

IVM Institute for Environmental Studies

Handling adaptation governance choices in Sweden, Germany, the UK and the Netherlands

Workpackage 6, Deliverable 6A

Knowledge for Climate, theme 7 "The governance of Adaptation"

Dave Huitema

Heleen Mees

Katrien Termeer

Sofie Storbjörk

Heiko Garrelts

Kevin Grecksch

Maik Winges

Tim Rayner

This report is released by: Dave Huiteima
Associate Professor



 IVM Institute for
Environmental Studies



This report was commissioned by the
Dutch Research Programme Knowledge for Climate

IVM

Institute for Environmental Studies
VU University Amsterdam
De Boelelaan 1087
1081 HV AMSTERDAM
The Netherlands
T +31-20-598 9555
F +31-20-598 9553
E info@ivm.vu.nl

Kennis voor Klimaat Programmabureau
Daltonlaan 400
3584 BK Utrecht
T +31 317 48 6540
M +31 621 20 2447
E info@kennisvoorklimaat.nl

Copyright © 2012, Institute for Environmental Studies

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without the prior written permission of the copyright holder

Contents

Contents	3
A comparison of adaptation governance in four countries	5
1 Adaptation policies in Sweden 2004-2011	9
1.1 Climate change effects	9
1.2 Policy developments in Sweden	9
1.3 Thematic framework	12
References	17
2 Adaptation policies in Germany	21
2.1 Climate change effects	21
2.2 Policy developments in Germany	22
2.3 Thematic framework	24
References	31
3 UK Adaptation Policy	35
3.1 Introduction	35
3.2 Problem framing/ objective-setting	36
3.3 Levels and scales	37
3.4 Timing and sequencing	39
3.5 Modes and instruments	40
3.6 Costs and benefits	43
3.7 Implementation and enforcement	45
References	49
4 The Netherlands	53
4.1 Problem definitions	53
4.2 Levels and scales	55
4.3 Timing and sequencing	57
4.4 Modes of governance and instruments	58
4.5 Cost and benefits	59
4.6 Implementation and enforcement	59
References	61

A comparison of adaptation governance in four countries

Dave Huitema, VU University Amsterdam, Institute for Environmental Studies

This document presents an overview of climate adaptation policies in four countries: Sweden, Germany, the UK and the Netherlands. The present report presents a collection of the papers that were discussed during a workshop with the international partners under KfC theme 7 Governance.

To guarantee coherence, each of the papers discussed a set of predefined themes. They all zoom in on various choices that climate governors in the countries have had to make in setting up a climate adaptation policy framework: problem definitions, levels and scales, timing and sequencing, modes of governance, costs and benefits, and implementation and enforcement (based on Jordan et al. 2010).

The most salient findings from these analyses are as follows:

When it comes to *problem framing*, all four countries have tended to treat adaptation as a developing country issue for much of the 1990s. Adaptation policy in that sense was connected to development aid, with climate change creating an additional threat to already vulnerable societies and countries. In Germany this problem framing was also connected to an awareness that climate change could subsequently also affect migratory movements around the globe (see Garrelts et al., this report). Nationally, the priority has long been on mitigation, and adaptation long seen as “inadequate surrender” (see Garrelts et al. for Germany, this report) has only slowly emerged on the agenda.

In all countries, extreme weather events seem to have been instrumental in driving home the message that climate adaptation was necessary (Sweden storms of January 2005; Germany the devastating 1,000 year floods of 2002 and heat wave of 2003; Netherlands (near-) floods and heavy rains of 1993, 1995 and 1998). Such events are obviously not new to these societies, but climate change is seen as increasing variability and thus exacerbating existing risks. Preparing for extreme weather events is seen as a key target in all countries and much effort is put into mapping risks and vulnerabilities. Which events can be expected is obviously different for the various countries due to their variegating geologies. Sweden pays attention to landslides, beach erosion, hydro power dam security, drinking water supplies, and animal health effects of climate change, etc. (Storbjörk, this document). Germany pays attention to waterways and navigation, flood safety, biodiversity and the preservation of genetic resources, vector borne and infectious diseases, allergies, human sensitivities towards weather conditions, etc. etc. (see Garrelts et al., this report) Such lists make clear at once that climate adaptation is multifaceted, and involves a lot of horizontal and vertical interplay between policy sectors. In the UK, an attempt is being made to connect the various facets and solutions through cost-benefit analysis, thereby framing the problem in monetary terms, and directing policy priorities to those domains where cost effective measures can be taken. Such a framing is not without contestation however as it assumes commensurability of metrics between biophysical and socio-economic spheres. Indeed, reports by the Adaptation Sub-Committee of the UK Climate Change Committee has a.o. rather emphasized the context specific nature of adaptation challenges (see Rayner, this report).

Because of the multifaceted nature of the adaptation problematique, it is not always so clear what climate adaptation policy really is, as it is debatable whether it is a policy field in its own right. Take the Dutch situation, where most of the adaptation work is

done in the water sector, without it formally being named climate adaptation policy. Of the four countries analyzed here, progress towards an independent policy sector in the UK seems to be most advanced, for instance because it has the Climate Change Act of 2008 which provides for a legal foundation for capacity building in adaptation, its National Indicator for adaptation, its attempt to mainstream climate adaptation through Departmental Adaptation Plans, and its Adapting to Climate Change Programme (see Rayner, this report). Mainstreaming is obviously also a popular approach in the other countries.

In terms of *levels and scales*: all countries see adaptation largely as a local or regional issue, but the division of responsibilities still differs somewhat. In Sweden there is no national adaptation strategy and the emphasis is on the County Administrative Boards and municipalities (Storbjörk, this document). In Germany, there is a national adaptation strategy, but it emphasizes the subsidiarity principle and therefore assumes that measures must be taken at the local and regional levels and important stated principle is the “strengthening individual responsibility” (see Garrelts et al., this report). In Sweden, a wish for more national leadership - in the form of creating the right institutional setting and concrete guidance and recommendations not overtaking control- is expressed on part of the regional and local authorities. The national adaptation strategy in Germany provides some of such guidance, and the ministerial conference of all federal environment ministers has a standing committee on adaptation (see Garrelts et al., this report). Regulation and cost benefit analysis play such a central role in the UK approach that the adaptation policy there has been described as “a top down risk-based adaptation strategy” (Rayner quoting others, this report). However the UK national government itself sees itself rather as a provider for the right institutional environment that allows others to take the right decisions - indeed the nomenclature of some of the key organizations such as “Local and Regional Adaptation Partnership Board” suggests a more collaborative approach. There is thus a gap between the various perceptions of the actual level of centralization. In the Netherlands, the water management field has a long tradition of decentral control (through the water boards), yet the central government is in control of all national waters and plays a key role in almost all water infrastructure development and this role is often fulfilled in quite a top down way. Especially in periods of drought decision making is fully centralized to the national level in the Netherlands.

When it comes to *timing and sequencing*, all countries show a mixed bag of authorities that are pro-active and have started developing climate policies now, and authorities that take a wait and see approach. In Sweden there are some municipalities that have decided to act on their own, whilst others remain inactive for the moment. The more active local authorities there appear to be the ones that have recently experienced extreme weather events and relate them to climate change. The time horizon of policies differs somewhat, with the Swedish Commission on Climate and Vulnerability taking a 100 year perspective, but most local land use planners there working with a view to the next 5-15 years (Storbjörk, this document). This connects to the experiences in the UK with a cross-government project that sought to examine and implement solutions for the long term (defined as 20-90 years). A review of that project showed “reluctance to plan for the long term impacts of climate change due to perceived uncertainty associated with the impacts of climate change and the financial risks” (Rayner quoting others, this report). In the Netherlands, water management authorities and the so called Delta committee, have applied quite a long term perspective to assess flood risks (looking 100 years ahead), but actual measures are rather taken with a view of developments (e.g. certain level of sea level rise) that are deemed relatively certain in the next 50 years.

As for *modes of governance*, it is important to state that in several countries there is some level of trepidation accepting an active role for the state (government) in providing for climate adaptation. Thus statements from the Swedish Commission on Climate and Vulnerability emphasize the “own responsibility” of all actors, and in Germany research programs like KLIMZUG (Managing climate change in the regions for the future) explore the capacity of regional cooperation networks and emphasize education and capacity building (see Garrelts et al., this report). Mees et al. (this report) note however how the Dutch construction sector for instance, despite standing to gain considerably from an active role in shaping adaptation, remains largely inactive. Given the emphasis on the “own initiative” it should not come as a surprise that there is much emphasis on communication and awareness raising in Germany and Sweden through risk mapping and early warning systems. But despite all the communication, the countries are surprisingly similar in how they also emphasize the need for regulation through the (local) land use/spatial planning system to keep risks below acceptable levels. In Germany for instance, climate adaptation is now described as a principle of regional planning, and the Building Code also incorporated it as a principle (see Garrelts et al., this report). In the Netherlands, the incorporation of climate change knowledge in the land use planning process is supposed to be guaranteed by the “Water test”, which regulates that planning authorities need to consult the water boards on proposed land use developments (Mees et al, this report). The development of knowledge on risks is subsidized in all four countries, and in all countries there is facilitation of knowledge exchange between local and regional parties so that they can learn from each other. In Sweden, the state does accept responsibility for the national infrastructure and general emergency preparedness, and similar obligations apply to the regional and local level. Interestingly, local authorities can be held liable for “bad” land use planning decisions there (Storbjörk, this document). In Germany, climate adaptation issues may become an aspect in regulatory assessment procedures (see Garrelts et al., this report).

When it comes to the *costs and benefits* associated with climate change, these are considered to be clouded in uncertainty in all four countries, but increasingly calculations are being made. In The Netherlands and the UK, the emphasis is on no- or low regret measures, which implies that they take those measures that have strong positive corollary effects making them attractive from a range of perspectives, or are relatively cheap and potentially very high returns. In the UK, this implies that land use planning measures, building renovation, national infrastructure, natural resources and emergency planning are targeted (Rayner, this paper) – these sectors are also often mentioned in plans of the other countries, but research in the UK seems to show that even in these sectors there is little “uptake” of adaptation measures, with even the water sector largely ignoring climate change effects on water availability (ibid.). In Germany, the question of costs and benefits is seen as requiring further research. Consultations with the leading financial providers have however taken place, and a connection is seen with funding schemes of the federal government to the Laender. Also, there is some mentioning of the opportunities that climate change offers (see Garrelts et al., this report), which is also the case in the Netherlands (Mees et al. in this report). The risks and benefits are not spread equally across regions and sectors, and in keeping with the modes of governance just sketched, there little talk about solidarity between regions, except in Sweden, where the Swedish Commission on Climate and Vulnerability has hinted at the need to adjust state funding to the regions to compensate for risk differences; so far no implementation has been given to such notions (Storbjörk, this document). In the UK, flood insurance is enveloped into property insurance, effectively creating a level of solidarity between inhabitants of the more flood prone regions and others. The flood insurance system there is essentially a

co-production between government and the insurance industry, and the insurance industry has recently expressed concern for the reduced government investment in flood defences (Rayner, this document). Equity considerations do play an explicit role in the UK debate on adaptation, as witnessed by the discussions in the House of Commons Environmental Audit Committee that spoke of burden sharing and the dilemma between public liability and private responsibility (ibid.).

Finally, in terms of *implementation and enforcement*, it has been noted that Germany and the UK, have clear time frames for the revision of National Adaptation Strategies, and that the UK comes closest to having a monitoring framework for the implementation of climate adaptation policies, through the Adaptation Sub-Committee (Rayner, this report). However, as the goals of adaptation policies are relatively diffuse progress appears to be hard to measure – hence the usefulness of the “adaptation ladder” developed by the Subcommittee. This ladder focuses on capacity building, decision making, and timely action. The Subcommittee applied the ladder in 2011 and the findings suggest increased rather than decreased vulnerabilities in the nine local authorities studied in the last ten years (Rayner, this report). It is also relevant to mention that in Sweden the County Administrative Boards are increasingly communicating the need for climate adaptation to the municipalities (Storbjörk, this document). Germany has had a national climate strategy since 2008, which has been concretised by an Adaptation Action Plan in 2011.

1 Adaptation policies in Sweden 2004-2011

Sofie Storbjörk, Linköping University, Centre for Climate Science and Policy Research

1.1 Climate change effects

Increased precipitation, temperatures and sea-level rise is expected in a future climate in Sweden. The average of all scenario analysis gives a temperature increase in winter in northern Sweden of 5,7°C and a precipitation increase of 25% and for summer a temperature increase of 2,9°C and a precipitation increase of 11%. In southern Sweden, the corresponding figures are a temperature rise in the winter of 4,4°C and a precipitation increase of 21% and for summer a temperature increase of 2,8°C and a precipitation increase of 3%. This will have a bearing on the intensity and occurrence of flooding, landslides and erosion, of which the South and South-Western part of Sweden are particularly exposed. In the southern parts of Sweden sea level rise is expected to be up to 80 cm in a hundred year perspective. Depending on the land elevation expected sea level rise varies along the Swedish coastline, and in northern Sweden sea level reductions are instead expected (SOU 2007:60; Miljödepartementet 2009, www.klimatanpassningsportalen.se). There are few businesses and sectors that remain completely unaffected by a changing climate and in many cases our current society is also poorly adapted to variations occurring in today's climate (SOU 2007:60).

1.2 Policy developments in Sweden

The Swedish climate change strategy has developed gradually since the late 1980's. In 2002 The Swedish Parliament decided upon a combination of "carrot, sticks and sermons" to serve as national strategy for reducing emissions (Lundqvist & Biel, 2007:17ff). Gradually, since 2004, climate adaptation has been recognised as a policy issue that needs to be dealt with at national, regional and local levels in Swedish society. There is however no coherent national adaptation strategy at hand and the approach to climate adaptation has been characterized by a combination of voluntary efforts, network coordinative initiatives, governmental commissions/knowledge generation and legislative expectations on municipalities.

At *the national level* one starting point for collective efforts of climate adaptation is a seminar in December 2004, hosted by the Swedish Environmental Protection Agency (SEPA) and attended by sector representatives and regional and local stakeholders. At the seminar results were presented from a survey of the state of climate adaptation in Sweden, initiated by SEPA to support the Fourth Swedish National Report on Climate Change and undertaken by the Swedish Meteorological and Hydrological Institute (SMHI). The survey concluded that if measures aimed to target current climate variability were sorted out, only a few examples of adapting to climate change could be found e.g. where exposed municipalities had changed their building recommendations in waterfront areas (Rummukainen et al 2005). During the SEPA-seminar it became clear that there was a frustration that not enough political initiatives had been taken to tackle climate adaptation. As a result, an informal authority-network on adaptation was initiated with the task to clarify responsibilities and coordinate the work amongst national authorities more effectively. The most active members in the network were the SEPA, SMHI and the Swedish Geotechnical Institute (SGI). Particularly

the research department at SMHI had since the middle of the 1990's been striving to take on a more active role in climate adaptation (Uggla, 2009, Johansson & Mobjörk 2009). Only a few months after the initiation of network, there was however a sudden political momentum for acting on climate adaptation.

When the severe January-storm struck large parts of Sweden in 2005, there was a growing awareness that societal robustness and capacity to deal with extreme weather could not be taken for granted and a corresponding call for action. During the spring of 2005 the Committee on Climate and Vulnerability was therefore formed with the task to assess Swedish vulnerability to climate change and its regional consequences. The task was also to clarify responsibilities and organisational changes needed for supporting Swedish climate adaptation. In 2007 the Final Report was presented, highlighting the need for strategic planning and proposing a number of sectoral measures for dealing with the consequences of climate change. A strengthened role was also suggested for the County Administrative Boards (elaborated in the regional section) together with the proposition of a new institute for climate science and adaptation. All in all 59 suggestions of climate adaptation measures were made (SOU 2007:60). A recent inventory from August 2010 showed that out of these 59 suggestions 14 have resulted in direct governmental commissions and another 14 are partly identified in governmental commissions. The remaining 22 have not yet been taken further (Rydell et al 2010). The latest Governmental Bill on climate change mainly focused on emission-reductions but suggested that adaptation is given increased recognition in Swedish climate change politics at large (Prop 2008/2009:162). The Bill caused the Swedish Government to invest 300 million SEK between 2009-2011 to adaptation measures in the form of: improved knowledge of landslides in the Götas Älv catchment (South-Western Sweden) and improved national height data to better assess flood-risks (105 MSEK to SGI), a strengthened role for the County Administrative Boards (75 MSEK to 21 CAB:s), an improved height-database for assessing risks in planning (120 MSEK to the Swedish Mapping, Cadastral and Land Registration Authority). Legislative changes have been made in the Planning and Building Act, where it is, since the 1st of January 2008 made clear that considerations of climate change and to risks e.g. flooding and erosion are to be made in strategic and detailed planning (Boverket 2009 and 2010).

In parallel with the ongoing commission, members from the informal authority network on climate adaptation came to play an important role in developing the Swedish web-portal "Klimatanpassningsportalen", which was launched in June 2007. The aim of the portal has since then been to spread knowledge of the consequences of climate change, risk-management and examples of how climate adaptation can be integrated in the work practices of municipalities and regions. The portal is currently run by the SMHI in informal cooperation with the SEPA, the Swedish Geotechnical Institute, the National Housing Agency, the Swedish Civil Contingencies Agency, the Swedish Mapping, Cadastral and Land Registration Authority, the National Food Administration and the Swedish Energy Agency (www.klimatanpassningsportalen.se). The informal authority network has since its start had regular meetings and arranged a number of workshops and seminars both for internal coordination and for external communication where they present ongoing work and activities (Regeringskansliet 2009).

Following the Hyogo Framework for Action, there is since September 2007 also an authority network called the National Platform for working with natural disasters in Sweden, coordinated by the Swedish Civil Contingencies Agency. They have initiated an inventory (Rydell et al 2010) of current assignments and governmental commissions for climate adaptation in Sweden in sectors e.g. transportation, technical support

systems, planning, agricultural practices and tourism, natural environments and environmental goals, and human health. It is clear from the inventory that today, several key sectoral authorities have taken on a role in climate adaptation and are collaborating in different forms of networks, projects and commissions either by demand from governmental commissions or by their own initiatives. The inventory shows that up to date 74 activities relating to climate adaptation has been undertaken by various national authorities, mainly in the areas of city planning, technical support systems and agricultural practices. The activities concern e.g. networks, efforts to produce usable knowledge within their sectoral sphere (sectoral risk-inventories, vulnerability assessments etc.), working with sectoral action-plans, producing guidelines/handbooks/ reports, and developing methods for considering climate risks in planning and other strategic activities (Rydell et al 2010). Besides the National Platform there is also a Delegation for Landslide-issues as well as an Authority Network for Beach Erosion led by the Swedish Geotechnical Institute, a National Coordination of Drinking Water Issues led by the National Food Administration, a Network for Animal Health and Husbandry led by the National Veterinary Institute and a Committee for Dam-Security led by the Swedish National Grid. From this it is safe to say that there is, at the national level, today several sectoral and cross-sectoral coordinating initiatives at work through different administrative channels but so far the Government has not appointed an authority to take on the role of chief-coordinator (Rydell et al 2010). In the recent Governmental budget proposal from the 20th of September 2011 new investments in climate adaptation are suggested between 2012-2015. Besides a continued support to the County Administrative Boards and new money for better geographical and geotechnical data, it is suggested that SMHI is appointed a new role as a national competence centre on climate adaptation. It is stated that SMHI "will work as a node for collecting, compiling and making international, national and regional knowledge on climate adaptation accessible (Regeringskansliet 2011-09-20).

At *the regional level*, the County Administrative Boards (CAB:s) – as regional state actors – have since 2009 been given the task and some strengthened financial resources to coordinate adaptation within each region as part of their annual governmental direction (Prop 2008/2009:162). It has been suggested that regional delegations are established to support local efforts, provide, interpret and communicate knowledge as well as coordinate, press for action and assess ongoing work (Prop. 2008/09:162, SOU 2007:60). The work so far has been directed at establishing necessary organisational structures and producing action plans (Rydell et al 2010). Some early recommendations were made for managing climate risks in planning (ÖSAM 2006, CAB Skåne & Blekinge 2008) but in the last years the work to summarize information and present the ongoing work within regions to support adaptation practices has increased (CAB Stockholms län 2011, Västra Götalands län 2011, Östergötland 2011 and Skåne 2010). There is also an informal network where climate adaptation coordinators at the 21 CAB:s regularly meet and exchange experiences (Rydell et al 2010).

The main adaptation work is however expected to take place at *the local level* where the 290 municipalities have operational responsibility for climate adaptation. Municipalities in Sweden have extensive responsibilities for spatial planning and building, drainage and water supply, emergency planning and rescue services and are – as of January 2008 – to consider the consequences of climate change in spatial planning, following the Planning and Building Act (Boverket, 2009). There are some state funds where municipalities can apply for state subsidies to work with risk-management measures in existing settlements. E.g. the city of Kristianstad finance 80% of their very large scale technical embankment with such state subsidies

(Storbjörk 2006). The budget for subsidies was for 2010 43 million SEK which means that only a limited number of projects can be given support. The Commission on Climate and Vulnerability suggested another fund for large scale investments to be established with a bigger budget so that the current fund could be directed at smaller investments. This suggestion has however not been realised as of yet (Rydell et al 2010).

In a self-evaluative survey sent out by the Association of Swedish Municipalities and Regions (SKL) in the fall of 2009 it was shown that 9 of 10 of the responding 200 municipalities claims to somehow approach adaptation in their spatial planning and every fourth municipality stated that they are approaching adaptation to “a high degree” (SKL, 2009b). Compared to previous surveys (Rummikainen et al 2005, Viehhauser et al 2006, Langlais et al 2007) and case studies (e.g. Ugglå & Lidskog, 2006, Storbjörk; 2006) showing that local initiatives vary strongly across the country and stretch between e.g. wait-and-see, reactive and proactive climate change adaptation, a more optimistic picture was drawn on municipality responses to our changing climate. At the same time the results gave little indication of what the high degree stand for and how these municipalities concretely approach climate adaptation in spatial planning practice. In an interview-study in September 2010 with the 10 municipalities from the SKL-survey that agreed to be identified and stated that they to a high degree approach climate adaptation in master plans, detail plans and recommendations for planning we learn that “a high degree” can mean anything between 1. that climate adaptation will be discussed in coming master plans based on current variability, that climate change risks are assessed in singular detail plans but without any general strategy/ recommendation, in a policy context where political priorities for climate change is low, and 2. that climate change risks form preconditions in master plans based on specific risk/vulnerability analysis and are assessed in all detail plans based on planning-recommendations (Storbjörk and Ugglå, in preparation). When looking at what concrete adaptation measures have been taken, the most common approach seems to have been undertaking local risk- and vulnerability assessments, changing building recommendations for waterfront housing (i.e. prescribed lowest levels for building foundations), investing in temporary and/or permanent protection (e.g. quick water walls, embankments etc.) and updated pumping systems for flooding (Miljödepartementet 2009, Johansson & Mobjörk 2009).

1.3 Thematic framework

1.3.1 Problem definitions

On the one hand there is policy-agreement that the problem of climate change and its societal consequences needs to be dealt with proactively in society. In national policy documents no doubts regarding the occurrence of climate change is expressed and even if different scenarios are presented the general message – often with reference to the IPCC-reports – is that we need to take action today. One example: “Climate change is complex and demands initiatives and measures on global, national, regional and local levels in order to reduce emissions and adapt society to climate change” (Boverket 2010). On the other hand there is still practical confusion regarding what is included in the term climate adaptation. A recent inventory of adaptation measures taken in Sweden e.g. highlights the need to further define and be clear on what we mean by climate adaptation as it stretches from adaptation that responds to current climate variability, observed trends backwards in time and adaptation to scenarios describing possible future changes (Rydell et al 2010, Rummikainen et al 2005). Also,

when e.g. doing interviews with local representatives some interviewees clearly expresses doubts regarding the occurrence, pace and magnitude of climate change and would prefer to adopt a wait-and-see-strategy – as the belief is that we do not know enough to be able to prioritize taking action – and instead target what are perceived to be more pressing political concerns. Further, local and regional representatives are at times uncertain of what is to be included in the climate adaptation discussion, i.e. current variations or climate change, adaptation or mitigation efforts etc. (Uggla 2006, Storbjörk 2006, Storbjörk 2007, Johansson et al 2009, Uggla and Storbjörk, submitted).

1.3.2 Levels and scales

In section 2 it is shown that there is no national adaptation strategy and that knowledge generation, knowledge coordination/networking and knowledge communication takes place among national sector and regional authorities while the operational adaptation efforts are expected from municipalities. There is in Sweden a critique regarding the lack of common national guidelines and leadership in climate adaptation and questions are raised whether there is a need “for a national authority with responsibilities to coordinate the work of key authorities?” (Boverket 2010, Rydell et al 2010). Both authority reports and current research has stated that climate adaptation requires better coordination and clarification of roles and responsibilities, vertically and horizontally amongst authorities (e.g. Glaas et al 2010, Rydell et al 2010, Johansson & Mobjörk 2009, Nilsson & Gerger Swartling 2009). There is also a critique that not enough direct responsibilities have been given to sector authorities. Further, the lack of coordination in the Government Offices is also been pointed out, where authorities that today are working with climate adaptation belong to different offices with varying priority to climate change. This means a risk of double-work and contradictions (Rydell et al 2010).

Between national and regional authorities there are also intense discussions on how to communicate knowledge and guidance to municipalities (SEPA 2008). On the one hand municipality key actors have often expressed a frustration by the experienced lack in support, knowledge and recommendations from regional and national authorities, except for some of the bigger particularly exposed and proactive municipalities that have chosen to act on their own (SKL 2009b, Viehhauser et al 2006, Uggla and Lidskog 2006, Storbjörk 2006, Rummukainen et al 2005). On the other hand municipalities strongly claim their independence when recommendations are seen as too intrusive upon local self-determinism, which complicates the production of regional guidelines (Uggla 2009, Lidskog & Uggla 2009, Storbjörk 2007, 2011). In this respect it is clear that e.g. the CAB:s have had difficulties in taking a more proactive role towards municipalities, due to the strong local monopoly of planning. To what extent this has changed with the new role of the CAB:s is still an open question. In recent interviews with local planners in ten municipalities, there are indications that some of the CAB:s has put increased pressure on municipalities (Uggla and Storbjörk, submitted). There has however also been a critique from more proactive municipalities that the CABs, in determining appropriate risk-levels, risk watering down their recommendations to be able to fit all (Storbjörk and Uggla, in preparation).

Regarding the EU, there is in national policy documents often a section where “international activities” are reported and where it is stated that the issue of climate change is put high on the agenda in both EU and the UN. The EU Adaptation White Paper is briefly presented as are EU-directives e.g. related to floods and the UN Hyogo Framework for Action (see e.g. Rydell et al 2010, Boverket 2010).

1.3.3 Timing and sequencing

Adaptation entered the climate policy debate in Sweden much later than emission-reductions but due to extreme weather events e.g. storms and flooding and the work of the Commission on Climate and Vulnerability, adaptation has become a legitimate policy issue. The time perspective adopted in the Commission is “how Swedish climate can be changed in the coming 100 years” (SOU 2007:60). Concerning the timing of adaptation measures there is no doubt that the more proactive municipalities are those that have been exposed to extreme weather in the recent past and where risk-inventories show continued vulnerabilities, i.e. in this sense it is reasonable to speak of reactive adaptation that triggers various adaptation measures. There is however the constant debate of *what to adapt to*, in terms of different assessments that are made of e.g. what flood-levels and scenarios of sea-level rise it is reasonable to adapt to and what a good-enough safety-margin is for municipalities (experienced floods, hundred-year-flows, worst-case scenarios etc.). In many municipalities it has been difficult to legitimise e.g. risk-management measures beyond what is practically experienced every 5-10 years in terms of e.g. floods (Uggla 2009, Storbjörk 2007, 2009). Also in planning future areas it appears that planners – despite risk-inventories at hand – make their interpretations and negotiates what safety-margins are actually reasonable in individual plans as a compromise between climate risks and political ambitions (Uggla and Storbjörk, submitted). Concerning *time-perspectives* recent interviews show that political leaders and city planners in their practical work seems to work with perspectives of 5-15 years – depending on the time-frames adopted in strategic documents – while at the same time planning for spatial structures that are likely to last at least 50-100 years. Also the time-perspective in climate scenarios at hand are often made in a longer time-perspective than local plans, a mismatch that is likely to influence the role of climate data and scenarios in planning and decision-making. It seems problematic to incorporate the more long-term perspectives in everyday planning and decision-making and going beyond no-regret measures, particularly when no state subsidies are at hand (Hjerpe, Storbjörk & Alberth, in preparation, Uggla and Storbjörk, submitted). While there is perhaps no taboo on adaptation, mitigation seems to be more politically easy and “attractive” to work with in terms of investments and public good-will (Hjerpe, Storbjörk & Alberth, in preparation).

1.3.4 Modes of governance, instruments

The Commission on Climate and Vulnerability has emphasised that *local authorities, businesses and individuals* all have key roles to play in facilitating climate adaptation (SOU 2007:60). The main principle when it comes to preventing and repairing damages due to extreme weather – stated by the Commission – is that “all actors are responsible for their own property”. The state is responsible for national infrastructure as well as emergency preparedness and large-scale risks. The municipality has the responsibility of local risks, as well as emergency preparedness, health care, water and land management, municipal roads and transportation. In spatial planning municipalities have the task to safeguard that the land used for settlements is suitable for its purpose and so makes an assessment of appropriateness (*lämplighetsprövning*) as regards e.g. climate risks. The municipality can be held liable for bad decisions up to 10 years. It was suggested in the Commission on Climate and Vulnerability that an increase from 10 to 20 years is made in the period during which local authorities are liable for compensation (SOU 2007:60). This could be a way to increase financial responsibility for local authorities but is a suggestion that has met with resistance, e.g. from the Swedish Association of Local and Regional Authorities (Johansson & Mobjörk 2009). The suggestion has not been taken further as of yet (Rydell et al 2010). The

building constructor has the responsibility to certify that building is carried out under existing plans and regulations. It is stated that property owners “must protect themselves from damages after best ability” as regards fires and water. Measures to limit fires are regulated in law while no equivalent for landslides, erosion and flooding was identified. It was also stated that municipalities cannot force individuals to take measures on their land and that if no action is taken and there is damage it is still unclear who is responsible. The Commission also suggests that when risks have not been known when constructions were made or when costs for the individual are significant it can be appropriate for the state to give certain support (SOU 2007:60). The research project *Climatools*, funded by the Swedish Environmental Protection Agency, has raised the issue of the responsibility of individuals for climate adaptation and sees individuals and consumers as new target actors in climate change.

As regards *policy instruments*, there is today no coherent national adaptation strategy in Sweden, compared with other countries. Instead the current work has on the one hand consisted of “early” voluntary initiatives from national and regional authorities as well as highly exposed proactive municipalities and, on the other hand, since 2007 and onwards an increased number of governmental commissions, network activities and knowledge-production/communication aimed at supporting the mainstreaming of climate adaptation across sectors and administrative levels (see section 2). Listed policy-instruments in the Commission on Climate and Vulnerability are mapping of risks for flooding, erosion and landslides, data bases and knowledge support, early warning systems and operative support in crises, spatial planning, state subsidies for preventive measures, insurance, information and education, research funding and changed organisational structures (SOU 2007:60). Steering has thus to a large extent taken place by diffusing responsibility, mainstreaming within existing policy structures/instruments already in use and stimulating different actors to coordinate their work and engage in capacity-building (Montin 2009).

1.3.5 Cost and benefits

The Commission on Climate and Vulnerability presents sector-wise accounting of expected costs and benefits for climate adaptation. E.g. the costs for damaged roads and bridges due to landslides, erosion and flooding are estimated to amount to a total of between 9 and 13 billion SEK up until 2100 (not including big flooding. A flooding of Lake Vänern is e.g. approximated to cost 900 million SEK concerning 100-years flows and 1,9 billion SEK for maximum flows) while the costs for preventing up to 50% of these damages amount to only 2-3,5 billion SEK. Estimations are also made for railroads, the flight and maritime industry, telecommunications, electrical systems, dams, heating and cooling, drinking water, days- and wastewater, buildings, forestry, agriculture, fishing, tourism, health etc (SOU 2007:60). The Commission expects heat related deaths to represent the largest increase in costs but high costs are also expected related to increased need of cooling systems and increased infections (ibid). Who is expected to carry the burden varies across sectors. Regarding to what extent geographical fairness is considered the Commission of Climate and vulnerability has stated that “a certain reallocation of state funding can be seen as motivated as climate change strikes differently across the country and in different sectors. Some municipalities will be burdened by increased costs while others will benefit” (SOU 2007:60, p 581). What this could mean in practice is not made clear however. At the local level some of the more proactive municipalities, e.g. the city of Gothenburg have, within a cross-sectoral working group made calculations of costs for local adaptation measures in particular areas, following different runoff scenarios. Scenarios to protect an area under planning would vary between 200 to 1500 million SEK and if measures

would include securing central parts of Gothenburg it is calculated that costs would amount to between 3000 to 10 000 million SEK (Gothenburg 2009, Glaas et al 2010).

1.3.6 Implementation and enforcement

The implementation of climate adaptation policies and measures is highly decentralized, where municipalities are seen as the key agents for change, albeit with the knowledge support from regional (e.g. the new role of the CAB:s) and national authorities. The role of municipalities in climate adaptation is particularly pointed out in the Planning and Building Act and in the contingency legislation. As regards planning, the County Administrative Boards have a monitoring role in respect of both master plans and detail plans at the same time as the monopoly of planning rests with municipalities. Previous studies have shown that the CAB:s have used their monitoring role to point out risks when they have not been called attention to by municipalities e.g. "have you considered the risks of climate change" (Storbjörk 2006) while recent interviews with planners give indications that at least in some regions municipalities experience greater demands and that municipalities have to comply with regional demands so that local plans are not re-examined (Ugгла and Storbjörk, submitted). As mentioned in section 2 national authorities have worked with the production of what is seen as usable knowledge within their sectoral spheres e.g. risk-inventories, vulnerability assessments, guidelines/handbooks and methods for considering climate risks as support to sectoral and local implementation. At the same time it is precisely at the level of implementation and of turning climate adaptation policy expectations to practice that challenges ahead are expected. Previously identified key implementation challenges lie in e.g. challenging vertical administrative interplay (relationship between administrative levels), local ability to evaluate and use available knowledge, how to facilitate horizontal interaction, learning/changing mindsets and ownership across sectoral divides in local planning and politics, raising and keeping political momentum for prioritizing climate adaptation and managing conflicts between taking climate considerations and other pressing local concerns (Ugгла & Lidskog 2006, Storbjörk 2006, Keskitalo 2008, Nilsson & Gerger Swartling 2009, Lidskog & Ugгла 2009, Glaas et al 2010, Storbjörk 2010, Simonsson et al 2011, Storbjörk & Hedrén 2011, Hjerpe & Glaas, conditionally accepted, Jonsson et al, under review).

References

- Boverket (2009). *Bygg för morgondagens klimat. Anpassning av planering och byggande*. Karlskrona: Boverket.
- Boverket (2010). *Klimatanpassning i planering och byggande – analys, åtgärder och exempel*. Regeringsuppdrag (6) M2009/4802/A. Karlskrona: Boverket
- CAB Stockholms län (2011). *Är våra kommuner klimatanpassade? Ansvar, riktlinjer och åtgärder*. Stockholm: Länsstyrelsen i Stockholms län.
- CAB Västra Götalands län (2011). *Klimatanpassning i Västra Götaland. Lägesrapport om klimatanpassningsarbetet i länet 2010*. Länsstyrelsen i Västra Götaland Rapport 2011:27.
- CAB Östergötland (2011). *Introduktion till klimatanpassning i Östergötland*. Linköping: Länsstyrelsen i Östergötland.
- CAB Skåne (2010). *Klimatanpassning. Planera för ett förändrat klimat*. Malmö: Länsstyrelsen i Skåne.
- CAB Skåne & Blekinge (2008). *Stigande havsnivå – konsekvenser för fysisk planering*.
- City of Gothenburg (2009). *Extrema väderhändelser fas 2. Fallstudie Gullbergsvass*. Göteborg: Göteborgs Stad.
- Glaas, E., Jonsson, A., Hjerpe, M. & Andersson-Sköld, Y. (2010). Managing climate change vulnerabilities: formal institutions and knowledge use as determinants of adaptive capacity at the local level in Sweden. *Local Environment* 15, 525-539.
- Hjerpe, M. & Glaas, E. (conditionally accepted). Evolving climate adaptation strategies: incorporating influences of socio-economic stress. *Mitigation and adaptation strategies for global change*.
- Hjerpe, M., Storbjörk, S. & Alberth, J. (in preparation). Climate adaptation in local politics.
- Granberg, M. & Elander, I. (2007). Local Governance and Climate Change, *Local Environment*, 12, pp. 537-548.
- Johansson, B. & M. Mobjörk (2009). *Climate adaptation in Sweden. Organisation and experience*. FOI Rapport 2725.
- Johansson, M., Hjerpe, M., Simonsson, L. & Storbjörk, S. (2009). *Hur möter östgötakommunerna klimatfrågan? En kartläggning av risker, sårbarhet och anpassning inför klimatvariationer och klimatförändringar*. CKS Research Report 2009:4.
- Jonsson, A. et al (under review). Cities' capacity to manage climate vulnerability: experiences from participatory vulnerability assessments in the lower Göta Älv Catchment, Sweden. *Local Environment*.
- Keskitalo, E.C.H. (2008). *Climate Change and globalization in the Arctic: an integrated approach to vulnerability assessment*. London: Earthscan.
- Langlais, R. et al. (2007). *Turning point on Climate Change? Emergent Municipal Response in Sweden: Pilot Study*. Nordregio Working Paper 2007:3.
- Lidskog, R. & Ugglå, Y. (2009). Lokalt klimatarbete: kommunen som lärande organisation, in: Ugglå, Y. & Elander, I. (Eds.). *Global uppvärmning och lokal politik*. Stockholm: Santérus Academic Press.
- Lundqvist, L. J. & Biel, A. (2007). Coping with Climate Change: Sweden's Climate Strategy as a Case in Point, in Lundqvist, L. J. & Biel, A. (Eds). *From Kyoto to the Town Hall*.

- Making International and National Climate Policy Work at the Local Level*. London: Earthscan.
- Miljödepartementet (2009). *Sveriges femte nationalrapport om klimatförändringar*. Ds 2009:63. Stockholm: Fritzes förlag.
- Montin, S. (2009). Klimatpolitiken och kommunerna, in: Ugglå, Y. & Elander, I. (Eds.). *Global uppvärmning och lokal politik*. Stockholm: Santérus Academic Press.
- Nilsson, A. & Gerger Swartling, Å. (2009). Social learning about climate adaptation: global and local perspectives. Paper presented at the 9th NESS Conference *Knowledge, learning and action for sustainability*, 10-12th of June 2009, London.
- Prop. 2008/09:162 *En sammanhållen klimat- och energipolitik*. Stockholm: Regeringskansliet.
- Rummukainen, M., Bergström, S., Persson, G. & Ressner, E. (2005). *Anpassning till klimatförändringar. Kartläggning av arbete med sårbarhetsanalyser, anpassningsbehov och anpassningsåtgärder i Sverige till en framtida klimatförändring*. Norrköping: SMHI.
- Rydell, B., Nilsson, C., Alfredsson, C. & Lind, E. (2010). *Klimatanpassning i Sverige – en översikt. Nationell plattform för arbete med naturolyckor*. Karlstad: MSB.
- SEPA (2008). *The role of central authorities in climate adaptation*. Summary of group discussions from a workshop on Climate adaptation from 2 of October 2008.
- SKL (2009a). *Hanteringen av vattenfrågorna är avgörande – Om att klimatanpassa den fysiska planeringen*. Stockholm: SKL.
- SKL (2009b). *Läget i landet. En enkätundersökning om klimatanpassning i den fysiska planeringen*. Stockholm: SKL.
- SOU 2007:60 *Sverige inför klimatförändringarna – hot och möjligheter* (Stockholm, Fritzells). Swedish Official Report on Climate and Vulnerability.
- Simonsson, L., Gerger Swartling, Å., André, K., Wallgren, O. & Klein, R.J.T. (2011). Perceptions of risk and limits for climate change adaptation: case studies of two Swedish urban regions. In Ford, J. & Berrang-Ford, L. (Eds), *Climate Change Adaptation in Developed Nations: From Theory to Practice*. Advances in Global Change Research 42. Dordrecht: Springer Publ.
- Storbjörk, S. & Y. Ugglå (in preparation). Approaching climate change adaptation in Swedish spatial planning practice. Lessons from 10 "proactive" municipalities.
- Storbjörk, S. & J. Hedrén (2011). Institutional capacity-building for targeting sea level rise in the climate adaptation of Swedish coastal zone management. Lessons from Coastby. *Ocean and Coastal Management* Vol. 54, No 3, 265-273.
- Storbjörk, S. (2010). It takes more to get a ship to change course. Barriers for organisational learning and local climate adaptation in Sweden. *Journal of Environmental Policy and Planning* 12, 235-254.
- Storbjörk, S. (2009). Perspektiv på klimatanpassningens tekniska fix, in Gyberg P. & Hallström, J. (Eds). *Världens gång – teknikens utveckling*. Studentlitteratur: Lund.
- Storbjörk, S. (2007). Governing Climate Adaptation in the Local Arena: Challenges of Risk-Management and Planning in Sweden. *Local Environment* 12, 457-469.
- Storbjörk, S. (2006). *Klimatanpassning i Sverige – Drivkrafter och utmaningar för riskhantering och fysisk planering*. Linköping: CSPR Research Report 06:02.
- Ugglå, Y. & Storbjörk, S. (under review). Klimatrisker på planerarnas agenda: Erfarenheter, perspektiv och förhållningssätt. *Dansk Sociologi* specialnummer om klimatförändring och bypolitik (Ed) Anders Blok.

- Ugbla, Y. (2009). Framtiden är inte längre vad den varit: anpassning till ett förändrat klimat, in Ugbla, Y. & Elander, I. (Eds.). *Global uppvärmning och lokal politik*, Stockholm: Santérus Academic Press.
- Ugbla, Y. & Lidskog, R. (2006). *Att planera för en osäker framtid. Kommuners arbete inför hotet om ett förändrat klimat*. Örebro: Centre for Urban and Regional Studies Report No 60.
- Viehhauser, M. m.fl. (2006). *Inventering av kommunernas hantering av översvämning, ras och skred inom den kommunala planeringsprocessen*. Klimat- och sårbarhetsutredningen bilaga B15. Stockholm: Fritzells förlag.

2 Adaptation policies in Germany

Heiko Garrelts, artec, University of Bremen

Kevin Grecksch, CENTOS, University of Oldenburg

Maik Winges, CENTOS, University of Oldenburg

2.1 Climate change effects

Generally speaking the climate in Germany can be described as temperate seasonal with humid westerly winds predominating. Furthermore the climate is moderated by the North Atlantic Drift. Germany's landscape can be characterised as diverse and moderate, ranging from the peaks of the Alps to the lowlands of northern Germany. In general, the impacts of climate change are expected to vary and to be mostly rather moderate (Swart et al. 2009). On the basis of the latest report by the Intergovernmental Panel on Climate Change (IPCC) the German National Adaptation Strategy (NAS) as the main document at hand (Federal Government 2008a) elaborates in its second chapter ("The climate is changing!") on details of existing and expected changes in climate parameters (temperature and precipitation), both worldwide and in Germany. A comparative evaluation, based on work by the German National Meteorological Service (DWD), presents the results of four existing regional models. According to the authors, this "ensemble evaluation makes it possible to arrive at reasonably robust statements about corridors of change" (Federal Government 2008b).

These corridors consist of the following trends: Depending on the global trend in anthropogenic emissions of climate-relevant gases, the temperature rise in Germany is expected to increase between 0.5 and 1.5°C during the period 2021-2050 and between 1.5 and 3.5°C during the period 2071-2100. This warming will be most noticeable in winter months. Winter precipitation could increase by an average of up to 40%, and in some parts of the central upland areas¹ the increase could even be as much as 70%. Summer precipitation could decrease by up to 40% on a nationwide average, with the south-west of Germany being particularly affected.

In its third chapter ("What are the consequences? - What can be done?") the document classifies the consequences of climate change as follows (Federal Government 2008a, 15f.):

- Consequences arising from continuous changes (e.g. seasonal shifts in vegetation periods, long-term changes in groundwater recharge or reduced heating requirements in winter)
- Consequences dictated by more frequent or more intense occurrence of extreme events, such as intense rainfall, storms and storm surges, heat waves or long periods of drought. These also include forest fires, floods and droughts
- Consequences of increasing climate variability. Climate fluctuations could acquire short term importance, e.g. droughts might occur in rapid succession, thereby overtaxing the capacity of the agricultural and forestry sectors to cope with them.

¹ This concerns the federal states of Rhineland-Palatinate, Hessen and north-eastern Bavaria.

The NAS also emphasises the following points:

- In the second chapter's concluding part, the number of uncertainty factors being involved in the model calculations is emphasised, e.g. the impossibility to predict the worldwide trend in emissions of greenhouse gases and aerosols with any certainty (Federal Government 2008a, 13).
- Regional differences in the availability and use of natural resources (e.g. water), but also influences on the environment may have regional and local effects on adaptive capacity and hence on the scale of climate change impacts.
- There may be regional differences in the "positive or negative nature of the impacts" (ibid.) as well.
- Many of the consequences arising from gradual changes cannot be attributed to the single factor of climate change, since they are also influenced – e.g. – by population growth or changes on settlement patterns.
- Climate change has impacts not only on nature, but also on industry and society.

The latter aspect is the starting point to differentiate the possible consequences of future climate change for 15 sectors and areas and to identify options for action. These vulnerable sectors are human health, building sector, water regime, water management (including coastal and marine protection), soil, biodiversity, agriculture, forestry and forest management, fishery, energy industry (including conversion, transport and supply), financial services industry, transport and transport infrastructure, trade and industry and tourism industry. In addition, cross-sectional topics are identified: spatial, regional and physical development planning and civil protection.

2.2 Policy developments in Germany

Today, climate change adaptation is recognised as a policy issue that needs to be dealt with at different levels in German society. This perception has developed gradually, especially since 2002. There is a coherent German climate change strategy on the national level (NAS, Federal Government 2008a), being complemented and concretised by an action plan (Bundesregierung 2011). The national level also initiates and coordinates activities on the regional and local level. In addition, there are adaptation programmes on the Laender (German Federal States) and to some extent on the local level. Rather independently from the NAS, the northern German coastal states are busily engaged in determining potential dangers to the coastal region and implementing appropriate technical adaptation measures (Garrelts/Lange 2011). With regard to other actors, especially the economic sector has adopted the issue of climate change adaptation (Karcmarzyk/Pfriem 2011). In contrast, civil society organisations seem to refer to the issue only in so far as it touches "traditional" claims, such as biodiversity protection.

According to Swart et al. (2009, 218), the debate in Germany has long been influenced by the perception that climate policies should focus on mitigation. With regard to the causes of climate change, adaptation has been considered an inadequate surrender. This is one reason why German politicians have been somewhat reluctant to take on the challenge of adaptation as a public political issue (ibid.). An important milestone for the phase of political agenda setting was the devastating thousand-year-flood in South-East Europe in 2002 (the most affected federal states in Germany were Saxony and Saxony-Anhalt). It became obvious that affluent industrialised countries are vulnerable vis-à-vis extreme events as well, not only third world countries. The mass-media and nongovernmental organisations framed this extreme event as a first sign of

a changing and threatening climate (Schrage 2005; Lange/Garrelts 2007). The same amounts for the heat wave of 2003 which caused approximately 7.000 deaths in Germany, thus linking climate adaptation to health issues (Swart et al. 2009, 217). Further drivers for climate adaptation policies in Germany can be derived from the IPCC's 2007 report (Garrelts/Lange 2011).

The intention to draw up a national adaptation strategy was first announced officially by the German Climate Protection Programme (cf. Federal Government 2008a). According to Swart et al. 2009, after two years of inaction, the government was called upon by the environmental ministers of the federal states (Laender) to bring forward the development of a national strategy as a basis for further regional planning and action. Then, in 2007 and 2008, the NAS was formulated under the auspices of the Federal Ministry for the Environment, Nature Protection and Nuclear Safety (BMU) in cooperation with the Federal Environmental Agency (UBA). Ministries of the Laender and stakeholders were included in the process through stakeholder conferences and countless informal consultations (Swart et al. 2009, 218). The NAS was adopted by the Federal Cabinet on 17th December 2008. The NAS is embedded in the Federal Government's sustainability policy.

The Federal Government's adaptation and sustainability strategies are intended to complement each other. Furthermore, the NAS is intended to supplement and support other cross-sectional strategies, such as the National Strategy on Biological Diversity, the sectoral strategy on agro-biodiversity or the proposals by the Interministerial Working Group on "Rural areas", by taking up elements of these strategies which focus on improving adaptive capacity and reducing climate-induced risks (Federal Government 2008a, 7).

In addition to the NAS, several activities of *adaptation research* in the sense of ministerial research have to be mentioned, above all the research priority "KLIMZUG – Managing climate change in the regions for the future" (2008-2014; subsidy amount: 75 Mio. €). The Federal German Ministry of Education and Research (BMBF) is funding seven projects in different regions in Germany. The underlying assumption is that global problems such as climate change must be tackled by measures at regional and local level (BMBF 2011; Federal Government 2008a, 60). The objective of KLIMZUG is the development of innovative strategies for adaptation to climate change and related weather extremes in regions. The aim is to integrate the anticipated changes in climate in processes of regional planning and development. There is a second requirement: "The future competitiveness of regions, also in a changing climate, must be ensured. In addition, KLIMZUG is meant to advance the development and use of new technologies, procedures and strategies for adapting to climate change in the regions" (BMBF 2011). Thus, KLIMZUG is supposed to contribute especially to the German High-Tech Strategy on Climate Protection as well as to the NAS. With regard to governance, KLIMZUG mainly pursues network development in regions and their implementation. Regional cooperation networks are intended to pool the scientific, planning, technical and entrepreneurial strengths of the stakeholders involved in a region and to actively establish structures to managing climate change. The networks are thought "to exist and to evolve on a long term basis and thus to strengthen the competitive advantages for future climate conditions" (ibid). The BMBF sees the commitment of local citizens as a condition for the successful implementation of measures for climate change adaptation. For that reason, KLIMZUG emphasizes also educational and capacity building aspects. In addition, partner regions abroad which may already live and manage their affairs under climatic and weather conditions comparable to those being forecasted for Germany in the longer term may cooperate with the KLIMZUG projects. The aim here is to ensure the international know-how transfer: "Germany thus

accentuates its role as a pacesetter and driving force as well as its scientific competence for developing suitable adaptation measures in an international context” (ibid.).

Another research project (KLIWAS – “Impacts of climate change on waterways and navigation - Searching for options of adaptation”), conducted by different agencies (Federal Waterways Engineering and Research Institute, Federal Maritime and Hydrographic Agency, Federal Institute of Hydrology, German National Meteorological Service) examines the effects of climate change on waterways. In addition, the Federal Ministry of Health, the Robert Koch Institute together with the Federal Ministry of the Environment, and the Federal Environment Agency examine vector based and infectious diseases, allergies and humans’ sensitivity towards weather conditions. The Federal Ministry of Food, Agriculture and Consumer Protection together with the Julius Kühn-Institute monitor the spread of selected invasive plants. The Federal Ministry of Food, Agriculture and Consumer Protection is also involved in the preservation of genetic resources in gene databases. By summer 2011 the Federal Agency for Nature Conservation conducts 27 research projects on biodiversity and climate change (Bundesregierung 2011). In general, specific emphasis is set on the integration of up-to-date knowledge on climate (especially future climate scenarios) as basis for the adaptation measures developed under KLIMZUG. Support on this item is given by the German Climate Service Center (CSC) which was established in summer 2009.

2.3 Thematic framework

2.3.1 Problem definitions

With regard to the NAS, the problem definition draws on the increase in mean global temperature and its expected far-reaching consequences. These consequences result from a *vulnerability* of relevant parts of the environment and the society (Federal Government 2008a; 2008b). It has to be taken into account, according to the NAS, that vulnerability to the impacts of climate change varies from one region to another. In addition, there are several uncertainty factors (see above), which go along with many knowledge gaps. And apart from negative impacts, there might also be *opportunities* such as new climatic conditions making it possible to grow new varieties or advantages for the tourism industry (Federal Government 2008a, 15). Adaptation measures “should be cost-effective and commensurate to the risks” (ibid, 7). In the NAS, there is much talk of *resilience*, e.g. “resilient spatial structures” (Federal Government 2008a, 40).

At the same time, the problem definition is not limited to Germany. Rather it also involves a consideration of aspects on the international level. With reference to decisions on the Bali Action Plan (UNFCCC Decision 1/CP.13), the NAS document regards it “necessary to take account of the possible implications for development, migration and security policy that could be associated with the impacts of climate change on developing countries especially affected by the adverse impacts of climate change. These impacts could have considerable negative implications for the achievement of the millennium goals of poverty alleviation and sustainable development” (Federal Government 2008b, 3; cf. Federal Government 2008a, 52ff.). In consequence, and this might be the actual fear, there is the risk of “migratory movements on a regional and supraregional scale”, and “social tensions and destabilisation of society, and to political or possibly religious radicalisation of the population in the countries of origin” (Federal Government 2008a, 53). In sum, the

dominant German framing of adaptation to a relevant degree also involves *migration and security issues* (see also below, ‘scales’). In other programmes further aspects, such as the competitiveness of regions under a changing climate, are strengthened (see above).

2.3.2 Levels and scales

According to the NAS, “to some extent, the federal level can only play a supporting and assisting role” (Federal Government 2008a, 7). This encompasses coordination, advice and – sometimes – fiscal support. At the same time there is a strong emphasis on the *subsidiarity principle* (Federal Government 2008a, 7). Because climate change will have different impacts on Germany’s different regions and economic sectors, “any adaptation measures necessary (...) should be taken at the decision level appropriate to the individual case. In many cases this will be the local or regional level. An important guiding principle here is strengthening individual responsibility” (ibid.).

On the one hand, the NAS itself does not comprise a definite multi-level-governance strategy (Swart et al. 2009, 222). On the other hand, the NAS clearly acknowledges that interregional cooperation is crucial in coping with general problems such as flood risk, water quality or biodiversity issues. As a consequence, several federal measures, including legal standards, have already been taken into consideration (cf. ibid.). Above all, this applies for the realm of spatial planning. The German spatial planning system (in many regards in conjunction with a landscape planning system) plays a crucial role as instruments for multi-level governance; they set out common aims and methods of cooperation and coordination where this appears necessary (ibid.). In detail: Since the amendment of the Spatial Planning Act in 2008, adaptation to climate change is described as one of the principles of regional planning (§ 2 Paragraph 2 No. 6). In July 2011, an amendment to the Building Code came into force adding this principle to construction planning (§ 1 V BauBG). Climate change was also accounted for in the amendment of the Water Resources Act in 2009. Furthermore, every resort, especially in the area of planning and environment is encouraged to check bills for their need to incorporate climate adaptation. Because of the low depth of intervention the federal government plans to table climate adaptation in national standardisation processes (Bundesregierung 2011). Another field of national intervention relates to federally owned real estate, infrastructure (railway transportation, arterial roads) and forests. Infrastructure, especially new constructions in the future, will be assessed in terms of construction methods and materials, or in the case of roads in terms of alternative routes. Technical directives for railway transport including plantations along the railway embankment are supposed to address climate change as well (ibid.).

Within this multi-level planning system, municipalities play a crucial role – in general and with regard to Germany’s adaptation efforts in particular. The instrument to fund municipal mitigation concepts was widened, so that *integrated mitigation and adaptation concepts* are eligible for receiving financial assistance. Further funding measures for municipal adaptation have been announced. Again, the focus lies on networking and education (see above). The same funding program will support selected companies to develop corporate adaptation concepts. Municipal and regional levels are also included via spatial planning *pilot projects* – besides physical development planning and civil protection one of the three key cross-sectional topics according to the adaptation strategy. So called KLIMAMoro projects (model region regional planning) advance spatial development strategies KlimaExWoST (experimental domestic construction and urban development) projects generate strategies for climate-proof urban development from the perspective of urban planning as well as the

real estate business. Both projects regularly publish their results to professional audiences (Birkmann et al 2011; BMVBS/BBSR 2008a-b; 2009a-f; BMVBS 2010a-d; IÖR 2011, KlimaMORO/BBSR, et al. 2011). Since previous studies implied information had been too remote from actual practice (cf. Kropp/Daschkeit 2008, Overbeck, et al. 2008), the aim now is to create target-group oriented information. KLARANet, another pilot project, has generated options for actions to react to specific climate change impacts in the field of regional, town and building planning, construction techniques, urban water management and traffic.

With regard to scale(s), it has already been mentioned that the NAS not only draws on national or regional issues. In its fourth chapter ("Worldwide adaptation – the German contribution"), the scale is widened and adaptation is also framed as an international task. The impacts of climate change are linked to possible implications for development, migration and security policies. According to the NAS, development policy measures should be generally geared to support adaptation strategies in the countries affected (cf. Federal Government 2008a, 51ff).

When it comes to activities on the Laender level, the following can be stated: Of the 16 Laender all have included climate adaptation in one way or another. Four federal states already have own adaptation strategies, at least three states are currently in the phase of setting up a strategy. Seven states do have a climate change impact report or results from climate change impact and adaptation research. Furthermore, five states have addressed climate adaptation within their mitigation concepts or other strategic papers.

2.3.3 Timing and sequencing

Regarding timing the NAS outlined a milestone agenda. Starting with the adoption of the NAS in December 2008 by the German federal cabinet an Interministerial Working Group "Adaptation Strategy" (IWG Adaptation Strategy) was founded in spring 2009. May 2009 saw the kick-off of conferences for the dialogue and participation process for the Adaptation Action Plan. In the meantime this process led to a series of dialogues in 2009 and 2010 resulting in working papers and other documents on education, metropolitan regions, norms and technical rules, insurance industry, civil protection, chemical industry, transport infrastructure, energy industry and coastal protection. The Adaptation Action Plan was adopted by the federal cabinet in late August 2011. The last milestone outlined in the NAS is the IWG's first interim report to both houses of parliament on implementation due in April 2013 (Federal Government 2008a, 63).

The need for further knowledge has led to a promotion of new research projects. On the one hand assessments of future climate change as well as probability statements shall be made more reliable (Bundesregierung 2011). The German National Meteorological Service (DWD) and the Federal Ministry of Education and Research aim to further develop the regional climate models COSMO-CLM and REMO. By working on a climate assessment model system the Federal Ministry of Education and Research aims to create the basis for decadal climate prediction covering a period of up to ten years (MIKlip) (BMBF 2011). Besides improving the predictability of climate change itself research about the impacts and consequences is being funded. An alliance of public authorities (German National Meteorological Service, Federal Agency for Technical Relief (THW), Federal Office of Civil Protection and Disaster Assistance (BBK), Federal Environment Agency (UBA)) will prepare a national cross-sector vulnerability assessment. At the same time an integrated vulnerability assessment connecting climatic and non-climatic changes will be developed. Still, sector specific vulnerability

research will be continued, covering a) human security, b) soil, c) business, industry and SMEs, d) tourism and e) traffic. On the basis of analyses prioritisation of climate change risks adaptation instruments and measures shall be delivered until late 2014. By then, the adaptation action plan will be available. It will also include an indicator based report evaluating the progress of the (political) adaptation process.

The Federal Ministry of the Interior fathoms the possibility of enriching the guidelines for regulatory impact assessment with impacts on adaptation measures.

The Federal level will furthermore develop and test guidelines und decision assistance tools on how to keep up important functions of nature and free spaces for municipalities.

In addition, energy saving laws will consider climate change impacts. Incentives to promote adaptation related investments are possible, however not yet decided. In general, climate adaptation shall find its way into the design of incentives (Bundesregierung 2011).

2.3.4 Modes of governance, instruments

According to Bauer et al. (2011), governments face at least four challenges when developing and implementing adaptation policies: current and future climate change effects cutting horizontally across policy sectors (i) and vertically across different levels of government (ii), the uncertainty of climate change effects (iii), the range of non-state actors being concerned (iv).

ad (i): In order to ensure the integration of climate adaptation issues in other sectors and policies, the German Action plan makes a distinction between *four pillars*. First, there is the broad approach of information provision and of enabling (cf. Bundesregierung 2011, 16ff.). The second pillar aims at modifications of the legislative and norm-related framework by the Federal Government (ibid., 28ff.) (e.g. amendment of the Spatial Planning Act in 2008, amendment to the Building Code, amendment of the Water Resources Act in 2009). In addition, needs of adaptation shall be integrated in support programs; there is explicit talk of economic incentives (ibid., 32). The third pillar names activities which stand in a direct responsibility of the Federal Government, above all the adaptation of public and state-owned infrastructure. Finally, adaptation shall be part of activities on the international level, such as international cooperation, development aid etc. (ibid., 36ff.).

Then, the NAS is linked to the Sustainability Strategy, to the National Strategy on Biological Diversity, to the Strategy on Agro-biodiversity, and to the High-Tech Strategy 2020 (Federal Government 2008b, Bundesregierung 2011).

In institutional terms, an Inter-ministerial working group (IWG adaptation strategy) has been established (cf. Federal Government 2008, 62). It is headed by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

ad (ii): (Note: This part complements chapter 'levels and scales'): In order to integrate adaptation policies across different levels of government several approaches are applied. In general, the framework of different pillars (see above) has far-reaching consequences for aspects of vertical policy integration. In addition to the measures mentioned here, the pre-existing federal conference of the environment ministers ("Umweltministerkonferenz") established a standing commission on adaptation to climate change which involves heads of ministerial directorates from all Laender and the Federal Government (Bauer et al. 2011, 13). The research priority KLIMZUG (see above) can be seen as an approach to facilitate vertical coordination: (selected)

networks and partnerships that are concerned with adaptation planning at sub-national levels are being funded. Finally, the Federal Government (represented by the Ministry of Environment, Nature Protection and Nuclear Safety) conducts regional conferences, focused on special issues such as coastal protection. For example, the first regional conference under the title “Regional Conference Climate Adaptation in Coastal Regions” (2011, March) involved the five concerned Laender and other non-state stakeholders. Further conferences are being planned. The municipal level is also included via spatial planning pilot projects, as already mentioned above. KLIMAMoro projects (model region regional planning) advance spatial development strategies KlimaExWoST (experimental domestic construction and urban development) projects generate strategies for climate-proof urban development from the perspective of urban planning as well as the real estate business (see above).

ad (iii): Like other countries, Germany commissions assessments and studies which are concerned with expected climate change impacts, adaptation needs and options. For example, there has been the research priority KLIMAZWEI (2006-2009). Another research priority initiated by the Federal Ministry for Education and Research (BMBF) deals with social impacts of climate change. In addition, Germany has established new advisory bodies: the Climate Change Impact and Adaptation Competence Centre (KomPass) at the Federal Environmental Agency (UBA) and the Climate Service Centre (CSC, hosted by a Helmholtz centre). KomPass offers a so called Klimalotse (climate pilot), an online guidance tool for adaptation oriented towards local municipalities and SMEs. Tatenbank (deed database), another resource provided by KomPass, is a database of adaptation projects and measures. It can be entered by its users which then present the projects and measures. The scientific expertise gained in these bodies is being integrated in diverse activities (e.g.) of the Adaptation Action Plan. The monitoring and evaluation scheme consists of a first interim report to both houses of parliament (Bundestag, Bundesrat), delivered by the Inter-ministerial working group (see above). In addition, there will be a common indicator scheme for the NAS (cf. Bundesregierung 2011, 23).

ad (iv): Germany has established networks and partnerships that involve not only policy makers but also non-state stakeholders. This applies (e.g.) for the online consultation (Adaptation Action Plan), stakeholder conferences (see above), and the KLIMZUG-programme. In addition, there is a partnership with the German Insurance Association (cf. Bauer et al. 2011, 21).

In sum: with regard to modes of governance applied, the picture is mixed. The network mode of governance dominates, in conjunction with the idea of mutual adaptation through informing, awareness raising and policy learning. The amendments of several legislative frameworks are relevant examples of hierarchical modes as well. In addition, incentives and subsidies are foreseen both in regional programmes and in activities on the international level.

2.3.5 Costs and benefits

The question about the costs and benefits of adaptation has not been answered yet. Hence, the German Action Plan on Adaptation formulates the need for further research on the issue. The NAS presents the following aspects with regard to climate change adaptation:

- the costs and benefits (of possible) impacts of global climate change without adaptation, which depend directly on the scale and speed of future global climate change and its national, regional and local effects,
- the costs and benefits of alternative adaptation methods, and

- the cost of the residual damage (Federal Government 2008a, 63).

Economic analyses shall deliver essential arguments for the prioritisation of adaptation measures and are supposed to consider the costs of financial benefits that could arise for industries or economic sectors as a result of international climate policy agreements or adaptation measures (ibid.).

One key area of the federal government is the development of funding options and investment strategies to fight climate change and take advantage of future market potentials at the same time. Therefore the “Climate Change” Financial Forum (CFI) has been set up involving Germany’s leading financial providers. The idea is to prepare the financial sector for climate change and to prepare the sector for its role in implementing adaptation and mitigation strategies (ibid., 60, Bundesregierung 2011, 25).

Since mid-2011 the BMBF funds projects on the “Economics of Climate Change”. Primarily the funded projects have a strong macroeconomic focus and shall develop adaptation models and measures as well as approaches to estimate the costs, risks and opportunities of carbon-reduced growth and development models for Germany. More generally speaking, the federal government sees funding initiatives as an essential steering instrument to significantly influence investments and land use decisions of actors (Bundesregierung 2011, 32). In order to implement climate change adaptation, the federal government will check existing and future funding initiatives in terms of their relation to adaptation and how adaptation can be integrated into existing initiatives.

The NAS is more concrete with regard to costs for adaptation in developing countries. Here, different estimates of the total financial requirement for adaptation to climate change are referred to (World Bank, Oxfam, UNDP, UNFCCC) (Federal Government 2008a, 51).

2.3.6 Implementation and enforcement

In order to arrange for timely follow-up and implementation, the NAS includes a schedule which sets out the “milestones” of the further (seen from this moment in time: recent) mid-term process, such as the interdepartmental working group in climate adaptation to be appointed or initial stakeholder conferences (cf. Swart et al. 2009, 224).

The Adaptation Action Plan, submitted in August 2011, is the central official tool to implement the NAS. Its aim is to concretise the NAS with specific activities, parts of them taking place in the future. The “architecture” of this plan is based on four pillars (Bundesregierung 2011, 15ff.):

- pillar one: providing knowledge, informing, enabling
- pillar two: modifications of the legislative and norm-related framework (aim: to foster standardisation) by the federal government
- pillar three: activities in immediate responsibility of the federal government, referring to the adaptation of government-owned infrastructure
- pillar four: international responsibility.

In sum, we find a mix of different tools and approaches in order to implement and enforce adaptation (cf. Biesbroek et al. 2010). To a certain and limited degree, the adaptation process shows regulative mechanisms – adaptation policies are binding and implemented immediately. In addition, the federal government commits to further funding. Apart from that, the adaptation strategy follows an approach of soft

enforcement (informing, awareness raising, pilot projects etc.). It should be mentioned that part of the action plan's pillar one is an indicator based report evaluating the progress of the (political) adaptation process. This report will be provided by 2014.²

According to our interviews (cf. Garrelts et al. 2011), many actors wait for further support programmes (especially) by the EU level in order to provide more incentives for adaptation. Open is so far the influence of insurance activities (e.g. Munich Re).

² This approach can also be found in other strategy processes. Already in 2010 a first report on indicators for the national biodiversity strategy has been published. It will be followed by a report on the implementation in 2012.

References

- Bauer, A., Feichtinger, J. & Steurer, R. (2011). *The governance of climate change adaptation in ten OECD countries: Challenges and approaches*. University of Natural Resources and Applied Life Sciences, Department of Economic and Social Sciences: Discussion Paper 1-2011. Vienna.
- Biesbroek, G. R. et al. (2010). Europe adapts to climate change: Comparing national adaptation strategies. In: *Global Environmental Change* 20(3): 440-450.
- Birkmann, J. et al. (2011). *Glossar - Klimawandel und Raumentwicklung ARL*. E-Paper 10. URL: http://www.klimamoro.de/fileadmin/Dateien/Veroeffentlichungen/E-Paper_der_ARL_Nr_10_2.pdf (October 13, 2011).
- BMBF (Federal Ministry of Education and Research) (2010). *Funding Announcement „Ökonomie des Klimawandels“*. URL: <http://www.bmbf.de/foerderungen/14682.php> (October 13, 2011).
- BMBF (2011). Funding Announcement MiKlip. URL: <http://www.bmbf.de/en/furtherance/13594.php> (October 13, 2011).
- BMBF (2011). *About KLIMZUG*. URL: <http://www.klimzug.de/en/160.php> (October 10, 2011).
- BMVBS (Federal Ministry of Transport, Building and Urban Development) (ed.) (2010a). Regionale Klimamodellierung für Anpassungsstrategien. *BMVBS-Online-Publikation* 07/10 URL: http://www.bbsr.bund.de/cln_032/nn_629248/BBSR/DE/Veroeffentlichungen/BMVBS/Online/2010/DL_ON072010.templateId=raw.property=publicationFile.pdf/DL_ON072010.pdf (October 13, 2011)
- BMVBS (ed.) (2010b). Klimawandelgerechte Stadtentwicklung: Planungspraxis. *BBSR-Online-Publikation* 11/10 (updated version of the BMVBS-Online-Publikation 25/09) http://www.bbsr.bund.de/cln_032/nn_629248/BBSR/DE/Veroeffentlichungen/BMVBS/Online/2010/DL_ON112010.templateId=raw.property=publicationFile.pdf/DL_ON112010.pdf (October 13, 2011).
- BMVBS (ed.) (2011a). Raumentwicklungsstrategien zum Klimawandel. *Moro Informationen* 7/3. http://www.klimamoro.de/fileadmin/Dateien/Veroeffentlichungen/MORO-Info_7-3_Webversion_barrierefrei.pdf (October 13, 2011).
- BMVBS (ed.) (2011b). Querschnittsauswertung von Status-quo Aktivitäten der Länder und Regionen zum Klimawandel. *BMVBS -Online-Publikation* 17/11 http://www.bbsr.bund.de/cln_032/nn_629248/BBSR/DE/Veroeffentlichungen/BMVBS/Online/2011/DL_ON172011.templateId=raw.property=publicationFile.pdf/DL_ON172011.pdf (October 13, 2011)
- BMVBS (ed.) (2011c). *Urbane Strategien zum Klimawandel. Dokumentation der Auftaktkonferenz 2010 zum ExWoSt-Forschungsfeld*. BMVBS-Sonderveröffentlichung. Berlin.
- BMVBS (ed.), 2011d). Ursachen und Folgen des Klimawandels durch urbane Konzepte begegnen Forschungen. *Heft* 149, Hrsg.: BMVBS, Berlin. http://www.bbsr.bund.de/cln_032/nn_21272/BBSR/DE/Veroeffentlichungen/BMVBS/Forschungen/2011/Heft149_DL.templateId=raw.property=publicationFile.pdf/Heft149_DL.pdf (October 13, 2011).
- BMVBS & BBSR (Federal Ministry of Transport, Building and Urban Development & Federal Institute for Research on Building, Urban Affairs and Spatial Development) (2008a). Raumentwicklungsstrategien und Klimawandel. Dokumentation der Fachtagung am 30. Oktober 2007 im Umweltforum Berlin. *BBSR-Online-Publikation* 11/08. URL:

- http://www.bbsr.bund.de/cln_032/nn_23582/BBSR/DE/Veroeffentlichungen/BBSROnline/2008/DL_ON112008.templateId=raw.property=publicationFile.pdf/DL_ON112008.pdf (October 13, 2011).
- BMVBS & BBSR (ed.) (2008b). Vorstudie zur wissenschaftlichen Vorbereitung der Modellvorhaben 19/08. *BBSR-Online-Publikation* 19/08. http://www.bbsr.bund.de/cln_032/nn_23582/BBSR/DE/Veroeffentlichungen/BBSROnline/2008/DL_ON192008.templateId=raw.property=publicationFile.pdf/DL_ON192008.pdf (October 13, 2011).
- BMVBS & BBSR (ed.) (2009a). Entwurf eines regionalen Handlungs- und Aktionsrahmens Klima-anpassung („Blaupause“). *BBSR-Online-Publikation* 17/09 http://www.bbsr.bund.de/cln_032/nn_23582/BBSR/DE/Veroeffentlichungen/BBSROnline/2009/DL_ON172009.templateId=raw.property=publicationFile.pdf/DL_ON172009.pdf (October 13, 2011).
- BMVBS & BBSR (ed.) (2009b). Ursachen und Folgen des Klimawandels durch urbane Konzepte begegnen. Skizzierung einer klimawandelgerechten Stadtentwicklung. *BBSR-Online-Publikation* 22/09. URL: http://www.bbsr.bund.de/cln_032/nn_23582/BBSR/DE/Veroeffentlichungen/BBSROnline/2009/DL_ON222009.templateId=raw.property=publicationFile.pdf/DL_ON222009.pdf (October 13, 2011).
- BMVBS & BBSR (ed.) (2009c). Klimawandelgerechte Stadtentwicklung. Wirkfolgen des Klimawandels. *BBSR-Online-Publikation* 23/09. http://www.bbsr.bund.de/cln_032/nn_23582/BBSR/DE/Veroeffentlichungen/BBSROnline/2009/DL_ON232009.templateId=raw.property=publicationFile.pdf/DL_ON232009.pdf (October 13, 2011).
- BMVBS & BBSR (ed.) (2009d). Klimawandelgerechte Stadtentwicklung. Leitbilder und Instrumente. *BBSR-Online-Publikation* 24/09. URL: http://www.bbsr.bund.de/cln_032/nn_23582/BBSR/DE/Veroeffentlichungen/BBSROnline/2009/DL_ON242009.templateId=raw.property=publicationFile.pdf/DL_ON242009.pdf (October 13, 2011).
- BMVBS & BBSR (ed.) (2009e). Klimawandelgerechte Stadtentwicklung: Planungspraxis. *BBSR-Online-Publikation* 25/09. URL: http://www.bbsr.bund.de/cln_032/nn_23582/BBSR/DE/Veroeffentlichungen/BBSROnline/2009/DL_ON252009.templateId=raw.property=publicationFile.pdf/DL_ON252009.pdf (October 13, 2011).
- BMVBS & BBSR (ed.) (2009f). Klimawandelgerechte Stadtentwicklung. "Climate-Proof Planning". *BBSR-Online-Publikation* 26/09. http://www.bbsr.bund.de/cln_032/nn_23582/BBSR/DE/Veroeffentlichungen/BBSROnline/2009/DL_ON262009.templateId=raw.property=publicationFile.pdf/DL_ON262009.pdf (October 13, 2011).
- Bundesregierung (2011). Aktionsplan Anpassung der Deutschen Anpassungsstrategie an den Klimawandel vom Bundeskabinett am 31. August 2011 beschlossen. Berlin.
- Federal Government, (2008a). *German Strategy for Adaptation to Climate Change*. Berlin. URL: <http://www.bmu.de/english/climate/downloads/doc/42841.php> (October 10, 2011).
- Federal Government (2008b). *German Strategy for Adaptation to Climate Change, adopted by the Federal Cabinet on 17 December 2008*. Executive summary. URL: http://www.bmu.de/files/english/pdf/application/pdf/das_zusammenfassung_en.pdf (October 10, 2011).
- Garrelts, H., Grothmann, T., Grecksch, K., Wings, M., Siebenhüner, B. & Flitner, M. (eds.) (2011). Vulnerabilität und Klimaanpassung: Herausforderungen adaptiver Governance im Nordwesten Deutschlands. *Nordwest2050-Bericht*, Bremen/Oldenburg, appearing.

- Garrelts, H. & Lange, H. (2011). Path dependencies and path change in complex fields of action. Climate adaptation policies in Germany in the realm of flood risk management. *Ambio* 40(2), 200-209.
- IÖR (Leibniz Institute of Ecological Urban and Regional Development) (2011). Risiken des Klimawandels. Neue Aufgaben für Städte und Regionen. *IÖR-Info* 46. http://www.klimamoro.de/fileadmin/Dateien/Veroeffentlichungen/IOERinfo_Heft46.pdf (October 13, 2011).
- Karcmarzyk, A. & Pfriem, R. (eds.) (2011). *Klimaanpassungsstrategien von Unternehmen*. Marburg: Metropolis.
- KlimaMORO & BBSR et al. (2011). Thesenpapier: Bilanzworkshop am 7. Juni 2011. Hamburg.
- Kropp, J. P. & Daschkeit, A. (2008). Anpassung und Planungshandeln im Licht des Klimawandels. *Informationen zur Raumentwicklung* 6/7: 353-362.
- Lange, H. & Garrelts, H. (2007). Risk Management at the Science–Policy Interface: Two Contrasting Cases in the Field of Flood Protection in Germany. *Journal of Environmental Policy & Planning* 9(3-4), 263-279.
- Overbeck G., Hartz, A. & Fleischhauer, A. (2008). Ein 10-Punkte-Plan "Klimaanpassung". Raumentwicklungsstrategien zum Klimawandel im Überblick. *Information zur Raumentwicklung* 6/7: 363-380.
- Schrage, D. (ed.) (2005). *Die Flut. Diskursanalysen zum Dresdner Hochwasser im August 2002*. Münster: Monsenstein und Vannerdat.
- Swart, R. et al. (2009). *Europ Adapts to Climate Change. Comparing National Adaptation Strategies*. Helsinki: PEER Report No. 1.

3 UK Adaptation Policy

Tim Rayner, Tyndall Centre for Climate Change Research, University of East Anglia

3.1 Introduction

In the coming decades, the UK is expected to have to adapt to impacts from climate change including warmer and wetter winters and hotter, drier summers, and a higher incidence of extreme weather events, including flooding, the effects of which will become increasingly costly (DEFRA 2009, Environment Agency 2009). While summer heat waves will adversely affect human health, there will be fewer deaths due to winter cold. Biodiversity and crop yields also stand to be affected (DEFRA 2008). The UK is also likely to experience indirect effects from impacts in other parts of the world, such as changes in the security and the supply of food and raw materials, political stability, and patterns of migration (Foresight 2011a, 2011b).

The Climate Change Act 2008, by which the UK became the first country in the world to have legally binding long-term emission reduction targets, also created a framework for building capacity to adapt to climate change. Its provisions included:

- a UK wide climate change risk assessment to take place every five years (the first by 2012);
- a Statutory National Adaptation Programme to be in place by 2012 and reviewed every five years to address the most pressing climate change risks to England;³
- a requirement for ‘bodies with functions of a public nature’ and ‘statutory undertakers’ (e.g. water and energy utilities) to report to government on what they are doing to address the risks posed by climate change to their work.

Tompkins *et al.* (2010: 634) refer to the UK’s approach as a ‘top-down risk-based adaptation strategy’. The Act also created an Adaptation Sub-Committee (ASC) of the Committee on Climate Change as a source of independent expertise and scrutiny, advising on the risks and opportunities that climate change will bring and monitoring progress in preparing for these impacts.

These new arrangements build on the UK’s cross-governmental *Adapting to Climate Change Programme* (ACC), based in the Department for Environment, Food and Rural Affairs (DEFRA 2008). The Programme leads work across Government to prepare for climate change, including coordinating and driving the delivery of Departmental Adaptation Plans, in which ministries report on how they are assessing and managing climate-related risks (NAO 2009). The first of these appeared in April 2010.

This paper applies the analytical framework suggested by the *Knowledge for Climate* programme to recent development of adaptation policy in the UK, including the suggested discussion points under recommended headings. Judgments are necessarily tentative, given that adaptation policy continues to evolve across multiple sectors and levels of governance.

³ Devolved administrations in Scotland, Wales and Northern Ireland have the authority and responsibility over their own adaptation strategies.

3.2 Problem framing/ objective-setting

‘How is the problem that adaptation policies address defined? Is there agreement about the occurrence of climate change and the core purpose of these policies, or is there much disagreement, are alternative problem conceptions discussed?’

The UK, as a relative leader on climate policy among EU member states (Rayner and Jordan 2011), is of course officially committed to preventing global temperature rises above 2°C (an EU commitment since 1996). But given lack of mitigation effort commensurate with achieving such a target, ‘mitigate for 2°C but plan for 4’ has become an increasingly common ‘storyline’ in UK science advisory circles (Randerson 2008; New *et al.* 2011). The implication is that basing adaptation efforts on an assumed 2°C global average change could lead to insufficient effort, a kind of ‘mal-adaptation’.

Much problem framing work will be undertaken under the auspices of the first UK Climate Change Risk Assessment (UK CCRA), due to report in 2012. This aims to capture and delineate the uncertain, diverse and interacting impacts of climate change, and as far as possible to translate these, through metrics for estimating cost, into a method for adjudicating between the potentially enormous range of priorities for adaptation (Webb 2011: 280). This process, however, is not without controversy. As Webb (2011) notes, controversy arises because the technical devices of risk assessment and economic cost-benefit analysis can be interpreted not as providing objective solutions to pre-given problems, but as instrumental in problem definition itself, embodying and ‘naturalising’ certain assumptions about society, social values and political priorities, as well as potentially obscuring or strategically deleting alternatives’ (Webb 2011: 281). Not all stakeholders will accept the framing that emerges:

‘The commensurability of metrics between biophysical and socio-economic spheres and ‘sectors’ entails a leap of faith. Different expert groups use different assumptions about how to model impacts and costs, what methods to use and what timeframes are relevant, with bio-physical scientists using long-term (ecosystem) impacts to devise adaptation strategies, while social scientists focus on social vulnerability (poverty, inequality, skills, economic resources) and threats to societal resilience...’ (Webb 2011: 285).

The Adaptation Sub-Committee of the UK Climate Change Committee expressed its concern in a November 2009 letter to Hilary Benn, then Secretary of State for Environment, Food and Rural Affairs. The consultants, it said, had ‘not yet presented a coherent framework to address the CCRA’s stated objectives’ and the methodology for the Adaptation Economic Analysis was even less developed. The committee also expressed concern about the effectiveness of planned stakeholder participation.

Defining the nature of the problem and objectives that need to be addressed are increasingly the remit of the Adaptation Sub-Committee. In its second report (ASC 2011), the sub-committee has highlighted that ‘assessing national preparedness is challenging, ‘because it is difficult to determine in advance what good adaptation looks like:

- adaptation is context-specific – effective adaptation depends on who is adapting, where they are, their attitude to risk, and how they weigh up other factors in their decisions. The costs and benefits of options vary by location and decision-maker, unlike carbon emissions that have the same cost regardless of where they are emitted (reflected in the carbon price);
- adaptation has no prescribed target – there is no single metric, like tonnes of carbon emitted, against which to assess decisions; and

- uncertainty – about the scale, timing and spatial nature of how the climate might change puts greater weight on flexibility and keeping options open. The benefits of flexibility are harder to evaluate against other, less flexible options that might provide more certain, short-term benefits. ... (ASC 2011: 19)

Nevertheless, from its first annual report (ASC 2010), the Committee has highlighted five adaptation priorities, on the basis that there is scope for low-regret actions or decisions taken today could have significant long-term, systemic consequences for future vulnerability:

- land use planning;
- designing and renovating buildings;
- providing national infrastructure;
- managing natural resources; and
- emergency planning.

In its second annual report, following up on the first three of these, the ASC (2011) said of current and future vulnerability to climate change that:

- The UK is near the limits of coping with the current climate in some sectors and could be pushed over the edge by climate change. For example:
 - While only 8% of water resource zones in England are currently at risk of failing to meet demand during a severe drought, this could increase to around 45% by 2035 without remedial action.
 - Security of water supply for consumers is good and improving, but there remains an environmental cost. The Environment Agency indicates that 11% of rivers and 35% of groundwater aquifers in England are “probably at risk” of environmental damage due to water abstraction.
- Patterns of development are potentially increasing the UK’s vulnerability in some areas.
(see also the section below on implementation and enforcement).

Finally, the UK government is relatively advanced in highlighting the implications of climate change impacts occurring *outside* Europe, which can have important implications for European economies (Biesbroek *et al.* 2010). The UK Foresight office has reported on International Dimensions of Climate Change (Foresight 2011a), and a separate study on Migration and Global Environmental Change examines how profound changes in environmental conditions such as flooding, drought and rising sea levels will influence and interact with patterns of global human migration over the next 50 years (Foresight 2011b).

3.3 Levels and scales

‘How do the national and regional governments see their role in achieving adaptation? How important are European policies in each country and how is the connection with those arranged for?’

3.3.1 National

In their review of National Adaptation Strategies (NASs), Biesbroek *et al.* (2009; 2010) note that most do not clearly specify the roles and responsibilities of regional and local scales. In order to enable lower levels to make effective and efficient adaptation decisions, some national strategies, however, do foresee an important role for the national government to retain responsibility and provide the right institutional settings. In the UK the role of the national scale is to ensure that local governments,

key public authorities and statutory undertakers are taking adaptation actions as well as providing the right institutional environment to enable organisations and individuals to make effective and efficient adaptation decisions (Biesbroek *et al.* 2009). The UK NAS explicitly mentions the removal of any formal or informal barrier that might hinder the development and implementation of adaptation strategies (Biesbroek *et al.* 2010).

3.3.2 Regional

DEFRA established a Local and Regional Adaptation Partnership Board (LRAP) to help local and regional bodies adapt. It aims to facilitate action at a local and regional level by highlighting best practice, enhancing skills, providing toolkits and encouraging joint working between agencies. The Board does not dictate what local and regional bodies should be doing, but collates and shares best practice around the country. DEFRA also funds nine Regional Climate Change Partnerships (RCCP). Each Partnership consists of a range of local stakeholders and works closely with the UK Climate Impact Programme (UKCIP) (for more on which, see section on modes and instruments). They investigate and advise on the impacts of climate change regionally, assessing how this may affect regional economic, social and environmental well-being. They also share experiences and work together on joint projects, like the “Checklist for Development” produced by the East of England, London and the South East through the Three Regions Climate Change Group (Biesbroek *et al.* 2009).

Until early 2009, Regional Assemblies acted as regional statutory planning bodies, scrutinising the work of Regional Development Agencies (and supporting their development of Regional Economic Strategies), while promoting regional strategies such as the Regional Sustainable Development Frameworks (DEFRA 2006). They served as partnership bodies between regional and local stakeholders. Originally created as a potential step towards elected regional government in England, RAs are currently undergoing a process of dissolution. Some of these assemblies were particularly active in regard to climate change (Keskitalo 2010). The South East England Regional Assembly, for example, was noteworthy for its Climate Change and the South East Plan (2007), which served to guide regional and local planners, as well as its mitigation and adaptation implementation plan and a relevant local development framework (Keskitalo 2010). Both the plans were partly developed with national and international expertise from Germany, the Netherlands and Belgium, made available through the region’s involvement in the EU European Spatial Planning: Adapting to Climate Events (ESPACE) project. ESPACE was developed from the outset within the South East Regional Climate Change Partnership and led by regional bodies and the Hampshire County Council. The project addressed adaptation measures in relation to pressure on water resources, flood risks, and other water-related climate change impacts (SEERA 2007).

3.3.3 Local

Until recently, the inclusion within the government’s performance assessment framework (by which the activities of local government are audited) of an indicator on adaptation to climate change arguably constituted an important multi-level steering mechanism (Keskitalo 2010). The National Indicator framework provided ‘the single route through which central government sets priorities for local government’ (DEFRA 2008). National Indicators, including NI 188 for ‘preparing to adapt’, had to be implemented in cooperation between the local authority and local stakeholders under

Local Area Agreements.⁴ NI 188, 'preparing to adapt' was a self-assessed process-based indicator that measured progress on assessing climate risks and incorporating appropriate action into local authority strategic planning. In 2008, nearly one-third of all English LAAs included the new adaptation indicator or took it on as a local target (DEFRA 2008). In part, the incorporation of adaptation into the local performance assessment framework occurred in response to earlier criticisms that without a specific target or indicator, climate change would not be considered a priority by local authorities (Demeritt and Langdon 2004). As discussed in the final section, this framework has been abolished by the post-2009 coalition government.

3.3.4 EU-National

The UK was always encouraging of the EU Commission's Adaptation White Paper as long as it didn't become too prescriptive on how member states should proceed (Rayner and Jordan 2010). Many in the UK policy community suggested that the main role for the EU (Commission) is to ensure adaptation through programme funding: 'we and a lot of other people have said that the single thing the European Union could do is to require [that] anything they put money into should demonstrate they have taken risks of climate change into account' (UKCIP, interview, quoted in Keskitalo 2010).

Regarding the relevance of key EU legislation, such as birds and habitats directives, some UK adaptation policy makers have suggested that they could be interpreted more constructively by national authorities with a view to facilitating adaptation (Acclimatise and Hampshire County Council 2006).

3.4 Timing and sequencing

'Which time horizons are taken into account? Has there been a taboo on adaptation as the emphasis was more on mitigation? Which assumptions are made about the timing of climate impacts, and do current adaptation measures go beyond 'no regret' measures?'

While there may have been a taboo on adaptation in terms of climate diplomacy, where the emphasis has clearly been on achieving mitigation agreements, the UK has treated adaptation more seriously and for longer than most other EU states. The work since its foundation in 1997 of the UK Climate Impacts Programme (UKCIP) to identify and begin to address vulnerabilities interactively with various stakeholders - and the work of the Climate Impacts Review Group (CCIRG 1991; CCIRG 1996) prior to that - testifies to this.

In the adaptation policy realm itself, Tompkins *et al.* (2009, 2010) have attempted to systematically categorise observed adaptation in the UK, and found that most cases were related to capacity-building, rather than implementing actual measures. A previous study by West and Gawith (2005) produced similar results. Whether capacity is being translated into actions is not always easy to detect (Tompkins *et al.* 2009, 2010).

Although this section asks whether current measures go beyond 'no regret', research to investigate this question is on-going (by e.g. the ASC), and in the meantime it is as well to ask how far even no-regret measures are being taken. According to the ASC

⁴ The system included 198 national indicators (NIs) covering a wide range of Government priorities. Local Strategic Partnerships of LAs and other bodies were allowed to select up to 35 NIs for inclusion within their LAAs.

(2011), there are low-regret actions that could be taken now to reduce vulnerability, including measures to improve water efficiency, reduce damages to buildings from flooding, and protect buildings from overheating. Such measures would save householders money even today. However, ASC found only limited evidence of uptake of such measures, particularly in existing homes.

In the water sector, as yet there has been no specific investment to address the impacts of climate change on supply or demand, despite water company plans suggesting that some additional investment is necessary. The ASC warns that sustained absence of additional action to address the impacts of climate change could lead to higher costs in the future or increased risks of water shortages (ASC 2011: 56). It notes that water companies are spending £1.4 billion over the next five years to address potential supply shortfalls arising from non-climate change drivers, such as projected increases in population, but that this figure does not include specific investment to address the additional impacts of climate change on the supply demand balance. Its analysis suggests that many water companies may be neglecting “low-regret” demand management options in favour of more expensive supply side options (ASC 2011). A package of end-of-life water efficiency upgrades such as low-flow taps, showers and toilets, could be installed at no additional cost as they are replaced.

Rising future temperatures and more extreme weather also pose challenges to the built environment, with water stress, heat stress and flooding posing particular threats. Decisions in this sector are long-lasting and may be costly to reverse. However, ASC (2011) found limited evidence that local authorities were factoring in long-term costs when making decisions on the strategic location of new development in their Local Plan.

In 2009, a two-year cross-government project was established to examine and implement solutions to improve the long-term (i.e. 20–90 year timeframe) resilience of new and existing infrastructure in the water, transport and energy sectors. A review undertaken for the project found:

[...] that there is increasing awareness and understanding of the need to adapt to climate change within [the three] sectors. However, this has not generally led to adaptation action, with the focus remaining on mitigation of climate change impacts or short-term contingency planning [...] there is a reluctance to plan for the long term impacts of climate change due to perceived uncertainty associated with the impacts of climate change and the financial risks (URS 2010).

3.5 Modes and instruments

‘To which extent is adaptation seen as a task for government actors, and to which extent are private actors expected to bear their own risks and take care of their own preparation? Is there a ‘change of social contract’ to be expected? As far as a role for the government is seen, which instruments are in the toolkit (communication, regulation, market instruments)?’

Analysis by the lead UK department responsible for adaptation, DEFRA, lists a range of policy instruments that could potentially be deployed.

- *Direct regulation* can help overcome information failures and ensure certain types of actions are undertaken.

- *Market-based measures* such as price, licenses and property rights can create incentives for businesses and individuals to adapt.
- *Research and monitoring programmes* can incentivise research on climate change risks and adaptation technologies, which are likely to be underprovided by the private sector.
- *Information provision* and public engagement on climate change risks and adaptation options can encourage organisations, businesses and individuals to adapt (Cimato and Mullen 2010).

The multi-faceted nature of the adaptation ‘domain’ and the ‘sectors’ it covers makes generalisations regarding the modes and instruments of governance deployed problematic.⁵ It is also not always straightforward to assign particular measures to one of the above headings. Keskitalo, however, provides an overview of the initiatives taken to date in the UK (figure 3.1).

Types of national adaptation initiatives	Initiatives	Year
Framework (strategies and framework legislation)	Climate Bill and Act	2007–2008
	Performance Assessment including NI188	2008/2009
Planning system	ACC Programme (England)	2008
	PPS1 (climate change included)	2005
	PPG25 (flooding)	2001
	Building standards, Treasury Green Book procurement standards	2009
Awareness-raising and stakeholder integration measures	UKCIP	1997
	Regional climate change partnerships	1999–onwards
	LRAP	2009

Figure 3.1 UK government adaptation initiatives. Source: Keskitalo (2010).

3.5.1 Importance of land use planning for adaptation

In land use planning, the dominant mode of governance may be considered to be regulatory.

The planning system is widely seen as a priority area for early adaptation action because it is a primary mechanism for determining how vulnerability to climate change can be managed, particularly in towns and cities (ASC 2011). Done well, land use planning decisions can directly help to increase resilience to climate risks, but done badly they can lock future generations into development pathways that increase vulnerability or will be very costly to maintain or reverse.

Planning policies set out what is expected of development in order for planning permission to be obtained, identifying specific locations or setting criteria for types of locations that are suitable for particular land uses and also stipulating standards for the design of new development. Local authorities also make decisions on individual

⁵ OECD (2008) gives an overview of the kinds of measures that might be applied to different sectors.

planning applications (called ‘development management’), considering national and local planning policies to determine if a development proposal is acceptable. Guidance provided by central Government to local authorities takes the form of Planning Policy Statements. These cover both preparation of local plans and development management, and include reference to various climate risks. Planning Policy Statement 25 (revised 2010) seeks to “*ensure that flood risk is taken into account at all stages of the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at greatest risk*”. The supplement to Planning Policy Statement 1: Planning and Climate Change (2007) contains policy guidance in relation to climate change adaptation, seeking to “*shape sustainable communities that are resilient to and appropriate for the climate change now accepted as inevitable*”. As well as policy guidance, the Planning Act 2008 introduced a statutory obligation for local development plans to incorporate climate change policies.

3.5.2 Other regulatory initiatives

The reporting requirement included in the Climate Change Act is another regulatory measure, potentially an important driver for behavioural and organisational change (EAC 2010). This is described more in the final section on implementation and enforcement.

3.5.3 Information dissemination and awareness-raising for adaptive practices/ Partnership and stakeholder integration methods

The UK Climate Impacts Programme (UKCIP) was established in 1997, based at the Environmental Change Institute at the University of Oxford, to help co-ordinate scientific research into the impacts of climate change, and to help organisations, including the private sector, adapt to those unavoidable impacts. Its remit was ‘to provide information to help decision makers plan their response to the impacts of climate change’ (West and Gawith 2005: 6). Decision makers included not just those in government but also the private sector, trade groups and other interested groups. UKCIP provides tools and ‘wizards’ for regional and local governments and individuals, including information on vulnerabilities and options and government responses (Biesbroek *et al.* 2009, Boyd *et al.* 2011, Keskitalo 2010).

Arguably the most influential role of UKCIP has been to support the production of a succession of climate change scenarios, UKCIP98, UKCIP02 and, most recently, UKCIP09. The aim of these has been to encourage organisations to undertake climate change impact assessments, and to provide a common resource to facilitate such assessments and allow comparisons between sectors and places.

From October 2011, the Environment Agency became the Government’s delivery body in England for advice on climate adaptation, helping key sectors build resilience to the impacts expected from climate change.

3.5.4 ‘Mainstreaming’ in departmental objectives

In addition to building adaptive capacity and delivering adaptive actions, the role of government policy can be framed in terms of mainstreaming adaptation into existing policies, regulatory frameworks and processes (Cimato and Mullan 2010). As noted in the introduction, a central element of the ACC programme has been the development of Departmental Adaptation Plans (DAPs). In March 2010, sixteen Government Departments delivered DAPs, along with the Carbon Reduction Delivery Plans submitted under the terms of the Climate Change Act. These plans set out policies on

climate change adaptation and mitigation respectively and are meant to be complementary.

The DAPs identified individual Departments' policies and priorities in relation to adapting to climate change. These include describing the steps being taken to build skills and knowledge of climate change within Departments, and the work being undertaken to assess the risks to Departmental estates. Each central Government Department produced a short update on their DAPs in May 2011.

In addition, economic guidance used by government to assess spending, investment and policy decisions, as set out in the Treasury's 'Green Book', has been updated. New supplementary guidelines on adaptation have been produced, to include the key factors that could indicate whether climate change is likely to be an important risk, and the type of options that could be used to adapt.

3.5.5 Role of the private sector: Insurance

Insurance is a significant element in adaptation to climate change for two main reasons: first, it enables agents to spread the losses resulting from climate hazards across time, over large geographical areas, and among different social and commercial communities; and second, premiums can provide incentives to adapt and drive behaviour change (OECD 2008).

The UK is one of the few countries to provide flood coverage automatically through property insurance. More severe and extreme events will lead to higher premiums for certain categories of risks, such as flooding. The introduction of risk-based premiums would be efficient on the grounds that they would signal risks in an appropriate way, thus providing incentives to adapt. However, there might be implications for equity, particularly if those who are already vulnerable to climate change cannot afford insurance cover, or are left with uninsurable (and, hence, less valuable) assets (Stern 2006).

The UK government and the insurance industry in effect co-operate to offer flood cover. In 2002, the Association of British Insurers (ABI) agreed a statement of principles with the Government, whereby the industry would continue to provide flood cover as a standard feature of household and small business policies, conditional on the risk of flooding being no greater than once in 75 years. In return, the Government agreed to a set of actions intended to minimise the number of households and small businesses that would not be eligible for cover under this commitment. The agreement runs out in 2013, and insurers have expressed concern about cuts to investment in flood defences implied in the coalition government's Comprehensive Spending Review, and the effect of funding cuts on extending the agreement. Under the spending review, DEFRA took a 29 per cent budget cut, including £110m from planned spending on new flood defences (McCorkell 2011).

3.6 Costs and benefits

Are the potential costs and benefits of adaptation known? How much are they, and who is carrying the burden? Is geographical fairness a consideration?

One conclusion of the Stern Review on the Economics of Climate Change was that more quantitative information was needed on the costs and benefits of adaptation action across the economy (Stern 2006). The Climate Change Risk Assessment aims to fill this gap by assessing the risks and opportunities from current and future climate change. An Adaptation Economic Analysis, which aims to identify the overall costs and

benefits of adaptation to the UK economy, is being undertaken alongside the first Climate Change Risk Assessment. The Government says this work will enable it to: compare the risks of a changing climate with the other pressures it faces; prioritise adaptation policy geographically and by sector; and support the case for resources for adaptation. While distributional effects (inequalities) are certainly relevant in the analysis (Watkiss *et al.* 2009: 2), how far 'fairness' across regions will figure remains to be seen.

In framing its 2010 inquiry into government policy on adapting to climate change, the House of Commons Environmental Audit Committee highlighted two dilemmas that remain in effect unresolved:

- 'How do we define the public liability for climate change in a way that assists those hardest hit by the impacts but simultaneously controls costs, and encourages people and organisations to take responsibility for addressing the risks they face?
- How should the burden of adapting to climate change be shared between the current population, and future generations? For adaptation, there is a genuine dilemma over how to apportion the responsibility fairly across generations' (EAC 2010: 7).

It notes that while some costs, like adapting offices, factories and homes and paying for insurance, fall to businesses and private individuals, the taxpayer will also have to meet higher costs. For example, the Environment Agency has predicted that, to maintain current levels of protection from river and sea flooding, real terms spending on flood defences in England will need to increase from its current level of around £600 million per annum to around £1 billion in 2035. The Environment Agency also reports that from around 2035 to the end of the century, around £7 billion may need to be invested in the Thames estuary's tidal defences.

DEFRA and the Environment Agency want to reduce the proportion of flood defence work funded by central government. In principle, contributions could come from local authorities, businesses (who benefit from improved protection), developers (especially where improved protection enables new development to go ahead) and local people. Contributions from the latter are particularly important where a small number of homes need protection. In recent years the Environment Agency has helped small groups of property owners to develop and jointly fund flood defence schemes (EAC 2010: 16). In the aftermath of costly floods in 2007, the Pitt Review recommended that developers should make a full contribution to the costs of building and maintaining any necessary flood defences (Cabinet Office 2007). Under the Town and Country Planning Act 1990, planning authorities have been able to require developers to make contributions to new infrastructure related to a proposed development, although authorities vary in the use they make of this power.

In its evidence to the EAC, DEFRA claimed that '(e)quity is a key objective of the ACC Programme. Social justice is addressed through practical delivery work, such as the Environment Agency action to promote effective adaptation to coastal erosion in different socio-economic contexts, as well as being systematically embedded in adaptation policy through the Green Book Supplementary Guidance, which promotes equity as one of three essential benchmarks of well designed adaptation. Cross-Government work on Departmental Adaptation Plans will also consider and address the collective impact of Departmental adaptation responses on different communities and groups of vulnerable citizens' (EAC 2010: Ev 123).

The debate on financial compensation has focused on individuals losing their homes due to coastal erosion. The Environmental Audit Committee has highlighted dangers in the current ad hoc approach to the demands of different groups, recommending that the Government should establish broad principles to underpin decisions on assistance for communities badly affected by climate change, including what compensation should be paid to individuals who suffer major loss. 'Clear principles, informed by a public consultation, would help cap taxpayer liability and reduce the uncertainty faced by those suffering major loss about what help they will receive. Clarifying the limits on public liability will make clear who bears what risk and should encourage action by those who are at risk from future climate change impacts' (EAC 2010: 19).

3.7 Implementation and enforcement

'Which organizational structures, procedures and monitoring mechanisms have been put in place to ensure that the goals of adaptation policy are achieved?'

The PEER project has noted how, in order to provide for a regular review, a specific date or time frame can be included in an adaptation strategy and the review assigned to a responsible body. Competent bodies need to be established as permanent institutions and sufficiently equipped with resources and influence. Amongst the countries considered by the project, only Finland, Germany and the UK have set out a time frame for a general revision of their NAS (Biesbroek *et al.* 2010). In the UK (more specifically, England), the Climate Change Act states that once a national adaptation programme has been put into place it must be reviewed by parliament every 5 years, taking into account the updated climate change risk assessment that must also be carried out.

According to Biesbroek *et al.*, effective and efficient monitoring calls for two basic questions to be answered: what has to be monitored (objects and scope) and who has to monitor it (responsibilities)? Therefore, it becomes important that monitoring objects and responsibilities are identified by the NAS or by a subsequent programme of measures. The UK perhaps comes closest to defining a monitoring framework in that a legal mechanism has been established to enable it and the Government is required to report to Parliament on progress being made to tackle climate change risks. There is also an Adaptation Sub-Committee under a broader Climate Change Committee to review the progress of the national adaptation programme and provide independent advice on a national risk assessment. (Biesbroek *et al.* 2010).

As noted in earlier sections, the Climate Change Act 2008 also allows government to require 'bodies with functions of a public nature' and 'statutory undertakers' (e.g. water and energy utilities) to report on what they are doing to address the risks posed by climate change to their work. It is unclear, however, what would happen if government deems the actions being reported inadequate; the Environmental Audit committee urges further legislation in such cases (EAC 2010). In November 2009, DEFRA proposed that around 90 priority organisations should be asked to report in 2010 (of 100,000 potentially covered). Organisations were categorised by DEFRA according to their *vulnerability to climate change, responsibility for national infrastructure, and whether they have comprehensive regulations already in place relating to climate change*. 'Priority reporting authorities' are those which fall within the first two categories and have no existing reporting responsibilities. Government will determine the organisations to be included in the second round of reports, due in 2014 and 2015, after the first Climate Change Risk Assessment (EAC 2010).

3.7.1 Monitoring by the Adaptation Sub-Committee

It is widely recognised that progress is harder to monitor in adaptation than in mitigation, because there is no clear metric, like carbon emissions, and no clear target. Nevertheless, in its first report, the ASC established a framework to help assess progress on adaptation – the ‘adaptation ladder’ (see figure 3.2). Unusually, it focuses on indicators that measure progress towards adaptation *outcomes*, rather than relying on traditional approaches that simply measure the number of adaptation activities.

In its 2nd report, the Committee developed the framework further to identify indicators of progress and apply these in three of its priority areas: land use planning, managing water resources, and designing and renovating buildings. In examining progress made by local authorities, ASC (2011) found that since 2001:

- In almost all of the nine English local authorities studied, development in areas of
- Flood risk had increased, and in four of them the rate of development was higher than across the locality as a whole.
- Three of the four coastal authorities saw an increase in development in areas of
- eroding coastline, and in two of them the rate of development on unprotected coastline was higher than across the authority as a whole.
- The area of hard surfacing increased in five of the six urban authorities studied, primarily at the expense of urban green space, which declined in all six. This is likely to exacerbate surface water flooding risk and the urban heat island effect.
- These increases in vulnerability may have been offset at least to some degree by
- increased investment in flood defences and the greater use of adaptation measures in new homes built.

3.7.2 Local authority performance indicators

NI 188 was a process-driven indicator developed in consultation with the UKCIP, the Local Government Association (LGA), the Environment Agency and the Audit Commission. NI188 was designed to measure progress in preparedness in assessing and addressing the risks and opportunities of a changing climate. All authorities were expected to make an assessment of their performance across all indicators, but they selected only a number to report on as part of their Local Area Agreements. By 2010, only about 35% had chosen to report on NI188, raising questions about relying on this as the central reporting mechanism on adaptation for local authorities (EAC 2010). One of the first acts of the new Coalition Government was to abolish the local government National Performance Framework, including the national indicator set, undermining capacity to monitor progress made on adaptation.

Box ES.1: The three components of the ASC monitoring framework

- **Desired adaptation outcomes** – the top tier represents the results of actions that reduce the costs and damages of climate change and enhance any potential opportunities, for example less damage from flooding or fewer heat-related deaths.
Decision-makers should monitor and evaluate whether the measures are delivering the desired adaptation outcome and, where they are not, assess if alternative measures are required or if the current objectives are still appropriate under a changing climate.
- **Delivery of outcomes** – the rungs of the ladder illustrate increasing levels of adaptation activity by public sector organisations, businesses and individuals to make the UK better prepared. The first rung is raising awareness of adaptation and building capacity, the second rung is considering climate impacts in a structured way in decision making, and the third rung is taking concrete actions that directly reduce risk. In essence, the aim is to move up the ladder from capacity building to making the right decisions and finally to timely action.
- **Policy to enable delivery** – wider government policy will determine to what extent public sector organisations, businesses and individuals move up the ladder and take action to adapt. We need to understand what barriers to action exist and what can be done to overcome them, including removing barriers, providing incentives, and helping the most vulnerable.

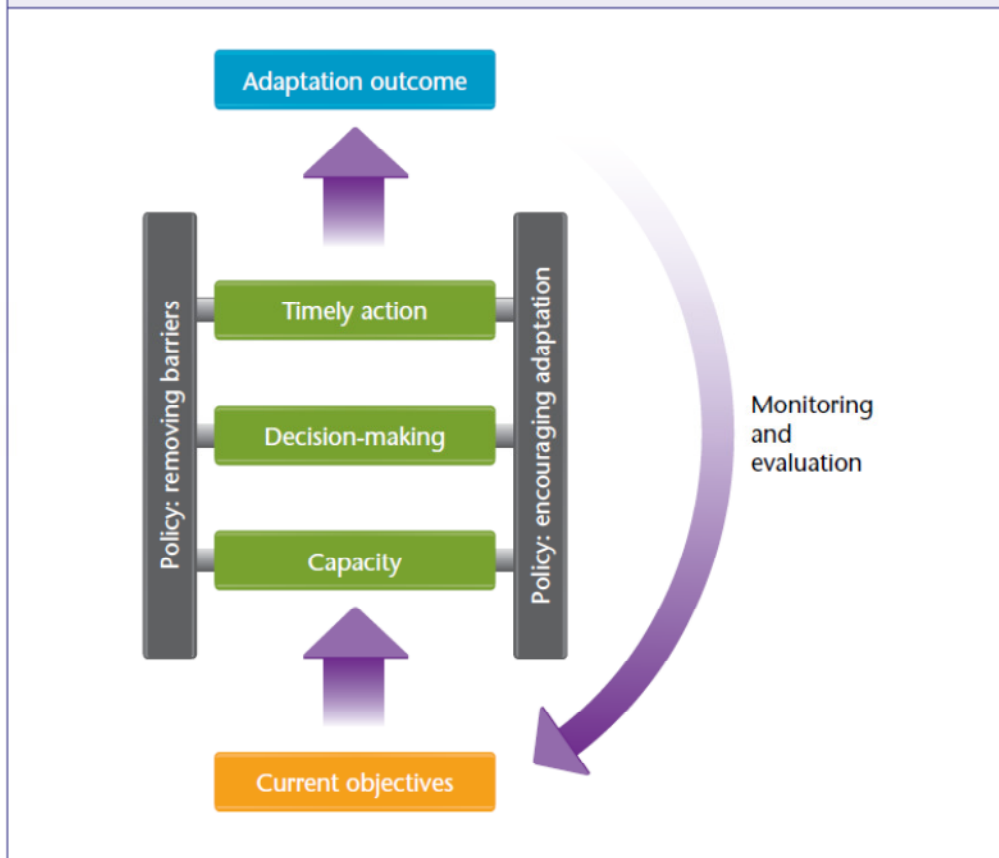


Figure 3.2 Source: Adaptation Sub-Committee (ASC 2010:10).

References

- Acclimatise and Hampshire County Council (2007). *What Policies Present Barriers to Adaptation in the UK and the Netherlands?* ESPACE Project Extension Action 1b: Final report. Southwell: Acclimatise.
- ASC (Adaptation Sub-Committee) (2010). *How well prepared is the UK for climate change?* Committee on Climate Change: London.
- ASC (Adaptation Sub-Committee) (2011). *Adapting to climate change in the UK. Measuring progress.* Adaptation Sub-Committee Progress Report 2011. Committee on Climate Change: London.
- Biesbroek, G. R., Swart, R. J., Carter, T. R., Cowan, C., Henrichs, T., Mela, H., Morecroft, M. D. & Rey, D. (2009). *Europe Adapts to Climate Change: Comparing National Adaptation Strategies.* Partnership for European Environmental Research (PEER): Helsinki.
- Biesbroek, G. R., Swart, R. J., Carter, T. R., Cowan, C., Henrichs, T., Mela, H., Morecroft, M. D. & Rey, D. (2010). Europe adapts to climate change: Comparing National Adaptation Strategies. *Global Environmental Change* 20, 440–450.
- Boyd, E., Street, R., Gawith, M., Lonsdale, K., Newton, L., Johnstone, K. & Metcalf, G. (2011). Leading the UK Adaptation Agenda: A Landscape of Stakeholders and Networked Organizations for Adaptation to Climate Change. In J.D. Ford & Berrang-Ford, L. (eds.), *Climate Change Adaptation in Developed Nations: From Theory to Practice*, Advances in Global Change Research 42. Springer.
- Cabinet Office (2007). *The Pitt Review: Learning lessons from the 2007 floods.* London: Cabinet Office.
- CCIRG (1991). *The Potential Effects of Climate Change on the United Kingdom.* Climate Change Impacts Review Group, Department of the Environment, HMSO.
- CCIRG (1996). *Review of the Potential Effects of Climate Change on the United Kingdom.* Climate Change Impacts Review Group, Department of the Environment, HMSO.
- Cimato, F. & Mullan, M. (2010). *Adapting to Climate Change: Analysing the Role of Government.* Defra Evidence and Analysis Series, Paper 1.
- DEFRA (2006). *Securing the regions' futures. Strengthening delivery of sustainable development in the English regions.* Department of Environment, Food and Rural Affairs: London.
- DEFRA (2008). *Adapting to Climate Change in England: A Framework for Action.* Department of Environment, Food and Rural Affairs: London.
- DEFRA (2009). *Adapting to climate change: UK Climate Projections.* Department of Environment, Food and Rural Affairs: London.
- Demeritt, D. & Langdon, D. (2004). The UK Climate Change Programme and communication with local authorities. *Global Environmental Change*, 14: 325–336.
- EAC (Environmental Audit Committee) (2010). *Adapting to climate change – Sixth Report of Session 2009–10, HC 113.* House of Commons, UK Parliament. <http://www.publications.parliament.uk/pa/cm200910/cmselect/cmenvaud/113/113.pdf>.
- Environment Agency (2009). *Investing for the future. Flood and coastal risk management in England—a long term investment strategy.* Environment Agency: London.
- Foresight (2011a). *International Dimensions of Climate Change. Final Project Report.* The Government Office for Science: London.

- Foresight (2011b). *Migration and Global Environmental Change Final Project Report*. The Government Office for Science: London.
- Keskitalo, C. (2010). Climate Change Adaptation in the United Kingdom: England and South-East England. In E.C.H. Keskitalo (ed.), *Developing Adaptation Policy and Practice in Europe: Multi-level Governance of Climate Change*. Springer: Dordrecht.
- McCorkell, A. (2011). Rise in flood risk could make one million homes uninsurable. Firms warn of effect of government spending cuts on planned defences. *The Independent on Sunday*, 9th January.
- NAO (2009). *Adapting to Climate Change: A Report for the Environmental Audit Committee*. National Audit Office: London.
- New, M., Liverman, D., Schroeder, H. & Anderson, K. (2011). Four degrees and beyond: the potential for a global temperature increase of four degrees and its implications *Phil. Trans. R. Soc. A*. vol. 369 no. 1934: 6-19
- OECD (2008). *Economic Aspects of Adaptation to Climate Change: Costs, Benefits And Policy Instruments*. Organisation for Economic Cooperation and Development: Paris.
- Randerson, J. (2008). *Climate change: Prepare for global temperature rise of 4C, warns top scientist*. <http://www.guardian.co.uk/environment/2008/aug/06/climatechange.scienceofclimatechange>
- Rayner, T. & Jordan, A. (2010). 'Adapting to a changing climate: an emerging European Union policy?', in Jordan, A.J., D. Huitema, H. van Asselt, T. Rayner and F. Berkhout (eds) *Climate Change Policy in the European Union: Confronting the Dilemmas of Mitigation and Adaptation?* Cambridge: Cambridge University Press.
- Rayner, T. & Jordan, A. (2011). 'The United Kingdom: a paradoxical leader', in R. Wurzel and S. Connelly (eds). *The European Union as a Leader in International Climate Change Politics*. Routledge: London.
- RCEP (2010). *Twenty-eighth report: Adapting Institutions to Climate Change*. Royal Commission on Environmental Pollution. HM Government. <http://www.rcep.org.uk/reports/28-adaptation/28-adaptation.htm>.
- SEERA (2007). *Climate Change and the South East Plan. Guide for Planners. Climate Change Mitigation and Adaptation Implementation Plan*. South East England Regional Assembly: Guildford.
- Stern, N. (2006). *Review of the Economics of Climate Change*. H.M. Treasury: London.
- Swart, R., Biesbroek, R. & Binnerup, S. et al. (2009). *Europe adapts to climate change: comparing national adaptation strategies* – PEER report no. 1. Partnership for European Environmental Research: Helsinki.
- Tompkins, E.L., Boyd, E., Nicholson-Cole, S.A., Weatherhead, K., Arnell, N.W. & Adger, W.N. (2009). *An Inventory of adaptation to climate change in the UK: challenges and findings* (Working Paper 135). Tyndall Centre for Climate Change Research.
- Tompkins, E.L., Boyd, E., Nicholson-Cole, S.A., Weatherhead, K., Arnell, N.W. & Adger, W.N. (2010). Observed adaptation to climate change: UK evidence of transition to a well-adapting society. *Global Environmental Change* 20: 627-635.
- URS Corporation Ltd (2010). *Adapting Energy, Transport and Water Infrastructure to the Long-term Impacts of Climate Change: Summary report*. DEFRA: London.
- Watkiss, P., Hunt, A. & Horrocks, L. (2009). *Scoping Study for a National Climate Change Risk Assessment and Adaptation Economic Analysis*. Defra Contract number GA0208. Metroeconomica, AEA group, and Paul Watkiss Associates.

- Webb, J. (2011). Making climate change governable: the case of the UK climate change risk assessment and adaptation planning. *Science and Public Policy* 38(4): 279–292.
- West, C.C. & Gawith, M.J. (eds.) (2005). *Measuring progress: Preparing for climate change through the UK Climate Impacts Programme*. UKCIP: Oxford.

4 The Netherlands

Heleen Mees, Utrecht University

Katrien Termeer, Wageningen UR

Dave Huitema, VU University

4.1 Problem definitions

The Netherlands was long recognized as an ‘environmental leader’ in the context of European Union environmental policies. The leadership was partly fuelled by the Dutch sense of interdependence with other countries, and its geographical location close to the North Sea and at the end of several international rivers. It expressed itself a.o. in an active Dutch role in the development of European and international climate policies. In the starting days, climate change was first and foremost seen as environmental policy (as opposed to water policy, or land use planning policy). Up to today, Dutch environmental policy is a field that revolves around quantified targets for emission reductions, and to that general rule climate change policies are no exception. CO-2 emission reduction target were already expressed in the first National Environmental Policy Plan in 1989, the discourse on *national* climate change policy was very much mitigation orientated and goals were expressed largely as emission reduction tasks. There was some recognition of climate change adaptation as a policy issue in the National Environmental Policy Plan, but this was largely framed as a developing country problem, which explains why the Ministry of Development Cooperation was asked to reserve a certain part of its budget for the implementation of the adaptation goals in the Plan. The resulting task division which can be summarized as ‘mitigation at home, adaptation abroad’, was enmeshed with normative considerations. Nationally, adaptation became a taboo topic as such conservation was seen as a threat to the necessary work on mitigation and thus undermining of the acceptance of the responsibilities the Dutch thought they had. Abroad, the same sense of responsibility meant that the Dutch wanted to be very active in supporting those countries and populations which needed to adapt. This framing of the climate change problematique drove *climate policy* in sensu stricto for around 15 years, roughly from 1990 until the mid 2000s, which is when Dutch climate policy starting addressing the issue of adaptation within the Netherlands as well.

This is however not to imply that nothing happened between 1990 and the mid 2000s. In fact, predictions of climate change effects were seriously taken into account, especially in the water management sector starting in that period already. In this sector, predictions of rising sea levels were the main trigger of concern, and the risks associated with extreme weather events for the water system inland were somewhat overlooked. However, this changed when a government response had to be developed to the (near-) floods of 1993 and 1995 (in the main river area, the centre of the country) and extreme rainfall in 1998 (throughout the country). In each of these cases, the country suffered a major scare and massive societal disruption was the result (see Huitema and Meijerink, 2009). The Netherlands has always had to deal with flood issues; almost 60% of the Netherlands is flood prone due to its location within deltas of the rivers Scheldt, Meuse, Rhine and Ems, and its proximity to the sea; urbanisation is expected to increase the economic value at risk from floods by 100 to 250% in 2040 versus 2000 (PBL, 2010) and climate change is expected to increase existing vulnerabilities. Research shows that climate change in the Netherlands, under certain

extreme scenarios of increased weather variability, will possibly bring new problems to the country, particularly heat stress and droughts. To some degree climate change might also be expected to have certain positive effects, especially for agricultural productivity. The key adaptation challenge for the Netherlands however remains how to deal with increased flood risk from sea level rise, river discharges and increased precipitation patterns.

The Dutch national government has made water an important structuring element in spatial planning; water management has been consolidated on the public agenda due to climate change (van Bommel and Kuindersma, 2008). This has resulted not only in infrastructural programmes for dykes and coastal defences, but also in the so-called 'Space for the Rivers' programme as a more adaptive strategy, which was launched in 1996 after the two (near) flood events in 1993 and 1995 and high levels of precipitation in 1998 (Meijerink and Dicke, 2008; Huitema and Meijerink, 2009). Although very much concerned with achieving long standing safety parameters, the program was innovative in suggesting that forever fortifying dikes would increase long term vulnerabilities, and that instead, more space should be created for the natural flow of rivers by reclaiming land for water retention and overflow purposes at the expense of other land uses, including agriculture.

A period of heightened attention to climate change issues due to the work of Al Gore, an emerging consensus that adaptation would be a necessary element of climate policies even under the best possible international agreements, and events like Hurricane Katrina in 2005 provided important impetuses to the development of a Dutch national adaptation policy. The National Adaptation Strategy (NAS), issued by the Ministry of Housing, Spatial Planning and the Environment (VROM) in 2007 is a case in point; it is referred to as the National Programme for Spatial Adaptation to Climate Change, with the illustrative title 'Make space for Climate!' ('Maak ruimte voor klimaat!')(VROM, 2007a). The NAS emphasises integration of adaptation into other policy sectors, rather than the creation of a new, separate policy area. Not surprisingly, the two main policy sectors considered for integration are water management and spatial planning, as a direct result of the framing of adaptation as a water issue. As a consequence the attention for other adaptation themes is still rather limited (Swart et al., 2009; van Bommel and Kuindersma, 2008).

At the regional and local level the same tendency is witnessed. All 12 provinces regard water safety as the key climate adaptation theme (Frederiks et al., 2011). A study performed in June 2010 among 10 municipalities made clear that increased flood risk most often associated with climate change (Runhaar et al., 2011). Although heat stress is raised as a potential issue by scientists, especially after the heat wave of 2003 (Mulder et al., 2009), and a considerable urban heat island effect has been demonstrated in studies in Dutch cities (Klok et al., 2009), none of the studied municipalities regards heat stress as a really urgent issue. Nevertheless, heat stress is seen as an additional argument for taking no-regret measures that raise urban sustainability in general, such as an increase of green space (Runhaar et al., 2011; Runhaar et al., submitted).

Another aspect worth mentioning is the gradual introduction of the view that climate change raises opportunities for innovation and for improving the environment next to the view that climate change involves risks that need to be reduced with infrastructural measures (Swart et al., 2009). In line with this view the National Knowledge for Climate Research Programme has launched a website and brochure with the title 'Climate as Chance'('Klimaat als Kans'): these give examples of innovative projects which aim to contribute to climate proofing while realising a better living quality at the same time

(KvK, 2010). Again, this positive mind-set was also found in the study among municipalities. In pro-active cities water related adaptation is seen as an opportunity for the introduction of new and innovative measures (such as water plazas, multifunctional dykes, and floating homes), as well as for introducing high quality living environments in the vicinity of water (Runhaar et al., 2011).

4.2 Levels and scales

The aim of the national government is focussed around providing a framework for climate adaptation planning and action at lower levels of government as well as the private sector. The NAS is aimed at securing adaptation action primarily through spatial planning. Furthermore the NAS suggests that the national scale is most relevant for assessment of the vulnerability of the national spatial development plan, for impact assessments related to water issues, and the initiation and financing of national knowledge development programs, such as the Climate Changes Spatial Planning Programme, the Knowledge for Climate Programme, and the Delta Programme. Although the NAS does not specify roles and responsibilities explicitly, it does mention that the regional/local scale is potentially the most suitable scale to bring knowledge, experience and actors together to deal with concrete innovative adaptation projects – leaving a facilitating role for central government (VROM, 2007a). This fits with the dominant role of local and regional governments in spatial planning in line with the view in the Dutch national spatial strategy that you should “centralise what you must, and decentralise what you can” (VROM, 2004; Spaans, 2006, p. 143).

Another national initiative is the second national Delta Commission and Delta Programme, which was set up in 2007 as the successor of the Delta commission created after the severe floods of 1953. Its role is to assess how the Netherlands can be made climate proof by 2050, 2100 and 2200. One of the aims of the new Delta Commission is to develop a Delta Act, in which roles and responsibilities are laid down for water safety and fresh water supply.

The national government has negotiated climate agreements with lower levels of government (with IPO and VNG, the umbrella organisations of the Dutch provinces and municipalities respectively). Both climate agreements suggest that, while central government defines the policy objectives, the lower governments are meant to implement the policy (Swart et al., 2009). In the agreement with the provinces (through IPO), agreements were made to map climate adaptation measures/projects, to take climate adaptation into account in current area developments, to work with the climate scenarios of the Dutch Meteorological Institute for new spatial developments, and to explore the economic opportunities of climate change, amongst others. Although this agreement has generally raised awareness for climate adaptation with provincial governors/policy makers, a recent study indicates that (only) 4 out of 12 provinces have included climate adaptation objectives in their regional spatial strategies ('structuurvisies'); with 5 more planning to do so in the near future (Frederiks et al., 2011). The most important roles the provinces claim for themselves relate to agenda setting and vision forming. The most active provinces see their added value in the integration of adaptation into area developments, in line with their generic role related to integration of various themes at the regional level (Frederiks et al., 2011).

The agreement with the municipalities (through VNG) gives most attention to mitigation (or sustainable development in general). There is one paragraph on climate adaptation, which mentions that municipalities have an important task in spatial planning, water management and health care. Like with the provinces, municipalities

are requested to map adaptation measures. Specifically they are asked to initiate pilot studies which can be linked to the Knowledge for Climate Research Programme (VROM, 2007b). A few empirical studies on local level adaptation activity suggest that generally speaking climate adaptation policy has low priority and limited funding with respect to alternative measures besides those employed in the regular water management operation (Runhaar et al., 2011; van den Berg et al., 2010). Pro-active municipalities are generally those that are relatively vulnerable to flood risk, and grasp climate adaptation measures as a means to improve the urban environment. 'Wait and see' municipalities do not have this sense of urgency because they are less exposed to increased flood risk, and regard other policy issues as more pressing. But even the pro-active municipalities tend to have a strong inclination towards no-regrets measures due to uncertainties about cost and benefits and ambiguities about the costs of taking action now versus the residual risk we are prepared to take (Runhaar et al., 2011). A tendency to develop innovative win-win solutions is described by van Bommel and Kuindersma (2010, p. 105) as a potential disguise for contradictions among policy areas. On top of the general agreement, the national government also negotiated a separate agreement with the four largest Dutch cities, which is referred to as the Alliance R2040.

The balance between responsibilities between central and local governments is somewhat different in the water management domain, as this is a domain where the national government traditionally plays a greater role than in land use planning. The construction and maintenance of coastal defences and the dikes along the main rivers and the country's biggest lake, the IJsselmeer, are all primarily considered national responsibilities. In the regional waters however, the oldest form of government in the Netherlands, the water boards dominate. Traditionally dominated by agricultural interests, these bodies have been implicated in the canalization of countless smaller water bodies, and the tailoring of water bodies to intensive agricultural practices. The management of the water boards has opened up however in the last decade, and various green representatives are now member of the general board and often even the executive boards. The water boards have the authority to tax inhabitants of their domains, and are therefore relatively well funded and able to implement large segments of the national water agenda of making space for water. They are steered in this direction by the provinces who supervise their operations and by various Water Agreements between all government level, and since recently the National Water Plan (2010). Their task is however not made easier by various problems, including forceful societal opposition to projects that claim space for water, the relatively uncertain scientific underpinnings of the new technology for dealing with water risks, difficult discussions about financing responsibilities between the various government levels, and last but not least the conservative approach adopted by many municipalities, who fear damage claims from affected land users and want to make sure that water boards carry the risks of such claims (Huiteima et al. 2003).

Somewhat frustrated with the slow implementation of the existing water agenda, and partly driven by ever more dire climate change impact predictions, the previous national government opted to appoint a so called Delta Commissioner. Named after the Delta programme, the country's response to the disastrous 1953 flood which took until the 1980s to implement, the Delta Commissioner was to develop a national plan for the water challenges ahead (including very prominently climate change), and was to have certain authorities that would pre-empt local governments. The Delta Programme is currently in progress, operating on the basis of a 2009 advice from the Delta Committee, and developing plans for various aspects, including the continued availability of fresh water in periods of drought. The Delta Commissioner is currently

organising consultation processes between national, regional and local government authorities, NGOs and involved citizens in the most vulnerable areas, with the purpose to develop strategic climate adaptation measures and investments.

Table 4. 1 below provides an overview of the way various tasks in Dutch water management are organized.

Table 4.1 Overview of the way various tasks in Dutch water management are organized (based on Ten Brinke et al., 2008).

	Chains and Responsibilities	Description
Risk Management	Pro-action Provinces and Municipalities	Eliminating structural causes of flood accidents and disasters to prevent them from happening in the first place (e.g. adjustments to real estate and infrastructure and relocating houses)
	Prevention National Government (main waters) and Water Boards (regional water systems)	Taking measures beforehand that aim to prevent flood accidents and disasters, and limit the consequences in case such events do occur (e.g. building dams, dikes and storm surge barriers)
Crisis Management	Preparation National Government and Safety Regions (sometimes Water Boards are included)	Taking measures to ensure sufficient preparation to deal with flood accidents and disasters in case they happen (i.e. contingency planning, training and practise)
	Response National Government and Safety Regions	Actually dealing with flood accidents and disasters (e.g. response and calamity teams)
	Aftercare National Government and Safety Regions	All activities that lead to rapid recovery from the consequences of flood accidents and disasters, and ensuring that all those affected can return to 'normal' and recover their equilibrium (including answering the responsibility question and evaluation)

4.3 Timing and sequencing

While water safety has always been a major policy issue for the Netherlands, climate adaptation policy as such was long considered to be a taboo subject, because it was believed to frustrate mitigation efforts. This was the view in the Netherlands and abroad, although the taboo has gradually disappeared in recent years (van Bommel and Kuindersma, 2008; Pielke et al., 2007). Even the NAS document states that the limiting of green house gas emissions is still the preferred approach to adaptation.

The time horizon of the national government tends to be long term, in tandem with a preference for large infrastructural measures (such as dykes). The Delta Commission for instance, looks at water safety and fresh water supply well into the next century. At the local/regional level time horizons are generally shorter. At this level a more adaptive, flexible approach is propagated, which aims to incorporate measures into urban new and re-development cycles. The first empirical studies among municipalities show that those adaptation measures that are planned or implemented in addition to the regular water management type of measures (related to the sewage system) are in fact no-regrets measures, or win-win solutions. They are not meant to be implemented for climate adaptation per se but serve multiple societal benefits, adaptation just being one of them. A typical example of such measures are green roofs, which store and delay discharge of excessive rainwater, as well as contribute to overall urban sustainability. In 2010 ten municipalities in the Netherlands provided a subsidy program to stimulate green roof adoption.

4.4 Modes of governance and instruments

The NAS mentions that the implementation of adaptation measures will be the responsibility of all stakeholders involved. Since many of the anticipated measures are cross-sectoral, the NAS encourages cooperation between governments, businesses, civil society and scientists. Public-private partnerships are explicitly mentioned (VROM, 2007a). Nevertheless, when it comes to water safety issues the (national) government takes primary responsibility: “The state consists of the dikes” (Elzinga et al., 2006). Planning for climate adaptation often appears to be government led at national, regional and local levels (Wilson and Termeer, 2011; Mees and Driessen, 2011; Rietveld, 2010). The same pattern is visible for the provision of fresh water for irrigation, drinking water production, cooling water for power production, etc. A set of interviews with 29 stakeholders recently done (Huitema and Kouwenhoven, 2011) suggests that almost all stakeholders see it as a government responsibility to provide for their water needs, and that they will demand more large scale infrastructural works if climate change should threaten the security of their supply.

To a certain extent public responsibilities can be derived from duties of care in the Dutch Constitution. Article 21 of the Dutch Constitution requires the government to take care of the inhabitability (‘leefbaarheid’) of the country, as well as the protection of the environment. One could interpret this to include a duty for adaptation policy (Driessen et al., 2010; Bruggeman and Peeters, 2008). Similarly, according to the Dutch Water Act of 2008, municipalities have a duty of care for the retention and discharge of rainwater on public ground. From an economic point of view, an active role for governments is envisioned due to free-rider issues and negative externalities (Rietveld, 2010).

The private sector is generally not yet actively dealing with climate adaptation. The Dutch construction sector, a very relevant private stakeholder for making new and re-developments more climate proof, does not yet regard adaptation an issue (Groot et al., 2009). Likewise, a recent study among social housing associations in the Netherlands showed that the majority is not aware of or does not act upon the impacts of climate change (Rodgers et al., 2011). Municipalities cannot mandate developers to build climate proof; there are no prescriptions in the National Building Code regarding adaptation of buildings to climate change. On the other hand, it appears that proactive municipalities do tend to involve relevant private stakeholders in their local adaptation projects (Runhaar et al., 2011). Given the extent of flood risk in the Netherlands, governmental bodies (in the form of water boards and provinces) do have

another regulatory instrument at their disposal to ensure that water issues are taken into account in spatial plans. This is the so-called Water Test, and many claim that this instrument can be expanded to include specific climate related water issues. Sometimes financial incentives are used to stimulate private adaptation action, as the example of the green roof subsidies has demonstrated.

4.5 Cost and benefits

Water management costs for the national water system largely paid for by national taxes. Regional water management paid for by levies from the water boards. Levels vary per category of inhabitant (industry, property owner, farmers, and ordinary residents).

Decisions about acceptable flood risk levels taken in the 1950s, largely motivated by economic worth of various areas. Infrastructure in the West of the country assumed to be able to withstand a 1/10.000 year event. In the North, the infrastructure is weaker and can only withstand 1/1.000 or 1/250 year flood events. The same is true for the main rivers. Such decisions might not be taken so easily and bureaucratically in the current political setting.

Costs of floods are not insurable in the Netherlands. Damages are born by the private sector (own risk), unless the event is declared a national disaster. For such situations, a large fund has been created with hundreds of millions Euros that could be used to help affected parties. There currently is interest in the topic in connection with the possible retreat of the state to certain minimal measures, combined with more transparent risk mapping. The insurance industry is attracted to the potential market and has funded various studies of the idea. The most workable solutions appear to still involve the government as the re-insurance party. Costs of droughts can be insured at present already but there is very little interest as these risks are very unevenly distributed and premiums for those who could use the insurance are prohibitively high.

The Delta Committee advised to organise an adaptation fund specifically for implementing long term strategies for guaranteeing water safety and fresh water supply. The idea was to safeguard this fund from short term motivated policy interventions. However this idea has not been implemented because it is not very popular in times of financial crisis and cutbacks. With a much lower budget the minister challenged the Delta commissioner to develop innovative financial arrangements.

4.6 Implementation and enforcement

Unlike for instance the UK, the Netherlands does not have a specific Climate Act. At the provincial level 7 provinces have integrated the adaptation work into existing sectoral departments or matrix organizations. 5 Provinces have formed a separate adaptation team, with the ultimate aim to make these teams redundant after a certain period of time. In these latter provinces vulnerabilities to climate change are higher, as well as the interest of the provincial governors (Frederiks et al., 2011).

At the municipal level adaptation policy/activity is integrated into other policy domains, such as water management and spatial planning, in line with the NAS. To our knowledge only the municipality of Rotterdam has formed a separate climate adaptation team. At the beginning of 2008 a separate Rotterdam Climate Proof (RCP) team was created, borne out of a group of six municipal officers who had been dealing

with water policy. The most important goal of Rotterdam Climate Proof (RCP) is to ensure that adaptation is considered in every policy division in the city by 2012 and integrated into the municipal planning processes. In order to achieve this RCP is developing the 'Rotterdam Adaptation Strategy' (RAS, 2011), meant to integrate adaptation measures into urban planning at different spatial scales (Mees and Driessen, 2011). The state's paternal role towards guaranteeing water safety may lead to passiveness on the part of the residents (Gupta et al, 2010).

References

- Bommel, van S. & Kuindersma, W. (2008). *Policy integration, coherence and governance in Dutch climate policy. A multi-level analysis of mitigation and adaptation policy*. Alterra report 1799, Wageningen.
- Bruggeman, V. & Peeters, M. (2008). *Exploring governmental and victim responsibilities in view of abrupt climate change in North-Western Europe*. Maastricht University, Faculty of Law. Retrieved from <http://ssrn.com/abstract=1334652>.
- Driessen, P.P.J., Gier, A.A.J. de, Meijerink, S.V., Pot, W.D., Reuding, M.A., Rijswick, H.F.M.W. van, Schueler, B.J., Tennekes, J. & Termeer, C.J.A.M. (2010). *Beleids- en rechtswetenschappelijke aspecten van klimaatadaptatie*. Klimaat voor Ruimte en Kennis voor Klimaat, Utrecht.
- Elzinga, D.J., De Lange, R., Hoogers, H.G. & Van der Pot, C.W. (2006). *Handboek van het Nederlands Staatsrecht*. Kluwer, Deventer.
- Frederiks, G., Duffheus, L. & Opdam, E. (2011). *Provincies en klimaatadaptatie: tussen kennis en gebiedsontwikkeling. Quick scan naar provinciale inzet voor klimaatadaptatie*. Interprovinciaal Overleg (IPO), 9 februari 2011.
- Groot, M.I., Wielders, L.M.L. & Vreede, G.J. van de (2008). *Relatie tussen mitigatie en adaptatie op gebouwniveau; Inventarisatie van tegenstrijdigheden en synergismen*. CE Delft, Delft.
- Gupta, J., Termeer, C., Bergsma, E., Biesbroek, R., Van den Brink, M., Jong, P., Klostermann, J., Meijerink, S. & Nooteboom, S. (2010). *How Dutch Institutions Enhance the Adaptive Capacity of Society*. IC12 Working Document 12, report number W-10/19, Institute for Environmental Studies, Amsterdam.
- Huitema, D. & Kouwenhoven, R. *Wie is aan zet in het zoetwaterbeheer?* IVM/VU Amsterdam, 2011.
- Huitema, D. & Meijerink, S. (2003). Policy dynamics in Dutch water management. In: Huitema, D. & Meijerink, S. (eds.), *Water policy entrepreneurs*. Cheltenham, Edward Elgar, 2009.
- Huitema, D., Goossen, H., van Hemert, P., Bos, L. & Hoekstra, R. (2003). *Functies combineren met water*. IVM/VU, Amsterdam.
- Klijn, F., Kwadijk, J., de Bruin, K. & Hunink, J. (2010). *Overstromingsrisico's en droogterisico's in een veranderend klimaat: verkenning van wegen naar een klimaatveranderingsbestendig Nederland*. Deltares, October 2010.
- Klok, L., Zwart, S., Verhagen, H. & Mauri, E. (2009). *The surface heat island of Rotterdam derived from satellite imagery*. Paper prepared for SENSE Symposium Climate Proofing Cities, 1 December 2009, Volendam, The Netherlands.
- KvK (2010). *Klimaat als Kans. Adaptatie aan klimaatverandering in de ruimtelijke ordening*. Programmabureau Kennis voor Klimaat, September 2010.
- Mees, H.L.P. & Driessen, P.P.J. (2011). Adaptation to climate change in urban areas: Climate-greening London, Rotterdam, and Toronto. *Climate Law* 2(2), 251-280.
- Meijerink, S. & Dicke, W. (2008). Shifts in the Public-Private Divide in Flood Management. *Water Resources Development* 24(4), 499-512.
- Mulder, K.F., Enserink, B. & Salcedo-Rahola, B. (2009) *The neglected effects of climate change*. Paper presented at the 15th International Sustainable Development Research Conference, July 5-8, Utrecht University, Utrecht.

- PBL (2010). *Adaptatiestrategie voor een klimaatbestendige natuur*. Bilthoven: Planbureau voor de Leefomgeving.
- Pielke, R., Prins, G., Rayner, S. & Sarewitz, D. (2007). Lifting the taboo on adaptation. Renewed attention to policies for adapting to climate change cannot come too soon. *Nature* 445(8), 597-598.
- RAS (2011). *De Rotterdamse Klimaatadaptatie Strategie*. See [http://www.rotterdamclimateinitiative.nl/nl/100_klimaatbestendig/projecten/rotterdamse_klimaatadaptiestrategie_\(ras\)?portfolio_id=36](http://www.rotterdamclimateinitiative.nl/nl/100_klimaatbestendig/projecten/rotterdamse_klimaatadaptiestrategie_(ras)?portfolio_id=36)
- Rietveld, P. (2010). Publiek en privaat initiatief bij klimaatadaptatie. *B en M tijdschrift voor beleid, politiek en maatschappij*, themanummer Vormgeving van klimaatadaptatie onder redactie van Arwin van Buuren, Peter Driessen en Geert Teisman 37(1): 29-42.
- Roders, M.J., Straub, A. & Visscher H.J. (2011). Climate change effects on living quality; awareness of housing associations. In J.W.F. Wamelink, R.P. Geraerds, L. Volker (eds.). *MISBE2011 – Proceedings of the international Conference on Management and Innovation for a Sustainable Built Environment*. Delft: Delft University of Technology.
- Runhaar, H.A.C., Mees, H.L.P., van der Sluijs, J., Wardekker, A. & Driessen, P.P.J. (2011). Omgaan met hittestress en wateroverlast in de stad. *Milieu* 2011-2, rubriek milieu dossier, 22-25.
- Runhaar, H.A.C., Mees, H.L.P., Wardekker, J.A., Van der Sluijs, J.P. & Driessen, P.P.J. (under review). *Adaptation to climate change related risks in Dutch urban areas: stimuli and barriers*.
- Spaans, M. (2006). Recent changes in the Dutch planning system. Towards a new governance model? *Town Planning Review* 77: 127-146.
- Termeer, C.J.A.M., Biesbroek, G.R. & Brink, M.A. van den (2011). Institutions for adaptation to climate change: comparing national adaptation strategies in Europe (online first). *European Political Science*, 1-13.
- Van den Berg, M.M., Lafferty, W.M. & Coenen, F.J.H.M. (2010). Adaptation to climate change induced flooding in Dutch municipalities. In: Martens, P. & Ting Chang, C. (Eds.), *The social and behavioural aspects of climate change*. Greenleaf Publishing, Sheffield, pp. 130-156.
- Veerbeek, W., Dijkhuis, L.J., Zevenbergen, C., Buckx, T.H.M., van den Bergh, B.P.J. & Hafkenscheid, R.L.L.J. (nd.) Naar een nieuw klimaat voor klimaatadaptatie. *Nederland Waterland*, 25-28.
- VROM (2007a). *Maak Ruimte voor Klimaat! Nationale adaptatiestrategie. De beleidsnotitie*. Ministry of Housing, Spatial Planning and the Environment, The Hague.
- VROM (2007b). *Klimaatakkoord Gemeenten en Rijk 2007 – 2011: Samen werken aan een klimaatbestendig en duurzaam Nederland*. Ministry of Housing, Spatial Planning and the Environment, The Hague.
- VROM (2004). *Nota Ruimte*. Ministry of Housing, Spatial Planning and the Environment, The Hague.
- Wilson, E. & Termeer, C. (2011). Governance of climate change adaptation: Introduction to the Special Issue. *Climate Law* 2: 149-157.