



Integration

Institutions for Adaptation: Do institutions allow society to adapt to the impacts of climate change?

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Summary



Summary in Dutch

Historisch gezien hebben instituties (formele en informele sociale regels en interactiepatronen) zich altijd ontwikkeld als reactie op sociale problemen, waaronder milieuproblemen. De laatste decennia worden gekenmerkt door toenemende economische ontwikkeling en globalisering, waardoor sociale problemen zich sneller ontwikkelen en onze kennis over deze problemen toeneemt. Belangrijke vraag is: in hoeverre maken instituties een tijdige en effectieve reactie vanuit de samenleving op de gevolgen van klimaatverandering mogelijk? Deze vraag is onderzocht in het Klimaat voor Ruimte onderzoeksproject: Instituties voor Adaptatie.

In het eerste deel van dit onderzoek is het Adaptatiewiel ontwikkeld als een methode om instituties te beoordelen op de mate waarin zij aanpassingen vanuit de samenlevingen bevorderen of belemmeren.

Daarna is met behulp van het Adaptatiewiel de officiële Nederlandse institutionele context geëvalueerd in vier beleidssectoren (natuur, landbouw, water en ruimtelijke ordening). Ook is het Adaptatiewiel toegepast in vier case studies (Individuele Verantwoordelijkheid, Waterveiligheid, Bouwen in Laaggelegen Gebieden en Waddenzee) om informele Nederlandse instituties te beoordelen. Op basis hiervan zijn conclusies getrokken over de bruikbaarheid van het Adaptatiewiel en het aanpassingsvermogen van de Nederlandse samenleving.

Tenslotte zijn algemene aanbevelingen opgesteld over het gebruik van het Adaptatiewiel in toekomstig onderzoek en zijn beleidsaanbevelingen opgesteld om het aanpassingsvermogen in Nederland te vergroten.

Extended summary

Climate change is likely to have serious ongoing impacts on all countries in the world. Historically, institutions have evolved incrementally to deal with socio-ecological problems. They provide continuity rather than change. However, the nature of societal problems is changing as a result of processes of globalisation and development. This raises a critical question: Do our institutions allow society to timely and adequately react to changing conditions caused by climate change?

This question is examined in the Climate changes Spatial Planning research project 'IC12: Institutions for Adaptation'. Three questions identified in this project are:

1. How can the adaptive capacity of Dutch institutions from local through to national level to deal with climate change be assessed?
2. What are the key implications of undertaking such an assessment?
3. What general and specific recommendations flow from such an assessment, both in terms of institutional design theory and in terms of policy?

In the first phase of the project, the research team has developed the Adaptive Capacity Wheel as a methodological tool to assess the extent to which institutions enhance, or hinder, the adaptive capacity of society, as depicted in the figure below.



Effect of institution on adaptive capacity	Score	Aggregated scores for dimensions and Adaptive Capacity
Positive effect	2	1.01 to 2.00
Slightly positive effect	1	0.01 to 1.00
Neutral or no effect	0	0
Slightly negative effect	-1	-0.01 to -1.00
Negative effect	-2	-1.01 to -2.00


In developing this tool, the key concepts used in this research (institutions, adaptive capacity, and the adaptive capacity of institutions) were defined (see 2.1). Adaptive capacity was broken down into six dimensions and twenty-two criteria (see 2.2). A tool was developed to both assess institutions in terms of adaptive capacity as well as to represent the results by using colours indicating high (green) and low (red) adaptive capacity (see 2.3). Finally, a research protocol for applying this wheel was generated (see 2.4).

In the second phase of the project, the Adaptive Capacity Wheel was tested in a comparative content analysis of policy documents that assessed the formal Dutch institutional context in four sectors: spatial planning, agriculture, nature and water (see 3.1) and in four qualitative case studies that assessed the informal Dutch institutional context (see 3.2). The Adaptive Capacity Wheel has also been applied in research outside of this project (see Annex VI).



Based on these applications, in the third phase of the project conclusions have been drawn on the usability of the Adaptive Capacity Wheel as a methodological and communicative tool on the one hand, and on the extent to which Dutch institutions enhance (or hinder) the adaptive capacity of Dutch society on the other hand (see 4.1). This research draws ten conclusions:

- First, the following five trends are visible in the evolution of national adaptation policy: (a) a shift from ad hoc incremental sector specific policy to more integrated policy; (b) a shift from non-priority through no-regrets approaches to prioritizing adaptation in climate policy; (c) a shift from technological and technocratic approaches to post-modern concepts such as living with water, dynamic coasts, etc.; (d) a shift from top down consensus building to decentralization and transfer of responsibility to individual residents; and (e) a shift from adaptation to building on adaptive capacity.
- Second, the comparative analysis of Dutch formal policies leads to the identification of different paradigms in different sectors. Each sector has different strengths and weaknesses and can, hence, learn from each other's institutions.
- Third, the Netherlands has a long history of coping with water problems. This has led to an accumulation of expertise in this area.
- Fourth, the comparative analysis reveals that the nature institutions are the weakest in adaptive capacity; water institutions are strong; and agriculture and spatial planning have an intermediate position, being enabling and flexible in character, even though climate change is not yet explicitly taken into account.
- Fifth, at the general level of Dutch institutions, the comparative analysis reveals that (a) redundancy is given less priority than efficiency in most sectors; (b) although climate change adaptation might have major equity implications within the country, and will probably raise new questions of responsibility for dealing with the impacts of climate change, this has not been taken into account so far; (c) long term resources may be in short supply.
- Sixth, the Individual Responsibility case shows that in relation to rainwater, there is a strong emphasis on transferring responsibilities to house and land owners. In practice this creates a lot of confusion, caused amongst others by a the lack of awareness of home and land owners about the existence of such a rule; (b) the lack of awareness on groundwater level of non-farm land owners; (c) the inability to actually take action on the part of non-farm land owners, and (d) the willingness of municipalities to sometimes step in and solve the problem, which creates new confusion in the minds of residents as to who is responsible.
- Seventh, the Water Safety case reveals different strengths (engagement of social actors, willingness to experiment, establishment of unique instruments) and weaknesses (institutional lock-in, paternal role of the state, excluding local knowledge, exclusive focus on probability reduction) of Dutch water safety institutions.
- Eighth, the case study about Climate-proof Spatial Planning for flood prone areas also identifies institutional strengths (variety in adaptation strategies; multi-level, multi-actor processes, room for experimenting and learning, strong visionary leadership) and weaknesses (dominant focus on vulnerability reduction, path dependency, lack of improvising capacity of society, lack of entrepreneurial leadership, lack of financial resources, and a lack of water safety norms for local and regional dikes and water defences).
- Ninth, the Wadden Sea case concludes that there is no comprehensive approach to dealing with climate adaptation in the Wadden Sea; and the sum of individual efforts combined with rigid European and national legislation indicates that present nature management progresses slowly, despite the recognition of the value of this ecosystem. The problems include a lack of leadership and a short-term focus. However, the learning capacity is promising and the Wadden fund is an interesting new institution to provide financial resources.

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- Tenth, the application of the Adaptive Capacity Wheel has revealed that this is an interesting science-policy instrument with considerable potential. It provides a qualitative method to assess institutions in terms of adaptive capacity. In presentations to policymakers and scientists, the Adaptive Capacity Wheel has been viewed as a useful framework for comparing and contrasting institutions and in promoting self-reflection among policymakers and other social actors. As a communicative instrument, the ACW can enhance the social learning processes amongst policymakers and other governance actors involved by revealing weaknesses and strengths and exchanging experiences across territorial and policy domain borders. The Adaptive Capacity Wheel can be a useful tool for international benchmarking, to structure information and to facilitate comparison. The coloured wheel should always be accompanied by an explanation which provides meaning to the analysis.

Based on these conclusions, the IC12 research team recommends that:

- The incremental process of preparing for adaptation needs to be accelerated through ‘governance in the shadow of hierarchy’; (e.g. through a National Climate Adaptation Act).
- Policy processes should embrace redundancy as a principle. Political support for redundancy can be organized through smart couplings between measures in different policy domains.
- There is a need for leadership that combines a long term vision, variety and collaboration to enable society to take action.
- Learning processes need to be less open-ended and more structured.
- Clear framework conditions at national level, working through to the provincial and local level, should be supplemented by monitoring and accountability procedures.
- Institutionalized support for adaptation by civil society should be enhanced through providing climate adaptation information, preventing policies that reduce the room for autonomous change and improvisations, and enabling self organizing communities.
- The long-term nature of the climate change problem calls for reserve funds for long-term problems.
- More flexible and responsive institutions for nature management are needed at EU level.
- The path dependency of building housing in low lying areas has led to maximum exploitation in these areas and there is need to consider alternative locations for new spatial developments.
- Over-confidence about flood protection skills should be avoided – good evacuation strategies and flood proofing urban areas are important as well.
- There is a need for a long-term policy and political process in the Wadden Sea area focussing on human safety on the islands and ecosystem goals.
- To prevent a situation in which no one feels responsible or accountable for solving local water nuisance at the local level, the municipality should take the lead in clarifying responsibilities.



1 Problem description

1.1 The problem definition

Climate change is likely to have serious ongoing impacts on all countries in the world. A key challenge then is: how will countries cope with these impacts? This report examines how the institutional framework of the Netherlands affects the capacity of Dutch society to cope with the impacts of climate change. It was partially financed by Project IC12 'Institutions for Adaptation' which started in May 2007 as a part of the Dutch Research Programme 'Climate changes Spatial Planning' (CcSP).

Historically, institutions have evolved incrementally to deal with existing social problems (Gupta and Dellapenna 2009). They provide norms and rules for collective action and create continuity rather than change (Pollitt & Bouckaert 2000). However, the nature of societal problems is changing as a result of processes of globalisation and economic development. With the progress made in the natural sciences, we are able to predict in advance, to a certain extent, the potential environmental impacts of various human actions on society, for example, climate change.

This raises some key questions: Are our institutions capable of dealing with this new knowledge about future impacts and the uncertainty surrounding those impacts and, more importantly, do they allow society to timely and adequately react to changing conditions caused by climate change?

1.2 Research objective and research questions

The general objective of the IC12 project is to understand the adaptive capacity of Dutch institutions to deal with climate adaptation. Based on this objective, three research questions are identified for this project.

1. How can the adaptive capacity of Dutch institutions from local through to national level to deal with climate change be assessed?
2. What are the key implications of undertaking such an assessment?
3. What general and specific recommendations flow from such an assessment, both in terms of institutional design theory and in terms of policy?

1.3 Research method

The project begins simultaneously at two ends. It briefly identifies the impacts of climate change on the Netherlands. Simultaneously, it develops criteria for assessing the adaptive capacity of institutions to deal with climate change. This is depicted in Figure 1.

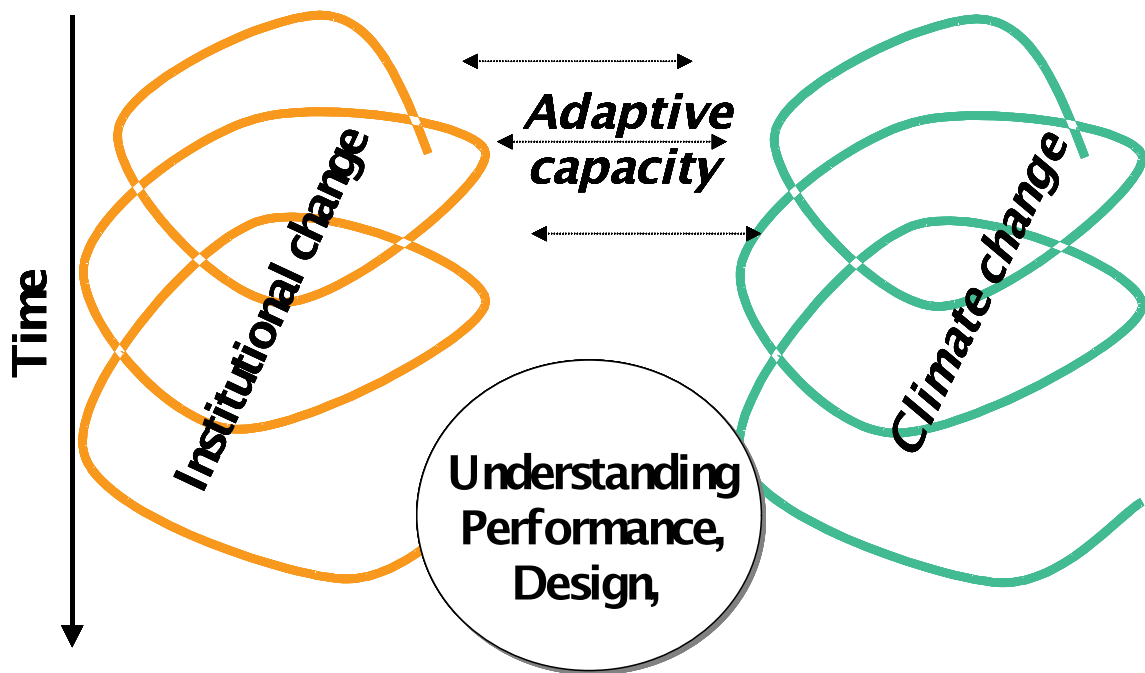


Figure 1 The Adaptive Capacity Wheel and Scoring System

1.4 Focus and limits

We frame climate change as a glocal (global through to local) issue, and at the same time we focus on the Dutch institutional infrastructure. The empirical focus on the Netherlands is a requirement of the CcSP programme. Our literature survey and analysis will be grounded in international literature and experiences, and on EU (and international) legislation, since this has a major influence on Dutch institutions. Nine sectors in the Netherlands are affected by climate change. Given the wish of the CcSP programme to do an in-depth scientific study, this project has focussed on a limited number of policy sectors. The project concentrates on adaptation in four sectors with a strong relation to spatial planning: water, agriculture, nature and urban planning.

The climate is not the only aspect in this world that is changing. A number of societal trends influence the capacity of institutions to deal with climate change. For example, in many neo-liberal societies, there is a tendency towards stressing individual responsibilities to deal with social problems; new organizational arrangements are developing, such as multilevel agreements between policy actors; more horizontal approaches to land use planning are applied; and there is a shift from national to European regulations. Hence, the system we try to study is a moving target, and the theoretical framework we use will have to be dynamic to be able to capture ongoing changes.

In this report we take the Veerman recommendations (Delta Commission 2008) and the work of the Intergovernmental Panel on Climate Change (IPCC 2007) as a starting point for the analysis without debate, although we recognize that such a debate is valuable. However, as social scientists we cannot assess the quality of the work of natural scientists, or whether the recommendations of the Veerman Committee are the best solutions. We tried to develop a tool that will be relevant even when insights on the climate system change.



2 Conceptual and methodological framework

This chapter defines the key concepts and their definitions, the six dimensions and twenty-two criteria of adaptive capacity of institutions, the Adaptive Capacity Wheel and a research protocol.

2.1 Key concepts

Our project seeks to understand how Dutch institutions affect the adaptive capacity of Dutch society to deal with the impacts of climate change. Hence, the key concepts that need to be defined for our research are institutions and adaptive capacity.

Following the IDGEC Scientific Planning Committee (1999), institutions are defined as “systems of rules, decision-making procedures, and programmes that give rise to social practices, assign roles to the participants in these practices, and guide interactions among the occupants of the relevant roles”. The rules and roles are both formal and informal, visible and latent and conscious and unconscious (Arts 2006). On the one hand, institutions restrict the possibilities of people to act, while, on the other hand, they enable people to act (Sharpf 1997).

The concept of adaptive capacity, influenced by social-ecological systems research (Holling 1986), has been defined by the Millennium Ecosystem Assessment (2006: Glossary, 599) and IPCC (2001: 6, IPCC 2007) as: “The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences”. We adopt this definition in our research.

Our literature review did not reveal a definition of the adaptive capacity of institutions, although we found many relevant definitions from the social and natural sciences literature. Building on these definitions, we define adaptive capacity as the inherent characteristics of institutions that empower social actors to respond to short and long-term measures either through planned measures or through allowing and encouraging creative responses from society both ex ante and ex post. It encompasses:

- The characteristics of institutions (formal and informal; rules, norms and beliefs) that enable society (individuals, organizations and networks) to cope with climate change; and
- The degree to which such institutions allow and encourage actors to change these institutions to cope with climate change;
- This implies that institutions should allow actors to learn from new insights and experiences in order to flexibly and creatively ‘manage’ the expected and the unexpected, while maintaining a degree of identity.

Adaptive capacity is not a static concept, but one which calls on society to continuously respond; however, the adaptive capacity for short-term climatic events will be different from the adaptive capacity for medium-to long term climatic events.

2.2 Six dimensions of adaptive capacity

To capture the diverse and complex characteristics of institutions that allow for – or hinder – the adaptive capacity of society, the project team has identified six dimensions and 22 criteria of adaptive capacity. The dimensions are explained below. Definitions of criteria and their epistemological roots are given in Table 1.



Variety

Unstructured problems like climate change, embedding diverse interests and perspectives, can only be dealt with within a framework of multiple discourses and solutions, where multiple actors intervene at multiple levels of governance. Variety implies the capability of a system to anticipate future expected and unexpected climate impacts through having a range of adaptive or proactive strategies, measures and instruments at its disposition. Variety calls for fostering diversity, understanding complication, creating redundancy and resisting the tendency towards simplification and efficiency. It encourages social ingenuity to continuously generate tailor-made solutions.

Learning capacity

The concepts of human learning, social learning, learning capacity and the ability to experiment while still maintaining all critical functions and feedback mechanisms or accommodating perturbations are integral to adaptive capacity. Mechanisms that enhance learning include single loop learning (improved routines) and double loop learning (when social actors challenge norms and basic assumptions). Mechanisms that inhibit genuine learning include defensive routines in organizations and overprotection of dominant frames.

Room for autonomous change

A third quality of adaptive capacity is the ability of an institution to permit social actors to explicitly or implicitly adjust their behaviour in response to environmental change. This calls for institutions to enable social actors, especially at lower levels of governance, to anticipate possible futures, to take planned preventive measures against important threats and to seize opportunities when they present themselves. Adaptive institutions enhance this self-help function by encouraging experimentation with and responding to everyday contingencies, breakdowns, and opportunities; continuously improvising in short feedback loops to promote a continual update of social practices.

Leadership

A fourth dimension is leadership, without which society is often unable to respond to the long-term, large scale challenges that affect humanity. Leadership is a driver for change, showing a direction, and motivating others to follow. The management literature differentiates between autonomous, entrepreneurial, and reformist leaders, and institutional or policy entrepreneurs. The institutions literature refers to structural, entrepreneurial and intellectual leadership, coercive, instrumental and unilateral leadership, sticks and carrots, problem solving and directional leadership and structural, instrumental and directional leadership. For the leadership dimension we chose visionary, entrepreneurial and collaborative leadership as the main three criteria.

Resources

The effectiveness of institutions often depends on their ability to generate resources. Institutional norms and rules should call for the generation of resources to help social actors implement these rules. Clearly, the context within which institutions exist will also have a major influence on whether such institutions are able to raise resources. Resources can include financial, social, human, legal, and technological resources.

Fair governance

Lastly, adaptive institutions should meet fair governance criteria. Since we emphasise redundancy over cost-effectiveness, we have chosen fair governance in preference to the dominant phrase of good governance. Of course, fairness also implies that resources should not be squandered indiscriminately and that an appropriate balance needs to be found between effectiveness and efficiency, as innovation processes are notoriously inefficient and should be allowed to be inefficient in order to take place at all.



Table 1 Adaptive capacity dimensions and criteria and their roots in the literature

Dimension	Criterion	Definition	Relation to literature	
Variety	Variety of problem frames	Room for multiple frames of references, opinions and problem definitions	Nooteboom 2006; Buckley 1968, Conant & Ashby 1970; Pollit and Bouckaert 2000; Power 1999	
	Multi-actor, multi-level, multi-sector	Involvement of different actors, levels and sectors in the governance process	Pahl-Wostl 2009; Duit & Galaz 2008; Armitage 2008; Folke et al. 2005	
	Diversity of solutions	Availability of a wide range of different policy options to tackle a problem	Ostrom 2005; Verweij & Thompson 2006	
	Redundancy (duplication)	Presence of overlapping measures and back-up systems; not cost-effective	Weick & Sutcliffe 2001	
Learning capacity	Trust	Presence of institutional patterns that promote mutual respect and trust	Pelling & High 2005	
	Single loop learning	Ability of institutional patterns to learn from past experiences and improve their routines	Olson et al. 2004; Folke et al. 2005; Carpenter et al. 2001; Marshal & Marshal 2007; Pelling et al. 2008	
	Double loop learning	Evidence of changes in assumptions underlying institutional patterns	Argyris 1990; Ormond 1999	
	Discuss doubts	Institutional openness towards uncertainties	Pahl-Wostl 2009; Weick & Sutcliffe 2001	
	Institutional memory	Institutional provision of monitoring and evaluation processes of policy experiences	Ostrom 2005; Gunderson & Holling, 2002	
	Room for autonomous change	Continuous access to information	Accessibility of data within institutional memory and early warning systems to individuals	Folke et al. 2005; Milman & Short 2008; Polsky et al. 2007
		Act according to plan	Increasing the ability of individuals to act by providing plans and scripts for action, especially in case of disasters	Smit et al. 2000
Capacity to improvise		Increasing the capacity of individuals to self-organize and innovate – foster of social capital	Armitage 2005; Folke et al. 2003 & 2005; Pelling & High 2005; Smit et al. 2000; Weick & Sutcliffe 2001; Orlikowski 1996	

Dimension	Criterion	Definition	Relation to literature
Leadership	Visionary	Room for long-term visions and reformist leaders	Pielke 1998; Goldfinch & 't Hart 2003; Young 1991; DiMaggio 1988
	Entrepreneurial	Room for leaders that stimulate actions and undertakings; leadership by example	Malnes 1995; Andersson & Mol 2002; Underdal 1994; Kingdon 1984
	Collaborative	Room for leaders who encourage collaboration between different actors – adaptive co-management	Folke et al. 2005; Olsson, Folke & Berkes 2004; Armitage 2005; Marlin et al. 2007; Tierney et al. 2006; Pahl-Wostl et al. 2007; Young 1991; Underdal 1994; Grubb and Gupta 2000; Anderson and Mol 2002; Termeer 2009
Resources	Authority	Provision of accepted or legitimate forms of power; Whether or not institutional rules are embedded in constitutional laws	Biermann 2007
	Human Resources	Availability of expertise, knowledge and human labour	Nelson et al. 2010
	Financial Resources	Availability of financial resources to support policy measures and financial incentives	Nelson et al. 2010; Mendelsohn & Nordhaus 1999; Yohe et al. 1996; Smit et al. 2000; Yohe & Tol 2002
Fair governance	Legitimacy	Whether there is public support for a specific institution	Haddad 2005; Botchway 2001
	Equity	Whether or not institutional rules are fair	Haddad 2005; Botchway 2001
	Responsiveness	Whether or not institutional patterns show response to society	Biermann 2007
	Accountability	Whether or not institutional patterns provide accountability procedures	Botchway 2001; Biermann 2007

2.3 The development of a methodological tool¹

The project team developed an Adaptive Capacity Wheel (see Figure 2 below) to assess the 6 dimensions and 22 criteria of adaptive capacity, as well as a tool to communicate the results of our research. By using colours (see colour scheme below the wheel in figure 2) indicating high (green) and low (red) adaptive capacity, the Adaptive Capacity Wheel may be used to inform social actors about how their institutions score on adaptive capacity and where there may be room for reform.

¹ The methodology developed and applied in this research is also elaborated in our article published in *Environmental Science and Policy*, see Gupta et al. 2010, and in IC12 Working Document 2, Gupta et al. 2008.



Effect of institution on adaptive capacity	Score	Aggregated scores for dimensions and Adaptive Capacity
Positive effect	2	1.01 to 2.00
Slightly positive effect	1	0.01 to 1.00
Neutral or no effect	0	0
Slightly negative effect	-1	-0.01 to -1.00
Negative effect	-2	-1.01 to -2.00

Figure 2 The Adaptive Capacity Wheel and Scoring System



2.4 Research protocol for applying the Adaptive Capacity Wheel

The Adaptive Capacity Wheel cannot be ‘objectively’ applied; the criteria are not additive in the sense that values given to each criterion can be simply added; it will always be subject to expert judgment and good interpretation. For such a qualitative tool to have scientific relevance, it is imperative that it is transparent and that its application by different researchers to the same institution(s) should lead to consistent results. Hence, a research protocol was developed consisting of five steps:

1. Preparing for research - internalize the meaning of the dimensions and criteria, and identify a clear research focus.
2. Collecting the data – collect data for each criterion using interviews, observations and/ or (policy) document analysis in a background document.
3. Analyzing the data – (multiple researchers) assign a score to each criterion based on data in the background document, aggregate if necessary to the level of dimensions and the level of overall adaptive capacity.
4. Interpreting the data - translate the information collected into a story that communicates the strengths and weaknesses of a specific institution or institutional context in terms of adaptive capacity. Discuss the data with stakeholders involved in the sector or case study that is being analyzed. Discuss the scores and, if necessary, adapt the scores and the argumentation. In this step, the scores are interpreted to give them meaning in their context.
5. Presenting the data - communicate how well a criterion or dimension scores by colouring the Adaptive Capacity Wheel. The coloured wheel should always be accompanied by an explanation which provides meaning to the analysis. In other words, it should never be left to the reader’s interpretation.



3 Results: Applying the Adaptive Capacity Wheel to Dutch institutions

It is expected that climate change has major implications for land use. Therefore, four sectors with most relevance to land use were selected for study – the spatial planning, agriculture, nature and water sector. Formal institutions were investigated through a content analysis. In the content analysis, the Adaptive Capacity Wheel was applied to assess legal and policy documents. Four case studies were conducted to study informal institutions. Finally, the information was integrated back to the level of Dutch institutions in general.



3.1 Content analysis of adaptation policy documents

The first step in the content analysis was to identify all possible policy and legal documents in the Netherlands that dealt with adaptation in the area of the four selected sectors. Where necessary, reference was also made to European Union Directives, international treaties and national climate policy documents. A total of 93 documents were studied.² The study revealed that there was strong coherence between documents within individual sectors and that there was a common paradigm in each sector. This meant that applying the wheel to a selection of documents within each sector would reveal the most important strengths and weaknesses of the institutions in that sector. It also implied that the sectors that were not investigated, such as transport and energy, will also have their own paradigms, and the conclusions for water, nature, agriculture and spatial planning most likely have no relevance for those domains. The results of this study cannot thus be extrapolated to the sectors that have not been studied.

From the 93 documents, 23 were selected for further analysis and application of the Adaptive Capacity Wheel (see Tables 2 and 3).³ These wheels reveal a number of conclusions.⁴

First, international and supranational instruments score well as instruments that stimulate the adaptive capacity of society in taking climate change into account. Second, the water sector in the EU and the Netherlands scores well in general and most of the instruments have high scores although there is room to improve new institutions like the water test. The agricultural sector scores well on the left side of the wheel: fair governance, resources and leadership. The spatial planning sector also scores well, especially on variety and leadership. However, the agricultural and spatial planning institutions show considerable room for improvement. Third, the nature sector tends to score poorly in the Adaptive Capacity Wheel. The EU Directives as well as the national policies appear to have a low ability to promote the adaptive capacity of society. Fourth, the fact that some sectors score better than others can be explained from the existence of sector-specific paradigms. The high scores for the water sector reflect the centuries long experience with water related issues and learning. The agricultural sector is to a high degree decentralized and provides autonomy to farmers to cope with the impacts of climate change. The nature sector is rigid, focused on in-situ preservation and takes little account of the dynamics of (the impacts of climate change on) nature. The ecological corridor idea is, however, attractive in this context. The spatial planning sector tries to give different administrative levels the authority to take decisions to ensure the multiple uses of land. This principle enables subsequent administrative levels to develop tailor-made solutions, which enhances adaptive capacity.

² This study is documented in IC12 Working Document 4, Klostermann et al. 2010.

³ This assessment is documented in IC12 Working Document 5, Klostermann et al. 2009.

⁴ These conclusions stem from the horizontal content analysis, submitted in IC12 Working Document 6, Klostermann et al. forthcoming.

Table 2 Comparative assessment of policies relevant for adaptation at different governance levels























International	European	National
<p style="text-align: center;">UNFCCC</p> 	<p style="text-align: center;">Water Framework Directive</p> 	<p style="text-align: center;">National Adaptation Strategy</p> 
	<p style="text-align: center;">Flood Risk Directive</p> 	<p style="text-align: center;">National Safety Strategy</p> 
<p style="text-align: center;">Common Agricultural Policy</p> 	<p style="text-align: center;">Natura 2000</p> 	<p style="text-align: center;">EU White Paper on Adaptation</p> 



Table 3 Comparative assessment of sectoral policies relevant for adaptation

Nature	Spatial Planning	Water	Agriculture
<p>National Ecological Network</p> 	<p>National Spatial Strategy</p> 	<p>National Agreement on Water</p> 	<p>Agenda for a Living Countryside</p> 
<p>Nature Protection Law</p> 	<p>Spatial Planning Act</p> 	<p>National Water Plan</p> 	<p>Law on Land Use in Rural Areas</p> 
<p>Flora and Fauna Law</p> 	<p>Strategic Environm. Assessment</p> 	<p>Major Rivers Guidelines</p> 	<p>New Agrarian Insurances</p> 
		<p>Water Act</p> 	
		<p>Water Test</p> 	

3.2 Application to case studies

The research team then selected four case studies to analyse the practice of social institutions – examining (a) individual responsibility in water management at municipal level, (b) water safety at the national level (c) a local and regional analysis of climate-proof spatial planning for flood prone areas; and (d) ecosystem protection of the Wadden Sea. The characteristics of the case studies are shown in Table 4⁵ and the comparative results in Table 5.

Table 4 Case study selection

	Individual Responsibility	Water Safety	Climate-proof Spatial Planning	Wadden Sea
Different spatial scales	Local	National	Local to regional	National
Spread between the sectors	Water, urban, agriculture, spatial planning	Water, nature, agriculture, spatial planning	Water, spatial planning	Nature, water, spatial planning
Main focus	Individual responsibility in water management	Environmental security	Multi-layered safety	Protection of ecosystems and biodiversity
Case study areas	Zaanstad, Delft, Wijde Wormer	Zuidplaspolder, Westergouwe	Room for the River, Second Delta Committee, Flood Risk Approach	Wadden Sea

The case studies show that the adaptive capacity of the water and the spatial planning sectors are relatively high, although the flood risk approach has not yet been implemented and the construction of, for example, Westergouwe is threatened by a potential lack of financial resources. The adaptive capacity in the Wadden Sea case is negative for all dimensions, especially leadership and financial resources, although the dimension of learning capacity scores well. Institutions that influence adaptive capacity at the individual level indicate that urbanized municipalities experience difficulties with providing room for autonomous change and accountability but do well in providing entrepreneurial leadership and resources, whereas in the rural municipality De Wijde Wormer a lack of resources and entrepreneurial leadership limit the adaptive capacity.

The case studies reveal some tensions or dilemmas between the dimensions and criteria. First, from the perspective of adaptive management, variety should be encouraged. As it is not known beforehand which strategies will turn out to be most effective, it is wise to implement and test various strategies at the same time. Some strategies, however, may be incompatible. For example, water safety is increasingly framed as an issue for which civil society and the private sector need to bear responsibility. The Dutch government aims to raise water awareness in Dutch society, and would like citizens and other social actors to take responsibility. The very same government, however, would like to increase safety standards by a factor 10, thus limiting flood probabilities considerably. It seeks public and political support for realizing large scale infrastructural projects, such as the construction of ‘unbreakable’ delta dikes, while it also increasingly stresses the responsibility of the individual in dealing with water nuisance. The case study on individual responsibility shows that (although recent legislative changes have clarified responsibilities in local water management)



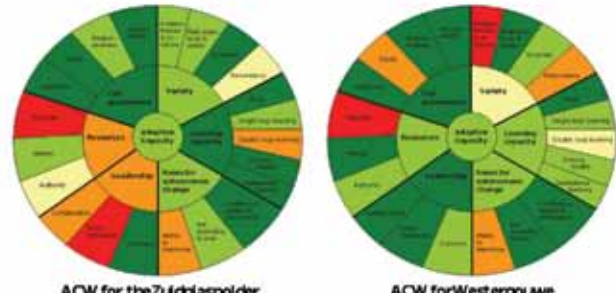

⁵ A short summary of each case study is included in Annex VII.



after intensive rainfall and urban flooding, responsibilities of the municipal government and the individual sometimes overlap and are not always clearly demarcated. If increasing variety of institutional arrangements is not accompanied by a clear division of responsibilities, this may easily lead to a situation in which no one feels responsible or accountable.

Second, the dimension of variety is strongly related to the dimensions of learning capacity and room for autonomous change. Where policy strategies are limited to a particular institutional path (for example, the decision to continue building in low-lying polders), learning is restricted to that particular policy path as well (i.e. deciding how to build in Westergouwe, but not whether housing could be shifted to other locations). The case studies show that government remains the dominant actor in adaptation to climate change as there are only a small variety of other actors involved. Therefore we might argue that the room for autonomous change for social actors is still relatively low. Both leadership and resources are crucial conditions for adaptive capacity. Whereas the Dutch water sector possesses relatively successful institutional mechanisms for generating the necessary resources (e.g. the water board taxes), in the policy sectors of spatial planning and nature management such mechanisms are lacking. The case studies indicate that the spatial planners and nature managers often depend on the water sector for realizing their objectives. For example, in the water safety case, the funds generated for large-scale revision of water infrastructure creates opportunities for local actors to improve the landscape and to realize recreational facilities.

Table 5 Comparative assessment of case study material⁶

Case	Application
Individual responsibility	 <p>ACW for Zaandam ACW for Delft ACW for De Wijde Wormer</p>
Water Safety	 <p>ACW Room for the River ACW Flood Risk Approach ACW Second Delta Plan</p>
Climate-proof Spatial Planning	 <p>ACW for the Zuidplaspolder ACW for Westergouwe</p>
Wadden Sea	 <p>ACW for the Wadden Sea Region</p>

⁶ For an extended analysis of each case study, see IC12 Working Documents 7-10: Bergsma et al. 2009, Klostermann & Bergsma 2010, Van den Brink et al. 2010a, Van den Brink et al. 2010b. For a comparative case study analysis, see IC12 Working Document 11, Meijerink et al. 2010.



4 Conclusions and recommendations⁷


4.1 Conclusions on adaptive capacity in four sectors

First, the following five trends are visible in the evolution of national adaptation policy: (a) a shift from ad hoc incremental sector specific policy to more integrated policy; (b) a shift from non-priority through no-regrets approaches to prioritizing adaptation in climate policy; (c) a shift from technological and technocratic approaches to post-modern concepts such as living with water, dynamic coasts, etc.; (d) a shift from top down consensus building to decentralization and transfer of responsibility to individual residents; and (e) a shift from adaptation to building on adaptive capacity.

Second, the comparative assessment of the sector specific policies leads to the identification of different paradigms in different sectors. These paradigm differences have grown partly because of the different evolutionary processes that these policy fields have undergone. The paradigms can be described as follows:

- Water governance in the Netherlands was traditionally dominated by a technology-oriented approach. This paradigm has changed under the influence of the trends described above, but technocratic approaches remain a dominant paradigm in Dutch water policy. Water governance has historically involved the decentralized water management authorities within a common vision of protection from floods, and multi-level governance. Cooperation is thus institutionalized. The Dutch are now discussing the possibility of social and ecological engineering to provide more space to nature and be more flexible in their protection standards.
- The nature regulations of the European Union appear to be quite static, and unable to cope with the notion of a dynamic natural system where changes in global, local and micro climate can have influences. This is so even though the EU directives are based on bottom-up information; possibly the process of making EU Directives is too slow. Multi-level cooperation is far from institutionalized and the notion of space for nature carries a rigid framework of maps with boundaries. The paradigm at work in the nature sector is that the past contains the ideal to which we must strive in the future (e.g. the natural system existing in the Netherlands in 1850). Such a paradigm obviously conflicts with the changes climate change may bring.
- In contrast, the agricultural regulations have focused on providing a framework within which innovation and the market can function, allowing for greater autonomy to the farmer. Policy intervention occurred only when a social and/ or ecological problem was signalled. The farmers have traditionally coped with climate variability through history. The paradigm in the agricultural sector appears to be to provide farmers with information inputs and financial incentives and helps them to become more adaptive.
- The spatial planning process is more densely regulated and has multiple tools and instruments at its disposal – but these can also be experienced as highly constricting when it comes to adaptation to climate change. The paradigm in Dutch spatial planning is to accommodate urbanization processes. Because nearly all good building locations are already utilized, this results in developing unsuitable and marginalized locations, also from the water management and climate change viewpoint. Attempts to make this sector more adaptive and innovative are evident in the new Spatial Planning Act (2008).

⁷ Conclusions and recommendations are elaborated in IC12 Working Document 12: Integrated Analysis, Gupta et al. 2010.



Third, the Netherlands have a long history of coping with water problems. This has led to an accumulation of expertise in this area. Engineering marvels such as the Oosterscheldt flexible barrier and in more recent years the Maeslant barrier are coupled with a tradition of community management and funding of water works through water management authorities that can be traced back to the Middle Ages.

Fourth, the comparative analysis reveals that (a) nature institutions are the weakest in adaptive capacity, possibly because there are few interactions with institutions outside the nature sector, since they strive towards recreating situations that existed in the past, and caused by rigid regulatory approaches focusing on protected areas, spatial borders and rare species; (b) the water institutions are strong on dynamic aspects such as variety and learning, and on the more classical aspects such as fair governance and resources; and (c) agriculture and spatial planning have an intermediate position, being enabling and flexible in character, even though climate change is not yet explicitly taken into account. Local autonomy is strong in agriculture and spatial planning but aspects such as authority and accountability have low scores.

Fifth, at the general level of Dutch institutions, the comparative analysis reveals that (a) redundancy is given less priority than efficiency in most sectors; (b) although climate change adaptation might have major equity implications within the country, and will probably raise new questions of responsibility for dealing with the impacts of climate change, this has not been taken into account so far; (c) long term resources may be in short supply (the Wadden fund and the Delta fund are first attempts to build a financial reserve for the future); and (d) that each sector has different strengths and weaknesses and can, hence, learn from each other's institutions.

Sixth, the Individual Responsibility case shows that in relation to rainwater, there is a strong emphasis on transferring responsibilities to house and land owners. In practice this creates a lot of confusion. Such confusion relates to (a) the lack of awareness of home and land owners about the existence of such a rule; (b) the lack of awareness on ground water levels of non-farm land owners; (c) the inability of non-agricultural land owners to actually take action, and (d) the willingness of municipalities to sometimes step in and solve the problem, which creates new confusion in the minds of residents as to who is responsible.

Seventh, the Water Safety case reveals greater engagement of social actors, the willingness to experiment, the creation of awareness in and relations with other sectors including the spatial sector; and the establishment of unique instruments including the Delta Fund to deal with water safety. However, (i) the successful experience with and reliance on technological and technical methods implies that other more experimental approaches are not adequately implemented – creating institutional lock-in. (ii) The state's paternalistic role towards guaranteeing safety may lead to passiveness on the part of the residents. This has had the side-effect of (iii) excluding the knowledge of social and local actors in creating safety systems, and (iv) an exclusive focus on probability reduction implies less synergy between collaborative and entrepreneurial leadership. Finally, although there are resources for the state to realise water safety; there are few resources for other types of inclusive approaches to water safety.

Eighth, the case study about Climate-proof Spatial Planning for flood prone areas examines the flood risk approach and the concept of multi-layered safety. It identifies five institutional strengths: Variety in potential adaptation strategies to climate-proof spatial developments; inclusion of a wide variety of actors, sectors and administrative levels; room for experimenting and learning; involvement of private construction companies; and visionary leadership. However, Dutch spatial planning institutions also face institutional weaknesses: A dominant focus on vulnerability



reduction; strong path dependent development of institutions; lack of improvising capacity of society; lack of entrepreneurial leadership; lack of financial resources for adaptation strategies; lack of water safety norms for local and regional dikes and water defences.

Ninth, the Wadden Sea case concludes that there is no comprehensive approach to dealing with climate adaptation in the Wadden Sea; and the sum of individual efforts combined with rigid European and national legislation indicates that present nature management progresses slowly, despite the uniqueness of the ecosystem. The problems include a lack of leadership and a short-term focus: at the time of the case study there was no debate on the safety of the islands on the long-term (it is starting now with the implementation of the Delta Program) and no vision on ecosystem development in the future. However, the learning capacity is promising and the Wadden fund is an interesting experiment as well.

4.2 Conclusions on method of the adaptive capacity wheel

Concerning the methodological approach we conclude that there are clear advantages to using the Adaptive Capacity Wheel.

First, its elements provide a comprehensive idea of the dimensions relevant for assessing the adaptive capacity of society through its institutions. In all our applications, we have asked our participants if we have overlooked a key dimension, which is also perhaps missing in the literature. In general, we may have erred more in being too comprehensive than under-comprehensive. However, the Wheel allows for expansion and inclusion of new ideas in the future, if that is needed.

Second, colours have been used to represent the results of the assessment. We have two variations: a variation in shades of grey (not applied in this article), which is entirely neutral in terms of its message; and a variation that builds on the traffic-light colours which is more judgmental, but is also more communicative.

Third, the Adaptive Capacity Wheel can be used to generate semi-quantitative results. Semi-quantitative results can be used, for example, to rank which institutions score better and which worse on an adaptive capacity scale. The aggregated picture can draw attention to a set of institutions that is working in a specific field. For example, our document analysis shows that in the nature sector there is probably a common underlying paradigm that is responsible for the relatively low score assigned to these institutions' ability to stimulate the adaptive capacity of society. The application of the Adaptive Capacity Wheel allows us to see if some institutions promote adaptive capacity (e.g. several water arrangements) or not (e.g. the nature arrangements in the Netherlands). This shows which institutions are the most inhibitive and are likely to need redesign. Although such a semi-quantitative analysis may reduce complex information into a simple format and be useful for a ranking process, it may also reduce the information to something relatively meaningless and too aggregated. If the institutions in the nature sector are really inhibiting adaptation, this will become clearer when the results of the analysis with the adaptive capacity wheel are discussed in detail with the relevant stakeholders.

Fourth, in several experiments it was shown that the Adaptive Capacity Wheel can be used by other researchers and applied in different contexts (Germany, Venice, Korea). This has for example shown that the Wheel can be expanded to include indicators for each criterion.



Fifth, the Wheel can be potentially tailor-made to fit specific impacts – as our case studies show.

Finally, the Wheel is essentially a diagnostic tool – it diagnoses areas of possible problems that can be then the subject of discussion and debate. It indicates areas of strength which can be further built upon; it indicates areas of concern. An area of concern is not always a weakness; for example, if the criterion is not important for the adaptive capacity of the institution. Such judgments call for interpretive analysis.

There are also some weaknesses in the method:

Certain terms may be perceived as ‘loaded’ in a particular culture (e.g. authority is negative in South Korea); ‘unfamiliar’ in a non-social science context (e.g. learning, redundancy); or ‘confusing’ (e.g. difference between legitimacy and authority; single and double loop learning) and calls for clear explanations of the criteria and examples;

Second, application of the method has shown that there could potentially be a trade-off between inclusiveness and aggregation. The case studies have shown that increased complexity makes interpretation of the data more difficult, while the content analysis has shown that aggregation leads to less explanative power. Different research aims (e.g. compare results at higher level or describe adaptive capacity in a specific context) may call for different approaches.

Third, the Adaptive Capacity Wheel contains some interesting paradoxes. For example, the paradox between variety and leadership: strong leadership may automatically lead to less variety and weak leadership may have the advantage that a lot of variety is developed in society. Such paradoxes in the Wheel reflect paradoxes in social reality itself. Understanding adaptive capacity may call for expert judgments regarding how to deal with the overlaps and contradictions between criteria.

Fourth, a question that was often raised: How objective is the evaluation? A comprehensive coding system allows for enhanced transparency of the evaluation; even though there will always be a subjective element in it. The bottom-line is that the ACW allows for evaluation of issues that are not necessarily measurable in numbers; it allows for a certain amount of subjective expert judgement about, e.g. what constitutes leadership in specific contexts.

Fifth: are the equal shares for each dimension and criteria in the Wheel reflective of equal weights? We have implicitly assigned equal weights to the dimensions or criteria in our applications, because we lacked the information to differentiate in weights. At the same time, we implicitly put extra weight to learning (5 criteria) variety and fair governance (both 4 criteria) compared to the other 3 dimensions which have only 3 criteria. This does not stop future applications of the wheel from experimenting with assigning weights in specific contexts in a more rationalized way; and on comparing how adaptive capacity improves or changes over time.

We conclude that the Adaptive Capacity Wheel can be a useful tool for international benchmarking, for structuring information to facilitate comparison. Also, the Adaptive Capacity Wheel could be particularly useful in an encompassing analysis of the whole range of formal and informal institutions influencing a specific problem.



4.3 Recommendations

The project comes up with a number of policy recommendations. In terms of general policy recommendations, the document recommends that:

- The incremental process of preparing for adaptation is slow and needs to be accelerated in accordance with the recommendations of the Veerman Committee and the work of the Intergovernmental Panel on Climate Change. Such acceleration may take place in the context of ‘governance in the shadow of hierarchy’; there is a need to create a shadow of hierarchy to facilitate this process (e.g. through a National Climate Adaptation Act).
- Policy processes need to avoid focusing exclusively on cost-efficiency and embrace redundancy as a principle. Redundancy is expensive and politically challenging especially in times of recession where duplication of services is minimized and public bureaucracies streamlined. Political support for redundancy can be organized through smart couplings between measures in different policy domains. This implies that redundant institutions, considered necessary for adaptation must, at the same time, support problem solving in other policy domains (e.g. create employment).
- There is a need for leadership to ensure variety and collaboration at multiple levels of governance, but leadership should also provide clear guidance to enable society to take action.
- Learning processes need to be more structured. Current learning processes (e.g. review of strategy implementation) are open-ended. Procedural and substantive targets and timetables for learning are needed to ensure structural learning.
- There is a need for clear framework conditions to be developed at national level, which are then to be appropriately translated into action at provincial through to local level (as was done in the “weak links programme”), backed by monitoring and accountability procedures.
- The state has to realize it cannot address all adaptation challenges alone, and needs to create institutionalized support for civil society to take action, through 1) giving residents access to relevant climate adaptation information; 2) assessing new policies on the potential effects of reducing the room for autonomous change and improvisations and 3) enabling self organizing communities.
- The long-term nature of climate change calls for reserve funds for long-term problems. An innovative system for fund raising is probably needed.
- Climate change mitigation and adaptation have major equity implications not only globally but also nationally. At present policy processes have glossed over these national equity challenges.

In terms of policy domain/ region specific issues, this project recommends that:

- The nature institutions at EU level are at present too rigid and inflexible; a more flexible and responsive institution is needed at EU level.
- The path dependency of building housing in low lying areas has led to maximum exploitation of such low lying areas. There is need to think of alternative locations for new developments.
- Over-confidence about flood protection skills should be avoided. Although flood protection must be a priority of the low-lying Netherlands, there is need for redundancy measures that reduce flood exposure and flood vulnerability; good evacuation strategies and flood proofing urban areas are critical as well.
- The stagnated policy process in the Wadden Sea area should be revitalized. Politics and policies in the Wadden Sea are too focused on the short-term (next year’s mussels) and inadequately focused on the long term (e.g. safety on the islands, ecosystem goals, etc.). There is need for a long-term policy and political process.

- Although recent legislative changes have clarified responsibilities in local water management, in practice responsibilities may still conflict. To prevent a situation in which no one feels responsible or accountable for solving local water nuisance, the municipality should take the lead in clarifying and communicating the division of responsibilities between different social actors.

The results of this project have been disseminated through scientific and popular publications (see Annex I), presentations for scientists, policy makers and other social actors at international and national conferences and meetings (see Annex II), the media (see Annex III), hosting workshops and conferences (see Annex IV) and through IC12 Working Documents available from the KvR website (see Annex V). Furthermore, this project has had several spin-offs (see Annex VI). The project team hopes that the work done in this project will be used to further improve our understanding of the role of institutions in adapting to climate change in the future.

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Annex I. Dissemination of outcomes

Publications

Item no.	Publication
1	Bestuurskunde (2009), nummer 4. Special issue. Hierin: Katrien Termeer, Sander Meijerink en Sibout Nootboom (2009) Klimaatneutrale of klimaatbestendige bestuurskunde?
2	Katrien Termeer en Sander Meijerink. Klimaat bestendig of klimaat neutraal bestuur? Een essay over het adaptief vermogen van instituties voor de Raad voor Verkeer en Waterstaat. www.raadvenw.nl , 2009.
3	Gupta, J., K. Termeer, J. Klostermann, S. Meijerink, M.van den Brink, P. Jong, S. Nootboom and E. Bergsma (2010). Institutions for Climate Change: A Method to Assess the Inherent Characteristics of Institutions to Enable the Adaptive Capacity of Society, <i>Environmental Science and Policy</i> , 13, 459-471.
4	Jong, P. (2009) Wateroverlast op straat: een juridische verkenning van een lokaal milieuprobleem. In: N. Teesing (red.), <i>Juridische aspecten van klimaatverandering</i> , Preadvis van de werkgroep klimaatverandering en rechtsontwikkeling, Boom Juridische Uitgevers, Den Haag, 2009, p. 97-113. ISBN 978-90-8974-083-0.
5	Klostermann, J., P. Jong, J. Gupta R. Biesbroek and E. Bergsma (2010) Het adaptieve vermogen van het Nationaal Waterplan, <i>H2O</i> , 42: 25/26.
6	Van den Brink, M., K. Termeer and S. Meijerink (...) Are Dutch water safety institutions prepared for climate change? <i>Journal of Water and Climate</i> , in review.
7	Bergsma, E., J. Gupta and P. Jong (...) Climate Change and Individual Responsibility in Adaptive Capacity – the case of the Netherlands. <i>Journal of Resources, Conservation & Recycling</i> , in review.
8	Sander Meijerink, Sibout Nootboom and Katrien Termeer (...) The use of system archetypes for social learning the case of dutch water policy adaptation to climate change. <i>Water Policy</i> , submitted.
9	Gupta, J., K. Termeer, J. Klostermann, S. Meijerink, M.van den Brink, P. Jong, S. Nootboom, R. Biesbroek and E. Bergsma (...) The Adaptive Capacity of Dutch Institutions. <i>Climate Policy</i> , submitted.

Working Documents

WD no.	Name	Authors
1	Institutions for Adaptation: The Capacity and Ability of the Dutch Institutional Framework to Adapt to Climate Change – Research Protocol. IC12 Working document 1, Report number Wo8/03, Institute for Environmental Studies, Amsterdam.	Joyeeta Gupta, Katrien Termeer, Margo van den Brink, Judith Klostermann
2	Institutions for Climate Change – A Method to assess the Inherent Characteristics of Institutions to enable the Adaptive Capacity of Society. IC12 Working document 2, Report number Wo8/21, Institute for Environmental Studies, Amsterdam.	Joyeeta Gupta, Katrien Termeer, Judith Klostermann, Sander Meijerink, Margo van den Brink, Pieter Jong and Sibout Nooteboom
3	Verslag Bijeenkomst IC12-team “Instituten voor adaptatie”, 4 March 2009, Academiegebouw Utrecht. IC12 Working document 3, Report number Wo9/006, Institute for Environmental Studies, Amsterdam.	Sibout Nooteboom, Joyeeta Gupta, Katrien Termeer, Judith Klostermann, Sander Meijerink, Margo van den Brink, Pieter Jong en Robbert Biesbroek.
4	An Inventory of Institutions in the Netherlands that are Relevant for Climate Change. IC12 Working document 4, Report number W-10/019, Institute for Environmental Studies, Amsterdam.	Judith Klostermann, Joyeeta Gupta, Pieter Jong, Emmy Bergsma
5	Applying the Adaptive Capacity Wheel on the background document of the Content Analysis. IC12 Working Document 5, Report number W-10/008, Institute for Environmental Studies, Amsterdam.	Judith Klostermann, Emmy Bergsma, Joyeeta Gupta and Pieter Jong
6	Horizontal Analysis of Content Analysis. IC12 Working document 6, Report number (forthcoming), Institute for Environmental Studies, Amsterdam.	Judith Klostermann, Emmy Bergsma, Joyeeta Gupta
7	Case Study on Individual Responsibility in Adaptive Capacity. IC12 Working Document 7, Report number Wo9/10, Institute for Environmental Studies, Amsterdam.	Emmy Bergsma, Joyeeta Gupta and Pieter Jong
8	Zuinig omgaan met het Wad; Casus natuur in het Waddengebied van het Klimaat voor Ruimte project IC12' Adaptieve capaciteit en instituties. IC12 Working Document 8, Wageningen, Alterra.	Judith Klostermann, Emmy Bergsma
9	Case study on Sustainable and Climate-proof spatial planning. IC12 Working Document 9, Report number W-10/020, Institute for Environmental Studies, Amsterdam.	Margo van den Brink
10	Are Dutch water safety institutions prepared for climate change? IC12 Working Document 10, Report number W-10/009, Institute for Environmental Studies, Amsterdam.	Margo van den Brink, Katrien Termeer, Sander Meijerink
11	Cross case analysis of institutions and adaptive capacity in the Netherlands. IC12 Working Document 11, Report number W10-016, Institute for Environmental Studies, Amsterdam.	Sander Meijerink, Emmy Bergsma, Margo van den Brink, Joyeeta Gupta, Pieter Jong, Judith Klostermann, Katrien Termeer



WD no.	Name	Authors
12	Assessing the Ability of Dutch Institutions to Stimulate the Adaptive Capacity of Society. IC12 Working Document 12, Report number (forthcoming), Institute for Environmental Studies, Amsterdam.	Joyeeta Gupta, Sander Meijerink, Emmy Bergsma, Robbert Biesbroek, Margo van den Brink, Pieter Jong, Judith Klostermann, Katrien Termeer
13	Het 'adaptieve vermogen' van het ontwerp Nationaal Waterplan. IC12 Working Document 13, Institute for Environmental Studies, Amsterdam.	Judith Klostermann, Pieter Jong, Joyeeta Gupta, Robbert Biesbroek
14	PhD thesis "Barriers in the governance of climate change adaptation" (forthcoming)	Robbert Biesbroek

Working documents can be downloaded from
<http://www.klimaatonderzoeknederland.nl/projecten/projectendatabank>

Annex II. Description of case studies

Case study 1 Individual responsibility

National and regional governments all over the world are shifting responsibilities to lower levels as a key element in their adaptation strategies. A first reason is that private companies are assumed to compete and, therefore, they are expected to be more efficient than a government that is operating under monopoly conditions. The second reason is to make citizens and other private actors more aware of their own behaviour and their own contribution to public problems. This strategy has also been adopted in the Netherlands. Case study 1 focuses on the adaptive capacity of Dutch institutions for local water management and tries to assess how the shift to individual responsibility affects the adaptive capacity of these institutions. The research addresses three questions. How is the shift to individual responsibility dealt with in practice? What are the strengths and weaknesses of the approach for enlarging the adaptive capacity for local water management? And how useful is the applied analytic framework to assess institutions on adaptive capacity? To address these questions, research for this case study was conducted in three local regions: the city of Zaandam and its recent city extensions, the agricultural polder Wijde Wormer and the urbanized municipality of Delft.

Case study 2 National Water Safety

Since the Netherlands is a low-lying delta area, threatened by floods from the sea and the rivers, around 50% of this country is protected by natural sand dunes and artificial dikes. A key concept in the Netherlands is the notion of water safety – which combines the post modern concepts of dynamic coasts and room for the river with hard infrastructure focused on protection. Finding the balance between the two approaches is a challenge. This case study deals with the question: To what extent do the historically evolved Dutch water safety institutions have the capacity to cope with the 'new' challenges of climate change? As a result of the relatively successful implementation of large water works in the past – such as the Delta Works – the Dutch water safety policy domain is generally considered exemplary for the adaptive capacity of the Dutch institutional framework

with respect to the effects of climate change. Central in this case study is the Dutch water sector and it assesses the adaptive capacity of Dutch water safety institutions more in particular.

Case study 3 Climate-proof spatial planning for flood prone areas

The concept of 'multi-layered safety' has been adopted as a central concept of Dutch water safety policy. This concept introduces a distinction between three different safety layers. The first safety layer is flood prevention: the reduction of flood probability by taking both technical and spatial measures. The second safety layer aims at reducing the potential impacts of flooding. The third safety layer involves disaster preparedness. In the Netherlands, where the main focus is on the reduction of the flood probability, the development and implementation of the second safety layer in particular is problematic. This case study zooms in on the development and implementation of the second safety layer: climate-proof spatial planning for flood prone areas. Both vulnerability reduction and exposure reduction are essential parts of climate-proof spatial planning. Vulnerability reduction involves the process of urban planning. Exposure reduction involves the location choice debate: where do we (not) want to build in anticipation to the effects of climate change? The case study focuses on two geographical levels: climate-proof spatial planning in the Zuidplaspolder at the regional level, and climate-proof spatial planning in Westergouwe at the local level. The central question is: To what extent do the existing spatial planning institutions enhance the capacity of Dutch society to adapt to the potential impacts of climate change?

Case study 4 Adaptive Capacity of Nature Institutions for the Wadden Sea

This case study assesses Dutch institutions within the nature sector and analyses their capacity to adapt the Wadden Sea region to climate change. A key challenge with respect to adaptive capacity is ensuring that ecosystems can adapt. One of the most important ecosystems in the Netherlands is the Wadden Sea ecosystem. The Wadden Sea is a system of islands, sandbanks, sludge plates and gullies stretching from the north of the Netherlands along the German coast to Denmark. It functions as an important habitat for shellfish, fish and migrating birds. The ecosystem changed fundamentally when the Zuiderzee was closed off by the Afsluitdijk into a large freshwater lake (the IJsselmeer). The remaining Wadden Sea is under pressure because of fisheries, shipping, pollution and other human influences. At the same time, the beauty of the area attracts many tourists. A key question is how can this system be protected? This case study focuses on climate change adaptation in the Wadden Sea region. The research aims to answer the question: Do Dutch institutions for nature enable adaptation to climate change in the Wadden Sea region? The impacts of climate change on the Wadden Sea region can be categorized into two themes: sea level rise combined with land subsidence on the one hand, and increased temperatures of sea water on the other hand. Both impacts have consequences on the conditions for existing species and ecosystems.



Climate changes Spatial Planning

Climate change is one of the major environmental issues of this century. The Netherlands are expected to face climate change impacts on all land- and water related sectors. Therefore water management and spatial planning have to take climate change into account. The research programme 'Climate changes Spatial Planning', that ran from 2004 to 2011, aimed to create applied knowledge to support society to take the right decisions and measures to reduce the adverse impacts of climate change. It focused on enhancing joint learning between scientists and practitioners in the fields of spatial planning, nature, agriculture, and water- and flood risk management. Under the programme five themes were developed: climate scenarios; mitigation; adaptation; integration and communication. Of all scientific research projects synthesis reports were produced. This report is part of the Integration series.

Integration

The question is how to increase the 'adaptive capacity' of our society. Analysis of the adaptive capacity is related to the physical component (the feasibility of physical spatial adaptation) and to the existing institutional structures. Areas Climate changes Spatial Planning dealt with are: uncertainties and perceptions of risk; institutional capacity to deal with climate change; the use of policy instruments; and cost benefit analysis. Adaptation strategies must be in line with the current institutional structures of a policy area. For a proper decision process we developed decision support tools, such as socio-economic scenarios, the Climate Effect Atlas and other assessment frameworks.

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