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The governance of climate change adaptation in ten OECD countries: Challenges and approaches

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Abstract

The governance of climate change adaptation gained increasing attention among both policy makers and researchers in recent years. Nevertheless, it is still largely unclear how governments aim to develop and implement adaptation policies. This paper takes stock of respective governance approaches at the national level in ten OECD countries. It first introduces four governance challenges that play a key role in the literature, i.e. (i) how to better integrate adaptation policies horizontally across policy sectors and (ii) vertically across jurisdictional levels, (iii) how to deal with uncertainties and integrate knowledge in adaptation policy decisions and, (iv), how to involve non-state stakeholders in adaptation decisions. Based on a desk research and a telephone survey, the paper then highlights a plethora of governance approaches the selected governments employ to cope with these four challenges. Overall, it is shown that most governance approaches are restricted to soft, voluntary ways of coordination and steering, and that national adaptation strategies often mark a centre piece around which complex governance setups emerge.

Keywords

adaptation to climate change, adaptation policies, adaptation governance, horizontal integration, vertical integration, knowledge integration, participation.

1. Adaptation to climate change and its governance

After two decades of climate change mitigation policies that failed to curb global greenhouse gas emissions and frequent catastrophic signs of already changed climate patterns in many regions of the world (IPCC, 2007), adapting to these and future changes became an increasingly important policy issue around the world. Although “adjustment in natural or human systems in response to actual or expected climatic changes or their effects, which moderates harm or exploits beneficial opportunities” (IPCC, 2001, 2007) has been the rule rather than the exemption throughout the history of humankind, the adaptation to the impacts of anthropogenic climate change poses new challenges to individuals, organizations and societies. The unprecedented pace of current changes in the world’s climate and the increasing complexity of societies suggest that autonomous, self-regulated societal adaptation alone is not sufficient and that governments have to play an active role (Berkhout, 2005). Consequently, climate change adaptation gained increasing attention among both policy makers and researchers in recent years (Adger, 2003; Adger et al., 2007; Biesbroek et al., 2010; Kahn, 2003; Klein and Smith, 2003).

Public policies on the adaptation to climate change are (or ought to be) concerned with, inter alia, raising awareness, building adequate capacities and helping to put capacities into action (Adger et al., 2005; Nelson et al., 2007), resolving conflicts of interest, reducing external effects that are triggered or reinforced by climate change, and ensuring that public infrastructure withstands future climate impacts. This paper shows how governments in ten OECD countries aim to develop (and implement) such policies in integrated, knowledge-based, and participatory ways. So far, research on climate change adaptation has focused mainly on climate scenarios, observed and expected impacts, and on respective ecological, societal and economic vulnerabilities. Only little systematic research has been done on actual adaptation policies, and even less on *how* these policies are (or ought to be) developed and implemented. With a few recent exceptions (Biesbroek et al., 2010; Hulme et al., 2009; Keskitalo, 2010a) the governance of climate change adaptation is still a blind spot in social science research (IPCC, 2007, 19f; Schipper and Burton, 2009). Although this scholarly gap may be due to the fact that “[t]he governance framework of adaptation is still largely in the making” (Paavola, 2008, 652), it is problematic because not paying attention to the question of how to deliver adaptation policies through adequate governance approaches would inevitably hamper effective adaptation driven by public policies. In this sense, “institutional requirements for adaptation” are also acknowledged as important in facilitating adaptation to climate change in the fourth IPCC assessment report (Adger et al., 2007, 731; Klein et al., 2007).

After describing the methods used (section 2) the present paper addresses this scholarly gap in three steps: Section 3 explores what challenges governments face when developing and implementing adaptation policies. Section 4 then presents the governance approaches ten OECD countries have in place to address these challenges and identifies common patterns and modes of governing. Section 5 compares and discusses the governance approaches across the four challenges for all ten countries. Section 6 provides a concluding discussion. Overall, the present paper goes far beyond national adaptation strategies, one of the few governance approaches that have been researched in depth so far (Biesbroek et al., 2010; Hulme et al., 2009; Keskitalo, 2010a; Massey and Bergsma, 2008; Swart et al., 2009).

2. Methods

The section introducing the four governance challenges is based on a desk research of the policy-oriented adaptation literature (for details see the references in section 3). The stocktaking survey summarised in section 4 combines desk research and a telephone survey. Since it intends to take stock of a preferably broad variety of innovative and politically salient governance approaches in developed countries, we selected ten OECD countries that have been identified as rather active and advanced in the field of adaptation, i.e. Australia, Austria, Canada, Denmark, Finland, Germany, Norway, Spain, the Netherlands, and the United Kingdom.¹ The selection was based on a literature review, advice from a panel of experts,² and a preliminary screening of 19 potentially relevant countries.³ Based on concepts and categories described in an analytical framework (Steurer et al., 2010a), the stock taking started with an analysis of scholarly literature, policy documents, government reports, and websites. In this phase, well documented governance approaches were identified and characterised. In a second step, 22 semi-structured telephone interviews were conducted between July and November 2010 (for the interview guide, see Steurer et al., 2010a). All interviewees played a key role in the adaptation process of their country (in public administration or in key support units), and they were either identified via internet search or recommended by other adaptation experts. The interviews added information on governance approaches found in the desk research, and it revealed additional approaches.

The survey interviews were recorded, and the interview responses were analysed qualitatively together with the desk research findings. The key purposes of the analysis were to group the empirical stock of governance approaches into types with similar characteristics, and to identify patterns and modes of governance that several (or all) governance approaches have in common.

3. Four Governance challenges

Governments face at least four major challenges when developing and implementing adaptation policies: They have to cope with current and future climate change effects that (i) cut horizontally across different policy sectors and (ii) vertically across different levels of government, (iii) are uncertain, and, (iv) concern a broad range of non-state actors who often lack capacities to adapt. By introducing these four 'governance challenges' and by outlining basic modes of governance to address them, this section prepares the conceptual ground for the empirical stocktaking of respective governance approaches presented in section 4.

First, adaptation pressures and responses cut horizontally across the ministerial (or departmental) organisation of governments. The policy fields with high relevance for climate change adaptation include, inter alia, water and coastal management, housing, spatial planning, public health, tourism, public infrastructure, agriculture and forestry (Burton et al., 2006, 6ff, 12; European Commission, 2007; FAO, 2007; OECD, 2008; Yohe et al., 2007). To make complexity worse, most of these policy fields are also relevant for climate change mitigation (Klein et al., 2007) and sustainable development policies

¹ Austria was also selected because later stages of the project are expected to provide policy advice on the governance of adaptation in Austria.

² See <http://www.wiso.boku.ac.at/16381.html>.

³ The countries excluded after the screening were the Czech Republic, France, Hungary, Italy, Japan, South Korea, Portugal, Sweden and the United States.

(Yohe et al., 2007). Thus, governments are called upon to better integrate adaptation policies within and beyond the environmental domain. As the European Commission (2007, 13) puts it in its Green Paper, "Adaptation is largely a question of political coherence, forward planning and consistent and coordinated action". While the adaptation experts (including the authors of the IPCC reports) demand 'climate mainstreaming' (Klein et al., 2007, 768), the environmental and sustainable development policy and governance literature refers to this challenge as 'policy integration' (see European Environment Agency, 2005; Jordan and Lenschow, 2008; Lafferty, 2002, 13; Lenschow, 2002; Nilsson and Persson, 2003; Volkery, 2006). Horizontal policy integration can be achieved with hierarchies, markets or networks. While the hierarchical mode of governance relies mainly on command and control, network governance relies mainly on collaboration among actors with common interests or complementary resources, and the market mode of governance relies on financial incentives (Considine and Lewis, 2003; Donahue, 2004; European Commission, 2001; Gamble, 2000; Kooiman, 2003; Thompson et al., 1991).

Second, adaptation pressures and responses also cut across different jurisdictional levels, from the EU via the national to the provincial and local levels of policy making (European Commission, 2007, 11f; Klein et al., 2007, 747). As Adger et al. (2005, 80) emphasise, "the dynamic nature of linkages between levels of governance is not well-understood, and the politics of the construction of scale are often ignored". Since policy-making at these different levels is not always joined-up and coordinated well, the climate change literature speaks of 'cross-scale interdependencies' that are not matched with adequate 'cross-scale linkages' (Adger et al., 2005, 79f). According to the EU's Green Paper on adaptation, "Multi-level governance is [...] emerging" to achieve a better vertical coordination and integration of policy making across levels of government (European Commission, 2007, 11). As the multi-level governance literature suggests, vertical coordination can be achieved by the three governance modes mentioned above (i.e. by command-and-control in hierarchies, competition in markets, and negotiations in networks), plus by mutual adaptation, e.g. through exchanging information, policy ideas and arguments that entail policy learning (Benz, 2004; Scharpf, 2000; Schimank, 2007).

Third, when developing adaptation policies governments aim to address uncertainties by integrating knowledge in decision making. Thus, science plays an important role in the governance of adaptation, in particular in terms of (a) developing climate scenarios in general, (b) assessing the variations of regional impacts and vulnerabilities in particular, (c) identifying resulting adaptation needs, options and priorities, and, (d) in evaluating the effectiveness of actual adaptation policies (Barnett, 2001; Ford, 2008; Tol, 2005). When integrating scientific knowledge into decision making, researchers and policy makers face not only the problem of uncertainties (and not only with respect to policy options but also regarding the often anticipatory scientific knowledge itself). Moreover, the integration of knowledge in decision-making contexts requires managing complex science-policy(-society) relations. Depending on what counts as expertise or who counts as an expert, how the boundary between science, society and government is understood, and how knowledge and value claims are negotiated, knowledge brokerage approaches can be broadly differentiated into a linear model (characterised by the notion of 'speaking truth to power') or an interactive model of science-policy(-society) relations (characterised by complex interactions between scientists and policy makers) (Jasanoff, 2004, 6; Kevenhörster, 2003; Schützeichel, 2008, 18f). Studies and assessments were considered as governance approaches only if they fulfilled a clearly defined role in the policy making process.

The fourth challenge for adaptation governance concerns the involvement of non-state stakeholders and the broader public in the governance of adaptation. They often have valuable knowledge on and experience with local or sectoral particularities in the context of climate change adaptation. In addition, they are crucial actors in the implementation of adaptation policies and measures. The scholarly literature recognises participation as an important governance response that addresses both normative concepts such as 'procedural justice' (Nelson et al., 2007, 409ff; Paavola, 2008, 650) or good governance (Steurer et al., 2010b) as well as instrumental considerations, stressing that participation can improve and legitimise policy decisions (Fiorino, 1990; OECD, 2008, 66f; Yohe et al., 2007, 832). Participation can assume an informative, consultative or decisional character. The three modes of participation differ concerning the possibilities of stakeholders to contribute their experiences to the policy making process and their decisional power. While informative participation is concerned with informing stakeholders, consultative participation means that stakeholders contribute their expertise to the policy making process, and decisional participation means that policy makers and stakeholders take common decisions (Green and Hunton-Clarke, 2003).

4. Governance approaches in ten OECD countries: Taking Stock

This section provides a comprehensive empirical account of how selected governments address adaptation to climate change across sectoral and territorial domains, how they address uncertainties by integrating knowledge into decision-making, and how they involve stakeholders in policy making. It focuses on governance approaches, i.e. on sophisticated (and often resource intensive) institutions in the sense of organisations, structures or policy making procedures that aim to address one or more of the challenges introduced above. To be effective, governance approaches usually require high-level political commitment. In contrast, smaller scale governance tools (such as guidelines and checklists) are rather simple, less politicized or institutionalized tools (often developed at the national level) that help public administrators (in particular at sub-national levels) to develop adaptation policies. In order to keep the survey focused, the numerous governance tools are mentioned only in the context of vertical integration where they play a key role. Overall, however, neither governance approaches nor tools are ends in themselves. They are means that help to develop and implement adaptation policies which, in turn, aim to steer society or improve public infrastructure (such as roads).

After introducing general policy frameworks and overall responsibilities for adaptation, the following sub-sections highlight governance approaches grouped into similar types and respective modes of governance for each of the four governance challenges described above.

Adaptation to climate change is a young policy field with a history of less than ten years in most of the surveyed countries. The extensive coverage of adaptation in the fourth IPCC assessment report (IPCC, 2007) as well as the publication of the EU's Green Paper (European Commission, 2007, 11) and White Paper on Adaptation to Climate Change (European Commission, 2009) can be regarded as important impulses for stepping up the governance of adaptation (the latter two at least for European countries).

All surveyed countries (aim to) guide governmental adaptation activities with a general policy framework, most often referred to as National Adaptation Strategy (NAS), sometimes also referred to as National Adaptation Plan or National Adaptation Framework (for an overview see table 1). These frameworks all set a non-binding frame for the governance and policy-making of adaptation. Most often,

NAS focus on horizontal coordination by defining cross-sectoral goals and priorities that are relevant for many ministries (the Dutch NAS with its strong focus on water management and physical planning is an exception because only four ministries were involved). Some NAS also facilitate vertical coordination by providing guidance to sub-national jurisdictions (according to interviewees, the Canadian National Adaptation Framework was more helpful for the vertical coordination between the national government, territories and provinces than for the horizontal coordination in Ottawa). As regards the integration of knowledge, NAS often provide first status quo assessments of impacts, vulnerabilities and potential policy options, and many of them also define further research, assessment and evaluation actions. Six of the nine NAS have also established monitoring schemes (for details see section 4.4). Regarding participation, most NAS are/have been developed also based on stakeholder input, and some of them also define the involvement of non-state actors later on (see section 4.5).

The UK government adopted its non-binding adaptation framework in 2008, and complemented it with a binding "Climate Change Act" in the same year. The Act requires the creation of an Adaptation Sub-Committee within the Committee on Climate Change (a scientific advisory body), and it demands that Climate Change Risk Assessments and the National Adaptation Programme have to be renewed every five years, starting with 2012 (Department of Energy and Climate Change, 2009, 87). Furthermore, the Act enables the government to require reporting on adaptation activities by public authorities and statutory undertakers (Department of Energy and Climate Change, 2009, 87). Similarly, the Netherlands intend to establish a legal basis for adaptation in water management (Delta Act).

As Table 1 shows, responsibilities for coordinating adaptation and mitigation policies are located in the same ministry in six of the ten countries: While four of these countries (Austria, Germany, Norway, and Spain) have assigned both climate change mitigation and adaptation policies to their environment ministries, Australia and Denmark have assigned these responsibilities to climate change ministries. In six of the ten countries, the various ministries collaborate closely with other public or semi-public units (such as Environment or Energy Agencies). Since these support units help organising coordination and consultation processes, their roles go well beyond those of the scientific advisory bodies and services described in section 4.4.

Table 1: Policy frameworks and responsibilities for adaptation governance

Country	Policy frameworks: Adaptation strategies* and legal acts** (year of adoption)	Coordination responsibilities (mitigation and adaptation policies*; adaptation only**)	Support units
AU	National Climate Change Adaptation Framework* (2007-2012/14)	Government Department for Climate Change*	
AT	National Adaptation Strategy in development* (planned for early 2012)	Federal Ministry of Agriculture, Forestry, Environment and Water Management, section 'emissions and climate change mitigation'*	Federal Environment Agency
CA	National Climate Change Adaptation Framework (2005)*	Environment Canada*, Natural Resources Canada**,	
ES	National Plan for Adaptation (PNACC) and Working Programme I (2006) *, Working Programme II (2009)*	Ministry of Environment, Land and Sea, Spanish Office on Climate Change (OECC)*	
DE	German Strategy for Adaptation to Climate Change (2008)*	Ministry of Environment*	Climate Service Centre (KomPass) at the Federal Environment Agency
DK	Danish Strategy for adaptation to a changing climate (2008)*	Ministry for Climate Change*	Information Centre on adaptation at the Energy Agency
FI	National Adaptation Strategy (2005)*	Ministry of Forestry and Agriculture**	
NL	<ul style="list-style-type: none"> • National adaptation strategy 'Make room for Climate' (2007)* • Delta programme (2009)* • Delta Act (expected for 2011)** 	Ministry of Transport, Public Works and Water Management** (initially: Ministry of Housing, Spatial Planning and the Environment*)	Delta Programme Commissioner
NO	Klimatilpasning i Norge (2008)*	Ministry of Environment*	Secretariat at the Norwegian Directorate for Civil Protection and Emergency Planning (DSB) under the Ministry of Justice and the Police
UK⁴	<ul style="list-style-type: none"> • Adapting to Climate Change: A framework for Action (2008)* • Climate Change Act (2008)** 	Department for Environment, Food and Rural Affairs (DEFRA)**	UK Climate Impacts Programme (UKCIP)

In the course of elaborating and implementing policy frameworks (such as NAS) and respective policies, the surveyed countries have developed a range of additional governance approaches. The remainder of this section describes them in line with the four governance challenges introduced in section 3, and it analyses what modes of governance these approaches resemble.

4.2 Horizontal integration across sectors

Horizontal coordination approaches are supposed to establish a common national or federal approach to climate change adaptation across different ministries, trigger synergies and avoid trade-offs between sectors. What most of the governance approaches described here actually achieve is the formulation of a common ground, an improved awareness and a first impulse for climate change adaptation in different ministries.

⁴ Adaptation is a devolved issue in the UK. Therefore England, Scotland, Wales and Northern Ireland have their own adaptation policies. Within this paper we refer mainly to the adaptation approaches for England and for the UK as a whole (the latter address mostly on the challenge of knowledge integration).

Governance approaches

In all countries surveyed, the process of developing a national adaptation strategy (NAS) marks the first systematic approach of coordinating adaptation policies horizontally across sectors. Since NAS (are supposed to) play a key role in the governance of climate change adaptation (Biesbroek et al., 2010), all the temporary or institutionalised governance approaches described here are somehow related to the development and/or the implementation of the NAS. Temporary coordination arrangements such as the series of workshops in Austria and Finland or the inter-ministerial working groups in Canada and the Netherlands are linked exclusively to the NAS development and are dissolved once the strategy document is completed. Many of these coordination efforts go hand in hand with stakeholder consultation (see section 4.5).

In all countries but Canada, the formulation and/or the implementation of the NAS is also facilitated by institutionalised coordination bodies. While Austria and Spain broadened the scope of existing coordination units that were originally responsible for mitigation policies only, the seven remaining countries have established new coordination bodies that are exclusively concerned with climate change adaptation. Coordination in some of the institutionalised bodies takes place complementarily at a technical-administrative and at a political level (either in the same or in separate institutions). At the political level, high-level administrators or politicians from different ministries set the overall goals and directions. At the technical-administrative level, public administrators elaborate the details of the NAS and of subsequent policies.

In addition, horizontal coordination is also pursued by integrating adaptation issues in broader policies (e.g. in Australia's policy on the Great Barrier Reef), and/or in other strategies (e.g. in Finland, Germany and the UK). The UK government demonstrates its leading role in the governance of climate change adaptation inter alia with the fact that all departments have compiled a departmental adaptation plan in 2010 (a process guided and coordinated by DEFRA). Moreover, the UK treasury provides guidance on climate change adaptation in a Green Book on policy appraisal.

Table 2: Types and examples of governance approaches addressing horizontal integration

Country	Temporary coordination and consultation for elaborating NAS	Institutionalised coordination bodies (pre-existing* or new**)	Other strategies addressing adaptation
AU	Several intergovernmental ministerial councils	Adaptation Network across the Australian public service for capacity building**	<ul style="list-style-type: none"> Water for the Future Great Barrier Reef Intergovernmental Agreement
AT	<ul style="list-style-type: none"> Series of 'informal workshops' Participation process (workshops with public administrators and non-state actors) 	<ul style="list-style-type: none"> Austrian Kyoto Forum* Inter-ministerial committee on climate change (IMK)* 	
CA	Intergovernmental Climate Change Impact and Adaptation Working Group		
ES		<ul style="list-style-type: none"> Working Group on Impacts and Adaptation** Spanish Coordination Commission of Climate Change Policies (CCPCC)* Inter-ministerial Group on Climate Change* National Climate Council* 	
DE	Preliminary inter-ministerial working group	Inter-ministerial working group (IWG adaptation)**	<ul style="list-style-type: none"> Sustainability strategy, National strategy on biological diversity, (In planning: Strategy on agro-biodiversity)
DK	Preliminary inter-ministerial working group	Coordination Forum for Climate Change Adaptation**	
FI	Series of seminars during the development of the NAS	Finish Coordination Group for Adaptation to Climate Change**	<ul style="list-style-type: none"> Forestry strategy Foresight report
NL	<ul style="list-style-type: none"> ARK steering committee and the ARK programme team Delta Commission 	Ministerial Steering Group of the Delta Programme **	Delta Programme is included in the National Water Plan
NO	Preliminary inter-ministerial coordination team	Inter-ministerial coordination team**	Integration of climate adaptation and disaster risk reduction
UK		<ul style="list-style-type: none"> Adapting to Climate Change (ACC) Programme** DASH-Board** Domestic Adaptation Programme Board** 	<ul style="list-style-type: none"> Departmental adaptation plans (2010) in all departments Climate change Public Service Agreement

Patterns and modes of governance

So far, horizontal coordination efforts have usually peaked during the development of NAS (or similar policy frameworks), and they have often lost momentum (or were deliberately terminated) once these strategies were adopted. In Canada, e.g., horizontal integration was intentionally restricted to the formulation phase of the NAS. Since its completion in 2005, adaptation is pursued by four departments more or less independently from each other. Australian interviewees emphasised that the Australian NAS addresses primarily new areas of collaborative actions and that several other adaptation policies (such as the water reform process 'Water for Future') are conducted independently of the NAS. Even though most countries continue to discuss adaptation policies in inter-ministerial groups once the NAS is adopted, implementation decisions are usually taken in the sectorally organised ministries.

Regarding the relationship of adaptation and mitigation policies, the interviewees acknowledged close linkages but most of them did not see a need to better coordinate the two policy fields, mainly because they see different logics at work: While mitigation policies are perceived as mature, technical matters that have to be governed mostly top-down, adaptation policies are perceived as young, open and rather bottom-up matters.

Although NAS often state responsibilities for particular policies, all governance approaches discussed so far usually follow the network mode of governance: Interactions between ministries (be it in workshops or in inter-ministerial working groups) usually take place on a voluntary basis and allow for networking, negotiation and persuasion among equals who seek consensual solutions. Only the UK and the Netherlands complement their network governance approaches with legal acts that employ the hierarchical mode of governance. Once a NAS is developed, most countries also seem to shift their focus from the national to the regional and local levels of government. This leads us to the next governance challenge.

4.3. Vertical integration across levels of Government

The importance of integrating adaptation policies across different levels of government is widely acknowledged in the surveyed countries. This is because policy makers at the national/federal level are aware that adaptation pressures materialize locally, and that many adaptation activities lie within the responsibilities of sub-national entities such as provinces and municipalities.

Governance approaches

Although horizontal and vertical integration are clearly distinct challenges from an analytical point of view (see section 3), governments often address them jointly. This applies in particular to the temporary coordination and consultation approaches that helped to elaborate the NAS: they all aimed to coordinate policies in different ministries and at different levels of government at the same time. In four of the ten countries, the institutionalised coordination bodies also join representatives from different national ministries and from regional and local levels. In Denmark, for example, sub-national authorities are represented in the national coordination body in order to represent their views at the national level.

Since the need for vertical integration is particularly pronounced in federal states, two of them have institutionalised coordination bodies in place that are exclusively concerned with this challenge: The (pre-existing) Council of Australian Governments (COAG) established a Working Group on adaptation which involves the prime minister of Australia, the first minister of each state and territory, and a representative of the Australian Local Government Association. Similarly, the pre-existing federal conference of the environment ministers ("Umweltministerkonferenz") in Germany established a standing commission on adaptation to climate change which involves heads of ministerial directorates from all Laender and the federal government. Most of the other institutionalised coordination bodies tackle vertical integration jointly with horizontal integration.

Four of the ten countries facilitate vertical coordination also by initiating and (partly) funding networks and partnerships that are concerned with adaptation planning and decision-making at sub-national levels. Since these approaches usually include public administrators, stakeholders and scientists they also address the challenges of knowledge and stakeholder integration.

So far, only the UK and Norway use monitoring and reporting schemes as a mean of vertical integration. The Climate Change Act 2008 enables the UK government to require public authorities at all levels and statutory undertakers to report on how they have assessed the risks of climate change to their work, and what they are doing to address these risks. For this purpose, an indicator on adaptation was added to the National Indicator Set that is part of the Local Government Performance Framework introduced in 2008. It aims “to embed the management of climate risks and opportunities across all levels of services, plans and estates”, and it is “designed to help local authorities assess and address the risks and opportunities presented by a changing climate”.⁵ Similarly, Norway decreed risk and vulnerability analyses for municipalities by law in order to ensure that municipalities involve climate change adaptation into their spatial planning.

Six of the ten surveyed countries facilitate vertical integration also with guidance tools.⁶ Although developed and promoted by national/federal governments, these tools aim to support regional and local governments in assessing vulnerabilities and developing respective adaptation policies. Again, the UK is a frontrunner: Especially the UKCIP has developed a range of tools, such as the local climate impacts profile and a case study database.⁷ Since the remaining four countries were in the process of developing and/or testing similar guidance tools, these smaller-scale arrangements will become standard in the near future.

⁵ <http://www.defra.gov.uk/corporate/about/with/localgov/indicators/ni188.htm>

⁶ The six countries are Australia, Canada, Germany, Denmark, Norway and the UK. The tools are not included in table 3 because it lists governance approaches only.

⁷ <http://www.ukcip.org.uk/>

Table 3: Types and examples of governance approaches addressing vertical integration

Country	Temporary coordination and consultation for elaborating NAS	Institutionalised coordination bodies (jointly with horizontal integration*)	Networks and partnerships	Monitoring and reporting schemes
AU		Council of Australian Governments (COAG): Working Group on Climate Change and Water	Local Adaptation Pathways Program	
AT	<ul style="list-style-type: none"> • Series of 'informal workshops' • Participation process 	<ul style="list-style-type: none"> • Austrian Kyoto Forum* • Inter-ministerial committee on climate change (IMK)* 		
CA	Intergovernmental Climate Change Impact and Adaptation Working Group		Regional Adaptation Collaboratives (RACs)	
ES		<ul style="list-style-type: none"> • Working Group on Impacts and Adaptation* • Spanish Coordination Commission of Climate Change Policies (CCPCC)* • National Climate Council* 		
DE	Consultation procedures in specific sectors	Standing commission on adaptation to Climate Change		
DK		Coordination Forum for Climate Change Adaptation*		
FI	Seminars	Finish Coordination Group for Adaptation to Climate Change*		
NL	ARK steering committee and the ARK programme team	Steering committees of area-based Delta subprogrammes		
NO	Norwegian Commission on Vulnerability and Adaptation to Climate Change		Cities of the Future	Decree on risk analyses (part of the planning and building act 2008)
UK	Consultation on Framework	<ul style="list-style-type: none"> • Adapting to Climate Change Programme (ACC)* • Local and regional adaptation partnership board 	Regional climate change partnerships (RCCP)	<ul style="list-style-type: none"> • Statutory reporting • National Indicator 188

Patterns and modes of governance

The five types of vertical coordination approaches distinguished above and the many examples listed thereunder may convey the impression that the surveyed governments pursue vertical integration more seriously than horizontal integration. To better understand the picture described above, however, the following three nuances have to be considered: First, almost half of the governance approaches listed in table 3 tackle both horizontal and vertical integration. This, in turn, does not mean that horizontal and

vertical integration are necessarily intertwined, on the contrary. When policies are coordinated vertically across levels of government, sectoral boundaries are rarely crossed. In Germany, e.g., representatives from the inter-ministerial working group (the horizontal coordination body) rely on existing sectoral coordination structures (such as the conferences of environment ministers, etc.) to integrate adaptation issues vertically.

Second, the importance of vertical integration varies from country to country, and many of the variations are determined by the political system. While Denmark, Finland, Norway and the UK are unitary states with comparatively strong central governments, Australia, Austria, Canada and Germany are federal states in which sub-national levels hold legislative powers relevant for climate change adaptation (Spain and the Netherlands can be regarded as semi-federal, see Keskitalo, 2010b, 13). In the (semi-)federal states, representatives from sub-national levels are included earlier and more intensively in the governance of climate change adaptation than in unitary states. A key concern of vertical integration in all ten countries is to raise awareness and build capacities for adaptation in municipalities. Thus, municipalities are usually the most important addressees of awareness raising initiatives and guidance tools, irrespective of the political system of a country.

Third, the importance of vertical coordination arrangements is not consistently high throughout the policy cycle of an adaptation policy framework: While horizontal integration seems to peak during the development of a NAS, vertical integration seems to be of higher importance once a NAS is adopted and implemented with concrete adaptation projects. This applies in particular to guidance tools that help to customise the contents of a NAS to regional and municipal needs.

Regarding the governance modes employed in the approaches described above, the picture is mixed. While the network mode of governance dominates temporary and institutionalised coordination approaches, mutual adaptation through informing, awareness raising and policy learning dominates network programmes and guidance tools. These overall soft governance modes are complemented by the UK's statutory reporting and the Norwegian mandatory assessment schemes, both following the hierarchical mode of governance.

4.4 Integrating scientific knowledge in policy making

Governance approaches and tools addressing the production and transfer of scientific knowledge play a key role in adaptation governance in all surveyed countries. They always marked the first steps once adaptation entered the political agenda, and they remained crucial elements of a comprehensive governance of climate change adaptation so far.

Governance approaches

Governments in all surveyed countries commissioned assessments and studies which are usually concerned with (expected) climate change impacts, vulnerabilities as well as risks on the one hand and adaptation needs and options on the other. While their initial focus was on natural science assessments, more recent studies focus on economic assessments of expected economic and social impacts, and they aim to identify, develop and assess respective policy options. Mirroring the IPCC approach, most of these national assessments are conducted by large consortia on an ad hoc basis with the explicit purpose to inform policy makers. Instead of conducting new research these studies usually collected and summarised existing findings. So far, the only institutionalised assessment regime has been established in the UK through the Climate Change Act 2008. It foresees a Climate Change Risk Assessment for the UK that informs the National Adaptation Programme every five years.

Research programmes that aim to inform climate change policies have been set up in all surveyed countries but Denmark. Setting up a research programme is often one of the first policies triggered by a NAS. We found research programmes specifically targeted at climate change adaptation, programmes addressing both mitigation and adaptation, and general research programmes with sub-sections focussing on adaptation.

Scientific advisory bodies and services that provide information, guidance tools and individual advice to policy makers (sometimes also to non-state actors) on a continuous basis are also widespread. Germany, Denmark, Norway and the UK have established new advisory bodies that play a clearly defined role in their adaptation governance. In the UK, the Adaptation Sub-Committee of the Climate Change Committee was established by the Climate Change Act 2008. Joining scientists and other experts on adaptation, the Sub-Committee provides advice on the climate change risk assessment, and monitors and assesses the progress of UK adaptation policies (Adaptation Sub-Committee (2010)). Alternatively to setting up new advisory bodies, some countries also broadened the scope of existing boundary organizations, including meteorological services (Spain, Finland), environmental agencies (Austria, Germany), an energy agency (Denmark), and a civil protection directorate (Norway). The tasks these agencies fulfil are diverse: The Spanish Meteorological Service, for examples, builds the scenarios which form the basis for all adaptation policies and actions in Spain. The Norwegian Directorate for Civil Protection and Emergency Planning is concerned with the practical coordination of climate adaptation and organises courses and seminars for national and local government representatives on a regular basis. The UKCIP develops scenarios and a range of tools that help state and non-state actors to assess their climate change vulnerabilities, needs and options.

All countries also integrate scientific expertise in some of the coordination and/or consultation bodies described in the sections above. In coordination bodies, experts are usually expected to provide input to the development of the NAS, and sometimes also to their operationalisation and implementation later on (e.g. by means of action plans). Countries that involve scientists in consultation processes apply various formats. They e.g. organise seminars (Finland), or they establish networks that facilitate regular exchange between scientists and other stakeholders (the Netherlands).

Finally, six of the ten governments address uncertainties also by establishing monitoring, reporting and/or evaluation schemes that aim to assess the effectiveness of a NAS or of particular adaptation policies. In the UK, e.g., progress in adaptation policy making is assessed by the Adaptation Sub-Committee on a regular basis.

Table 4: Types and examples of governance approaches integrating scientific knowledge

Country	Assessments and studies (year of publication) ⁸	Research programmes (focus on adaptation*, climate change**, wider topic***)	Scientific advisory bodies and services	Coordination bodies (temporary or institutionalised)	Monitoring reporting and evaluation schemes
AU	<ul style="list-style-type: none"> Garnaut Review (2008); National Coastal Risk Assessment (2009), Biodiversity Vulnerability Assessment (2009) 	<ul style="list-style-type: none"> National Climate Change Adaptation Research Facility (NCCARF, 2007-2012/13)* CSIRO Climate Adaptation Flagship (2007-2011)* 	National Climate Change Adaptation Research Facility/NCCARF (hosted by Griffith University)	Regular workshops with national and state administrators organised by NCCARF	Annual reporting within the Department
AT	<ul style="list-style-type: none"> Vulnerability assessments by the environmental agency (2008; 2010) Status quo study (2008) Study - Recommendations for Actions (2008) 	<ul style="list-style-type: none"> Austrian Climate Research Programme (ACRP)** StartClim Global Change Programm (ÖAW) 	<ul style="list-style-type: none"> Environmental agency (vulnerability assessments, participation process) AustroClim 	<ul style="list-style-type: none"> Informal workshops of the BMLFUW include experts One workshop with scientists and policy maker in the course of the participation process 	
CA	<ul style="list-style-type: none"> Climate Change Impacts and Adaptation - A Canadian Perspective (2003) Assessment: From Impacts to Adaptation: Canada 2007 	Climate Change Impacts and Adaptation Programme (CCIAP)*		Experts provided advice to NAF	
ES	<ul style="list-style-type: none"> Assessment: Evaluacion preliminar de los impactos en Espana por Efecto del cambio climatico (2005) 	National Research and Development and Innovation Programme***	Meteorological service (scenarios)	Sectoral workshops planned (implementation)	Monitoring report on activities of regions
DE	Status quo and vulnerability studies (2005)	<ul style="list-style-type: none"> Klimazwei (2006-2009)** Klimzug (2008-2014), regional adaptation research* 	<ul style="list-style-type: none"> Competence centre (KomPass) at the Federal Environment Agency Climate service centre (hosted by a Helmholtz Centre) 	(Through Klimzug and KomPass)	<ul style="list-style-type: none"> IWG's first Interim Report to both houses of parliament (Bundesrat and Bundestag) due in April 2013 Common indicator scheme for NAS
DK	First report commissioned by the Energy Agency (2002/03)		Information Centre on adaptation (hosted by the Energy Agency)	The Coordination Unit for Research in Climate, represented in the Coordination Forum	Coordination forum reports to the government once a year

⁸ This table reflects contracted research only if it has a clearly defined role in the adaptation governance process. In addition, research with a sectoral focus is very common but also not included here.

FI	<ul style="list-style-type: none"> • FinAdapt (2004-2005) • Use of the international assessment of climate change impacts in the Arctic/ACIA (2005) 	<ul style="list-style-type: none"> • Climate Change Adaptation Research Programme ISTO (2006-2010) • Government sectoral research: Climate programme (2010-2011) • Academy of Finland: Climate Programme FICCA (2011-2014) 	<ul style="list-style-type: none"> • Finnish Environmental Institute SYKE • Finnish Meteorological Institute (scenarios) 	<ul style="list-style-type: none"> • Sectoral seminars with experts in the course of the development of the Finnish NAS • Coordination group: research institutes, research financiers 	Evaluation of the NAS in 2008/2009
NL	Assessment of the effects of Climate Change in the Netherlands Routeplanner-Project (2007)	<ul style="list-style-type: none"> • Climate changes Spatial Planning Programme (2004-2011)** • Knowledge for Climate (KfC, 2008-2014)* 	<ul style="list-style-type: none"> • Platform Communication on Climate Change • Netherlands Environmental Assessment Agency 	Knowledge Network Delta Programme	
NO	Pre-study conducted by CICERO, indicating alternative models of organizing adaptation processes (2004)	NORKLIMA (2004-2013)*	Secretariat at Directorate for Civil Protection and Emergency Planning (DSB)	Norwegian Commission on Vulnerability and Adaptation to Climate Change	
UK	<ul style="list-style-type: none"> • Climate change risk assessment (CCRA, every 5 years) • Adaptation Economic Assessment (along with CCRA) 	<ul style="list-style-type: none"> • Living with Environmental Change (LWEC) programme • ARCC • UKCIP 	<ul style="list-style-type: none"> • Adaptation Sub-committee (ASC) of the Climate Change Committee (CCC) • UKCIP (scenarios, tools) 	UKCIP is involved in most coordination bodies and processes, e.g. ACC programme, local and regional adaptation board	<ul style="list-style-type: none"> • ACC Report: How well is the UK prepared for climate Change • Measuring success as the 4th strand of the ACC programme • Statutory reporting • National Indicator 188

Patterns and modes of governance

All approaches described above are expected to produce policy-relevant findings that address the needs of state and non-state actors. Thus, these actors frequently engage in setting research priorities and in (co-)selecting projects (e.g. as representatives in steering committees of research programmes), or in co-shaping single research projects (e.g. as project advisors). When Canada conducted a status-quo assessment in 2007, the research was e.g. guided by an advisory committee consisting of various decision-makers, and state as well as non-state actors discussed the scope, methods and contents of the assessment with the lead authors in several workshops. The strong involvement of decision-makers and stakeholders was due to rather disappointing experiences with the less policy-related research programme CCIAP launched in 2003. Similar trends, leading away from classical research programmes with limited science-policy-society interactions towards more interactive approaches of knowledge production and brokerage can be observed in Australia, the UK, Germany and the Netherlands. The trend towards interactive knowledge production and brokerage implies not only that non-scientists engage in scientific programmes and projects. In most countries, it also implies that scientists (or other experts) are involved in coordination or consultation processes that lead to the formulation of the NAS.

More linear models of science-policy relations can be observed in Austria and Denmark. Here, experts are rather detached from the political process of formulating a NAS and provide input 'from a distance'. In Austria, scientists and other experts first developed adaptation options and recommendations in several sectorally organised workshop rounds. The resulting document then served as an input to the coordination and consultation process involving various federal ministries, provincial administrators and various non-state actors except scientists.

4.5 participation

The participation of non-state stakeholders (and to some degree the general public) in adaptation policy making is recognized as an important challenge in all surveyed countries, mainly for two reasons: First, the interviewees believe that the knowledge of non-state actors improves the substance of policies. Second, they regard participation also as awareness-raising and capacity-building. While some countries (in particular Australia, Austria, Germany, and the Netherlands) have involved stakeholders already in the early phase of formulating adaptation policies, several other countries (e.g. Spain) waited until the implementation of adaptation policies and projects.

Governance approaches

In seven of the ten countries, stakeholders are involved as fellow experts in temporary coordination bodies (e.g. in workshops series) during the development of the NAS. Spain is the only country that involves non-state stakeholders in an institutionalised coordination body alongside local, regional and national administrators, and only three countries (Australia, the Netherlands and the UK) involve non-state stakeholders in institutionalised consultation bodies that have no coordinating function.

Temporary 'stand-alone consultation' on the NAS addressing the broader public took place in all surveyed countries apart from Canada, the Netherlands and Norway. Respective approaches can aim at written statements from targeted organizations and/or individuals, they can be organised as an open internet consultation, or they may be organized as public hearings. The different consultation approaches can take place (successively) at various stages of the adaptation governance process. In Austria, for example, a broad online consultation was employed to gain a first overview on the state of knowledge and perspectives on adaptation when work on the NAS began. Usually, however, the public is consulted at a later stage, e.g. to comment on a draft strategy (like in Spain) or on the draft Action Plan that facilitates the implementation of the NAS (foreseen in Germany for 2011). In Denmark, the NAS was presented and discussed in a public hearing before it was adopted by parliament.

Four countries (Canada, Germany, Norway and the UK) have established networks and partnerships that join not only policy makers from different levels but also non-state stakeholders. The Regional Adaptation Collaboratives in Canada and the Regional climate change partnerships in the UK are prominent examples that aim to share knowledge among local and regional administrative actors as well as non-state stakeholders. Smaller partnerships that join public administrators and experts from insurance companies (mainly concerned with risk evaluation and prevention) exist in Germany and Norway.

Table 5: Types and examples of governance approaches addressing participation

Country	Coordination bodies (temporary* or institutionalised**)	Institutionalised consultation bodies	Temporary 'stand-alone consultation' (of particular stakeholders* or the public**)	Networks and partnerships
AU	Range of workshops*	Stakeholder group advising the Department of Climate Change and the CSIRO Adaptation Flagship	Consultation in developing National Climate Change Adaptation Framework*	
AT	Participation process*		<ul style="list-style-type: none"> • Internet consultation** • Several consultation rounds (draft of NAS)* 	
CA				Regional Adaptation Collaboratives
ES	<ul style="list-style-type: none"> • National Climate Council** • Sectoral workshops (planned for implementation)* 		Public consultation of the PNACC**	
DE	Stakeholder conferences or stakeholder-dialogues*		Online-Consultation (Action Plan on Adaptation - March 2011)**	Partnership with German Insurance Association
DK			NAS presented in a public hearing**	
FI	Sectoral workshops during the formulation of NAS*			
NL	<ul style="list-style-type: none"> • Regional impulse meetings with local authorities and non-state stakeholders* • Joint fact finding (Delta Programme)* 	Delta subprogrammes installed advisory boards who advice the steering committees	Meetings during elaboration of NAS (ARK)*	
NO	Norwegian Commission on Vulnerability and Adaptation to Climate Change*			Partnership between county administrators, municipalities and insurance companies
UK		ACC Partnership Board	Consultation over the Adaptation Policy Framework**	Regional climate change partnerships (RCCP)

Patterns and modes of governance

Most of the surveyed governance approaches aim to consult well-organised interest groups, such as farmers, forestry or insurance associations, or environmental NGOs. While the survey did not cover the plethora of informational participation (usually hard to distinguish from informational policy instruments), not a single case of decisional participation was found. Even when consultation leads to the joint drafting of a NAS the final decision-making rests with policy makers (e.g. the parliament or the council of ministers). This is neither unusual nor problematic. With the exception of written online consultations, participatory approaches usually facilitate some kind of deliberation among policy makers and non-state actors on a level playing field.

The selection of stakeholders is either open or guided by established contacts. However, while online consultations (such as those in Austria, Germany and Spain) are usually open to the public, a closer look reveals that most of the participants are professionals from academia or NGOs. Interviewees interpret this as a lack of awareness and interest among the public (in particular when a consultation is concerned with abstract strategic processes).

5. Comparison across challenges and countries

This section compares the stocktaking findings presented above across the four governance challenges for all ten countries. First, we point out some similarities and varieties in the governance of climate change adaptation. Second, we highlight that many of the governance approaches described above transverse two or more of the challenges addressed here. Finally, we reflect on dominant patterns and modes of governance.

Similarities and varieties in adaptation governance

The development of a policy framework is usually the first and so far most important effort to coordinate adaptation policies horizontally across different ministries in all surveyed countries. Obviously, the development and the implementation of NAS depend on several other governance approaches, such as respective coordination bodies. Vertical integration arrangements, in turn, depend largely on the political system of a country, at least in the early phases of the adaptation policy cycle. While federal states tackle this challenge early on, usually on par with horizontal integration and with more approaches, unitary states hardly involve sub-national actors during the formulation of a NAS. The differences fade and vertical integration becomes an important challenge in all countries once a NAS is adopted. Many of the approaches and tools employed in this later phase support the formulation of adaptation policies at regional or local levels. This pattern is replicated for participation: most of the (federal) countries that involve sub-national administrators early on also involve non-state actors in the formulation of a NAS, usually in the same governance approaches, and often without differentiating between public administrators and non-state stakeholders as two distinct groups of actors. As for vertical integration, participation approaches play similar roles in federal and unitary states once a NAS is adopted. Despite stakeholder participation is often conducted together with the vertical coordination of adaptation policies with sub-national administrators, respective governance approaches are overall scarcest so far.

Although all ten surveyed countries can be regarded as rather active in the governance of climate change adaptation, different levels of activity are nevertheless obvious: The UK and Germany are, for example, by far the most active of the surveyed countries. This qualitative impression gained in the interviews is confirmed by the number governance approaches listed above. Regarding the least active countries the picture is not so clear.

The transverse character of governance approaches

The four challenges introduced in section 3 serve as useful organising categories of the research presented here. Nevertheless, many of the governance approaches described above go obviously beyond single governance challenges. Table 6 summarises all types of governance approaches listed in the tables above, and it shows how they transverse governance challenges. Obviously, policy frameworks, temporary and institutionalised coordination bodies are the most transverse governance approaches that tackle all four governance challenges to varying degrees.

Table 6: Types of governance approaches addressing the four governance challenges

		Governance challenges			
		Horizontal integration	Vertical integration	Knowledge integration	Participation
Governance approaches	Policy frameworks (linked to several of the governance approaches summarised here)	+	+	+	~
	Temporary coordination and consultation for elaborating NAS	+	+	+	+
	Institutionalised coordination bodies (horizontal, vertical, or both jointly)	+	+	+	~
	Other strategies addressing adaptation	+			
	Monitoring, reporting (and evaluation) schemes		+	+	
	Networks and partnerships		+	~	+
	Status quo assessments and studies	~	~	+	~
	Research programmes	~	~	+	~
	Scientific advisory bodies and services	~	~	+	
	Institutionalised consultation bodies			~	+
	Temporary stand-alone consultation			~	+

Legend:

+ : most governance approaches address the challenge extensively

~ : some governance approaches address the challenge to some degree

: Challenge under which governance approaches are described in section 4

The transverse character of the governance approaches can be explicit or implicit. Good examples for explicitly transverse governance approaches are coordination bodies that involve different federal ministries as well as sub-national levels of government. Good examples for implicitly transverse governance approaches are status-quo assessments or research programmes that address not only knowledge on climate change vulnerabilities, impacts, options, etc but that also facilitate the horizontal and vertical integration of adaptation issues by assessing impacts in different sectors and/or at different geographic scales.

Overall, table 6 confirms once again that governments address the challenge of uncertainties and knowledge integration most intensely and participation comparatively extensively. Knowledge and reflexivity play obviously a key role in the climate change adaptation policy field.

Patterns and modes of governing

Most governance approaches described above rely on soft, voluntary forms of coordination or steering, and if governments involve non-state actors in policy-making they consult them usually without sharing decisional power. Since many of the governance approaches aim at raising awareness and building capacities for climate change adaptation in various ministries, at different levels of government, and among various non-state actors, the network mode of governance seems to materialise rather as a mode of mutual adaptation or persuasion than as one of serious political negotiations. Although these very soft forms of network governance have been on the rise in various (environmental) policy fields in recent years (Esmark, 2009; Hysing, 2009), it is nevertheless remarkable that, so far, they play an almost exclusive role in the adaptation policy field (the only exceptions being the legal frameworks in the UK and in Norway). The reliance on soft coordination mechanisms may be due to the facts that adaptation pressures are still relatively moderate, and that the adaptation policy field is still in its infancy stage.

6. Discussion

The present paper has introduced the horizontal and vertical integration of adaptation policies, the integration of scientific knowledge, and of non-state stakeholders in policy making as key challenges in the governance of climate change adaptation, and it has shown that selected OECD countries address them with a plethora of governance approaches, many of them addressing more than one challenge at once. By doing so, the present paper has outlined how the establishment of comprehensive governance setups (consisting of several complementary governance approaches) is under way, and it has shown that the soft network mode of governance (characterised by mutual adaptation, awareness raising and persuasion) has dominated these efforts so far.

While the paper provides an overview of the means governments employ to develop adaptation policies, the question of how good these means are in achieving their ends of shaping adaptation policies (and ultimately also adaptation behaviour) is not addressed. An obvious reason for this limitation is that a stocktaking survey covering 10 countries and about 150 governance approaches can only scratch the surface. If much needed case studies attempt to evaluate the policy relevance of selected governance approaches they will have to overcome two difficulties: first, since most of the 'means' described above were only one or two years old when surveyed, many of them may still be too young for an evaluation of their policy relevance. Second, since most adaptation policies seem to be rather in the formulation than in the implementation phase of the policy cycle, it may also be difficult to find 'mature ends'. As we can learn from other policy fields and strategy processes, proceeding from the policy formulation to the implementation phase of the policy cycle is a serious stumbling block in policy making. The fact that the interviewees frequently mentioned a lack of high-level political commitment and of adequate budgets as key obstacles in adaptation policy making are certainly not helpful in this respect. However, these circumstances as well as the almost exclusive reliance on soft network governance are likely to change quickly once adaptation pressures increase.

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