of **indicators** for impacts and adaptation to climate change.

In order to evaluate the advances made within these four axes the program proposes a calendar and several progress indicators. The next follow up report of the Second Work Programme should be released in late 2010.

7.2.1.3 Adaptation plans at the regional/autonomous level

Given the current distribution of competences in Spain, coordination with regions is an issue of the highest relevance. In Spain, most environmental affairs are under the competence of regional governments (Krysanova et al., *in press*), and therefore, regions must elaborate their own climate change strategies following the principles established in the PNACC and in the EECCEL. Moreover, each region has either created a Climate Change Office, or designated a commission or working group for climate change, which normally depend on the regional department of environmental affairs.

Progress in the development of such regional strategies varies largely across the Spanish territory. From a total of 17 Spanish regions, 16 have developed special plans, programmes or strategies for climate change. While originally many of these plans were devoted exclusively to mitigation strategies, events at the international and national level in 2006-2008 (Bali Summit, discussion and approval of the European White Paper on Adaptation, approval of the PNACC) resulted in many draft plans and programmes being revised before final approval to include adaptation measures, or the development of specific adaptation plans (interviews). Of the 16 regional climate change plans and strategies, 12 are devoted to adaptation or at least include some measures or lines of action related to it, and 2 other regions (Andalucía and Cataluña) are working on specific adaptation plans or pending approval.

Coordination among the different adaptation programs and plans and between these and the PNACC is the task of the CCPCC. The Working Group on Adaptation within the CCPCC meets periodically to share information and coordinate activities between different regional governments. However, there are no regular intervals between meetings and some participants feel there is insufficient time assigned to discuss the different topics in-depth (interview). There is a perceived need for stronger coordination both of basic information and of policy initiatives, the creation of platforms for joint learning and information sharing, and greater support from the central government (interview). Additionally, given a lack of detailed regional information on impacts and vulnerability, adaptation measures and proposals are necessarily general in nature and often focus on efforts to improve regional and local-based information through specific research programs, development of indicators, and other assessment and early warning systems.

Adaptation policy in Spain largely reflects EU policy in terms of the structure of the main adaptation policy document. The Spanish PNACC was adopted three years in advance, in 2006. The second work programme however was approved in 2009 and adapted the White Paper's guidelines. It focuses on the analysis of impacts and vulnerability in different sectors and systems that coincide with the sectors highlighted in the White Paper, namely agriculture, forests, coasts and marine ecosystems, energy, infrastructures, tourism, health, biodiversity, water resources.

The PNACC, similarly to the White Paper, highlights the relevance of assessments and development of strategies at the regional and local level. Concerning the regional adaptation, as explained above, most regional governments have already developed their regional plans following a similar structure to the National plan. They envisage the development of the current adaptation plans from now to 2012, as the White Paper does. Sectors and resources considered are similar as well, although they prioritize the sectors that are most relevant in each region, and the knowledge base development and impact assessment approach is equally adopted.

Summing, we can conclude that Spanish adaptation policy is coherent with EU policy developments, covering similar issues, and in the same time frame. The National adaptation plan was launched in the late 2006 and, currently, one work programme has been completed and the second work programme is underway. Regional plans are being developed as well, and most regions have already brought out at least the main axes of their adaptation plans, either in specific adaptation plans or in wider climate change programs including both adaptation and mitigation.

In general terms we can say that, although mitigation is still more present in CC oriented programs and plans than adaptation, significant efforts are being made at the national and the regional levels.

7.2.1.4 Drought, water resources and agriculture

Drought management in Spain is primarily a water management concern, with significant implications in other water related sectors such as irrigated agriculture (which consumes up to 75% of Spain´s water resources) and urban water supply. Ecosystem conservation is also impacted by droughts.

Spain's water administration is divided into river basins. When a river basin crosses more than one autonomous region (interregional river basins) planning and management responsibilities fall to River Basin Agencies, autonomous administrations that depend functionally from the Directorate General of Water in the MERMA. When a river basin falls entirely within one autonomous region (intraregional river basins), water planning and management is the responsibility of the autonomous government through their Water Agencies. However as in other sectors, it is the central government who sets national standards and goals and ensures compliance with EU legislation. Agricultural policy is largely set at the autonomous region level, with the MERMA setting national guidelines and priorities primarily through the distribution of national and European funds. Finally, water supply and sanitation are a local responsibility. Municipalities either directly or through private companies are responsible for this service and thus for establishing adaptation strategies for future climate change drought scenarios.

Spain is dominated by a Mediterranean climate where droughts are a recurring reality. As a result many policy programmes and plans already address water saving measures and adaptation to droughts. It is worth highlighting three policies that address adaptation to water scarcity and drought and preceded explicit climate change adaptation policies although they

have become an integral part of these policies:

- Special Action Plans for Situations of Alert and Eventual Drought (*Planes Especiales de Actuación en Situación de Alerta y Eventual Sequía*). The National Hydrologic Plan Law of 2001 required that all basin management agencies develop special drought management plans that served to minimize the economic, social and environmental impacts of droughts. In 2006 the Directorate General of Water published the guidelines for the elaboration of these plans, based primarily in a set of hydrologic indicators that determined whether the basin or sub-basin is in one of four possible hydrologic levels: normal, pre-alert, alert or emergency drought situation. Each level triggers a series of predefined responses ranging from public awareness campaigns, water saving measures, water rights exchange mechanisms, conjunctive use of surface and groundwater resources, search for additional resources (water reuse, desalination, etc.) or ultimately water use restrictions. The Special Drought Plans were approved in 2007 for all interregional river basins and have been applied in the most recent drought period that has affected many river basins in Spain since 2005 and ended in December 2009.
- Emergency drought plans for urban water supply systems (*Planes de Emergencia por Sequía en Sistemas de Abastecimiento Urbano).* The National Hydrologic Plan Law of 2001 also required municipalities of over 20000 inhabitants to develop drought emergency plans, with some Autonomous regions, such as Andalucía, establishing this requirement for municipalities of over 10000 inhabitants. The Directorate General of Water in collaboration with the Spanish Association of Water Supply and Sanitation (*Asociación Española de Abastecimiento de Agua y Saneamiento* – AEAS) issued emergency plan guidelines in 2007. The Emergency Plans had to be coordinated with the 2007 Special Drought Plans. They become operational at the alert and emergency levels, and distinguish between 3 alert categories: emergency phase 1 (severe drought); emergency phase 2 (serious drought); and emergency phase 3 (extreme drought), once again with different responses coming into effect at each level. However few municipalities have so far developed and implemented these plans.
- National Irrigation Plan (MAPA, 2001) and the Agricultural Modernization Action Plan 2006-2008 (*Plan de Choque de Modernización de Regadíos)* (MAPA, 2006): The National Irrigation Plans was operational from 2002 to 2008. The 2006 - 2008 redirected the primary objective of the irrigation plan toward an increase in water distribution and use efficiency through the modernization of irrigation infrastructures. The Action Plan was put into practice in response to the intense drought that affected Spain in 2005 and 2006 that had a severe impact on agricultural production, and in order to enhance the process of modernization already underway. While significant public and private funds have been spent in agricultural modernization programs, the final results in terms of drought management are questionable. According to official data, up to 66% of total irrigated area in Spain uses efficient irrigation methods (localized or drip irrigation). However, it is not certain how much water was saved overall and, what is more significant, to what extent the modern water-saving technologies have been used to increase, in some regions in Spain, the production of irrigated crops or of total irrigated area. As a result, the flexibility of the system could have been reduced in the face of future droughts or climatic variations although irrigation accounts for the major share of the overall buffering capacity of the water sector in Spain.
- The PNACC considers drought in most of its lines of action, as water scarcity and drought are the main expected impacts of climate change in Spain. Specifically, drought is addressed within the measures related to water resources, agriculture, tourism, biodiversity and forests.

In the field of water resources management, the impact of climate change on Spain's water resources was first publicly addressed in Spain's White Paper on Water (MMA, 1998), a wide

ranging assessment of the situation of Spain's water resources that was intended to provide the conceptual framework for Spain's National Hydrologic Plan, which was approved in 2001. The White Paper established different possible scenarios of a reduction in precipitation and an increase in temperatures, in accordance with the scenarios developed by the National Climate Commission. As was discussed above, the National Hydrologic Plan also required the approval of Drought Emergency Plans at the Basin and the local levels.

With the approval of the EU Water Framework Directive (WFD) in 2000 and its transposition into Spanish law in December 2003 water planning and management priorities and goals have changed. A new river basin planning process was launched in 2004 in compliance with WFD's specifications. The General Directorate for Water issued the Technical Water Planning Guidelines (*Instrucción de Planificación Hidrológica.* MMA, 2007) which specifically require river basin plans to account for the effects of climate change on water resources availability in the basin according to the climate change scenarios developed by MARM. It also determines that, as long as those regional-specific scenarios are not available, specific water resources availability reduction percentages need to be applied (see table 2). The instruction indicates that this reduction in available resources needs to be accounted for in the calculation of water demands, overall balances and determination of environmental flows.

Table 2: Reduction in available water resources as a result of incorporating climate change considerations. Source: Instrucción de Planificación Hidrológica (MMA, 2007)

River basin	Reduction (%)
Miño-Sil	3
Cantábrico	2
Duero	6
Tajo	7
Guadiana	11
Guadalquivir	8
Segura	11
Júcar	9
Ebro	5

As was described above, the First Work Programme of the PNACC, included an assessment of climate change impacts on water resources, which is to provide the regional and basin-specific impact scenarios. The assessment has been carried out by the Center for Hydrographic Studies (*Centro de Estudios Hidrográficos – CEDEX)* and a first progress report been made available to water resources planning agencies. Final results are expected in 2010.

The Second Work Programme of the PNACC (2009-2012) continues focusing on water resources. The specific lines of work in this are the following (OECC 2009):

- Continue and finalize the study on the *Impacts of Climate Change on Water Resources and Water Bodies*. Final report in 2010.
- Detailed study on climate change and groundwater resources. Final report in 2012.

- Detailed study of climate change impacts on snowmelt-derived water resources in the primary Spanish mountain ranges in the XXIst century. Final report in 2012.
- Development and implementation of a methodology for cost analysis of climate change impacts in pilot areas.
- Mobilization of key actors through the development of communication, public participation and social education initiatives.
- Development of a sectoral evaluation of water resources (2012)

Agriculture was not a sector of primary focus in the PNACC's first Work Programme. However, autonomous regions where agriculture is particularly relevant from a socioeconomic perspective (for instance Extremadura, Castilla-La Mancha and Andalucía), have included measures relating to agriculture in the adaptation plans that are pending final approval. Overall, however, there is still insufficient regional specific information of the impacts on climate change on the agricultural and livestock sectors for the measures proposed to be particularly specific (interview). The National Government has now incorporated it into the second Work Programme, and it is expected that the results of some of this work can help advance regional adaptation plans on agricultural issues. Specific lines of work in relation to agriculture in PNACC2 include:

- Agreements with competent authorities to establish a collaborative framework in the area of agricultural insurance (2009)
- Analysis and cartography of climate change impacts on water resources availability in different agricultural and for different types of crops, including an evaluation of the impacts of overall demand for irrigation in Spain in the XXIst century (2010)
- Development and application of a methodology for cost analysis of climate change impacts on pilot agricultural areas.
- Mobilization of key actors through the development of communication, public participation and social education initiatives.
- Prepare a report on the evaluation and follow up of the impacts, vulnerability and adaptation to climate change in Spanish agriculture (2011)

Besides specific adaptation strategies in agriculture, it is worth noting that, at the European level, the Common Agricultural Policy Cross-Compliance measures included in the 2003 CAP Reform (European Commission 2003; European Commission, 2004; BOE, 2004), comprise several measures related to water quantity and water quality protection, erosion and habitats protection, such as the Statutory Management Requirements of compliance with the Nitrates Directive, the Groundwater Directive and the Habitats and Birds protection Directives, and the Good Agricultural and Environmental Conditions, regarding soil erosion and maintenance of habitats, that in the case of Spain include provisions about legal water permits in overexploited aquifers.

The new CAP reform, the CAP "Health Check", is a further step in the mainstreaming of climate change into sectoral policies. The new CAP (European Commission, 2009a, 2009e, 2009f) advances in the environmental protection focus, already present in the 2003 CAP reform, and addresses four main challenges: water management biodiversity, climate change and renewable energies. Therefore, this new CAP reform promotes adaptation to climate change through a wiser water management in agriculture.

At the national level, the second National Strategy for the Sustainable Modernization of Irrigated Agriculture – Horizon 2015 (*Estrategia Nacional para la Modernización Sostenible de los Regadíos Horizonte* 2015), explicitly refers to the PNACC as one of the overarching

policy goals that must inform the strategy.

7.2.1.5 Heat weaves

Heat waves and their effect on human health and ecosystems have been discussed and identified in several preliminary studies and evaluations both at regional and national level. For instance, the report on Impacts of Climate Change in Castilla-La Mancha (OCC-CLM, 2009) already mentions the effects of heat waves on mortality rates and human health. However, regional adaptation strategies and plans rarely include specific measures related to heat waves and the national strategy does not mention them.

7.2.2 Synthesis and perceived policy needs

Climate change adaptation policies and measures in Spain are still at an incipient phase. While the National Plan on Climate Change Adaptation was approved in 2006, measures so far have focused primarily on improving basic information and impact analysis on four priority areas: regionalizing climatic models and improving the estimation of impacts on water resources, biodiversity and coastal areas. The second PNACC Work Programme, which takes a broader approach to climate change adaptation in line with the European White Paper, also focuses its lines of work primarily in gathering basic regional-based information on impacts and vulnerability. Given that impacts and adaptation measures are necessarily regional and local in scale, it makes sense that it is for the autonomous regional governments to develop more specific adaptation strategies.

Each autonomous government is developing strategies that respond to the particular regional needs, and focus on those sectors that are either particularly vulnerable or that are of particular socioeconomic importance, such as agriculture, biodiversity or tourism, to name just the most common ones.

From that perspective, the primary needs to develop adaptation plans in Spain focus on five main areas:

1. **Information needs**. Adaptation policies require a good scientific and information base from which to evaluate impacts, assess vulnerability and propose specific measures. This need is clearly reflected in the fact that both national as well as several regional climate change policies have started from comprehensive reviews of the state of the art knowledge on climate change and from collaborative agreements with experts from various disciplines and in the different areas or sectors[47].

   However, there is a **lack of solid scientific basis** for policy decision making on adaptation, particularly on regionalized impacts and vulnerability (interview), and a sense that a lot more **information at a smaller regional/local scale** is necessary in order to be able to propose specific adaptation measures that may require significant private and public investment. While many autonomous governments are establishing funding lines for R&D on climate change impacts and vulnerability on priority sectors, there is a request for more detailed information from the national government, similar to that

[47] For instance, at the national level the 2005 Preliminary General Evaluation of the Impacts of Climate Change in Spain (*Evaluación Preliminar General de los Impactos en España por Efecto del Cambio Climático*) (MMA, 2005). In Castilla La Mancha the First Report on the Impacts of Climate Change in Castilla-La Mancha (OCC-CLM, 2009) commissioned to several research groups from the regional University, laid the groundwork for the region's climate change strategy (interview). In Aragon on the other hand, the elaboration of the strategy was commissioned to 6 working group of scientists and experts on each of the 6 priority areas (interview).

produced for water resources or coastal areas.

There is a clear need to improve the science/policy interactions in the field of climate change. This need is starting to be met through funding priorities for climate change research at the national and regional scale, the establishment of collaborative research projects between regional universities and research groups and policy makers, and the increasing number of symposiums and scientific and technical working group meetings that are being held. A good example is the National Convention on Climate Change and Sustainability *(Convención Nacional de Cambio Climático y Sostenibilidad)*, that was celebrated in Albacete in 2009 for the second consecutive year and where a growing number of climate change specialists, stakeholders and policy makers participate.

2. **Inter-administrative and scientific coordination and collaboration**. This report has described the quasi-federal characteristics of Spain's political structure and the essential coordination between national and autonomous governments as well as local authorities, in developing and implementing climate change mitigation and adaptation measures. Although the institutional structure for climate change policy-making contains several coordinating organisms (such as the Climate Change Council or the Commission for the Coordination of Climate Change Policies), our interviews have revealed a need to strengthen these mechanisms. There is a sense that each autonomous region has developed (or is developing) their own adaptation strategy largely in an information and policy void. While they are aware of and may have participated in debates over the National Adaptation Strategy or of the European White Paper on Adaptation, there is a sense that adaptation measures are primarily regional and local and there is little guidance for their elaboration. Often Climate Change Offices are not aware of what other regions are doing and proposing and, when they do it is often a result of personal affinities or interactions, more than institutional coordinating initiatives.

   A similar lack of coordination appears to exist among research groups working on climate change issues. Given the abundance of research projects that have started over the past few years, sometimes research groups are working on similar issues in different regions or universities without having knowledge of or contact with each other (interview).

   There is a need to build effective coordinating and collaborative platforms that serve to exchange experiences, knowledge gained, initiatives, and basic data and scientific information. The latter requires of flexible mechanisms that allow for the recognition of authorship and intellectual property while at the same time facilitating the flow of information.

3. **Public participation and social involvement in climate change policies and measures**. The need to incorporate stakeholders in particular and the public at large in the debates over climate change strategies and plans is widely recognized, particularly in terms of managing the diffuse nature of 55% of GHE in Spain, the largely voluntary nature of mitigation actions, and the need of making society aware of climate change impacts and therefore of the necessary adaptation measures.

   However, efforts to involve the public in debates over strategies and plans have largely been limited to making studies and draft proposed documents available on public websites or holding bilateral meetings with different stakeholder groups. As a result officials express a degree of disappointment over the limited public input to climate change strategies (interviews). In this sense it is clear that more specific guidelines could be provided to support the development of active public participation programs related to climate change, in a similar way as the Water Framework Directive has required an effort beyond consultation for the elaboration of River Basin Management Plans. A potential

example could be the experience of the autonomous regions of Aragon and Cataluña, both of which have Public Participation Directorates or Offices within their government structures, that have taken leadership in designing an active public participation program for climate change through meetings, workshops and other activities.

4. **Funding**. Given that policy guidelines are set at the EU and national scale but adaptation policies and measures must largely be set at the regional level, there is a request for funding support to develop these policies, particularly taking advantage of possible synergies between different broader policy areas, for instance redirecting European or national funding for agricultural and rural development, transportation, or tourism development, to incorporate climate change priorities and needs.

5. **Enforcement mechanisms**. The largely voluntary nature of climate change mitigation and adaptation strategies that address sectors not included in the emission control and trading schemes makes it difficult to implement these measures. Particularly in times of economic and financial limitations, policy makers find it difficult to propose specific measures that will have clear budgetary or financial implications when the level of uncertainty of the science on the basis of which the policies are made is high. As a result, climate change strategies and plans at the regional scale are made without incrementing the budgetary allocations of the different departments. There is therefore a perceived need to devise enforcement mechanisms that will help encourage the collaboration of both public and private partners in the implementation of these strategies.

8 Western Europe

The Western European Region includes countries spreading from the North Sea to the Mediterranean Sea. The focus is on Atlantic countries which share common problems of sea-level rise and coastal management when faced with climate change.

France has adopted a National Adaptation Strategy early on (2006). However, although France is a centralized state, studies on adaptation and guidelines directed towards local governments were published even before. A major point of interest is that France is in the process of converting the National Strategy in a National Plan which should be published in 2011. The added value of the Plan should be to provide more concrete recommendations to stakeholders on how to adapt to climate change.

8.1 France

8.1.1 Policy framework

8.1.1.1 General Adaptation Policy

The adoption of specific policies regarding adaptation in France has been spontaneous but the influence of the international community's actions within the UNFCCC is also considerable (especially after the Nairobi Climate Change Summit – COP 12, in 2006). Several extreme weather events[48] have also increased the awareness of the public and hence the pressure for action on the government.

Adaptation competencies

France is a unitary but decentralized state. As a result most of the policies, relevant for the

[48] In 1999, France was hit by several tempest episodes and in 2003 a heatwave provoked the death of thousands of citizens.

whole national territory, are defined at the central level by the government and the legislator. Article 34 of the Constitution provides that the Parliament is competent to enact legislation related to the protection of the environment. This provision was introduced in 2005 after an amendment of the Constitution to include the Charter for the environment. Locally, the state administration (prefects, decentralised ministries) is in charge of implementing the national policies. At the same time, decentralised authorities in the communes, départements and regions are also responsible for defining and implementing an environmental policy. This is effective mainly through their planning responsibilities. Article 1 of Law 83-8[49] on the division of competencies between communes, départements, regions and the state provides that the communes, the départements and the regions work with the state on the protection of the environment and on the improvement of lifestyle and environment.[50] Communes in particular are responsible for the provision of public services which relates to environmental matters such as waste management, water provision, public health. Then local governments have a general competency over local matters which allow them to take action when no formal legislation exists. Hence local initiatives are possible and in fact it is worth noting the 2007 initiative of the Rhône-Alpes region which set up a group of scientists to draft a guide on how to adapt to climate change in that region.

At the government level, the Ministry for Environment, Sustainable Development and Territories Planning (Ministère de l'écologie, de l'énergie, du développement durable et de la mer) is responsible for defining the environmental policy. The adaptation policy is largely inspired by the ONERC which studies the impacts of climate change and potential adaptive measures. This agency was created by a 2001 Act in order to collect and spread information, to study and research on risks related to global warming and disasters. The ONERC also formulates recommendations on potential preventive and adaptive actions. Since the Climate National Plan of 2004, it is also responsible for the coordination of adaptation actions and is in charge of preparing a national strategy.

France started to tackle the topic of adaptation to climate change in 2004. Before that, national strategies had mostly focused on sustainable development as a whole (a first strategy on this issue dates back to 1997 but was amended in 2003 to define more concrete actions). Then, in 2000, France adopted a National Programme to Fight Climate Change and climate change became a national priority issue. It aimed at defining a programme of actions which would allow France to fulfil its obligations set in the Kyoto Protocol. This programme provided mainly mitigation measures (MEEDDM 2001). A first review of this programme in 2002 showed that France had not reached its targets, especially in limiting greenhouse gas emissions. As a result, this programme was revised and another National Climate Plan was adopted in 2004 to cover the 2004-2012 period. It is based on the results of the 2001 IPCC Third Assessment report and aims at raising awareness in the public and at developing a low-carbon society. It also invites local governments to define their own climate plans. It contains 8 sections dedicated to the sectors which require special attention (outreach, sustainable transports, buildings, industry-energy and waste, sustainable agriculture and forests, sustainable air conditioning, territorial climate plans and exemplary state, research and after 2010) (MEEDDM 2004). Each sector is under the supervision of a designated body: sectoral ministries, environment agency or research institution. A forecast of the reduction of emissions provided by each action is presented as well as the cost foreseen. A time frame for each action is also provided. In 2006, after the Kyoto Protocol became enforceable, a short

[49] Loi n° 83-8 du 7 janvier 1983 relative à la répartition de compétences entre les communes, les départements, les régions et l'Etat, „loi Defferre" , JORF 9 Janvier1983 rectificatif JORF 25 septembre 1983

[50] Article 1 of Law 83-8: « *les communes, les départements et les régions concourent avec l'Etat à la protection de l'environnement et à l'amélioration du cadre de vie* »

review of the first actions taken under the First National Climate Plan and a positive outcome, the Plan was updated. It aims at strengthening and easing the access to information. It also creates an ecological taxation system with tax credits for owners of clean vehicles, a tax on companies vehicles and an additional tax on the cars registration documents on the heaviest emitting vehicles. It also establishes a National Allocation Plan for the allocation of greenhouse gas emission allowances (MEEDDM 2006).

In parallel, adaptation arose as a major issue. In 2001, to respond to that new issue, the Act 2001-153 created ONERC (Observatoire nationale sur les effets du rechauffement climatique – National observatory on the effects of global warming), responsible for gathering information and making recommendations, at first only in the field of adaptation (see below). In that context, at first, climate change adaptation was discussed among public stakeholders through various national meetings[51] or dealing with specific vulnerable areas or sectors (plans regarding protections of the forests and the prevention of waste production 2004, plan for the protection of biodiversity and a health and environment plan 2004, plan managing the scarce water resources in 2005, law defining the national policy on energy in 2005).

Later on, in 2007, the French President launched a great public consultation named the "Grenelle de l'environnement"[52], addressed to all the actors involved in environmental issues. The "Grenelle de l'environnement" consultation appears to have been a great success. It led to the adoption of three acts. Two reasons may explain this achievement: the method used (consultation, direct participation) and the importance of the topic for the public opinion. As a result, "Grenelle 1" (Act n°2009-967) Act was adopted by both chambers of the Parliament almost unanimously. This has fostered the government when defining the process of adoption of a National Plan on Adaptation, to apply the same method. The 2009 Act aims at enhancing the fight against climate change. Its priorities are the reduction of energy consumption and the reduction of greenhouse gas emissions in particular in the sectors of energy and transportation. However the Act covers a wide range of activities and fields such as buildings, urbanism, research, biodiversity, agriculture, water, health, waste, governance and information, an exemplary state, overseas territories. But the provisions focus mainly on mitigation.

The formal request of a National Plan on Adaptation dates back precisely to the 2009 "Grenelle 1" Act. Article 42 provides that "A national plan of climatic adaptation for the different sectors of activity shall be prepared by 2011". The added value of that Plan respect to the National Strategy shall be the precision of the recommendations. These are expected to be in fact more concrete than in the Strategy and will point for instance current inadequate provisions in legislative and regulatory measures. This plan will find its territorial expression in the "Climate Energy Plans" that must be drawn up by departments, urban communities, conurbation committees, municipalities and municipality committees with more than 50,000 inhabitants before 2012, and in the future regional "Energy Air Climate Plans" named in the Bill on a national commitment for the environment, which is before parliament since September 2009. Overseas territories should also adopt plans taking into account the

[51] Symposium on adaptation strategies (Colloque sur les stratégies d'adaptation), 2004 ; Symposium on local governments and Climate Change: which adaptation strategies? (Collectivités locales et changement climatique : quelles stratégies d'adaptation ?) 30 septembre 2004, Onerc, Paris, mai 2005. This led to publications addressed to the stakeholders : ONERC, Collectivités locales et changements climatiques : quelles stratégies d'adaptation ?, Actes du Colloques organisé à Paris le 30 septembre 2004, 2005 ; ONERC, Un climat à la dérive : comment s'adapter ?, Rapport de l'ONERC au Premier ministre et au Parlement, juin 2005 ; ONERC, Climate Change - Cost of impacts and adaptation avenues (Changement climatique : Coûts des impacts et pistes d'adaptation), November 2009

[52] The term „Grenelle" refers to the agreement of 1962 which ended the colonisation in Algeria. It has a high symbolic value in France.

peculiarities of their territories.

The current process of adoption of a National Plan on Adaptation

France has a national strategy but no formal Plan, so far. Its adoption is however in progress and should be completed by 2011. The National Strategy on Adaptation which was adopted in 2006, constitutes the basis of the future plan. It entails a number of recommendations concerning the content of the Plan. As a result, when starting the consultation on a future Plan, most of the strategic axes presented were copied from the National Strategy.

In 2006, following first partial initiatives, a general National Strategy on Adaptation was adopted, after a first report written by the ONERC, in 2005. It was published officially and accessible to the public in July 2007. The strategy is based on the hearing and consultation of various stakeholders: scientists, ministries representatives, local governments, public officers, businesses, citizens. This strategy constitutes the basis of the future NAP (National Adaptation Plan). It states the objectives of the adaptation policy in France. These are: ensuring public security and safety, reducing inequalities in face of the risks, limiting costs and taking advantage of potential benefits, protecting natural heritage. There are nine strategic axes: knowledge development, consolidating observation devices, raising public awareness, promoting policies adapted to the territories, financing adaptation actions, using legislative and regulatory instruments, favouring voluntary actions and the dialogue with private actors, considering the particular case of overseas territories, contributing to international exchanges. Moreover special sectors are considered through 3 perspectives: crossover approaches, economic activities and particularly vulnerable environments. The crossover approaches deal with water, prevention of disasters risks, health[53] and biodiversity. The economic activities section tackles agriculture, energy and industry, transports, buildings and habitat, tourism, banks and insurances. Finally, towns, coasts and seas, mountains, as well as forests are vulnerable environments which shall receive particular attention. Each section and strategic axes includes recommendations for the definition of the adaptation policy (ONERC 2007).

A series of principles are underpinning the national adaptation strategy:

- the concern about equity, which requires bringing together all communities and social and occupational categories likely to suffer the consequences of climate change;
- the need to anticipate crisis situations, in as much as possible;
- the necessity to review and improve insurance schemes which are not adapted to current problems created by climate change;
- the necessity to allow aid and subsidies to encourage change and economic diversification from a sustainable development perspective;
- the need to combine adaptation measures with mitigation actions;
- the need to identify new actions offering other advantages, outside of climate change policy.

The recommendations provide advice on what should be done to integrate adaptation in the various policies. Research and training, integration of climate change in sectoral issues, cooperation and improvement of existing regulatory and planning instruments are the most common solution suggested. However measures are not binding so far. The Strategy suggests

[53] Health is the first sector which was studied in particular by the ONERC. The study on adaptation in the health sector was published in 2007: ONERC, *Climate Change and Health risks* (*Changements climatiques et risques sanitaires en France)*, september 2007.

that public authorities adopt as soon as possible a plan recalling all the recommendations mentioned in the strategy (ONERC 2007).

The method chosen for the elaboration of the plan is consultation. The whole process began on the 8 December 2009. Three groups have been constituted to deal with the various issues: group 1 deals with crossover topics (water, biodiversity, health, natural hazards); group 2 tackles sectoral issues (agriculture/forests/fisheries, energy, tourism, infrastructure); group 3 considers the issues of governance, knowledge, education and financing. Later on (September 2010) a public consultation will be organised through the internet. The nine strategic axes are taken over. The added value of the Plan in comparison to the National Strategy should be the precision of the recommendations. It will not include binding measures since regulatory provisions shall be elaborated by the competent ministry and go through the standard legislative process. However it should point out indicators on climate change (such as frequency and intensity of tempests,) and solutions for the amendment of outdated regulations (MEEDDM 2009).

Influence of the European White Paper on Adaptation

The move towards a National Adaptation Strategy was parallel to the adoption of the White Paper and France had already conducted studies and drafted measures on that issue. Hence it is not proved that the EU played a particular role in the adoption of the strategy, nevertheless there are some similarities. First, it follows the same method of adoption. The White paper was the result of a consultation launched by the Commission after the publication of the Green paper on adaptation. Similarly, in France,on the basis of the National Strategy on Adaptation adopted in 2006, and parallel to the work at the central level, a consultation has been launched for the drafting of the Plan. So the European strategy as well as the French one reflects the wish of the policy-makers to involve civil society and stakeholders in the process of its definition. Then the approach is pretty similar. Most of the topics of the White Paper are repeated in the National Strategy and in the Plan proposal. White Paper and which are particularly relevant in the development of an adaptation policy: water, natural hazards, biodiversity, agriculture, forests, energy, tourism, road infrastructure. The National Strategy also highlights the role of local authorities as the White paper does when it provides that 'subsidiarity' is the underpinning principle of its action. Also both strategies attempt to foster cooperation between the various actors involved, as well as promoting the mainstreaming of climate change considerations into sectoral policies. It cannot be demonstrated however that the White Paper on Adaptation or even its precedent, the Green Paper, have had any impact on French policy up to now.

Research projects and institutions dealing with Climate Change and adaptation

France participates in several research projects concerning climate change, its impacts and potential policy action. Studies are also undertaken on a permanent basis in several universities, public bodies or private foundations. French research institutes tackling these issues are ADEME (French Environment and Energy Management Agency), Cemagref, IFB, Meteo France, IPSL, National Research Agency (ANR), INRA, among others. The French project Project GICC "(GICC: Gestion et Impacts du Changement Climatique) was launched in 1999 by the Directorate for economic studies and environmental evaluation (Ministry for Environment, Sustainable Development and Territories Planning). Half of this programme deals with adaptation and the other half with mitigation. In both parts, specific attention is paid to broadcasting the results to policymakers (Swart et al. 2009).

8.1.1.2 Coastal zone management and sea level rise

France has about 5 500 km of coasts bordering three different seas and one ocean, excluding

overseas territories. Coastal problems are therefore of particular concern. Eleven out of its 26 regions are located on the coasts, which are found along the Mediterranean basin, on the Atlantic ocean, along the Channel and the North Sea. In addition however it must face the impacts of climate change on the coastal zones of overseas territories which are located in the inter-tropical area. All coastal regions are affected by erosion and floods due to sea level rise. However vulnerability varies from one region to another. France also faces a freshwater shortage and threats to coastal ecosystems.

Adaptation Competencies

At national level, the Ministry of Ecology, Energy, Sustainable Development and Land Settlement is the competent authority for coastal defense of inhabited areas and the public maritime domain. This ministry is in charge of providing a coherent policy for coastal protection, but is not obliged to act in order to prevent erosion or flooding or to maintain the coastline. Support is provided by the French Institute for the Environment which collects and analyses all relevant information in relation to the environment and environmental risks as well as by the Coastal Conservatory (Conservatoire du littoral), a French coastal protection agency acquiring and thereby protecting threatened natural areas across the 22 mainland regions (Policy Research Corporation report 2009)[54]. The Conservatory has among its 5 major objectives the duty to tackle the issue of climate change. Against this background it has recently started a research project on adaptation to climate change in coastal areas.

At sub-national level the actors responsible for coastal protection are extremely diverse and the structures differ depending on the region. Besides private landowners, the relevant authorities that oversee coastal protection are the regional and departmental directorates for infrastructure, for the environment as well as for maritime affairs. They are state decentralised authorities. In each region, the state is represented by a prefect. With respect to coastal protection, prefects are mainly involved in spatial planning regulation (Policy Research Corporation Report 2009).

Climate change is receiving increased attention at regional level. In 2003, Languedoc-Roussillon local authorities in cooperation with the state defined strategic guidelines for the management of erosion in the region and identified 8 specific locations in need of additional protection. A technical and methodological guide was developed in 2005 to assist managers in dealing with the problem of coastal erosion locally. In 2007, the prefect of the Nord-Pas-de-Calais region organised a meeting with coastal stakeholders on natural risks and climate change. As a follow-up, the prefect initiated a research programme to assess the current situation regarding coastal flooding and to perform a regional analysis of the potential climate change consequences as well as flooding probability between 2050 and 2100 (Policy Research Corporation report 2009)
Eventually, private property owners are by law responsible for coastal protection measures. As a result, coastal protection measures are undertaken by a wide variety of actors and not recorded, only state-regional planning is[55] (Policy Research Corporation report 2009).

Research

Several institutions do research on Climate Change in coastal areas. Among them, the Mine and Geological Research Office ('Bureau de Recherches Géologiques et Minières'-BRGM)

[54] Policy Research Corporation (in cooperation with MRAG), Final report: *The economics of climate change adaptation in EU coastal areas*, commissioned by the European Commission, 2009.
[55]They are responsible for the protection of their goods and assets respect to sea related disaster and against this background, shall bear any financial burden. (1807 Decree)

participates in the projects : VULSACO (2008-2010) and MISEEVA (2007-2010) both investigating the vulnerability of sandy coasts to climatic and human pressures, especially concerning erosion and the Maritime and River Technical Studies Centre ('Centre d'Etudes Techniques Maritimes et Fluviales' - CETMEF) works on the DISCOBOLE project which aims at predicting the long term impact of climate change for the coast and maritime sector in order to provide a better design and maintenance of coastal defense and waterworks (Policy Research Corporation report 2009).

Coastal management and the National Strategy on Adaptation

The National Strategy of 2006 makes three recommendations regarding coastal zones. First, the strategy recommends that decision-makers enhance the withdrawal from risky zones. The second recommendation is to use the existing tools to foster adaptation as for instance the Risks Prevention Plans for the coastal zone ('Plans de Prévention des Risques Littoraux' - PPR). These are planning instruments established at the community level under the authority of the regional prefects. PPRs indicate the areas at risk of natural or industrial disasters in France. For the coastal zones, three relevant types of PPR can be distinguished:

- Floods Risks Prevention Plans (Plan de Prévention des Risques d'Inondation)

- Coastal Cliffs Risks Prevention Plans (Plan de Prévention des Risques Falaises)

- Low-lying areas Risks Prevention Plans (Plan de Prévention des Risques Zones Basses).

Each plan includes hazard areas as well as building restrictions.

Eventually, the Strategy encourages the amendment of the Coastal Law in order to allow a legal control over the local plans or over urbanism and the enlargement of non-constructible areas. The strategy also mentions the need to control the use and management of maritime resources. It suggests a greater participation to networks such as the Conference of Peripheral Maritime regions (CPMR) in order to exchange information and best practices with foreign countries. International cooperation is already important, especially with the Mediterranean basin countries. In particular, France recently enacted a norm[56] approving the Protocol on Integrated Coastal Zone Management (ICZM) signed in Madrid on 21 January 2008. The central provision of this original legal instrument, of regional scope, is that parties to the protocol shall ensure a coastal setback of no less than 100 meters in width (ONERC 2007).

Coastal zones are also tackled through the disaster risks perspective. In the 2009 outline of the future National Plan on Adaptation, some proposals have been made. They are presented in four sections: management of the risk of catastrophe, the withdrawal/expansion of clay, coastal risks and floods. Finally, regarding the management of the risk of disasters, the strategy favours the development of monitoring and alert systems and management at the river basin level. As for the withdrawal/expansion of clay, a first measure would be to adapt the houses' underpinning and another measure is to refine regulation.

The Xynthia windstorm of February 2010 hit the French coasts badly. As a result, under the pressure of public opinion, public authorities immediately reacted and proposed a "Dikes Plan". This Plan consists in gathering a group of specialists to assess the needs of coastal areas and why some dikes broke. Risks Prevention Plans shall be approved as possible and the inaction of local authorities punished. More broadly, the group should evaluate the necessity to build dikes out of urban areas and how to draw the shoreline.

[56] Loi n° 2009-1186 du 7 octobre 2009 autorisant l'approbation du protocole relatif à la gestion intégrée des zones côtières (GIZC) de la Méditerranée

8.1.2 Perceived policy needs

The perceived policy needs here mentioned are mostly the results of semi-structured interviews held in France in 2010.

8.1.2.1 Multi-level governance

In the coastal zone management area, only a few local initiatives have taken place. This might be because responsibilities are split between a large numbers of central and decentralised actors and hence action is hardly taken. The current approach of national authorities consist in favouring the use of existing planning and regulatory instruments to identify vulnerabilities and hence be able to determine which action should be taken.

8.1.2.2 Interagency Coordination

The coordination between sectors needs to be enhanced. This phenomenon may be the result of the absence of a special contact for climate change related questions in the various public agencies and ministries concerned. Sometimes, nobody in particular has these responsibilities. Therefore adaptation is not at all tackled specifically in the different departments. A specific person or department dealing with climate change and adaptation is also lacking in local governments.

Recent reforms of the state administration have also blurred the responsibilities and the incentives to act.

8.1.2.3 Mainstreaming

The National Strategy points out that existing regulatory or planning instruments are not well implemented although they could constitute a first step in the process of adaptation of a territory (for instance, the Risks Prevention Plans).

8.1.2.4 Awareness-raising

Public policies and local measures often still focus more on mitigation than on adaptation (Swart et al. 2009). For policy-makers the major issue in climate matters remains mitigation. Local policy makers do not make adaptation or are not aware that they are doing adaptation when, for instance, they build a dike. The National Strategy on Adaptation provided too broad solutions to be useful. It is merely mapping the possible responses to climate change impacts. The main problem is the lack of communication made around that strategy. Although it involved a lot of actors in its elaboration, the publication has not been accompanied by a strong promotion by the Ministry for Environment, Sustainable Development and Territories Planning.

8.1.2.5 Coping with uncertainty

Uncertainties and risks assessments are an issue when it comes to decision-making. Policy makers are unsure about which indicators should be retained to adopt a particular decision, for instance the minimum distance between constructions and the coast.

8.1.2.6 Research

The problem of retrieving scientific information exits. Research is independent and research organisations usually answer to calls for projects to get funding. Then however they deal autonomously with the research and define their approach and topic to a large extent freely.

Hence they do not always really respond to the knowledge needs of departments and public agencies. So now instead of general calls for projects, policy makers launches calls for particular studies. These calls are very precise in defining the topic and the underlying research question. Nevertheless a last problem is that sometimes the applicants are not always the most competent or "best" institutions, or at least not the ones the public agents would have favoured.

8.1.2.7 Tools and information access

Costs related to the National adaptation strategy are not clear yet. This may be a limit at the time of defining indicators and measures related to adaptation (Swart & al. 2009). This issue has however been tackled by ONERC, which in November 2009 published a report on the costs of impacts and adaptation avenues (ONERC 2009).

Furthermore, local governments lack local information on climate scenarios. Most of the research institutions have a national scope and do not focus on particular regions. Hence local governments may want to commission special studies but the costs of these are prohibitive.

8.1.2.8 Resources

Resources and financing adaptation are a common issue for every country. In the French case, the lack of staff appears to be a major issue. The national institution in charge of adaptation, ONERC, has limited human resources (two persons and a half until 2002 and then four and a half but after an increase in responsibilities) given the scope of the topic.

8.1.2.9 Political nature of decisions and political commitment

Political and social contexts at the local level may hinder local decision-makers in their capability to act. Locally elected officials tend to act more on a short-term basis rather than on a long-term basis. As a result, they adopt measures to respond to urgent situations (e.g. rebuild houses to house people displaced after a disaster) rather than launching a programme for the climate-proofing of infrastructure. Added to this political time scale limit, some social realities may be determining in the way a commune leads its housing policy. For instance, the multiplication of matrimonial separations and the will to keep the persons living on their territories has fostered municipalities to extend their housing park even in areas at risks such as flood plains. Another example is the pressing action of many citizens to settle as near as possible to the coast although this might be a zone at risk. When those citizens are well organized or influential social groups, they may lead the local decisions makers to refuse to take action.

8.1.3 Synthesis

Adaptation is increasingly attracting the attention of policy makers in France. Several symposiums in 2004 and the adoption of a National Strategy in 2006 have surely contributed to raising awareness among public actors. However the topic is still tackled in very broad terms.

Against this background, policy needs are numerous and varied. Along with awareness-raising, information still needs to be largely widespread between national and local actors. There are also important limits in the institutional capacity of public bodies dealing with adaptation, in terms of staff available or actual existence of personal dedicated to the issue of climate change. This constitutes a huge barrier to one of the major strategic axes of the French policy on adaptation: mainstreaming. Coordination and communication between ministries of various sectors is hindered by this absence of staff dealing with adaptation.

Nevertheless, in the area of coastal zone management and sea level rise, actions are taken. The adaptation issue is very vivid due to the oldness and the frequency of disasters. In that area some local initiatives are noteworthy. They aim especially at assessing the climate change impact and at defining solutions adapted to the local vulnerability settings. But action is also often the result of governmental emergency responses which may lead to maladaptation.

In the end, adaptation policy still appears to be at its very first stage. More concrete recommendations and information from the national level would help decision-makers to perceive the importance of the issue and assess various adaptation options. The adoption of the National Plan on Adaptation in 2011 may be therefore crucial in bringing France to develop a proper public policy on adaptation to climate change.

8.2 United Kingdom

8.2.1 Policy framework

8.2.1.1 Policy and institutional context

The UK consists of four constituent countries: England, Northern Ireland, Scotland and Wales. The majority of the UK population (more than 80%) lives in England (Office for National Statistics 2010). Northern Ireland, Scotland and Wales have devolved administrations, which take over part of the duties that the UK government has in England.

Owing to its complex history, the UK does not have a common set of consistent administrative strata at all levels in all policy areas across its different constituent countries. In England, local government consists partially of a two-tier system of counties (NUTS 3) and districts (LAU 1), and partially of so-called unitary authorities which cover both these levels (also LAU 1, mostly in urban areas). In addition, there are 9 regions between the national and local levels (NUTS 1). However, only one of these (the Greater London Region, administered by the Greater London Authority) has substantive devolved power.

The focus for adaptation policy in this assessment is set on UK-wide programmes and on policies in England. However, the devolved administrations have been active in adaptation policy in their countries as well[57].

There is UK government level administration, centred in ministries and agencies, many of which are located in London. The UK Department for Energy and Climate Change (DECC), formed in 2009, has taken on duties relating to climate change mitigation, and for international adaptation and negotiations, while the domestic adaptation portfolio remains with the UK Department for the Environment, Food and Rural Affairs (Defra). The adaptation policy context is set out below, and is correct at the time of writing (April 2010), however, it is subject to change due to the election of a new coalition Government in May 2010.

8.2.1.2 General adaptation policies

Beginnings of adaptation policy

The UK was one of the first countries to advance a national assessment of climate change

[57] For instance, the Scottish Government has passed a 2009 Climate Change Act, and based on it, produced a Climate Change Adaptation Framework (Scottish Government 2009). The Welsh Assembly Government is producing a climate change strategy to be published in late 2010.

risks. In 1991 the Climate Change Impacts Review Group published a report on the potential effects of climate change in the UK and this work was updated five years later (CCIRG 1991; CCIRG 1996). Following this report, the government set up the UK Climate Impacts Programme (UKCIP) in 1997 to help co-ordinate scientific research into the impacts of climate change, and to help organisations adapt to the unavoidable impacts. This programme has facilitated a large number of studies which are relevant to risk assessment and adaptation, summarised in the 2000 Highlights Report (McKenzie Hedger et al. 2000) and the 2005 Measuring Progress report (Gawith and West 2005). It also played a key role in the UK climate projections commissioned by Defra (most recently the UKCP09) and this has meant that nearly all UK studies use consistent climate projections, and usually consistent socio-economic scenarios. UKCIP, through its website[58], also provides a wide range of guidance and tools for organizations seeking to increase their adaptive capacity and take specific steps to adapt. Because much of the work in the UK has preceded the EU's work (for instance with the adaptation white paper), there is little similarity between the two.

Towards a national adaptation programme

The Climate Change Act of 2008 sets out a long term legally binding framework to tackle climate change. Specifically, it sets out ambitious long-term targets, a framework for setting short-term greenhouse gas carbon budgets, sets out the powers to help achieve these, strengthens the institutional framework, and introduces a series of measures to enhance the UK's ability to adapt to the impact of climate change. It also establishes clear and regular accountability to the UK parliament and devolved legislatures.

Part 4 of the Act sets out the responsibilities in relation to impacts and adaptation. This includes a statutory requirement to conduct a Climate Change Risk Assessment (CCRA). The first CCRA must go to Parliament no later than three years after the Act entered into force (thus, November 2011), and subsequent reports no later than five years after each previous report. There is therefore a continuing statutory obligation to repeat the risk assessment process every five years. Following a scoping study (Watkiss et al. 2009), the CCRA is now underway and will report by the end of 2011. In addition to the initial CCRA and running alongside it, an Adaptation Economic Assessment (AEA) was commissioned by the government to develop a methodology for prioritising adaptation activities and assess the overall economic costs of adaptation.

The Climate Change Act also established an independent body, the Committee on Climate Change (CCC), to advise the government on setting carbon budgets, and to report to Parliament on the progress made in reducing greenhouse gas emissions. The Adaptation Sub-Committee of the CCC provides a formal scrutiny committee for the CCRA. The CCRA must first take into account the advice of this committee before going to Parliament.

There is also a duty in the Act for the Secretary of State to respond to the CCRA and lay a programme for adaptation to climate change before Parliament (a National Adaptation Programme) setting out what the governments objectives for adaptation are, what policies for meeting those objectives are proposed, and in what scale these proposals will be introduced. The government has interpreted the Act as requiring a National Adaptation Programme for England which must be reviewed every five years and be based on the risks identified in the CCRA.

The existing Adapting to Climate Change (ACC) programme is a cross-government effort for England, coordinated by Defra, that has been running for several years. It is intended to unify

[58] http://www.ukcip.org.uk/

the work being done on adaptation across government. In 2008, the ACC published a framework for action on adaptation (Defra 2008a). This can be seen as, in a sense, an initial phase of national adaptation planning that will be supplanted in 2012 by the National Adaptation Programme (which responds to the first CCRA). As part of the ACC, government departments published Departmental Adaptation Plans (DAPs) in March 2010, setting out how they are assessing and managing the risks from climate change (together with their plans for mitigation). The plans for each of the 16 departments highlight the main climate risks affecting their activities and the actions they are taking to adapt. To accompany the departmental plans, an overarching document (HM Government 2010) provides an overall government view and highlights key actions in a number of cross-cutting areas. It also sets out the next steps: the DAPs will flow into the first CCRA, while that CCRA in turn will provide input for the planned second round of DAPs for the 2013-2018 period. Furthermore it is planned that the ACC programme will provide annual updates on how well the DAPs are being implemented.

Adaptation competencies

The responsibility for domestic adaptation policy sits within Defra, and they are leading the CCRA and the Adapting to Climate Change Programme. However, the responsibility for international adaptation (such as funding commitments within the UNFCCC) sits with the Department of Energy and Climate Change (DECC).

The Climate Change Act introduced a power (the Adaptation Reporting Power) for the Secretary of State to direct a reporting authority (a public body or statutory undertaker, such as a utility company) to prepare reports which explain how their organisation is assessing and acting on the risks and opportunities from a changing climate. Around 90 organisations will be required to report to the government. The Reporting Power focuses on organisations that are responsible for the functioning of key public services, such as energy, water, transport and health. Statutory Guidance (Defra 2009a) has been produced to help authorities prepare their reports. Organisations will be required to report between summer 2010 to the end of 2011.

Action is also taking place at other levels of government. As part of the new local government performance framework introduced in March 2008, the government included a national (process based) indicator on preparing to adapt to climate change (NI188). It gauges progress in planning for adaptation and aims to embed the management of climate risks (and opportunities) within local government activities. The Local and Regional Adaptation Partnership (LRAP) is an initiative where Defra, the Environment Agency, UKCIP, the Local Government Association and other stakeholders collaborate to give targeted support to local authorities to respond to this indicator and guidance on NI188 was published in December 2008 (LRAP 2008).

In 2000, the Nottingham Declaration was launched. Initially a declaration for local authorities to commit to help mitigation efforts and start adapting to climate change, it has grown into a programme that provides information and assistance to local authorities through a website (called the 'Nottingham Declaration Action Pack'), supported on the adaptation side by UKCIP. In addition to many local councils, local organisations such as fire and rescue services, park authorities and waste management authorities have signed (Nottingham Declaration Partnership 2010).

The Improvement and Development Agency (IdeA) and the Local Government Association (LGA) are other national-level actors that assist local governments in dealing with adaptation. LGA, for instance, has reviewed and published all the powers available to local authorities to tackle adaptation and mitigation (Local Government Association 2008).

Much work on local adaptation in the UK is organised around the English regions and the devolved administrations in Northern Ireland, Scotland and Wales. Many of the regions and all three of the devolved administrations have climate change partnerships to co-ordinate local action on climate change adaptation.

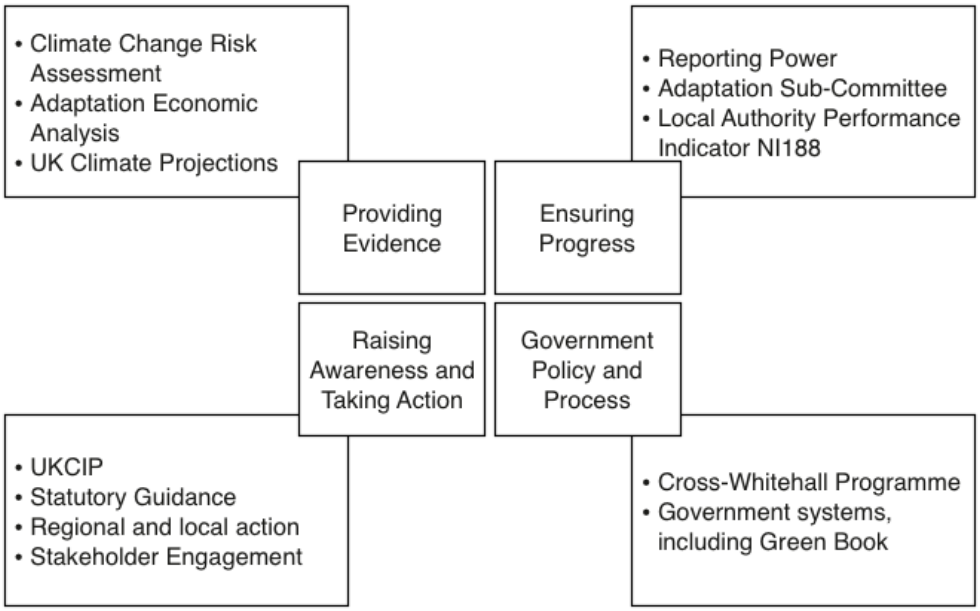

Figure 11: Structure of the 4 workstreams in the Adapting to Climate Change (ACC) Programme (Source: RCEP 2010)

Through UKCIP, there is also extensive consultation with the private sector and business. The wide array of activities taking place across different sectors and aggregation levels is captured by UKCIP as part of information and dissemination activities.

In a broader context of UK Government policy, any formal policy proposal within the UK has to undergo an impact assessment, which is heavily based on economic appraisal and cost-benefit analysis. Recent additional guidance regarding climate change adaptation has been published by the government. This guidance recognises the specific uncertainty issues surrounding adaptation and the issues that make traditional CBA challenging for economic appraisal (HMT 2009).

Science-policy interactions

There is a wide range of research projects in the UK. Of most direct policy relevance has been the successive development of UK climate projections under the UKCIP. These include the earlier UKCP02 scenarios (Hulme et al. 2002) and accompanying UKCIP socio-economic projections (UKCIP 2000). They have been used consistently across nearly all UK work – government, public and private sector activities, as well as research. More recently, they include observed climate of the United Kingdom (Jenkins et al. 2007) and the development of probabilistic climate projections as part of the new UKCP09 projections (Murphy et al. 2009). However, these new projections have also been the subject of considerable debate as probabilistic scenarios, instead of vulnerability-driven scenarios, may not always be the most suitable way to plan adaptation. Beyond the UKCP scenarios, UKCIP has held a key role as a policy-science boundary organisation by providing tools, information, and support to government and private sector organisations while also working to build awareness of climate change impacts.

There is a substantial body of scientific work on climate change and adaptation in the UK. A literature review for the CCRA scoping study provides an overview of some of it (Watkiss et al. 2009). The research work includes a number of major programmes and activities funded through the major UK research councils (publicly funded agencies responsible for funding research). One example is the "Building Knowledge for a Changing Climate" programme for the built environment[59]. The UK has a large government-funded climate research base with the Met Office and it's Hadley Centre. The UK has also funded a number of trans-disciplinary, cross institute research partnerships, including the Tyndall Centre, and there are now many academic institutes which have a climate change focus (e.g. the Walker Institute), including donor funded institutes (e.g. the Grantham institutes).

The Living With Environmental Change (LWEC[60]) programme funded by NERC (the National Environment Research Council) embeds climate change research in a broader context of a globally changing environment and aims, by 2017, to provide relevant information for decision-makers on how to manage and protect vital ecosystem services.

The House of Commons Environmental Audit Committee has produced a report on how well the UK is performing in climate change adaptation (House of Commons Environmental Audit Committee 2010). It confirms that the UK is further along in planning and implementing adaptation than most other developed countries, but also notes that there is much remaining room for improvement and that it is too early to tell whether the current policy framework will deliver. In addition, the Royal Commission on Environmental Pollution (RCEP) has also published a report on how institutions can adapt to climate change (Royal Commission on Environmental Pollution 2010). It presents a framework for helping organisations build climate change resilience, and is based on extensive background information including written and oral evidence from more than 80 organisations, as well as commissioned studies[61].

8.2.1.3 Coastal zone management and sea level rise

Adaptation competencies

The responsibilities and competencies for coastal zone management in the UK are complex and involve several organisations and governance levels (Defra 2010a). The main responsibility lies with Defra, which has responsibility for flood and coastal erosion risk management, i.e. for policy and legislation. Other organisations have responsibility for building and managing flood defences, notably the Environment Agency, local authorities and internal drainage boards (the latter two are collectively known as operating authorities). Defra's approach is detailed in the "Making Space for Water" programme (Defra 2005).

The Environment Agency (EA, established by the Environment Act 1995) is a Non-Departmental Public Body of Defra. It is the main operating authority for flood risk management in England and Wales. Scotland has a different regulatory body, the Scottish Environmental Protection Agency (SEPA), but this organization has different authority and competence to the EA.

The EA manages flood risk arising from 'main' rivers and the sea and oversees the construction and maintenance of flood defences and other management measures. It is also

[59] http://www.ukcip.org.uk/index.php?option=com_content&task=view&id=280
[60] http://www.nerc.ac.uk/research/programmes/lwec/
[61] All information and documents are available on the RCEP's web site: http://www.rcep.org.uk/reports/28-adaptation/28-adaptation.htm

responsible for flood forecasting and flood warnings. There is currently discussion under the "Making Space for Water" programme to expand the EA's role to give it a strategic overview for all flood and coastal erosion risk management, thus making it more feasible to move towards a holistic and coherent approach, which is difficult under the current matrix of responsibilities.

In addition to the EA, under the Land Drainage Act 1991 local authorities have the power to manage flood defence on watercourses that are neither 'main' nor within internal drainage board areas. They are also responsible for emergency planning and for responding to flooding events through emergency assistance and clear up operations (Defra 2010a). Maritime district councils also have the power to protect land against coastal erosion under the Coast Protection Act 1949. In addition to flood defence on ordinary watercourses, local authorities . Finally, there are around 170 Internal Drainage Boards (IDBs) in England and Wales, which are independent bodies with responsibilities for (non-main) areas with special drainage needs (internal drainage districts), with the power to construct drainage, water level management works and flood defences on watercourses. The role of IDBs was reviewed following an announcement from Defra in 2005 that options for future organisational management would be explored. The Flood and Water Management Act 2010 was built on consultations originating from that announcement, on possible reforms to the role and governance of IDBs, but there seem to be few details of actual IDB reform in the act itself.

The Department for Communities and Local Government (DCLG) also has a role in coastal flooding through development planning policy and building regulations, as well as in helping communities recovering from flooding and provide funding to local authorities through revenue support grants. The competency situation is different outside of England because of the roles and responsibility of the Devolved Administrations: the Welsh Assembly Government and Scottish Executive have similar responsibilities as Defra in Wales and Scotland, respectively.

As with all proposed policies in the UK, coastal management policies have been subject to impact assessment. In addition, Defra has produced guidance for operating authorities on integrating climate change considerations when implementing flood risk management projects (Defra 2006). According to a 2009 Defra policy statement on appraisal of flood and coastal erosion risk management (Defra 2009b), this guidance will be revised based on the latest UK climate projections. Within its risk-based approach, either a managed adaptive approach (continually performing interventions to reduce risk when it approaches the acceptable threshold) or a precautionary approach are given as recommendations.

Sectoral adaptation strategies and beyond

In 2002, the Safeguarding our seas strategy (Defra 2002) was released by Defra, and with support from the Scottish Government and the Welsh Assembly it encompassed the UK as a whole. Focussing on ecosystem-based coastal zone management, it already acknowledged the impact of climate change on the coast. The Flood and Water Management Act 2010 aims to reform flood and coastal protection legislation and unify the currently divided legislative landscape. It also aims to approach flooding as something dynamic that has to be lived with, rather than a force to be controlled (Royal Commission on Environmental Pollution 2008). It creates a simpler and more coherent framework that spans all forms of flooding as well as costal erosion.

Shoreline Management Plans (SMPs) are an important part of planning adaptation in coastal areas. The first round was completed in 1999, and the second round is currently being finalized. They cover the coast of England and Wales, providing an assessment of risks to people, the built and natural environment, and a long term policy framework to reduce these

risks (Defra 2010b). The plans are prepared by coastal groups, made up of coastal district authorities and other relevant bodies with coastal defence responsibilities. Defra provides extensive guidance materials for the preparation of SMPs (Defra 2010b), which also incorporates concerns over climate change (e.g. for the 2nd SMP round, a 100-year horizon instead of the previous 50 years is recommended).

Defra also funds the Environment Agency's flood risk maps and flood management plans, which aim to understand the factors that contribute to flood risk within a catchment (e.g. land use) and recommend the best ways of managing the risk of flooding within the catchment over the next 50 to 100 years. Flood risk maps (the EA's Indicative Flood Plain Map) are available for all of England and Wales (and similar initiatives exist in Scotland and Northern Ireland) through the internet, providing sufficient detail for national assessments that quantify the number of properties and vulnerable people located in floodplain areas. The Environment Agency is also producing draft coastal erosion maps based on a probabilistic method developed by the RACE (Risk Ass`essment of Coastal Erosion, Defra 2007) project. These are complimentary to the flood maps. The approach does not yet fully consider climate change, however.

The Departmental Adaptation Plan for Defra (-CITE- Defra, 2010) includes a summary of the current action on flood and coastal risks (such as the SMPs), as well as the activities planned for the near-term future.s

To incorporate flood risk into spatial planning, planning policy statement 25 (released in 2006, last updated in March 2010) on development and flood risk states that development in high flood risk areas should be avoided, and if new development is unavoidable in such an area it should be made as safe as possible without increasing the flood risk somewhere else (Communities and Local Government 2006). It contains explicit treatment of climate change in an annex, referring to UKCP scenarios and flood risk maps. This comes in addition to the climate change supplement to planning policy statement 1 ("Delivering Sustainable Development"). That supplement was released in 2007 and provides guidance on climate change and spatial planning more generally (Communities and Local Government 2007).

Science-policy interactions

There is a large body of studies relating to coastal management and flood risk in the UK. As a direct result of the floods which affected large parts of the country during the summer of 2007, the Pitt Review looked at its causes and subsequent management to see what lessons needed to be learned about how to manage and respond to this type of event in the future (Pitt 2008). This review was answered by the government with an action plan laying out how the issues would be addressed (Defra 2008b).

Defra has a joint flood and coastal defence R&D programme with the Environment Agency. Of particular note is the Foresight Future Flooding study (Evans et al. 2004; Hall et al. 2005). It presented a national-scale assessment for England and Wales that predicted up to a 20-fold increase in expected annual losses by the 2080s in the scenario with highest economic growth (all flood risk). These results include sea level rise, greater storminess increasing surges and waves, increasing precipitation and increasing economic vulnerability, as well as factors such as degraded natural protection from geomorphic features. The Foresight analysis was updated (Evans et al. 2008) as part of the Pitt review, reporting a change in risks from the earlier study. The project demonstrated that a holistic approach that includes risk sources, pathways and receptors is required to quantify future flood risk. It also showed the important effect that socio-economic development plays for future flood risk, indeed, in many scenarios, this was found to be more important than the risk of climate change.

8.2.2 Perceived policy needs

To determine perceived policy needs, interviews with policy-makers were conducted, and the information from these is supplemented with information from documents and literature. The insights within this section, if not otherwise attributed, come from interviews (see Annex for list of interviewees).

8.2.2.1 Multi-level governance: integrating local governments and individual organisations

Adaptation policies are made at the national level, but it is often local governments that ultimately have to implement them. At the national level, there is the impression that local level authorities and individual organizations often prefer to wait for central government to take up the issue. They want a level playing field and thus wait for signals that regulation is on its way. On the other hand UKCIP's experience shows that there is also willingness to push ahead, maybe partially fuelled through competitiveness between local councils. NI188, by giving local authorities a way to present themselves in a good light, seems to be helpful (noting this process based indicator focuses on adaptive capacity, rather than on actions).. On the other hand, authorities who do well in reality usually score lower on NI188 because they are aware of their shortfalls and have a more realistic picture. This same issue also arises through the government Adaptation Reporting Power (ARP) introduced as part of the 2008 Climate Change Act. Organisations are concerned about being identified as high-risk, because of the need to then respond to identified risks, and knock-on effects on investor confidence. They are therefore wary about publicly disclosing their vulnerability to climate change. These issues highlight some of the challenges in translating a national policy through to organisational change.

At the national level, there is an acknowledgement that current risks are already a problem, they are being examined and tackled (through a UK wide National Risk Assessment and a National Risk Register). There is also a process to cascade these risks down to regional and local level. However, for local authorities, a key question is for designing an evolving roadmap to tackle emerging future risks. At the local level, the questions are different: how to best invest money, deciding whether to protect or retreat, and how to deal with public engagement.

Communication between the national and local level is an issue too. Both within Defra and within UKCIP there is a feeling that it is difficult for a national ministry or agency to communicate what challenges are emerging because of climate change, and assist local authorities in dealing with projections that they might not understand, or even like. Coastal authorities in particular are used to seasonal changes and extreme weather events – the challenge is how the need for additional adaptation planning can be communicated to them.

The impression from the interviews is that not all of the questions surrounding the division of roles between national-level and local-level government, and between national-level public sector and the private sector have been sufficiently tackled. One successful example of an inclusive approach emanating from the national level is Defra's Coastal Pathfinders programme, where local councils get support to implement innovative approaches to coastal protection.

8.2.2.2 Coordination: conflicts and trade-offs

As with all Government, there are challenges in coordination and communication between differ competency and aggregation levels. Within national level government, there is a greater focus to encourage cross departmental discussion (and overcoming the 'silo effect')

and action on adaptation, though this is always challenging and is requires similar action across multiple policy areas.

At all aggregation levels, there are potential trade-offs and conflicts that have to be managed (although there may also be potential synergies and co-benefits). The challenge to address potential trade-offs is not new to the government activities, but there is some potential to consider these aspects more explicitly with a national adaptation strategy. Addressing trade-offs involves many potential aspects, such as risk transfer, inequality, greenhouse gas emission increases, which may arise between different geographical areas, groups in society, or between the natural and man-made environment. These cannot be managed merely at a local or regional level. Balancing short-term and longer-term action will be a further challenge: 'unsustainable' adaptation measures may be needed in the short term, for instance, initial coastal protective measures may be instated in some communities, while simultaneously preparing to permanently move the community in the medium to longer term.

In order to start this process of broad coordination, there is a need to move beyond organisational adaptation. The UK has a benefit in that the CCRA and reporting authorities (under the 2008 Climate Change Act) will deliver a broad range of relevant information on the major risks at the UK, DA and regional level. On the basis of this, and through the subsequent Adaptation Economic Assessment and National Adaptation Programmes, there will be the opportunity to consider any emerging conflicts. Nonetheless, it is still early on in the learning process of adapting. In many areas at the concrete and detailed level there is no understanding yet about the types of decisions that will be faced – though the expectation is that the CCRA will help to determine these more clearly.

Spatial planning undeniably has a role in adaptation. Although there a national level planning policy, it is not at the same level as in some other European countries. Interviewees suggested that there is room for improvement in embedding adaptation into spatial planning. Nonetheless, there is already spatial planning policy on development and flood risk in place (Planning Policy Statement 25), which sets out the government's spatial planning policy on development and flood risk, as well as the more general supplement to planning policy statement 1 (see section on adaptation policy above for details).

A key issue for coastal management is the consideration of the medium to longer sea level rise, in places where settlements may become non-viable. This is a particular issue for some regions, notably the East coast of England, which has already received some attention in the context of early discussions of proposals for managed retreat. Natural England (a public body charged with protecting the environment) published draft discussion on the potential for coastal realignment (managed retreat) for a 25 square mile area of low-lying land in this area, on the basis that sea defences were unsustainable in the medium term. This covered around 600 homes across 6 villages. The early plans caused a very strong reaction from local groups. There is also one village, Happisburgh, where defences have been allowed to disappear, and coastal erosion is leading to the loss of properties – though again there has been strong local opposition and even some attempts by locals to construct their own defences. Such issues involve complex issues of equity versus costs and cannot be addressed only at a local level. The multiple decision-making authority and competence outlined for coastal issues makes this more problematic.

This is now becoming an area of policy focus. The shoreline management plans (SMPs) are taking steps towards addressing these issues. In the first round, some did not explicitly include climate change, with anecdotal evidence suggesting this was because it was thought this could undermine the initial round of discussion. In the current round, more long-term thinking is emerging surrounding questions of sustainable coastal defence. However, there

remains the need to address overarching and very challenging issues at the national level, e.g. in relation to the range of potential sea level change, the appropriate time period to consider, the options to adapt, decisions on which areas can or should be defended, the balance between equity and efficiency, etc. The iterative CCRA process (repeated every five years) should deliver answers to some of these questions in the future, but it will need to be complemented by national level consultation and decisions that will inevitably involve controversy.

These issues highlight the challenges in decision making and in balancing top-down with bottom-up regulatory approaches to multi-level governance.

8.2.2.3 Awareness-raising

Awareness-raising is seen as a key first step that enables subsequent actions. Therefore it may be sufficient in the initial phase of adaptation policies to simply concentrate on raising awareness, while building trust and connections to stakeholders. UKCIP, since 1997, has been doing that, and this existing base of awareness, knowledge and trust was useful when more structured policies started to move forward. Inter-departmental communication has been increasing. The consensus seems that awareness-raising has been successful in the UK so far.

However, public engagement is still seem as an issue, as interviewees perceive a growing tiredness of climate change among the general public. For coastal issues in particular, one perceived issue is how to enable people to enjoy an environment in continuous change. This 'building literacy about the coast' has already come a long way in the past decade, and the acceptance of how shorelines are dynamic and changing is steadily increasing.

Communicating changing climate risk is doubly abstract, as both 'the future' and 'the climate' are abstract concepts. From the national-level point of view, it seems that local authorities may think current defences have worked well for a long time, and have no clear understanding of the escalation of risks, particularly given the uncertainty of sea level rise projections. The awareness of what climate change means for coastal defence is still incomplete, and there is a need to drive the willingness to adapt existing defences. Yet, according to interviews, the amount of developments in risk areas is decreasing.

8.2.2.4 Coping with uncertainty

On the one hand, adaptation needs to be planned, but on the other hand, there is still major uncertainty about the future impacts of climate. This uncertainty still represents a problem in making decisions. User demand has already led to publications from UKCIP (Hulme and Dessai 2008), with a technical note on handling uncertainty (Jenkins and Lowe 2003) but clearly there is still need to further deal with this issue.

UKCIP also offers a different perspective: although the need to reduce uncertainty is real and relevant, the key way forward is to embrace uncertainty. Improved scientific understanding of the climate system will gradually reduce uncertainty, but decisions on adaptation will be made under uncertainty for the foreseeable future. Therefore, it is necessary to think more deeply about making good decisions in the context of this uncertainty. In other words, rather than 'being adapted well', being 'adapting well' is the state to be achieved.

While 'uncertainty' in the climate change context usually refers to the uncertainty inherent in climate science, from the policy perspective there is another type of uncertainty: uncertainty in decision preferences. This involves questions about moving settlements versus improving defences, or sacrificing the natural environment versus adapting to radically changed surroundings.

These issues are already being explored in practical policy-making, for instance through proposals for the Thames Estuary 2100 (TE2100) project, which is about upgrading the flood barriers that protect London, but many more areas and aggregation levels need to be considered to truly address how to deal with uncertainty.

8.2.2.5 Tools and information access

Some interviewees think that it is too early to tell what tools and information are necessary to deal with decisions that will come up within the next 20 years. This suggests that both impacts and decision domains are not clear yet.

The way in which information and tools are presented and provided is important. Initial experience with UKCIP's risk and decision-making framework showed that they were not widely used. After packaging them in an online wizard, use increased. The online wizard is often merely read through in part or used as guidance. It allows users to take only the steps from the parts that they need at this point, and return later for different parts. It encourages an interactive, constant process. This flexibility and modularity seems to be useful because it can be fitted into existing decision processes, thus making it usable for decision-makers. There is a need for policy-makers to access information and tools, but if they are provided in a way that does not fit existing decision processes then they may be of little use. The ease of use and the applicability within existing decision processes also relate to the challenge of mainstreaming – bringing considerations of climate risk and adaptation into mainstream decision-making.

UKCIP is moving away from climate-driven approach to a vulnerability-driven approach. Part of this is also the issue that some sectors may not be well adapted to current climatic conditions. Some consider that the current deficit has to be addressed first. The adaptation paradigm has often assumed that the current baseline is ok, but that is not necessarily always the case, or uniformly the case across all areas. A key issue is to assess the baseline risks – an area of focus in the CCRA.

Interviews showed that projections are the tool requested most from UKCIP, which is confirmed by Gawith et al. (2009). Users like projections because they give a sense of security through numbers. But by themselves, projections are not always useful. The tension between what stakeholders want and what science can deliver is a consistent feature of UKCIP's interactions with stakeholders (Gawith et al. 2009). Sustained interaction between policy-makers and scientific organisations such as UKCIP is necessary to create trust and build capacity to deal with climate change over a long time. The use of UKCP scenarios also gives a certain legitimacy to decisions taken, because one can then point to the scenarios. The issue then moves again to a communication one: making others understand ones interpretation of the scenarios.

The access to information within the UK is good because of the availability of UKCP scenarios. Yet, information barriers in general are a problem, as some datasets (particularly international ones, and not just the directly climate-related ones) cost money to access or are not publicly available at all. While a unified global database, going beyond such proposals as the Global Framework for Climate Services, is one option, there are many issues with such approaches. The appropriateness of available information or tools is also not always given. UKCP09 sea level rise scenarios include thermal expansion as the sea level rise model, and glacial melt as high-risk low-probability events on the side. Uninformed users may then think that the actual risk has decreased compared to the UKCP02 scenarios, if they do not look closely.

Case studies are valuable means to spread information. Using a generic framework and

abstract tools can be difficult, making strategies hard to put into practice. This 'best practice' sharing, giving examples on how this was actually done on the ground in a specific context, together with contact details to the relevant people involved, is useful. It provides different approaches that people have taken to the same challenge. Innovative approaches can be communicated through case studies. One example given by UKCIP is an LCA-like approach to adaptation by following an agricultural product along its entire production line, from farm to fork. The potential for adapting that entire process can then be investigated.

8.2.2.6 The role of the EU

There is a potential role for the EU to gather and disseminate evidence (climate modelling and impacts), as well as to gather and disseminate case examples of successful adaptation ('best practice' and policy insights): some interviewees envision that some of the functions covered by UKCIP within the UK could be delivered by the EU at a Europe-wide scale. On the other hand, there are limited resources available, and many areas may simply make more sense to coordinate at the national level due to the often locally specific nature of adaptation. Having processes synchronized through the EU may have little real benefit – UKCIP, based on its experience in the UK, is critical of how well scaling its approach to the EU level would work.

There are also inequalities in vulnerability and adaptation needs across the EU. The Northern countries may initially benefit from climate change, while the Southern ones may suffer. Such an issue might be addressed at the EU level. EU-level policy also brings in new challenges. For instance, because of the habitats directive, there are instances where habitats become protected, while communities may not be, raising policy inequalities which may be exacerbated for socially deprived groups.

8.2.3 Synthesis

There is a wide range of adaptation activities in the UK, but authority and competence is distributed across various agencies, as shown with the example in the coastal sector, which may make coherent adaptation action difficult. The process of developing a national adaptation programme has been supported through various bottom-up activities, and the process is still ongoing with the first iteration of the Climate Change Act leading to a statutory national adaptation programme in 2012.

There is a sense of needing more coordination at the national scale, while at the same time providing more room for local decisions, though this is not a issue to exclusive to adaptation. The new Government has advanced a desire for decentralising decisions in general (though not as yet on adaptation), yet the complexities of adaptation decisions also require a strengthening of high-level decision systems to deal with conflicts and coordination. The national strategy also puts in place a structure to deliver something regarding cross-sectoral cooperation. No systematic priorities exist at the moment, consistent with the current place in the policy making cycle, but the CCRA and AEA may start helping to remedy that.

The question of how the local level is integrated appears as another issue. There is some limited evidence to support this, e.g. Few et al. (2007) report on a case study where it became apparent that limits to tackling long-term climate change adaptation arose due to a lack of motivation and local politics. Few et al. further argue that because decisions may be controversial at a local scale, decision-making may become more centralized, limiting the scope for participatory action.

Dealing with uncertainty is a key point where further support to decision-makers is needed – be it through new tools or through building awareness of uncertainty and its implications. Uncertainty has more dimensions than climate or model uncertainty, because decision

preferences are uncertain too. The amount of resources flowing into adaptation is itself uncertain, particularly with the recent change in government.

At present, it is unclear what further types of tools or information are needed, because uncertainty about future impacts and the process of determining the issues of risks, vulnerabilities and impacts has only just started.

The one area where the UK can be seen as a leading example is in building adaptive capacity. UKCIP has had a particularly important role as a science-policy boundary organisation, working since 1997 to promote adaptation with people that are willing to be first movers. This gathering of experience and building of trust, makes it much easier to launch formal measures through more recent legislation like the 2008 Climate Change Act. The important role of UKCIP in awareness-raising is confirmed by Hulme and Turnpenny (2004). The lessons learnt by UKCIP should be valuable for any European country wishing to engage in adaptation.

Some of the problems and future needs may require political decisions based on value judgements. Therefore, a key question is the extent to which decisions should and will be based on science or scientific scenarios and tools, rather than being pure political and value-based decisions.

9 Synthesis

9.1 Summary of countries

The categories of adaptation needs are based on the semi-structured interviews conducted for this report and the policy documents as well as literature analysis. Only needs that have been mentioned by our interview partners or are indicated in policy documents of the respective countries have been taken into account. Even though interviews were conducted in countries that are at very different stages of adaptation policy, we independently created very similar categories, which were easily harmonized to arrive at a set of common types of adaptation policy needs[62]. The categories are also largely in line with the key facilitating factors identified by Swart & al. 2009 (cf. section 2), which gives our results a certain consistency with previous work on adaptation policy. Some categories were not brought up in interviews in all countries (e.g. human and financial resources) or are less important in some than in others (e.g. awareness-raising, multi-level governance). Furthermore, some categories are hard to delineate clearly and to populate with the interview results – e.g., a problem may be seen as 'lack of research' whereas it is actually a 'lack of access to information' problem.

The synthesis table gives an overview of the core needs according to country and category. For Austria, Romania and Italy it is more difficult to define needs, because these countries are either only in the elaboration phase of the strategy itself and not yet implementing it or in the case of Italy, there is no strategy or nationally coordinated structured work on adaptation. Not surprisingly, interviewees in countries with a longer history of adaptation policy had a clearer idea of their needs regarding adaptation decisions.

Inter-agency coordination. There is consensus that coordination across sectors and between ministries is crucial for successful adaptation policy, however different countries are at very different stages in terms of inter-agency coordination. While Austrian representatives feel to

[62] Note that within these categorizations, there are substantial details that come up only in specific countries. For full details of the issues in one particular country, refer to the country-specific section above.

have this aspect entirely under control other countries lack clear assignments or blurred responsibilities (Finland, France). In Romania efficient communication between government departments has yet to be established; an issue that is related to needs in other categories (e.g. awareness-raising, political commitment and human resources).

Multi-level governance. In this category many of the differences are based on different administrative structures. In Romania the regional and local levels have very limited competencies and financial resources and thus little potential to act on their own. Additionally, the national strategies mostly do not include details about the involvement of lower level administration, even though they recognize their role in the implementation of adaptation measures. Other countries such Austria have very decentralized governments; coordinating adaption across scales and different decision domains requires therefore a lot of attention and can be tricky and often inefficient. In France local initiatives are rare and are taken both by the local authorities and by the state decentralized authorities. While it is widely recognized that adaptation works only by considering multiple scales, countries are on different stages in terms of involving the regional and the local level. Romania does not consider these levels yet, Italy has no national strategy to trigger regional and local action, Austria has no choice due to its administrative structures, Finland plans on doing it in the next strategy iteration and the UK are already working on trying to realize inclusiveness across scales.

Mainstreaming. Integrating adaptation into (sectoral) policies is also a well known and recognized aspect of effective adaptation policy (cf. Swart et al. 2009). In most countries documents and experts simply emphasize the need for mainstreaming without suggesting solutions or more concrete problems in the area. The UK identified the key for successful mainstreaming in the accessibility of tools and information on adaptation. Some sectors seem to be more problematic than others while in agriculture, water management and forestry measures often already exist under different labels (disaster management, sustainable development etc.) and just need optimization. Some sectors need more explicit work, such as spatial planning, infrastructure and energy.

Awareness-raising. Awareness-raising on all levels and in all sectors is another key aspect for successful adaptation. Here the stages of progress are also quite broadly dispersed. Countries like the UK and Finland which have been pursuing adaptation policies for a while demonstrate the value of a national strategy and other adaptation policy processes to raise awareness and prepare for more specific measures. Romania needs a lot both among the general and the organized public. In Austria some specific aspects of adaptation (e.g. long-term thinking/planning, responsibility of individuals) are felt to need more awareness. In France the lack of promotion of the national strategy impeded awareness-raising. This aspect is even felt stronger in countries where there is no adaptation strategy such as in Italy. The particular target of such awareness-raising, in general, would likely be local authorities as they have little capacity to understand and act on vulnerability to climate. At the same time, in many countries it is local authorities who have to deal with adaptation decisions. This is one area where countries could exchange approaches that work well (e.g. UKCIP successes).

Coping with uncertainty. In almost all countries and even at the EU level, uncertainty about future climate impacts impedes adaptation planning. This suggests that there is a need to help decision-makers understand what uncertainty means in the climate change context and that it will not be possible to eliminate it entirely.

Research needs. Most interviewees state a need for more research, to fill knowledge gaps, for better planning and to reduce uncertainty. In many countries (Spain, UK, Austria, Finland) structured research programs are addressing this issue. In the countries that do not have such

programs, it is felt as a limit in the decision making process. Some interviewees suggest that a current focus on impacts on the natural environment should give way to an increased focus on socio-economic effects.

Tools and information access. Tools are formal methods to support decision-making, which can include economic methods such as cost-benefit analysis or knowledge elicitation methods such as expert interviews or working groups. Participatory tools can also be important support mechanisms for mainstreaming and awareness raising, by making both professionals as well as the general public aware of issues that otherwise may not have come to their attention. Amongst the countries assessed, the UK stands out with the array of tools and guidance developed through UKCIP. In most of the countries it seems that decision-makers use few formal tools apart from knowledge elicitation methods (which, as some indicate, is due to absence of better formalized methods). Information access happens in different ways, e.g. through information portals, but informal connections between civil servants in different countries seem to play an important role. The capacity of decision-makers to find tools and information is limited, so there appears to be an important role for science-policy boundary organizations to make decision-makers aware of what is available to support them. Existing economic assessment methods, chiefly cost-benefit analysis, are seen as insufficient to address decisions constrained by climate change (which is also concluded by economists, e.g. Stern 2007). For decision-makers, it appears that it is often still too early to know what types of tools will be needed due to climate system and regulatory uncertainty.

Financial and human resources. The lack of money and staff is a barrier that everyone claims to face; however, usually these needs have very different extents. In Romania and Poland the worries are great that the implementation of an adaptation strategy cannot be financed. In France it is the lacking human resources dedicated to the issue of climate change that were highlighted. The UK seems currently well equipped in terms of resources for adaptation policy, but the new government may put the focus somewhere else. Austria also has quite limited resources. The public servants face the problem that it is difficult to estimate the costs of adaptation measures, which in turn complicates elaborating a concrete strategy and plan multi-level implementation (who pays for what?).

Political commitment. The level of political commitment ultimately determines how much resources (both human and financial) are put behind adaptation planning and policy. Since climate impacts are projected to be much less challenging for some countries this is not necessarily a problem. Political commitment also concerns the legal level at which an adaptation policy is introduced. Whether adaptation is binding because it is based in a law or it is just an indicative guideline may be a big factor in the effectiveness (i.e. actual implementation) of such a policy. Political commitment can be an issue at the national and/or local level. In Italy, the lack of a national adaptation strategy shows that climate change adaptation is clearly not a priority for the government. In France the issue of political commitment seems particularly sensitive at the local level where decision-makers are faced with a wide variety of interests and different social pressuring groups to deal with.

The role of the EU. The role of the EU is seen differently across countries. Some member countries started the process of developing adaptation policy before there EU process started, and are therefore influenced little by the green and white papers. On the other hand, some member states benefit from EU incentives and often without them adaptation as a distinct issue would not be on the agenda yet. Given that adaptation has only recently become a topic, it seems too early to tell whether this is a leader vs laggard issue (a notion which has been criticized in the past anyway, e.g. in Borzel 2000)."The role of the EU" is an overarching category since it provides incentives in different sectors (e.g. Flood Directive) and on different scales (ERDF and Cohesion Funds). Furthermore, it might play a central role in

harmonizing adaptation across Europe. A consistent theme in the interviews is that adaptation, as a locally very specific process, may not need to be coordinated by the EU in the same fashion as other policy areas (such as mitigation). However, the EU is commonly seen as placed ideally to facilitate information and best-practice exchange between member states and as well as subnational entities, be they private or public.

9.2 Major challenges

Using the categories of needs we developed, we identify where the major challenges lie. Based on our interpretation of the results from the interviews and documents, we distinguish three levels[63]: (1) Major challenge, (2) minor challenge and (3) not a challenge.

This is an assessment of the current state of these challenges. Countries, as they move further along in developing adaptation policies, may find that some challenges become less important while previously unimportant issues become major challenges. Indeed, we find some indication that challenges faced by countries differ according to how far along the process of developing national adaptation policy they are.

Table 3: Challenges

	Major challenge	Minor challenge	Not a challenge
Inter-agency Coordination	Romania, Finland, France	Italy, UK	Austria
Multi-level governance	Austria, Finland, Italy, UK		Romania, France
Mainstreaming	Romania, Italy, France	Austria, Finland, UK	
Awareness-raising	Romania	Austria, Finland, France	Italy, UK
Coping with uncertainty	Austria, Finland, Romania, UK	France	Italy
Research needs	Italy	Austria, Romania, Finland,	France, UK
Tools and information access	Italy	Austria, Romania, Finland	France, UK
Financial and human resources	Romania, France	Austria, Finland, Spain, UK	Italy

The major challenges appear to be inter-agency coordination, multi-level governance, mainstreaming and coping with uncertainty.

[63] Spain and Poland are not part of this synthesis – it is based on the countries analyzed by the three main authors only.

Multi-level governance and coping with uncertainty are the most important challenges. All the countries are faced with these issues except France and Romania for multi-level governance and Italy for uncertainty. For Romania and France, the centralized organisation of the states may explain the lack of a perceived need. It is noticeable that the profile of Italy looks somewhat different than the other countries. The lack of interview responses makes it difficult to make definite statements, but it could be that uncertainty has not yet emerged as an issue because planning for a national strategy has not yet begun. In any case, it is noticeable that these common challenges are also acknowledged by the European Union in its White Paper. Inter-agency coordination and mainstreaming appear to be other crucial issues for the countries, except for Austria, where inter-agency coordination proved to work well and efficiently.

Overall, it is not possible to determine patterns across the different countries. Setting forth a general model of how countries at different stages in adaptation policy-making have different perceived needs is therefore not possible. It does appear that many factors shape the needs within different countries, and simplistic explanations are not probable to hold true. This would also indicate that EU action could be concentrated on bringing member countries together to learn from each other.

9.3 Decision-making tools

The interviews revealed little concrete evidence of formal, analytical decision-making tools for adaptation. At the moment, it seems that adaptation is still too fuzzy a term for practitioners to clearly identify what sort of decision-making tools will be most useful. In devising adaptation policy, our impression from the interviews is that decisions often seem to be taken by gathering information from various sources mostly within a given country, sometimes formalized through knowledge elicitation methods or expert consultations, but sometimes also done informally[64].

There may be sectoral differences: flooding and sea-level rise, for instance, are easily quantifiable at first glance, and lend themselves well to model-based decision-making. But they also contain inherent uncertainties, which make it difficult to use results from models for clear decisions. Developing flood risk maps, and restricting land use within risk areas, are examples of analytical tools used.

Agriculture or forestry, on the other hand, are much broader and entail complex natural systems, which make it more difficult to quantify the problems from the outset. Naturally, the process in such areas seems to move more towards building a general resilience which goes beyond an exclusive focus on climate change (for instance, specific farming methods, resilient crops, sustainable forest management practices).

The interviews also confirmed that there is a wealth of information available to decision-makers, but it is often not available easily enough or in the right form. It seems valuable to make a distinction between two main types of information:

[64] There was a noticeable focus in the UK on economic aspects, where every formal policy proposal must undergo an impact assessment based heavily on economic appraisal and cost-benefit analysis. In continental European countries interviewees made little mention of such tools apart from the need to develop cost assessment tools for adaptation (Finland, Austria, Romania, France, Italy). This may confirm the popular wisdom that the UK (together with the United States) are more inclined towards decisions based on economic assessment than other countries are. Nevertheless, the UK approach includes extensive stakeholder consultations as well, so this not necessarily a fair judgement to make.

- Scientific studies and information: this includes the results from models, but also for instance specific studies into regional impacts and vulnerabilities.

- Case-based examples of successful or unsuccessful adaptations ('best practice'): this is less formal knowledge, but interviews did suggest that knowing what government departments in other countries are doing, how they approached a problem and what pitfalls had to be solved, is something that decision-makers would find useful. It may serve not only as information but also as motivation.

Because dealing with risk seems to emerge as an issue particularly in countries that are further along the road of adaptation planning, one key element which tools may want to address is helping decision-makers to live with uncertainty. In particular, assessing costs and benefits of adaptation measures is all but impossible at the moment due to lack of consistent methods and ways to deal with inherent uncertainty. It therefore seems that the path already taken by the EU, towards promoting the development of tools and methods e.g. through the clearing house mechanism, are in the right direction.

9.4 Temporal scale of policy-making

In addition to the varying needs on different spatial scales, and the need to integrate them (which we frame as 'multi-level governance'), the temporal scale plays a role.

In the shorter term, adaptation policies are elaborated and adopted. From our categorization of policy needs and our assessment of key challenges, there is some indication that needs change over time as countries move through different phases of policy development. However, we are not yet able to establish clear relationships between specific policy needs and specific policy stages.

In the longer term, however, implementation of adaptation measures as well as evaluation of policies will take place. It is notable that the evaluation of adaptation policy is yet to start in most countries (Finland being the exception). When implementing measures, balancing short-term versus longer-term action is an issue that may increasingly become a challenge (and was already raised as an issue in the UK).

10 Conclusion

We have surveyed adaptation policies and the institutional competencies surrounding adaptation in 8 European countries. Furthermore, we have determined the key adaptation policy needs in those countries through document analysis and interviews. On that basis we attempted to identify the major challenges.

Coordination and communication stand out as key needs. Coordination, on the one hand, means inter-departmental and cross-sectoral coordination of activities. But it also means multi-level governance – coordinating effectively across scales. Both of these are still issues that need further work in all the countries surveyed. Dealing with uncertainty is another crucial need. It goes along with a need to improve access to information and tools. In that context, there is room for the development of methods to support stakeholders in their decisions.

Awareness-raising in particular has emerged as a key first step, and experience from countries that are further along in adaptation planning suggests that initially, adaptation activities at the national government level may be useful particularly to build awareness in preparation of further policy steps, such as mainstreaming of adaptation. Awareness-raising also takes place in different spheres, however: the general public's perception of the issue and information

needs differ from those of professionals and civil servants.

Representatives in all countries feel the need for more research. In early stages these needs are quite clear when concrete knowledge-gaps need filling, however, as countries progress the nature of further research becomes less clear-cut. Learning more about the socio-economic context of adaptation measures was one specification for future research.

The research showed that there is a great variety in adaptation policies in the member states. There is no obvious pattern explaining why some countries share particular needs or face different challenges. The EU may not have the capacity to cope with such variety and to harmonize national adaptation policies. It can nevertheless trigger action in countries where it is still missing. Interviews in the member countries suggest that it can particularly serve as a hub to exchange information and methods, such as best-practice (case study) examples — knowledge of what works in which context and what does not.

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	Austria	Poland	Romania	Finland	Italy	Spain	France	UK
Inter-agency Coordination	works well in the elaboration process – it needs to be seen whether the implementation process will be as successful in these terms	Integration of sectoral policies for adaption and inclusion of an adaptation program into a long term development strategy for Poland is needed.	Communication between ministries needs improvement	Competencies and responsibilities are not always clear, and the national strategy doe not assign them clearly. More cross-sectoral coordination will be part of next strategy iteration.	Results show no need in this area	Although there is a national climate change coordination body which includes regional representatives, coordination between regions and with the central government needs to improve.	Reform of the decentralised state administration which blurs the responsibilities Lack of staff dedicated specifically to the issue of Climate Change, even more to adaptation	Thinking towards managing trade-offs and conflicts that cannot be dealt with at the local level. But also coordination between different gov't departments.
Multi-level governance	Need for careful coordination and communication to avoid overlaps and inefficiency	Better and clearer division of competences between authorities as well as cooperation between different stakeholders is desirable	Regional and local level are not integrated yet	Current national strategy is not focussed on regional or local levels, but the next iteration is expected to address that Integrate other organisations, private sector more	No legislative competence for the regions concerning the protection of the environment	Regional governments need more support, as to an extent they are currently working in an information and policy void.	Results show no need in this area	Process of dividing competencies between local and national level ongoing, integrating local initiatives and providing inclusiveness beyond box-ticking
Main-streaming	Especially spatial planning, but also energy, health and biodiversity still need to mainstream adaptation. In other sectors optimization of existing measures and instruments is necessary	Adaptation needs to be addressed through sectors and existing regulations and practices should be better integrated for more effective adaptation	Many sectors (energy, infrastructure, health) are not considering mainstreaming yet.	Strategy has had some success here, but more is needed	Mainstreaming is already taken place but needs to be enhanced. It will constitute a key objective of a future national strategy,	Mainstreaming is a key objective of the national strategy, whereas regional strategies widely differ in the extent to which mainstreaming is included.	Adaptation needs to be tackled through sectors, at the same time existing planning and regulatory instruments could already contribute to adaptation if they were properly implemented or revised	Making tools and information more easily accessible and usable will aim in mainstreaming them
Awareness-raising	Awareness raising is only important on a specific level (individual actions, cascading effects, long-term planning)	Need for education about adaptation practices, awareness-raising on benefits of adaptation at all levels	More awareness needs to be a goal both for the entire population and the in the organised public.	Awareness has increased thanks to national strategy and ISTO research programme	Results show no need in this area	Public awareness is a key issue. Some regions have involved the public more than others in their regional strategy development.	Awareness-raising is particularly necessary in small local communities	Awareness across sectors and levels increased, e.g. thanks to UKCIP Communication with public more problematic
Coping with uncertainty	Proactive adaptation measures are not taken in the face of uncertainty of future developments	Risk, costs and benefits of different adaptation measures	Results show no need in this area	Discussion of uncertainty implications for adaptation needs to be further developed Move to acceptable risk approach suggested by strategy evaluation	Results show no need in this area	Scale mismatch between available information and policy decisions increase uncertainty	Better and more assessment of impacts and risks would help policy makers taking their decisions	Fostering understanding of how to deal with uncertainty Uncertainty in decision preferences, some decisions will be of political nature – but value judgements not explicit
Research needs	Some research holes need to be filled (e.g. regional climate scenarios)	Need for research on risk, costs and benefits of different adaptation measures. Research projects on climate change influence on environment, economy and society are in progress.	A structured research programme will be essential for efficient policy making	Primarily more treatment of socio-economic impacts, as well more detailed impact information and monitoring systems	There are still research gaps to be filled in particular regarding climate change impacts and vulnerabilities	More regional information on sectoral impacts needed Research projects needs to be coordinated better Research-practice and research-policy links need strengthening	Some research regarding local situations is needed by local policy makers	Wide range of climate change research already projects taking place
Tools and information access	A comprehensive information tool for stakeholders is planned. Many instruments are already used in the participatory process of elaboration of the NAS.	Better organisation of public consultations and implementation of tools for involving SHs into decision processes is needed	Only a few basic tools are being used (e.g. working groups, seminars). Harmonised information on the EU level (e.g. Clearing house) will be helpful.	Support 'learning by doing' by exchanging case study examples Tools to deal with cost-benefit assessments	Updated information is not easy to get – web portals and databases allowing the sharing of information are needed	Information-sharing platform is needed	Results show no need in this area	Good supply of tools and information available Projections most requested from UKCIP Best-practice/case study sharing is particularly useful and could be extended
Financial and human resources	Cost of adaptation measures is difficult to estimate / improvement of funding instruments	Not enough financial resources for the implementation of adaptation measures	Not enough resources for the implementation of strategies (adaptation, drought etc.) Human resources are also not sufficient	Mitigation gets more resources Government reducing spending overall	Results show no need in this area	Adaptation policy relies strongly on participation of departments with relevant competencies, for which no specific funding exists	The national public body dedicated to adaptation has limited human resources (4 persons)	New government reducing spending overall New funding instruments needed
Political commitment	Need for stronger commitment on higher political levels (parliament)	Political commitment depends on disastrous events. Need for adequate and timely responses from the national level to local needs	Very low	High-level commitment, but in practice mitigation is much more prominent. Government change brings in uncertainty	Very low at the national level – great variety at the local level depending on local resources	Very high at the national level but varied at the regional level	Local policy makers have to make up with particular social contexts that may hinder them from taking action on adaptation	Has been substantial but change of government brings some uncertainty
Role of the EU	Incentives and guidelines are welcome, friendly competition along the same lines seems useful. EU should focus on international issues such as climate refugees.	Providing resources, policy guidelines; EU Member States setting up benchmarks of the best practices	Incentives, regulations (binding?) and resources are needed	Best-practice sharing would be useful, also providing scientific summaries on EU research. Coordination of activities in some sectors, but often too context-specific for useful EU interaction.	The EU through its policy papers on adaptation, could play a role in raising awareness of the policy-makers and the citizens ; the White Paper also envisages useful tools for political guidance	EU White Paper is known but has little direct impact, thus, there is a perceived need for compulsory legislation Other EU policies should shift funding priorities to incorporate climate change	No perceived added value so far but positive in terms of research , exchange of information/best practices, cooperation between states	Best-practice sharing would be useful, evidence gathering and dissemination, addressing inner-European differences in vulnerability. Many adaptation activities however too context-specific for useful EU interaction.

Annex II: Table of interviewees

Interviews conducted between April and June 2010:

Austria	
Land Oberoesterreich	Andreas Drack
Umweltbundesamt (Federal Environmental Agency)	Maria Balas
BMLFUW (Department 5/4 Emissions and Climate Protection)	Barbara Kronberger-Kiewetter
BMLFUW (Department 7/5 Flood Protection Management)	Heinz Stiefelmeyer
BMLFUW (Department 3/9 Plant Cultivation)	Andrea Spanischberger
Finland	
Ministry of Agriculture and Forestry	Tiia Yrjölä, Marja Kokkonen
Prime Minister's Office	Pirkko Heikinheimo
Ministry of the Environment	Pekka Salminen
Regional Forest Centre of Kaakkois-Suomi (South-eastern Finland)	Anna Rakemaa
HSY Helsinki Region Environmental Services Authority	Susanna Kankaanpää
France	
Observatoire National sur les Effets du Changement climatique (ONERC)	Michel Galliot
Ministry of Ecology, Energy, Sustainable Development and Sea	Xavier De Lacaze
Conservatoire du littoral	Jade Isidore
Manche Département Directorate of the territory and the sea (DDTM)	Pascal Babillot
Italy	
Ministry for the Environment, Land and Sea	Giuliana Gasparrini
Poland	
Regional Water Management Board in Poznan	Senior Specialist

Center for Crisis Management in Krakow	Two inspectors
Institute of Meteorology and Water Management in Krakow	Department Leader
Romania	
Ministry of Environment (Climate Change Unit)	Miriana Roman, Cristina Stanica
Ministry for Agriculture and Rural Development	Mihai Constantinescu
National Institute for Hydrology and Water Management	Rodica Macaleț, Elisabeta Oprişan
Climate Action Network Romania (RAC-RO)	Eliza Teodorescu
Hotnews.ro (former MEP)	Magor Csibi
Spain	
Department of Industry, Energy and Environment. Regional Government of Extremadura	Director-General of Evaluation and Environmental Quality
Department of Agriculture and Environment. Regional Government of Castilla-La Mancha	One person interviewed at Climate Change Office.
Department of the Environment. Regional Government of Aragón	Director of the Climate Change Office.
United Kingdom	
United Kingdom Climate Impacts Programme (UKCIP)	Bill Donovan, Roger Street, Chris West, Alastair Brown, Kay Jenkinson, Kate Lonsdale
Department for Environment, Food and Rural Affairs (DEFRA) Adapting to Climate Change Programme (ACC)	Claire Lewis, Kathryn Humphrey
DEFRA Flood Management Division	Sarah Nightingale
Environment Agency	Bill Donovan

Annex III: Interview guidelines

A. Warm-Up Phase

- Introduction of our research project and objectives. Introduction of the interviewer.
- What is your position and what are your responsibilities?
- What are the major adaptation challenges faced in your country?
- What should be done to address them?
- Who should be doing that? (also prompt to think about decisions that have to be taken within the next 20 years)

B. Adaptation Strategy

B.1 with Strategy

- What are the reasons for the adoption of a national strategy on adaptation?
- What were the major challenges faced in elaborating the strategy?
- What are the major challenges faced in implementing the strategy?
- Is interagency cooperation a problem?
- What is the outcome of having the strategy?
- Does the strategy address the challenges identified in Question A.3?
- Are there clear benefits?
- Did it trigger actions that would not have taken place without it?
- Are there decision areas that could be sensitive to climate, that the adaptation strategy doesn't cover?
- Are climate change considerations taken into account in them?

B.2 without Strategy

- Are climate change considerations taken into account in decision-making in your area?
- Are you aware of initiatives by other actors (NGOs, the private sector or governments on another level) or regionally limited projects?
- Are you planning to have an adaptation strategy (why/why not)?
- In these areas of decision-making, are there any special challenges with respect to taking climate variability and change into account?

C. General Questions (as necessary/relevant for interviewee)

- From your experience, can you identify success factors or enabling factors that are paramount to successful planning and execution of adaptation policy?
- What kinds of scientific/technical tools are you using?
- Why are you using these tools?
- How well do they fulfill their purpose?
- Which main avenues of retrieving information relevant to adaptation are there?
- For you specifically?
- For other policy-makers, and stakeholders?
- Do you see a need for new or different tools and/or additional information to support adaptation decision-making within the next 20 years?
- What tools and information would be useful?
- Specifically from the EU, what tools or information would be useful?
- Which other institutes, government departments, agencies or organizations are the most important players when it comes to climate change adaptation?
- What is their specific expertise or area of work?
- How is your organisation linked with them? (e.g. information, authority, funding, ..)
- How well are national policies translated to the regional level?
- How are stakeholder's needs and opinions taken into account?
- How well are national policies translated to the local level?
- How are stakeholder's needs and opinions taken into account?
- Is cross-border (international) action necessary in your area of decision-making?
- What kind of cross-border adaptation problems are there?
- Are these problems being tackled with cross-border cooperation?
- Do you follow EU adaptation policy?
- Do you know the EU white paper on adaptation policy?
- How does the EU adaptation policy process (e.g. the white paper) influence what you do?
- What is useful about it?

- What is lacking?

D. Country-specific questions

(country-specific questions here depending on which stage the country is in)

E. Wrap-up

- Anything else that you think is important which we haven't touched upon yet?
- Thanks for your time and valuable contribution. If you wish, we will inform you when our report is released.