IVM Institute for Environmental Studies

How Dutch Institutions Enhance the Adaptive Capacity of Society

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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 the adaptive capacity of the institutional framework of the Netherlands 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. They provide norms and rules for collective action and create continuity rather than change. However, the nature of societal problems is changing as a result of the processes of globalization and 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, more importantly, with the impacts themselves? Are our institutions capable of dealing with the inherent uncertainty of the predictions?

Research questions

This leads to the identification of the overall research questions: How can the adaptive capacity of Dutch institutions from local through to national level to deal with climate change be assessed? What are the key implications of undertaking such an assessment? What general and specific recommendations flow from such an assessment, both in terms of institutional design theory and in terms of policy?

Key definitions

To ensure a consistent research approach during the course of the project on the one hand, and produce a basic structure for future comparable research on adaptive capacity on the other hand, the project team has defined the key concepts used in this research based on a literature review.

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. On the one hand, institutions restrict the possibilities of people to act, while, on the other hand, they enable people to act.

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, adaptive capacity in this research is seen 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.

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 of adaptive capacity. It has also identified twenty-two criteria to measure or evaluate the dimensions. The dimensions are explained below; for their epistemological roots, see Chapter 2. Definitions of the criteria are given in Table 1.

Variety

Unstructured problems like climate change 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 envisage future expected and unexpected climate impacts through having a range of adaptive or proactive strategies, measures and instruments at its disposition. It implies that there is no single appropriate ideological framework, no unique optimal policy strategy or set of mutually consistent solutions, but that there are many. Variety calls for fostering diversity, understanding complication, and resisting the tendency towards simplification and reductionism. It challenges mainstream policy approaches that focus on clarity, rationality and efficiency. It encourages social ingenuity to continuously generate tailor-made solutions. However, variety can also paralyze action; imply suffocating consensus and negotiated nonsense. The 'law' of requisite variety argues that the variety within the system must be at least as great as the environmental variety against which it is attempting to adjust itself.

We argue that an institution embeds variety when it (a) allows for a variety of problem frames and solutions; (b) allows for a variety of actors (multi-actor), levels (multi-level) and stakeholders (multi-sector) during the policy formulation process; (c) promotes diversity to reach tailor-made policies; and (d) allows redundancy in the short-term to promote the best long-term solutions. Redundancy implies 'more of the same', for example, a backup system for energy production.

Learning capacity

The concepts of human learning, social learning, learning capacity and the ability to experiment are integral to adaptive capacity because it leads to greater understanding of the situation and feedback mechanisms. Before learning can take place, enhancement of trust between social actors is necessary. Adaptive institutions encourage actors to learn, permit them to question underlying socially embedded meanings, assumptions, ideologies and frames, and allow them to adapt roles, rules and procedures that dominate present problem solving. This includes 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 that prevent participants from experiencing

embarrassment or threat, and overprotect current frames. Redesigning institutions often calls for 'unlearning' past insights, routines, fears and reflexes. Continuous learning does not mean reinvention of the wheel over and over again: at some point it needs to crystallize into new shared routines.

Criteria to assess the ability of an institution to demonstrate learning capacity include allowing and encouraging actors to (a) trust each other; (b) adopt single loop learning, (c) adopt double loop learning; (c) explicitly consider doubts and uncertainties; and (d) stimulate institutional memory.

Room for autonomous change

Since learning does not actually include behavioural changes, 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. Institutions have to enable social actors to anticipate possible futures, to take planned preventive measures against important threats and to seize opportunities when they present themselves. Institutions should also allow actors, particularly at lower levels of governance, to change behaviour especially during a crisis or disaster, since studies reveal that immediate relief efforts are mostly undertaken by other 'victims' and not by the government or aid organizations. Adaptive institutions enhance this self-help function by encouraging experimentation with and responding to everyday contingencies, breakdowns, and opportunities; they provide short feedback loops for actors to continuously improve their social practices. Yet, in a complex multi-actor, multi-level, multi-sector and multi-domain setting, short feedback loops between all interdependent units may make cooperation difficult.

Criteria to assess the room for autonomous change include understanding whether institutions ensure that actors have (a) continuous access to information, (b) are capable of acting according to plan and (c) have the capability to improvise.

Leadership

A fourth criterion is leadership, without which society is often unable to respond in a coordinated way to the long-term, large scale challenges that affect humanity. Leadership is a driver for change, showing a direction, 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.

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 enable social actors to implement these rules into daily practices. Clearly, the contexts within which institutions exist have a major influence whether institutions are able to raise resources. Resources can include financial, social, human, legal, and technological resources.

Criteria include whether institutions have (a) authority (mandate), (b) human, and (c) economic resources.

Fair governance

Lastly, adaptive institutions should meet fair governance criteria. We adopt several criteria attributed to 'good governance' in the literature; however, we have chosen the term fair governance in preference to the term good governance. One of the criteria for good governance is efficiency of resources, while we emphasise redundancy over cost-effectiveness, as innovation processes are notoriously inefficient and should be allowed to be inefficient in order to take place at all. Of course, fairness implies that resources should not be squandered indiscriminately and that an appropriate balance has to be found between effectiveness and efficiency. Maximum efficiency is only possible in a stable and certain environment and, therefore, it cannot be a first priority when dealing with climate change.

Criteria for fair governance include: (a) legitimate policy processes, (b) equity, (c) responsiveness and transparency and (e) accountability.

Table 1 Explaining the dimensions and criteria of the Adaptive Capacity Wheel

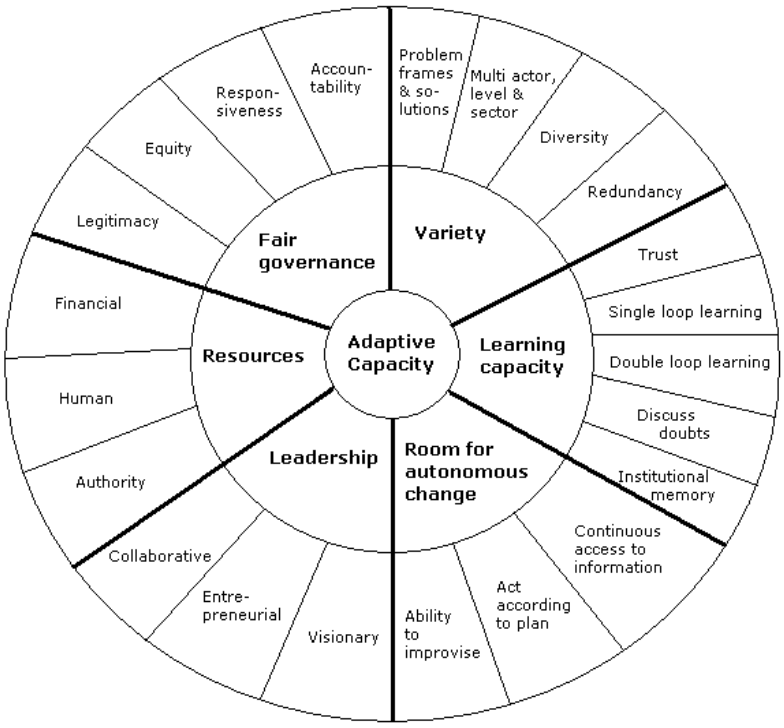
Dimension	Criterion	Definition
1. Variety	Variety of problem frames	Room for multiple frames of references, opinions and problem definitions
	Multi-actor, multi-level, multi-sector	Involvement of different actors, levels and sectors in the governance process
	Diversity of solutions	Availability of a wide range of policy options to tackle a problem
	Redundancy	Duplication, presence of overlapping measures and back-up systems; not necessarily cost-efficient
2. Learning capacity	Trust	Presence of institutional patterns that promote mutual respect and trust
	Single loop learning	Ability of institutional patterns to learn from past experiences and improve routines
	Double loop learning	Evidence of changes in assumptions underlying institutional patterns
	Discuss doubts	Institutional openness towards uncertainties
	Institutional memory	Institutional provision of monitoring and evaluation processes of policy experiences
3. Room for autonomous change	Continuous access to information	Accessibility of data and early warning systems to individuals
	Act according to plan	Increasing the ability of governments, companies and individuals to act, for example, in case of disasters
	Capacity to improvise	Increasing the capacity of individuals to self-organize and innovate –fostering social capital
4. Leadership	Visionary leadership	Room for long-term visions and reformist leaders
	Entrepreneurial leadership	Room for leaders that stimulate actions and undertakings; leadership by example
	Collaborative leadership	Room for leaders who encourage collaboration between different actors – adaptive co-management

Dimension	Criterion	Definition
5. Resources	Authority	Provision and use of accepted or legitimate forms of power
	Human Resources	Availability of expertise, knowledge and human labour
	Financial Resources	Availability of financial resources to support policy measures
6. Fair governance	Legitimacy	Whether or not institutional rules are embedded in constitutional laws and whether there is public support for a specific institution
	Equity	Whether or not institutional rules are fair and inclusive
	Responsiveness	Whether or not institutional patterns are open to feedback and show response to society
	Accountability	Whether or not institutions provide accountability procedures

The development of a methodology

The Adaptive Capacity Wheel

The project developed an Adaptive Capacity Wheel (see Figure 1 below) as a tool to assess the 6 dimensions of adaptive capacity and its and 22 criteria, as well as a tool to represent the results of our research. Colours (see colour scheme below the wheel in figure 1) indicate high (green) and low (red) adaptive capacity. This way, the Adaptive Capacity Wheel can be used to inform social actors about how their institutions perform on adaptive capacity and where there may be room for reform.



Effect of institution on adaptive capacity	Score	Aggregated scores for dimensions and adaptive capacity as a whole
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 1 The Adaptive Capacity Wheel and Scoring System

Research Protocol

The Adaptive Capacity Wheel cannot be 'objectively' applied. Values given to each criterion cannot simply be 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 dimension 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
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.
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.

Methodological implications

The advantages of the Adaptive Capacity Wheel as revealed within and outside the project are that the method:

- Is a comprehensive diagnostic tool – it diagnoses possible problems areas that can then be the subject of discussion and debate. It also indicates areas of strength which can be further built upon. Because of the qualitative character, it indicates areas of concern; not necessarily weakness. A concern may not be critical to the adaptive capacity of the institution – this calls for interpretive analysis. But, if it is, it needs attention;
- Allows for compressing large amounts of information in a concise overview;
- Uses a traffic light system and is highly communicative;
- Can be used for separate instruments as well as for case studies at different levels and in different contexts;
- Can be tailor-made to fit specific impacts – as the case studies show.
- Can be potentially expanded to include indicators for each criterion.

The disadvantages are:

- Certain terms may be perceived as 'loaded' in a particular culture (e.g. authority 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 term-sensitivity on the part of the researcher;
- The method has limited ability for meaningful aggregation of results because the criteria are not independent variables. Aggregation leads to less explanative power. It can be useful though to compare results on a higher level, for example, when different institutions within sectors are aggregated, sectors can be compared;
- The method incorporates and exposes some interesting paradoxes – e.g. is leadership compatible with variety? It calls for high quality interpretative skills on the part of the researcher;
- The method is not objective but intersubjective; it aims at maximum transparency – ensuring that there are clear arguments given as to why an institution has been classified in a particular manner.

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 sector, agriculture, nature and the water sector. Formal institutions were investigated through a content analysis. In the content analysis, the Adaptive Capacity wheel was applied to separate legal and policy documents. Four case studies were conducted to study the use of formal institutions in practice and to identify the relevant informal institutions. Finally, the information was integrated back to the level of Dutch institutions in general.

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. 93 documents were studied. The study revealed that there was strong coherence between documents within individual sectors: apparently, there was a common paradigm in use within each sector. This meant that applying the Wheel to a smaller selection of documents 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 have their own paradigms, and the conclusions for water, nature, agriculture and spatial planning most likely do not apply on those domains. The results of this study thus cannot be extrapolated to sectors that have not been studied.

From the 93 documents, 23 were selected for further analysis and application of the Adaptive Capacity Wheel. Tables 2 and 3 below show the Adaptive Capacity Wheels for all 23 documents. Table 2 shows a comparison of documents between different governance levels and Table 3 provides a sector by sector comparison. From these Wheels we draw a number of conclusions. First, the international and supranational level instruments tend to score quite well as instruments that stimulate the adaptive capacity of humans. 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 develop and improve 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. At the same time, 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 reason that some sectors score better than others is that the instruments in those sectors tend to have a more enabling character. They open up space for adaptation to climate change. Those that are more rigid and do not take climate change adaptation into account tend to fare poorly. The institutions in the nature sector focus more on a) in-situ conservation as the main goal, without taking into account the changing climatic zones; and b) the decision-making procedures in this sector are not open to stakeholders other than ecological experts, which limits variety.

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

International	European	National
Natura 2000	Water Framework Directive	National Adaptation Strategy
		
Common Agricultural Policy	Flood Risk Directive	National Safety Strategy
		
	EU White Papter on Adaptation	
		

Table 3 Comparative assessment of sectoral policies relevant for adaptation

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

Application to case studies

The research team selected four case studies to analyse the use of social institutions in practice. We examined (a) individual responsibility for water management at the municipal level, (b) water security at the national level; (c) a multi-level analysis of building in low lying areas and finally (d) protection of the Wadden Sea. The characteristics of the case studies are shown in Table 4.

Table 3 Case Study Selection

	Individual Responsibility	**Wadden Sea**	**Building in low lying areas**	**Water Safety**
Spatial scales	Local	National	Local to regional	National
Sectors	Water, urban, agriculture, spatial planning	Nature, water, spatial planning	Water, spatial planning	Water, nature, agriculture, spatial planning
Main focus	Individual responsibility for water management	Protection of ecosystems and biodiversity	Multi-layered safety	Environmental security
Innovative	Yes	Partly	Yes	Partly
Important for stakeholders	Yes	Yes	Yes	Yes

A comparative assessment of the Adaptive Capacity Wheel of the four case study areas is provided in Table 5. The overall scores for the case studies on individual responsibilities are neutral (they have a slightly negative or positive score). The adaptive capacity is relatively high in the water sector (case studies of Room for the River, Second Delta Committee and flood risk approach) and the spatial planning sector (case studies Zuidplaspolder, Westergouwe). There are also weaknesses though: the flood risk approach has not yet been implemented and the construction of Westergouwe is threatened by a lack of financial resources. The adaptive capacity in the Wadden Sea (sector of nature management) is negative for most dimensions, especially leadership and financial resources. The dimension of learning capacity scores well.

The case studies reveal some tensions or dilemmas between the criteria and dimensions. Firstly, there is a tension between Leadership and Room for autonomous change. In the area of water safety, autonomy is aimed for because it 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 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, or a range of technical measures needed to raise the water level in the freshwater lake IJsselmeer. This can be considered as visionary leadership; however, it would decrease water awareness. After all, why should citizens bother about water safety if the government takes care so well?

The case study on individual responsibility in urban water management has revealed the same tension. The government formally makes citizens and land owners responsible for water management on their own premises, such as drainage of rainwater. In practice this is hard to implement, especially in densely populated cities where people have very little room and are dependent on municipal water systems. Not surprisingly, the parties involved have different perceptions of the distribution of responsibilities between the local authorities and home / land owners. Intensive rainfall and urban flooding may easily lead to a situation in which government argues that land owners and citizens should have taken their responsibilities, whereas the latter hold the former accountable. In this case, some municipalities take leadership and others don't.

Variety and Leadership seem opposite forces. When there is strong leadership, only one policy alternative remains, such as the sand suppletion method to control sediment dynamics in the Wadden Sea. And weak leadership leaves a lot of room to experiment, leading to more variety in solutions and coalitions. This is one of the most important tensions in the adaptive capacity wheel that needs to be solved in order to achieve enough adaptive capacity.

The dimension of Variety appears to be strongly related to the dimension of Learning. Where the variety in policy strategies is 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 safer locations).

Variety is also related to Room for autonomous change. The case studies show that government remains the dominant actor in adaptation to climate change and there are only a limited variety of other actors involved. Therefore,, we argue that the Room for autonomous change for social actors is still relatively low.

Both Leadership and Resources are crucial conditions to adaptive capacity. Whereas the Dutch water sector possesses 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 4 Comparative assessment of case study material

Case	Application
Individual responsibility	 ACW for Zaandam  ACW for Delft  ACW for De Wijde Wormer
Wadden Sea	 ACW for the Wadden Sea Region
Building in low lying Areas	 ACW for the Zuidplaspolder  ACW for Westergouwe
Water Safety	 ACW Room for the River  ACW Flood Risk Approach  ACW Second Delta Plan

Conclusions

The conclusions are based on the content analysis as well as the four case studies. The research comes to the following conclusions.

First, the Netherlands has 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.

Second, 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.

Third, the comparative assessment of the sector specific policies leads to the identification of different paradigms in different sectors. These paradigms must have occurred 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 fluid 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 fluid 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 to 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 to help them 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).

Fourth, the comparative analysis reveals that (a) the nature institutions are the weakest in adaptive capacity, possibly because there are few interactions with institutions outside the nature sector, because they strive towards recreating situations that existed in the past, and because of the 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 rigid 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 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 is 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, in relation to storm water, formally there is a strong emphasis on transferring responsibilities to house and land owners. In practice this creates a lot of confusion. Such confusion relates (a) to the lack of awareness of home and land owners' awareness about the existence of such a rule; (b) citizens lack of awareness what ground water level is in urban areas; (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 assessment examining the room for the river project, the flood risk approach, and the second Delta plan reveals a number of strengths: a 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, there are also a number of weaknesses. (i) The successful experience with and reliance on technological and technical methods implies that other more experimental approaches are not adequately implemented – creating an institutional lock-in. (ii) The state has assumed a paternalistic role of guaranteeing the safety of Dutch citizens which may lead to a certain degree of 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. (iv) An exclusive focus on probability reduction has implied less synergy between collaborative and entrepreneurial leadership. Finally, although there are resources for state run water safety; there are few resources for other types of inclusive approaches to water safety.

Eighth, the case study about building in low-lying areas examines spatial planning institutions at regional and local level in Zuidplaspolder and Westergouwe. It reveals that spatial planning institutions are highly path dependent. There is a strong focus on technological climate proofing of spatial structures and encouraging the development of tailor made solutions rather than moving out of the more vulnerable areas. At regional and local level there is space for and use of variety – variety of problem definitions and solutions; however, synergies with the national level are low. The key question: should we be building in the most vulnerable areas is until now always answered with: 'Yes we can!'

Ninth, there is no comprehensive approach to dealing with climate adaptation in the Wadden sea; and the sum of individual efforts combined with a more rigid European and national legislation in this field 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: there is no debate on the safety of the islands on the long-term yet and no vision on ecosystem development in the future. However, the learning capacity is promising and the Wadden fund is an interesting experiment in long term funding as well.

Tenth, the application of the Adaptive Capacity Wheel by project members and non project members (to the Stichtste Rijnlanden in the Netherlands and national policy in South Korea) have revealed that this is an interesting science-policy instrument with considerable potential. The use of 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. It can help further professionalize and internalize the learning capacity, mobilizes practical knowledge from the policymakers themselves and may generate more support for the implications of these analyses. The ACW can be a useful tool for international benchmarking, for structuring information to facilitate comparison.

Recommendations

The project comes up with a number of policy recommendations.

- 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': legislation that becomes active when do not succeed in taking action themselves. There is 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 in some cases. Redundancy is expensive and politically challenging especially in times of recession where duplication of services is minimized and public bureaucracies streamlined. We recommend that political support for redundancy can be organized through smart couplings between measures in different policy domains. This implies that redundant measures, considered necessary for adaptation, must support problem solving in other policy domains (e.g. create employment).
- There is a need for clear leadership to ensure that variety and multiple levels of governance are optimized to and focused to address the challenge of adaptation. There needs to be room for leadership to emerge at different levels of governance that encapsulate visionary, collaborative and entrepreneurial leadership.
- 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. Such learning can be promoted through the shadow of hierarchy such as a Climate Act.
- There is a need for clear framework conditions to be developed at the national level, which are 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 also has to realize it cannot address all adaptation challenges alone. I needs to create institutionalized support for civil society to take action. It is not enough to transfer responsibility to citizens; there is need for support and capacity building to ensure that residents can take action through 1) giving residents access to relevant climate adaptation information; 2) assessing new policies on the

potential negative effects on reducing the room for autonomous change and improvisation and 3) enabling self organizing communities.

- The long-term nature of the problem calls for reserve funds for long-term problems. An innovative system for fund raising is probably needed.
- Climate change mitigation and adaptation may 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 building.
- 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 at the same time; good evacuation strategies and flood proofing urban areas are critical recommendations.
- 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.
- The confusions regarding individual responsibilities in local water management should be removed. Although recent legislative changes have clarified responsibilities in local water management, there is still lack of clarity. There should be a role for municipalities to take the lead in negotiating and communicating the differences in responsibilities and in creating the circumstances under which these can be improved.
- The accumulation of expertise creates confidence in the ability of the Netherlands to be able to rise to any challenge. On the other hand, one can question whether the Dutch have become over confident. Clearly, climate change is a complex problem, and the solutions chosen are also complex and pluralistic. The complexity of the entire process raises the hope that society as a whole can be empowered to deal with climate change impacts. However, the fear is that adaptive efforts may be dissipated between different actors and individuals and that the collective action may not amount to more than a sum of the individual acts. The VROM Council warned of this and called for the establishment of a watchdog to monitor the entire process.

1 Problem description

1.1 Introduction

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 the adaptive capacity as it is created by the institutional framework of the Netherlands to cope with the impacts of climate change. It is a result of Project IC12 'Institutions for Adaptation' which started in May 2007 as a part of the Dutch research Programme 'Climate Changes Spatial Planning' (CcSP). This document presents the integrated results of the research.

This chapter discusses the problem description, the research question and log frame; the objectives of this research, the focus and limits, the impacts of climate change on the Netherlands and the approach to the research.

1.2 The relation between climate change and institutions

Social institutions tend to create continuity in policy outcomes rather than change. Since science provides information about the potential climate changes that will influence and challenge society, it becomes increasingly necessary to understand the ability of institutions to enhance the adaptive capacity of society to deal with such continuous structural, and mostly, uncertain changes.

Institutions are defined as: "systems of rules, decision-making procedures, and programs that give rise to social practices, assign roles to the participants in these practices, and guide interactions among the occupants of the relevant roles" (IDGEC Scientific Planning Committee 1999). The rules and roles are 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). In some literature, the term 'institutions' can also refer to 'organizations'. According to our definition, organizations are also created by institutions, (eg the Waterboard Law) but a specific organization (Waterboard Regge and Dinkel) is not an institution. If we mean organizations, we will use the terms 'organizations' or 'actors'.

Institutions evolve incrementally to deal with existing social problems. However, the nature of societal problems is changing as a result of the processes of globalization and 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. Are our institutions capable of dealing with this new knowledge about future impacts and, more importantly, with the impacts themselves? Are our institutions capable of dealing with the inherent uncertainty of the predictions?

The climate is not the only aspect in this world that is changing. We notice a number of societal trends – a shift towards individual responsibility to receive rain water on private property and to encourage individuals to seek insurance rather than depend on a safety net to be provided by the government; increasing pressure on rural land use because of urbanisation processes, together with developments to combine land use functions; decisions to develop large scale housing projects that do not take into account the potential impact of climate change; and, the development of innovative solutions such as floating houses and brackish agriculture. We notice that nature

policy increasingly aims to protect and conserve nature within specific sites but climate change may change the attractiveness of existing habitats. How will institutions take this into account? We also notice the development of new organizational arrangements, such as multilevel agreements between policy actors, a more horizontal approach to land use planning, and a shift form national to European nature policies. Obviously, the system we will try to study is a moving target, and the theoretical framework we use will have to be able to deal with this.

We believe that climate change is a multi-scale problem both in terms of administrative levels and in terms of time-scales. In other words, we see climate change not merely as a global problem (Willink 1991), but as both a systemic and a cumulative problem whose causes occur at all levels and whose impacts will be felt at all levels now and into the future.[1] Upscaling and centralization appear to be attractive policy strategies for dealing with climate change (Kwadijk, Klijn & Van Drunen 2006), because the problems have global causes as drivers and because of the need to deal with free riders. A global approach helps to create a level playing field. At the same time, action ultimately has to be taken in specific contexts and by people living in those contexts. This calls for down-scaling the issue and understanding what sort of measures need to be taken in specific contexts. In the final analysis, it become critical to find the appropriate set of consistent and complementary measures that work at different administrative levels within different contexts that are conducive to changing human behaviour at those specific levels.

This approach is consistent with the trend in the social sciences to move from government to governance approaches, to move from discussion of hierarchical and well-institutionalized forms of government towards less formalized forms of governance in which networks and horizontal relations between interdependent actors have grown in importance (Hanf & Sharpf 1978; Blatter 2003; Arts & Van Tatenhove 2005; Hajer & Wagenaar 2003; Rhodes 1997; Pierre 2000; Kooiman 1997). Where government is visualized as a rigid, centralized, unitary, top-down process of providing rules in the public interest that have to be implemented at local level, governance[2] is seen as a flexible, diffuse, bottom-up and top-down process which allows for close interactions not only between the different levels of government but also with social actors (both commercial and non commercial entities) with vastly different interests (Krahmann 2003). Governance and good governance[3] are often seen as key institutional settings for addressing problems. Multi-level governance[4] emphasizes the diffuse and decentralized nature of governance as well as the need for links between all levels. However, governance approaches also face problems like inertia, syrupiness,

1 Turner II et al. (1990) argued that there were two types of global change – one that is systemic and one that is cumulative. Systemic impacts refer to processes with a direct impact on the global systems such as the emissions of greenhouse gases and land use change; and cumulative impacts are those where world-wide distribution of changes lead to major impacts. Kates and Wilbanks (2003) submit that while atmospheric processes can be seen as regional, emissions, impacts and responses could be seen as local. In effect, when one is referring to global concentrations and global mean temperature rise, one is referring to a global phenomenon.

2 "Governance is the sum of the many ways individuals and institutions, public and private, manage their common affairs. It is a continuing process through which conflicting or diverse interests may be accommodated and cooperative action may be taken" (Commission on Global Governance 1995).

3 Good governance is generally seen to include accountability; transparency; participation; effectiveness and efficiency; equity; and the rule of law. See e.g. Botchway (2001).

4 See, for example, Winter (2006).

suffocating consensus, and negotiated nonsense.[5] Multiple trade-offs may be made by multiple actors, leading to inconsistent decisions (Gupta 2004).

Based on the assumptions that climate change is a multi-scale problem, and that we are in the middle of a paradigm shift from government to governance, our assumptions at the start of this project were:

- The need to adapt to climate change requires changes in the Dutch system of institutions for governing land use, nature, agriculture and water.
- Which institutions this concerns, and how they should be changed, is not yet known, and there is no assessment method for it.
- A method to assess the degree to which Dutch institutions are climate-proof can be developed, and is useful for prioritizing institutional changes in order to adapt to climate change.
- Such an assessment method could, in principle, be also useful for other nations around the world.
- An institutional system that aims to deal with the problem of climate change needs to be a multi-level system: from local to global, aiming at short and long term impacts, with complementary and mutually consistent action taken at different levels.
- Climate change can be characterized as a complex, ill structured or wicked problem. Therefore, more horizontal forms of governance, inter-organizational cooperation and interactive policy processes are needed to deal with the growing complexity of such an ill-structured problem in an effective way.
- The shift from government to governance causes threats, and at the same time it offers opportunities for adaptation to climate change.
- Smart or clumsy combinations of more informal adaptive bottom-up governance strategies and formal top-down government strategies provide good opportunities to deal with climate change.

Moving from these starting points, our project seeks to understand the adaptive capacity[6] of Dutch governance institutions to deal with the impacts of climate change. We prefer to use the term adaptive capacity over the term resilience[7], because the latter can cause misunderstandings on what is to change and what is to remain the same: is a system only resilient when it goes back to its original state (something that natural and human systems rarely do) or is it also resilient when it changes into a new state? The concept of resilience as developed in the ecological studies was found to be less useful as a focus of study in this project.

We focus only on the Netherlands, although in some instances we may have to refer to the European and global level, for example, when domestic policies flow from or conflict with European and international agreements, and because the success of some domestic policies may call for complementary changes in policies at European or global systems of governance. We focus on adaptation, although in some instances we may have to refer to emission reduction opportunities as well (for more detailed research questions and hypotheses see Section 1.4 and Table 3.1).

5 See, for example, Termeer (2007).

6 Adaptive capacity is defined by IPCC WG II (2001: 6) 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”. It is closely related to several concepts such as coping ability, stability and robustness.

7 Resilience can be defined as the capacity of a system to experience disturbance and still maintain its ongoing functions and controls (Holling and Gunderson 2002).

1.3 Research questions

The overall research questions are:

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

There are three sets of sub-questions. The first, normative and theoretical question aims at describing criteria for a climate-proof institutional infrastructure. The second set of questions is empirical and investigates the current practices in the Netherlands, thereby identifying innovative opportunities to react to climate change. The third set consists of a combination of the outcomes of the first and second set of questions.

Normative question:

1. What are the criteria for an institutional infrastructure that is able to react adequately to climate change and how can these criteria be measured?

Empirical questions:

2. How can one map the institutional context in the Netherlands? What are the most important adaptation strategies that should inspire changes in the institutional framework? What are the various institutions that should deal with climate change, and which ones actually do so?

3. How does the current national policy promote or hamper climate policy in the four sectors? How can regional and local actors use and interpret the institutional framework to implement climate adaptation strategies? How do private and public actors deal with the possibilities and restrictions in practice and to what type of autonomous developments may this lead? What are the underlying patterns in the Dutch context? How does horizontal and vertical cooperation work in practice? Are citizens and the private sector involved? Are there indications that resources are taken care of (financial, knowledge)?

Concluding questions:

4. Considering the outcomes of the research, what are the strengths and weaknesses of the Dutch institutional infrastructure? What are the possibilities of the governance approach in the climate change domain? Can productive and unproductive approaches and/or tools be discerned in the current Dutch policy making practices?

5. What are the specific policy design issues that emerge from an analysis of the Dutch Institutional framework? What are the possible options and what are the challenges and bottlenecks?

1.4 Objectives

This project has a general objective, two scientific objectives and a policy objective. The general objective is to understand the adaptive capacity of Dutch institutions to deal with climate adaptation. The scientific objectives are (a) to contribute to the theory of adaptive capacity of institutions within the context of multi-level governance by developing an assessment method and applying it; (b) to contribute to the ongoing discussions on adaptive capacity in different for a – such as the Institutional Dimensions of Global Environmental Change of the International Human Dimensions

Programme (IHDP)[8], the Conference of the Parties to the Climate Change Convention and other scientific conferences. The policy objective is to assess the adaptive capacity of Dutch institutions from local to national level to cope with the impacts of climate change, and to make recommendations.

1.5 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. There is a tension between these two choices. The focus on the Netherlands is a requirement of the Climate Changes Spatial Planning programme. However, given the size and political nature of the Netherlands, we will focus on the Netherlands in terms of empirical issues. Our literature survey will be grounded in international literature and experiences, and the analysis will include EU (and international) legislation, since this has a major influence on Dutch institutions.

National climate policy includes energy policy, nature policy, agriculture, industry, urban infrastructure, waste, transport and water (VROM 2005b). Given the complex interaction between all these sectors both horizontally and vertically, and the wish of the Climate Change Spatial Planning programme to do an in-depth scientific study, this project will only focus on a limited number of policy sectors. Therefore, the project concentrates on adaptation in four sectors with a strong relation to land use: water, agriculture (including biomass), nature and spatial planning. This means that adaptation in other sectors such as industry and health, and mitigation policy including related sectors (energy, transport, industry and waste) cannot be dealt with in this project, even though they are scientifically interesting and socially relevant.

1.6 The impacts of climate change on The Netherlands

Before we analyzed the adaptive capacity of Dutch institutions to the problem of climate change we explored the possible impacts of climate change on the Netherlands. The Royal Netherlands Meteorological Institute (KNMI, 2006) has prepared four scenarios for the Netherlands (see Table 1.1 below) and identified specific impacts per scenario (see Table 1.2).

8 The International Human Dimensions Programme has established a programme called the Institutional Dimensions of Global Environmental Change. This programme published its research agenda in 1999 and has developed a conceptual framework, analytical themes and methodology to undertake research on the policy processes in relation to global environmental issues.

Table 1.1 Schematic overview of the four KNMI climate scenarios.

G	Moderate	1°C temperature rise on earth in 2050 compard to 1990 no change in air circulation patterns in West-Europe
G+	Moderate+	1°C teperature rise on earth in 2050 compared to 1990 + milder and wetter winters due to more westerly winds +warmer and drier summers due to more easterly winds
W	Warm	2°C temperature rise on earth in 2050 compared to 1990 no change in air circulation patterns in West Europe
W+	Warm+	2°C temperature rise on earth in 2050 compared to 1990 + milder and wetter winters due to moer westerly winds + warmer and drier summers due to more easterly winds

"G" is derived from "Gematigd", which is Dutch for "Moderate".

Table 1.2 Impacts on The Netherlands in different scenarios.

•	•	• G	• G+	• W	• W+
• Global temperatue rise		• 1°C	• 1°C	• 2°C	• 2°C
• Change in air circulation patterns in Western Europe		• no	• yes	• no	• yes
• Winter3	• average temperature	+0.9°C	+1.1°C	+1.8°C	+2.3°C
•	• coldest winter day per year	+1.0°C	+1.5°C	+2.1°C	+2.9°C
•	• average prcipitation amount	+4%	+7%	+7%	+14%
•	• number of wet days (? 0.1 mm)	0%	+1%	0%	+2%
•	• 10-day precipitation sum exceeded once in 10 years	+4%	+6%	+8%	+12%
•	• maximum average daily wind speed per year	0%	+2%	-2%	+4%
• Summer[3]	• average temperature	+0.9°C	+1.4°C	+1.7°C	+2.8°C
•	• warmest summer day per year	+1.0°C	+1.9°C	+2.1°C	+3.8°C
•	• average precipitation amount	+3%	-10%	+6%	-19%
•	• number of wet days (? 0.1mm)	-2%	-10%	-3%	-19%
•	• daily precipitation sum exceeded once in 10 years	+13%	+5%	+27%	+10%
•	• potential evaporation	+3%	+8%	+7%	+15%
• Sealevel	• absolute increase	• 15-25 cm	• 15-25 cm	• 20-35 cm	• 20-35 cm

This project focuses on four sectors and the following table highlights the key impacts on those sectors that will be dealt with in this project. As a starting point, we believe that the key impacts on the four sectors within the Netherlands are those presented in the table below.

Table 1.3 Impacts on the sectors studied in this report.

Sectors	Impacts
Water	Rivers; more extreme high and low river discharge Precipitation patterns; more rain in shorter periods Drought Salt water intrusion
Nature	Migration Impacts of extremes Impacts on phenology, physiology of plants and trees
Agriculture	Crop productivity Damage from extreme weather events Commodity prices and world markets
Spatial planning	Water impacts; e.g. flooding Heat

1.7 Research Approach

1.7.1 Structure of the research

Figure 1.1 provides a clear idea of the structure of the research.

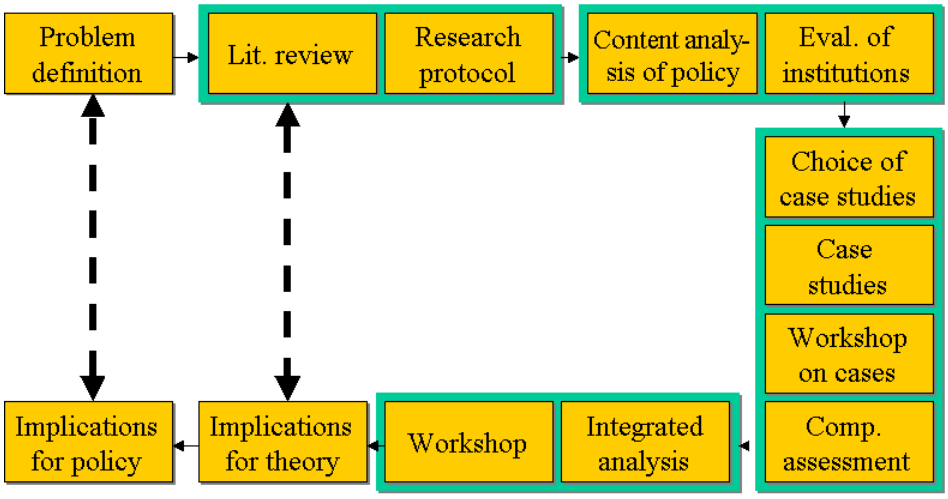


Figure 1.1 Structure of the research.

The research team met regularly to develop and refine a detailed research framework and a log frame approach in order to structure the research process (for details see IC12 Working Document 1). The log frame was completed in IC12 Working Document 2.

1.7.2 Brainstorm to develop a conceptual framework

One of the goals of the project was to integrate concepts from different disciplines and literatures into one assessment framework: public administration, law, political sciences, sociology, environmental management and spatial planning science. The

disciplines were represented by the different team members and each of them made a part of the literature available to the group. To develop the conceptual framework of this research, the team decided to organize an intensive brainstorm session supported by electronic Group Systems methodology. The Group Decision Room (GDR) session was organized on the 24th of January 2008, at the Radboud University Nijmegen. The central aim was to define and work out one of the central concepts of this research, namely the concept of 'adaptive capacity'. This brainstorm session was followed up by several sessions to refine the conceptual framework and benefited considerably by comments of the advisory board, stakeholders and reviewers. This conceptual framework was revised and fine tuned continuously, also on the basis of review comments from scientific journals. Chapter 2 explains the final conceptual framework of the Adaptive Capacity Wheel that is the central element of our methodology.

1.7.3 Content Analysis

The Adaptive Capacity Wheel was applied in an assessment of the policy and legal documents that deal with climate change adaptation and the four selected sectors related to land use in the Netherlands: water, agriculture, nature and spatial planning. The research team identified 93 formal documents of which 23 were selected for further analysis. These documents cover the four specific sectors that were identified for study.

The documents were analyzed at three levels. First, the individual documents were studied and summarized (see IC12 Working Document 4). Second, a de facto analysis of these documents was carried out with the Adaptive Capacity Wheel (see IC12 Working Document 5). Third, a horizontal analysis was undertaken: an analysis of the results for each criterion, based on Working Document 5 (see IC12 Working Document 6). Chapter 3 explains the key features of the content analysis of 93 documents and Chapter 4 presents the results of applying the Adaptive Capacity Wheel to the 23 selected documents.

1.7.4 Case Studies

Next to the formal institutions, the use of formal institutions in practice as well as the informal institutions needed to be studied. The research team identified 11 possible case studies that could be of interest to the project. Based on discussions with the advisory board, four case studies were finally identified for application of the Adaptive Capacity Wheel. These case studies are developed in detail in IC12 Working Documents 7-10. The comparative assessment of the case studies is discussed in Chapter 5.

1.7.5 Working Documents

A system of working documents was established to keep a record of all the activities that have been undertaken as part of this project; and to record the progress made. Table 1.4 below lists the IC12 Working Documents.

Table 1.4 List of IC12 Working Documents

Working Doc	Name	Focus	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 W08/03, Institute for Environmental Studies, Amsterdam.	Research protocol	Joyeeta Gupta, Katrien Termeer, Margo van den Brink, JudithKlostermann
2	Institutions for Adaptation – A Method to assess the Inherent Characteristics of Institutions to enable the Adaptive Capacity of Society. IC12 Working document 2, Report number W08/21, Institute for Environmental Studies, Amsterdam.	Conceptual and theoretical framework	Joyeeta Gupta, Katrien Termeer, Judith Klostermann, Sander Meijerink, Margo van den Brink, Pieter Jong and Sibout Nooteboom
3	Verslag Bijeenkomst IC12-team "Instituties voor adaptatie", 4 March 2009, Academiegebouw Utrecht. IC12 Working document 3, Report number W09/006, Institute for Environmental Studies, Amsterdam.	Report of Workshop 1	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 (forthcoming), Institute for Environmental Studies, Amsterdam.	Content analysis background report	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.	Adaptive Capacity Wheel; Analysis of background report	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.	Horizontal Analysis of Adaptive Capacity Wheel applications	Judith Klostermann
7	Case Study on Individual Responsibility in Adaptive Capacity. IC12 Working Document 7, Report number W09/10, Institute for Environmental Studies, Amsterdam.	Individual responsibility in Dutch local water management	Emmy Bergsma, Joyeeta Gupta and Pieter Jong

Working Doc	Name	Focus	Authors
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.	Adaptive capacity in the Wadden Sea region	Judith Klostermann, Emmy Bergsma
9	Case study on Sustainable and Climate-proof spatial planning. IC12 Working Document 9, Report number (forthcoming), Institute for Environmental Studies, Amsterdam.	Case study on sustainable and climate-proof spatial planning in low lying areas	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.	Case study on Dutch water safety	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.	Comparative Case Study Analysis	Sander Meijerink, Emmy Bergsma, Margo van den Brink, Joyeeta Gupta, Pieter Jong, Judith Klostermann, Katrien Termeer
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.	Integrated Analysis	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.	NWP inspraak	Judith Klostermann, Pieter Jong, Joyeeta Gupta, Robbert Biesbroek
14	PhD thesis (forthcoming)		Robbert Biesbroek

1.7.6 Workshops, presentations, reactions and papers to test results

Throughout the process, workshops have been held to test the results of the projects. Reports of these Workshops are also available (see Working Documents 3). Several presentations of the content of this project have been presented at scientific and policy conferences. Furthermore, articles have been submitted to scientific journals and MSc and post doc students have also applied the framework in different contexts (see Table 1.5).

Table 1.5 List of IC12 output and dissemination

Workshops				
Item no.	**Name**	**Venue**	**Date**	**Organizer**
1	IC12 klankbord meeting	Academiegebouw Utrecht	17 April 2008	IC12-team
2	IC12 klankbord meeting	Academiegebouw Utrecht	4 March 2009	IC12-team
3	IC12 klankbord meeting	Grand Kasteel Woerden	30 September 2009	IC12-team

Presentations				
Item no.	**Name**	**Venue**	**Date**	**Presenter**
1	IC12 Institutions for Adaptation: Are Dutch institutions capable of adapting to climate change?	Poster presentation at the CcSP International Conference, World Conference Centre, Den Haag	12 September 2007	IC12-team
2	IC12 Institutions for Adaptation: Are Dutch institutions capable of adapting to climate change?	Poster presentation at the CcSP Internal Conference, Cultuur- en Congrescentrum Antropia, Driebergen.	18 June 2008	IC12-team
3	Real Barriers to Climate Adaptation, A systems approach to learn about new modes of governance,	Paper & presentation for EGPA Conference, Rotterdam.	3 - 6 September 2008	Meijerink, S., S. Nooteboom, C.J.A.M. Termeer
4	The Adaptive capacity scorecard	Presentation at ESS CC meeting, Amsterdam.	17 February 2009	Klostermann, J.
5	IC12 Institutions for adaptation: De governance van klimaatadaptatie	Presentation at the Eindproductendag Klimaat voor Ruimte, Regardz Planetarium, Amsterdam.	15 October 2009	Termeer, C.
6	IC12 Institutions for Adaptation: Content Analysis	Poster presentation at the Eindproductendag Klimaat voor Ruimte, Regardz Planetarium, Amsterdam.	15 October 2009	IC12-team
7	IC12 Institutions for Adaptation: Case study on Individual Responsibility	Poster presentation at the Eindproductendag Klimaat voor Ruimte, Regardz Planetarium, Amsterdam.	15 October 2009	IC12-team
8	Bergsma, E., J. Gupta, P. Jong (2009) Climate Change and Individual Responsibility in Adaptive Capacity: Case of the Netherlands.	Paper presented at the SENSE Symposium Climate Proofing Cities, Volendam.	1 December 2009	Bergsma, E.

Item no.	Name	Venue	Date	Presenter
9	The adaptive capacity of Dutch legislation and policies for nature, water, spatial planning and agriculture,	Paper presented at the Amsterdam Conference on the Human Dimensions of Global Environmental Change.	2-4 December '09	Klostermann, J.
10	Termeer, C.J.A.M., Biesbroek, G.R. & M.A van der Brink (2009) Institutions for adaptation to climate change - Comparing national adaptation strategies in Europe.	Paper presented at the international ECPR APSA conference Panel on 'Energy Policy and Global Warming: American and European Approaches', Toronto, Canada.	3-6 September 2009.	Termeer, C
11	Institutions For Climate Change: A Method To Assess the Inherent Characteristics of Institutions to Enable the Adaptive Capacity of Society.	Presentation at UNFCCC COP, Copenhagen, Denmark.	15 December 2009	Gupta, J.
12	IC12 Institutions for Adaptation – Results of the Content Analysis	Poster presentation at UNFCCC COP, Copenhagen, Denmark.	15 December 2009	
13	IC12 Institutions for Adaptation – Individual responsibility in local water management	Poster presentation at UNFCCC COP, Copenhagen, Denmark.	15 December 2009	
14	Gupta, J. et al. (2010). Are Dutch Institutions Ready to Cope with Climate Change	Paper presented the Deltas in Times of Climate Change Conference, Rotterdam.	30 September 2010.	Gupta, J.

Publications	
1	Bestuurskunde (2009), nummer 4. Special issue. Hierin: Katrien Termeer, Sander Meijerink en Sibout Nooteboom (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. Nooteboom and E. Bergsma (2010). Institutions for Climate Change: A Method to Assess the Inherent Characteristics of Institutions to Enable the Adaptive Capacity of Society, Environmental Science and Policy, doi:10.1016/j.envsci.2010.05.006.
4	Jong, P. (2009) Wateroverlast op straat: een juridische verkenning van een lokaal milieuprobleem. In: N. Teesing (red.), Juridische aspecten van klimaatverandering, Preadvies 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, H2O, 42: 25/26.

Publications	
6	Termeer, C.J.A.M., Governance of Water Safety and Flood Protection. European Water Management, 'Challenges for Economics, Law and Spatial Planning'. Utrecht. 28-1-2010
7	Van den Brink, M., K. Termeer and S. Meijerink (...) Are Dutch water safety institutions prepared for climate change? Accepted for Review by the Journal of Water and Climate.
8	Bergsma, E., J. Gupta and P. Jong (...) Climate Change and Individual Responsibility in Adaptive Capacity – the case of the Netherlands. Accepted for review by the Journal of Resources, Conservation & Recycling
9	Van den Brink, M., K. Termeer and S. Meijerink (...) Are Dutch water safety institutions prepared for climate change? Submitted to Journal of Water and Climate.
10	Sander Meijerink, Sibout Nooteboom and Katrien Termeer (...) The use of system archetypes for social learning the case of Dutch water policy adaptation to climate change. Submitted to Water Policy.

Other activities	
1	Lectures on the Adaptive Capacity Wheel and climate change adaptation are part of the master course 'Transitions in Environmental Planning' (master EIP, Environmental and Infrastructure Planning, RUG)
2	Post-academic training Department of Strategy and Process, Royal Haskoning, organized by Radboud University Nijmegen

Spin-offs: research by students			
1	Adaptive Capacity Wheel and its application to South Korea	Summer 2010	Ki-Yong Do (VU-IVM master thesis)
2	MVO and Adaptive Capacity Wheel applied to Waterschap Rijnland	Summer 2010	Elwin Leusink, (VU-IVM master thesis)
3	Adaptive Capacity Wheel in the lower Mekong valley	2010-2011	Ram Chander B.
4	Adaptive Capacity Wheel in the upper Mekong valley	2010-2011	Hao Li
5	Adaptive Capacity Wheel for regional planning in Bremen-Oldenburg-region	2010	Maik Winges, University of Oldenburg
6	Adaptive Capacity Wheel applied to the Municipality of Dordrecht	Summer 2010	Erwin Hofman (RUG – bachelor thesis)
7	Adaptive Capacity Wheel applied to the Zuidplaspolder	Summer 2010	Maarten van der Wal (RUG – bachelor thesis)
8	Adaptive Capacity Wheel and the development of a 'climate assessment'	Summer 2010	Luitzen Jager (RUG – bachelor thesis)
9	Adaptive Capacity Wheel applied to the Dutch spatial planning sector	Summer 2010	Elze Reitsema (RUG–bachelor thesis)
10	A developing country perspective on adaptive capacity: coastal defence institutions for climate change adaptation, the case study of Semarang in Indonesia	Summer 2010	F. Tata Yunita (RUG – master thesis)

1.7.7 Structure of the Report

This report has the following structure. Chapter 2 provides an overview of the method of the Adaptive Capacity Wheel. Chapter 3 examines the evolution of adaptation policy in the Netherlands. Chapter 4 applies the adaptive capacity wheel to 23 selected adaptation policy and legal documents. Chapter 5 assesses the case studies and compares their results. Chapter 6 draws conclusions on the method developed in this research: the Adaptive Capacity Wheel. Chapter 7 provides an integrated analysis of the content analysis and case studies, draws conclusions and provides recommendations.

2 The conceptual framework[9]

2.1 Introduction

The global climatic system and human society are continuously changing systems. They sometimes evolve in response to impacts emerging from the other system and sometimes they evolve autonomously (cf. Gilbert 2006). Throughout human history, institutions have reacted incrementally and conservatively to deal with social problems based on existing culture, deep-rooted lifestyles and ideological premises (Gupta and Dellapenna 2009; Pollitt & Bouckaert 2000). These institutions also provide stability and predictability, without which every form of collective action of society would be impossible (Scharpf, 1997). Since the industrial revolution, human activities have led to a more rapid rate of environmental change. As the natural sciences are becoming better in predicting the potential future environmental impacts of anthropogenic activities, institutions will increasingly need to be able to rise to the challenge of the new information and become more proactive and progressive in coping with the projected impacts of climate change. From a social science perspective, it becomes critical to study the conditions under which institutions can stimulate the adaptive capacity of society to deal with the potentially serious and irreversible impacts of climate change.

Against this background, this chapter seeks to address the question: How can the inherent characteristics of institutions to stimulate the adaptive capacity of society from local through to national level be assessed? This conceptual chapter builds on the literature to identify dimensions and criteria and how these can be presented within the Adaptive Capacity Wheel, an analytical tool to assess the adaptive capacity of institutions (see 2.2). It presents a research protocol that shows how the Adaptive Capacity Wheel can be applied (see 3), and draws conclusions (see 4).

2.2 Towards a conceptual framework: the Adaptive Capacity Wheel

2.2.1 Introduction

The study of adaptation to climate change is a rapidly evolving field. Society will have to be ready to anticipate and respond to changes that may occur. Consequently its *institutions* need to support social actors to proactively respond. Because climate change brings unpredictable change, it calls for institutions that enhance the adaptive capacity of society. This paper develops a generic and flexible framework for assessing the extent to which different characteristics of institutions enable the adaptive capacity of societies.

This chapter highlights the literature on the subject and the gaps in knowledge, presents a definition of institutional adaptive capacity building on the existing literature, and introduces the Adaptive Capacity Wheel.

9 This chapter is based on Working Document 2 and parts of this chapter have been published by Environmental Science and Policy: Gupta, et al. (2010).

2.2.2 The literature and its gaps

There is an explosion in the literature on adaptation to climate change in the last ten years. This has mostly dealt with the impacts of climate change, vulnerability (e.g. Adger 2006), criteria and indicators (e.g. Smit and Wandel 2006; Brooks et al. 2005; Eriksen & Kelly 2007; Mos et al. 2001; Dow & Downing et al. 1995; Brooks & Adger 2003), the role of local institutions (Agrawal 2008), and adaptation to climate change (e.g. IPCC 2007, O'Brien et al. 2006, Eakin and Luers 2006, Rasmussen et al. 2009, Adger 2006, Polsky et al. 2007).

Vulnerability and adaptive capacity are closely linked: adaptive capacity is one of the determinants of vulnerability, in addition to exposure and sensitivity. This paper only focuses on adaptive capacity and not on the other two determinants. Some articles have discussed adaptive capacity (Tol and Yohe 2006, Eriksen and Lind 2009, Pelling et al. 2008, Gallopín 2006), others focus on resilience (Nelson et al. 2007, Folke et al. 2005, Milman and Short 2008). While these discussions focus on the adaptive capacity of households (Vincent 2006, Paavola 2008), of local communities (Smit and Wandel 2006, Nelson et al. 2008, cf. Pelling and High 2005; Agrawal 2008; Bapna et. al 2009) and of nations (Haddad 2005, Tol and Yohe 2006); there is little research on assessing institutions on their ability to enhance the adaptive capacity of society (WRR 2006). Furthermore, while much of this literature mentions institutions, they tend to use the word quite loosely (e.g. Yohe and Tol 2002 imply organizations). The website of the United Nations Framework Convention on Climate Change lists a number of tools on adaptation, but these do not include an exclusive tool to assess how institutions enhance adaptive capacity, nor do they provide adequate information on institutions in relations to adaptive capacity in other tools. At the same time, there is a rich history of literature on institutions, governance and management. This paper attempts to bridge the existing literature on institutions, governance and management with the newer literature on adaptation and adaptive capacity to develop a conceptual and methodological framework to assess how institutions can promote the adaptive capacity of societies.

2.2.3 Defining Institutions

The Institutions Project of the International Human Dimensions Programme defines institutions as: "systems of rules, decision-making procedures, and programs that give rise to social practices, assign roles to the participants in these practices, and guide interactions among the occupants of the relevant roles" (IDGEC 1999: 14). The rules and roles can be formal governmental policies and informal social patterns of engagement; they can be visible and latent (Arts 2006). In ordinary speech, the word 'institutions' is seen as synonymous with 'organizations'. Although organizations can be seen as formalised patterns of rules and decision making, institutions are not equivalent to organizations, as institutions also refer to underlying ideological values and norms (Zijderveld, 2000; Young 1989; IDGEC 1999).

Institutions are inherently conservative. This is a strength and yet a weakness. Institutions are agreements following long debate, and if these hard-won institutions would not survive until the next day, there would be little point in creating them. Moreover, institutions carry the bias of previous interactions, views and power relations (Klijn & Koppenjan 2006). Hence, all institutions embed a degree of robustness and resistance to change. This process is called institutionalization (Garud et al. 2007, March & Olsen 1989).

While institutions shape social practices, at the same time those social practices constitute and reproduce institutions (e.g. Giddens 1984). The same agency that sustains the reproduction of structures also makes possible their transformation. Hence, institutions change and can be changed, but it is difficult to do so. It is critical to ask: Do institutions allow society to adapt fast enough to environmental changes? What is needed is a balance between absolute rigidity and total flexibility; where should this balance be if we look at the problem of climate change? Is the 'natural' turnover speed of institutions enough to keep up with these changes, or do we need an extra effort? And if we do, which institutions are the most inhibitive and should be redesigned as a matter of priority?

2.2.4 Defining the adaptive capacity of institutions

Adaptation is distinct from adaptive capacity. The Intergovernmental Panel on Climate Change (IPCC) defines adaptation as: "Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (IPCC 2001: 982; cf. IPCC 2007). 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". Our literature review did not reveal a definition of institutions that fosters adaptive capacity, although we found many relevant definitions of adaptive capacity in general from the adaptation literature (e.g. Yohe and Tol 2002, Mendelsohn & Nordhaus 1999, Marlin et al. 2007, Smit et al. 2000, Smit & Pilifosova 2001) as well as the organizational change literature (e.g. Lengnick-Hall & Beck 2005; Weick & Sutcliffe 2001), cybernetics and complexity theories (e.g. Duit & Galaz 2008).

The next question is: what does adaptive capacity mean, when it is applied to institutions? In identifying criteria for assessing institutional adaptive capacity, the literature on governance (Tompkins & Adger 2005, Folke et al. 2005, Pierre 2000, Nooteboom 2006, Marks & Hooghe 1996, Klijn & Koppenjan 2006), international relations (e.g. Young 1991; Malnes 1995, Underdal 1994), organizations (e.g. Argyris 1990, Weick and Sutclilffe 2001) and earth system governance (e.g. Biermann 2007) provides some hints.

Building on the existing definitions and literature, we define adaptive capacity as the inherent characteristics of institutions that empower social actors to respond to short and long-term impacts 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.

2.2.5 Six dimensions of adaptive capacity to assess institutions

The literature confirms that adaptive capacity is a useful concept to assess institutions, but does not provide a systematic framework to assess the adaptive capacity created by institutions. Our assessment of the literature indicates that (a) a number of the proposed dimensions and criteria could be clustered together as common ideas (e.g. the need for resources); (b) that there is inconsistent understanding of the concept of institutions (see 2.3); (c) that different approaches emphasize different dimensions and criteria (e.g. organizational and international relations literature emphasize leadership, governance literature focuses on good governance); and (d) that most authors emphasize steps to be taken, rather than criteria to be met.

Based on our research, we decided to develop an assessment framework for analyzing the adaptive capacity fostered by institutions. In order to do so, we adopted a seven step methodology. First, we reviewed the existing literature in different disciplines (organization studies, management studies, political science, law) to identify the most important criteria for assessing institutions. Second, we used a computer based collaborative brainstorming session to sort out the different criteria. Similar criteria were evaluated as to whether they added anything new to the discussion or were merely different words for the same criterion. It was important that each criterion should be distinct and not overlapping. Third, in the same computer based collaborative session, we clustered the selected criteria under six different dimensions. Fourth, we defined each criterion (see Table 1). Fifth, we tested the application of the criteria through interviews with stakeholders in a number of case studies. Sixth, we applied the criteria through analyses of policy documents to see if the criteria were able to capture all relevant aspects of institutional adaptive capacity. Seventh, we tested the criteria through presentations to Dutch policymakers, three scientific presentations and one hour long presentation and discussion during a side-event at the Conference of the Parties to the United Nations Framework Convention on Climate Change in Copenhagen in December 2009 to see if some specific elements of adaptive capacity were not captured by the total set of criteria adopted. The dimensions and the criteria have accordingly been modified.

The fundamental story line is that institutions that promote adaptive capacity are those institutions that 1) encourage the involvement of a variety of perspectives, actors and solutions; 2) enable social actors to continuously learn and improve their institutions; 3) allow and motivate social actors to adjust their behaviour; 4) can mobilize leadership qualities, 5) can mobilize resources for implementing adaptation measures, and 6) enhance principles of fair governance. These six dimensions have twenty-two criteria. Table 2.1 presents the dimensions and criteria, defines the criteria, and relates them to the literature. The following paragraphs explain each dimension and criterion in more detail.

Table 2.1 Adaptive capacity dimensions and criteria and their roots in the literature

Dimension	Criterion	Definition	Relation to literature
1. Variety	Variety of problem frames	Room for multiple frames of references, opinions and problem definitions	Nooteboom 2006; Buckley 1968; Conant & Ashby 1970; Pollit & Boukaert 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
2. 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 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
3. Room for autonomous change	Continuous access to information	Accessibility of data 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 – fostering 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
4. Leadership	Visionary	Room for long-term visions and reformist leaders	Pielke 1998; Goldfinsh & '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
5. Resources	Authority	Provision of accepted or legitimate forms of power	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	Nelson et al. 2010; Mendelsohn & Nordhaus 1999; Yohe et al. 1996; Smit et al. 2000; Yohe & Tol 2002
6. Fair governance	Legitimacy	Whether or not institutional rules are embedded in constitutional laws and 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 are open to feedback and show response to society	Biermann 2007
	Accountability	Whether or not institutional patterns provide accountability procedures	Botchway 2001; Biermann 2007

Variety

Unstructured problems like climate change embed diverse interests and perspectives. They can only be dealt with within a framework of multiple discourses and solutions, where various actors intervene at different levels of governance. Hence, the

assumption is that they can only be addressed through variety. Variety implies that there is no single appropriate ideological framework, no unique optimal policy strategy or set of mutually consistent solutions, but that there are many. It encourages social ingenuity to continuously generate tailor-made solutions. Variety as a criterion can be traced back to the 1960s (Buckley 1968: 495). The 'law' of requisite variety argues that the variety within a system must be at least as great as the environmental variety against which it is attempting to adjust itself (Conant & Ashby 1970). Variety challenges mainstream policy approaches that focus on clarity, rationality, reductionism, 'performance oriented management' (Pollitt & Bouckaert 2000), the 'audit society' (Power 1999), efficiency and simplistic solutions, and opposes free riding. However, variety can also paralyze action (Weick 1979), imply suffocating consensus, and cause negotiated nonsense (Termeer 2007).

Variety requires an institution to anticipate future expected and unexpected climate impacts through having a range of proactive strategies, measures and instruments at its disposition "limiting lock-in into a development that precludes future adaptations" (Nooteboom 2006: 2-3). Variety calls for fostering diversity, understanding complication, creating redundancy and resisting the tendency towards simplification and reductionism. Redundancy implies 'more of the same', for example, a backup system for energy production. We argue that institutions embed variety when they (a) allow for a variety of problem frames and solutions; (b) allow for a variety of actors (multi-actor), levels (multi-level) and stakeholders (multi-sector) during the solution formulation process; (c) promote diversity to reach context relevant tailor-made policies; and (d) allow redundancy in the short-term to promote the best long-term solutions.

Learning capacity

The concepts of human learning (Ormond 1999), social learning (Wenger 1998), learning capacity and the ability to experiment (Walker et al. 2002) while maintaining all intrinsic critical functions and feedback mechanisms (Olsson et al. 2004) and accommodating perturbations (Adger 2003) are integral to adaptive capacity (Pahl-Wostl et al. 2007). Learning allows for changed understanding based on experiences. It also enhances trust between social actors. Adaptive institutions encourage actors to learn; they permit society to question socially embedded ideologies, frames, assumptions, claims, roles, rules and procedures that dominate problem solving. This includes single loop learning (improving routines) and double loop learning (when social actors challenge norms and basic assumptions). Mechanisms that inhibit genuine learning in organizations include defensive routines that prevent participants from experiencing embarrassment or threat, and overprotect current frames (Argyris 1990). Redesigning institutions often calls for 'unlearning' past insights, routines, fears and reflexes.

Criteria to assess whether an institution demonstrates learning capacity include allowing and encouraging actors to (a) trust each other; (b) adopt single loop learning, (c) adopt double loop learning; (c) explicitly consider doubts and uncertainties; and (d) stimulate institutional memory.

Room for autonomous change

A third quality of adaptive capacity is the ability of an institution to permit social actors to autonomously adjust their behaviour in response to environmental change. This calls for institutions to enable social actors to anticipate possible futures, to take planned preventive measures against important threats, by providing them with the necessary means and information. Institutions should also foster the autonomous

capacity of individuals and organizations to improvise. This requires institutions to allow social actors to seize opportunities when they present themselves. This is important particularly at lower levels of governance, and especially during a crisis or disaster, since studies reveal that immediate relief efforts are undertaken by 'victims' and not by the government or aid organizations (Tierney et al. 2006). Adaptive institutions enhance this self-help function by encouraging experimentation with and responding to everyday contingencies, breakdowns, and opportunities (Orlikowski 1996), and by allowing continuous improvising in short feedback loops to update social practices. Yet, in a complex multi-actor, multi-level, multi-sector and multi-domain setting, short feedback loops between all interdependent units may make cooperation difficult.

Criteria to assess the room for autonomous change include understanding whether institutions ensure that actors (a) have continuous access to information, (b) are capable of acting according to plan and (c) have the capability to improvise.

Leadership

A fourth criterion 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, motivating others to follow. The management literature differentiates between autonomous (Wallis & Dollery 1997), entrepreneurial (Andersson & Mol 2002), reformist (Goldfinch & 't Hart, 2003) and institutional leadership (DiMaggio 1988), and policy entrepreneurs (Kingdon 1984). The institutions literature refers to structural, entrepreneurial and intellectual leadership (Young 1991), coercive, instrumental and unilateral leadership (Underdal 1994), sticks and carrots, problem solving and directional leadership (Malnes 1995) and structural, instrumental and directional leadership (Grubb & Gupta 2000). Leadership may sometimes conflict with variety; but good leaders are able to provide space for variety.

Our focus is on how institutions encourage leaders to rise above and reshape the very institutions themselves. Criteria to evaluate leadership include whether institutions encourage the rise of (a) visionary leadership (which includes elements of reformist, intellectual, and sticks and carrots leadership), (b) entrepreneurial leadership (which includes elements of leadership by example, designing tools to engage the market, unilateral and directional leadership), and (c) collaborative leadership (which is also referred to as instrumental leadership in the literature). We have omitted structural and coercive leadership on the basis of the argument that in democratic countries leadership needs to be legitimate and inspirational, rather than coercive.

Resources

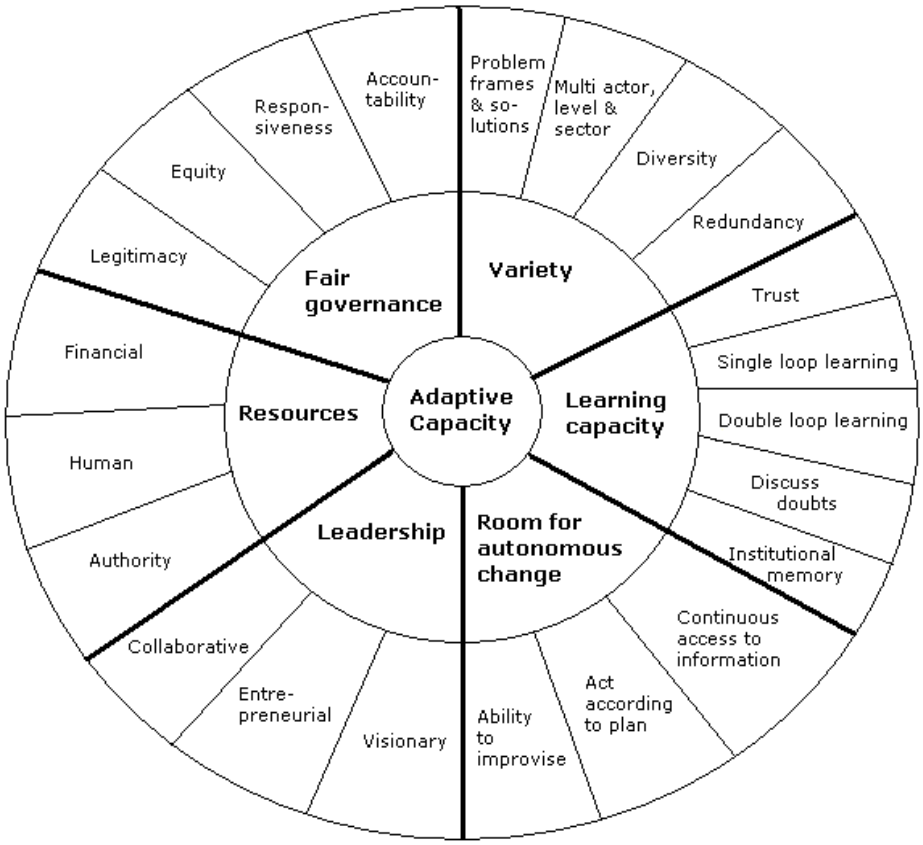
The effectiveness of institutions often depends on their ability to generate resources (Yohe et al. 1996, Mendelsohn & Nordhaus 1999). Institutions should be able to generate sufficient resources/incentives for actors to change norms and rules, implement those changed norms and rules and to live up to them. Such resources can include financial, political, human, legal, and technological resources. Criteria include whether institutions encourage (a) authority (legal and political mandate), (b) human resources (knowledge, skills and labour), and (c) financial resources (including access to technological). Clearly, the context within which institutions exist will also have a major influence on whether such institutions are able to raise resources.

Fair governance

Lastly, the assumption is that institutions support adaptive capacity when they 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 (e.g. Botchway 2001). Of course, fairness also implies that resources should not be squandered indiscriminately. An appropriate balance needs to be found between effectiveness and efficiency, as innovation processes are notoriously inefficient (Mintzberg 1989) and should be allowed to be inefficient in order to take place at all. Maximum efficiency is only possible in a stable and certain environment and, therefore, it cannot be a first priority when dealing with climate change. Fair governance furthermore includes legitimate policy-making that incorporates higher level legislation and agreements and is accepted by members of society, equitable policy processes and outcomes that take account of unequal circumstances in society, responsive processes that show a high degree of transparency and enable powerful stakeholders to respond to different voices in society, and clear accountability procedures that assign responsibilities to different parties. Therefore, the criteria for fair governance include: (a) legitimacy, (b) equity, (c) responsiveness and (d) accountability.

2.2.6 The Adaptive Capacity Wheel

In order to structure the information and to be able to communicate it more clearly, an Adaptive Capacity Wheel was designed in 2007 (see Figure 2.1). The inner circle shows adaptive capacity as a whole, the middle circle shows the dimensions and the outer-circle shows the criteria. Below the wheel, we present a table showing a colour and scoring system that could be applied to this wheel. By applying colours to distinguish between high (green: quantitative value +2) to low (red: quantitative value -2) adaptive capacity, this wheel may be used to both assess and inform social actors about how their institutions influence different aspects of adaptive capacity and where there may be room for discussion and reform. This wheel is to some extent similar to the Vulnerability Scoping Diagram of Polsky et al. (2007), except that it focuses and expands on the Adaptive Capacity component and is limited to institutions.



Effect of institution on adaptive capacity	Score	Aggregated scores for dimensions and adaptive capacity as a whole
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 2.1 The Adaptive Capacity Wheel and scoring system

2.2.7 Assessing the criteria

The identification of the dimensions and their underlying criteria appear to be relatively comprehensive. Hence, this conceptual framework consisting of the six dimensions and twenty-two criteria should be seen as an analytical structuring tool to assist researchers as well as policy makers in their efforts to understand, assess and increase the ability of institutions to foster the adaptive capacity of society.

However, there are some key points to keep in mind. First, even if an institution appears to create adaptive capacity, this does not automatically mean that society will use this capacity and be able to successfully adapt; merely that the institution provides a higher likelihood of allowing for adaptation. There can always be a difference between a formal institution on paper and the way it is used in practice. Second, the dimensions and criteria are not independent of each other. They can reinforce each other: for example, adequate resources and fair governance can reinforce all the others. There can be tensions between the criteria as well: for example, between diversity of solutions and act according to plan, or between strong leadership and high variety. Third, some criteria may make others less relevant. For example, if there is sufficient entrepreneurial leadership, this may displace the need for visionary leadership. Finally, the dimensions and criteria are not independent of context. This means that the specific application of the wheel to a specific problem may determine whether some of these dimensions are less or more important. This will imply giving different weights to the different criteria and / or dimensions in a specific context. For example, in some cases diversity of solutions might be considered a more important characteristic of institutions to increase the adaptive capacity of society than the ability to act according to a plan; however, in other situations the ability to act according to plan might be more crucial.

This implies that the 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. The evaluator will have to interpret the information collected in relation to the dimensions and criteria and draw lessons from the assessment to increase the capacity to adapt in a specific context. 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, it is important that there is a structured methodology for applying this wheel.

2.3 A protocol for applying the Adaptive Capacity Wheel

2.3.1 An outline

Where expert judgment is needed, a good research protocol needs to be made. This section highlights the five steps in such a protocol: preparing for the research; collecting the data; analyzing the data; interpreting the data; and presenting the data.

2.3.2 Preparing for the research

In the first step, the researcher needs to clearly understand and internalize the meaning of each dimension and criterion. Then he/she needs to identify a clear research focus: which institution or institutional context is to be the focus of attention for which period and why?

Collecting the data

In the second step, data are collected for each criterion. Data can be collected in different ways, e.g. through interviews, observations and/ or (policy) document analysis, depending on the institutional context that is being researched. For example, data on informal rules like norms and values and implementation challenges could be collected through interviews and data on formal rules like governmental policies could be collected through content analysis. Developing a list of questions can help secure information regarding the criteria. In the case of interviews, we argue that there are essentially six groups of questions – one on each dimension – following a warm-up question and a concluding question.[10] The questions should be open questions, with possible follow-up questions to elucidate the specific nature of the answer especially in relation to the definitions provided in Table 1. The questions should, as far as possible, not use technical language: i.e. they should not say: Is directional leadership a strong point of the local institution; but rather: how would you characterize the nature of the leadership shown or stimulated by the existing rule? The warm-up and concluding questions should try and ascertain if some important element has been missed out in the discussions; if there are reinforcing or contradictory ideas and forces within the institutional system in a specific context. For data collection through observations a similar technique could be used, with the difference that the researcher should answer the warm-up and concluding questions. In the case of a document analysis, a more comprehensive list of questions (for example, one on each criterion) could be useful, however, those should be well defined and delineated to keep a clear focus while studying the texts. The stakeholder answers and/or the observations and/or the document analysis must be registered in a formal background document without any additional interpretation.

Analyzing the data

The third step consists of analyzing the data collected to score each criterion of adaptive capacity (see table under Figure 2.1). It is necessary to have different researchers independently score the background data and then discuss the difference of opinion, if any, on a specific criterion. This helps to ensure transparency as well as robust results. All researchers should keep a record of the arguments why a particular criterion has been scored in a particular way.

There are some optional further steps: If needed, it is possible to generate aggregated scores for adaptive capacity as a whole, by adding the scores of each criterion and then dividing by the number of criterion per dimension, and then adding the scores for each dimension and then dividing by 6 (the number of dimensions). These steps are only useful if the researcher wishes to compare a large number of different institutions; but such an aggregation method needs to be used with caution because the explanation for a score becomes invisible and cannot be properly discussed anymore.

Interpreting the data

The fourth step is to translate the information collected into a story – a story that communicates the strengths and weaknesses of a specific institution or institutional

10 An MSc student has applied the Adaptive Capacity Wheel to South Korea using a detailed closed questionnaire with 22 questions on each sub-criterion. He was able to encourage his respondents to give him answers for each criterion, and this demonstrates that the alternative approach can also work; however, he was only able to generate quantitative results – as there was no room to secure quantitative results in a questionnaire of 22 questions.

context in terms of adaptive capacity. In this step, the scores are interpreted to give them meaning in their context. For example, what does a '-1' score on learning capacity mean for the institution that is being researched; and what can be done to improve this dimension of adaptive capacity? Data interpretation also includes explaining (inter)dependencies between criteria and/or dimensions; and tensions between criteria and/or dimensions; which criterion appears to be in conflict with another criterion in a specific situation and why? Finally the researcher needs to draw conclusions on what the interpretations imply about the ability of a specific institution to promote the adaptive capacity of society; and what can be done to improve the institution.

Presenting and communicating the data

The fifth step in the process is to present and communicate the data. The most useful way to present the data is to use colours or shades to communicate how well a criterion or dimension scores. One can use either grey tones or a traffic light system. A grey tone is non-judgmental and provides a neutral evaluation of the criteria. However, it is less communicative. Using a traffic light system, as is done throughout this article, where green symbolises a high score and red a low score, is more communicative. Then a decision has to be taken on the range of colours to be used. Using a palette of three colours/shades is the easiest, but the situation may call for using more shades. The coloured/shaded wheel should always be accompanied by an explanation – which provides the meaning to the analysis. In other words, it should never be left to the reader's interpretation. It should be used to stimulate discussion with social actors as to the kinds of institutional bottlenecks and stimuli that they have to deal with.

2.4 Conclusions

This chapter elaborates on a method to assess the inherent characteristics of institutions to promote the capacity of society to adapt to climate change. Institutions are not defined as actors (organizations); they are the social rules that both constrain and empower social actors. Institutions are both the result of human interaction and they in turn shape human action.

Based on the literature, field experiences and brainstorming, this chapter has generated six dimensions, each with its own criteria, to assess if institutions are designed to stimulate the adaptive capacity of society. This information is presented in the Adaptive Capacity Wheel.

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. Participants indicated that nothing important was left out. They did in some instances feel that different dimensions are closely connected. 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 quantitative results. Quantitative results can be used to rank, for example, 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 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. It will become clearer if the institutions in the nature sector are really inhibiting adaptation when the results of the analysis with the adaptive capacity wheel are discussed in detail with the relevant stakeholders.

The Adaptive Capacity Wheel also has some interesting paradoxes: for example, we hinted before at 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 judgements regarding how to deal with the overlaps and contradictions between criteria.

Other key questions include: How objective is the evaluation? Are the equal shares for each dimension and criteria in the Wheel reflective of equal weights? And why do some dimensions include four or five criteria and others only three? In response to the first question, a comprehensive coding system allows for enhanced transparency of the evaluation; even though there will always be a subjective element in it, this is partly counteracted by intersubjectivity. In response to the second and third question, we have assigned equal weights to the criteria in our applications. However, in a specific context, one dimension or criterion might be more important than another, and explaining these kinds of contextual varieties is an important step in applying the wheel. 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.

In presentations to policymakers and scientists, the Adaptive Capacity Wheel has been viewed as a useful qualitative tool for assessing institutions, for comparing and contrasting them and in promoting self-reflection among policymakers and other social actors. Comparing the results of policy sectors in an aggregated way may stimulate cross-sectoral learning on how institutions in each sector are built. The Adaptive Capacity Wheel furthermore need not be limited to assessing the adaptive capacity to responding to the problem of climate change, but could be expanded for use with respect assessing the capacity to deal with other long-term unstructured problems.

3 Adaptation strategies in The Netherlands[11]

3.1 Introduction

Climate change hit the global scientific agenda through the World Climate Conference in 1979 (WCC 1979); the Netherlands was very active in the coming years but especially in 1989 to ensure that climate change would be part of the global political agenda. The Netherlands published its National Adaptation Strategy in 2007. This paper attempts at examining the evolution of this policy, the key features of adaptation strategies in at least four key sectors in which adaptation policy is essential, and at drawing some general patterns regarding adaptation strategies in the Netherlands.

At the World Climate Conference (WCC 1979), at the Hague Conference for Heads of State (Hague Conference 1989) and at the Noordwijk Conference on Climate Change (Noordwijk Conference 1989), the emphasis was on realizing the seriousness of the impacts of the climate change problem; and based on that realization to promote efforts in the area of greenhouse gas mitigation. Although the first set of reports of the Intergovernmental Panel on Climate Change did indeed include a report on impacts and adaptation measures (IPCC-3 1990), when the United Nations Framework Convention on Climate Change (UNFCCC 1992) was finally adopted in 1992, the emphasis was clearly on mitigation as a global issue and adaptation as a local issue (Bodansky 1993). This emphasis was created for three reasons: first to disconnect liability for impacts and related adaptation measures with the emissions at the global level; to promote global action on mitigation and leave it to countries to decide on how best to deal with adaptation and finally, in recognition of the fact that adaptation measures are best constructed and negotiated at local level.

While there was a flurry of interest in adaptation related issues in the early 1990s in the Netherlands, the emphasis in that decade was on mitigation. It is only in the post 2000 period that there is a gradual re-emergence of the adaptation challenge in the domestic agenda. The following sections elaborate on this in some detail. This Chapter is a further analysis based on a content analysis of the relevant policy and legal documents in the Netherlands (Klostermann et al. 2010).

3.2 The evolution of climate policy in The Netherlands

Historically, the Netherlands as a low-lying country has always fought against water – the sea and the river! Since the 12th century it has developed an institutional framework to deal with water – the water management authorities. This long tradition of being able to manage the water despite being below sea level has created a sense of confidence in the Netherlands that it will be able to cope with the impacts of climate change.

However, Dutch climate policy in the 1990s focussed mainly on mitigation. In the first National Environmental Policy Plan of 1988, the government adopted a mitigation target of stabilizing CO2 emissions by 2000 at 1990 levels (VROM 1989). A year later, the newly elected government, enthusiastically revised this target to stabilizing CO2

11 The text of this chapter is identical to - Gupta, J., J. Klostermann, E. Bergsma and P. Jong (..). Adaptation Strategies in the Netherlands; in M. Schmidt, M. Mißler-Behr and E. Albrecht (Eds.) Implementing Adaptation Strategies by Legal, Economic and Planning Instruments on Climate Change, Dordrecht: Springer Verlag.

emissions by 1994 and reducing by 5% by 2000. In 1991, the Policy Note on Climate Change (VROM 1991) developed mitigation policies; which were further revised in the second policy note of 1996 (VROM 1996). It should be noted that these ambitious targets were not supported broadly by other ministries and social actors and were not ultimately achieved. In the meanwhile, the Netherlands ratified the 1992 United Nations Framework Convention on Climate Change as well as the 1997 Kyoto Protocol (United Nations 1997) which committed the Netherlands to contribute to an overall goal for developed countries of a -5.2% reduction of emissions from 1990 levels by 2005. This translated into a -6% reduction of emissions for the Netherlands. In the run up to the Copenhagen negotiations on Climate Change, the Netherlands committed itself to reducing its emissions by 30% in 2020 in relation to 1990 levels. In an effort to engage local actors and other ministries, the Netherlands has developed policies in collaboration with provincial and municipal actors since 1999.

In 1990, the Ministry of Transport, Public Works and Water Management came up with a new Coastal Policy (VenW 1990) and a year later with Rising Waters (De Ronde and De Vrees 1991). However, adaptation in all the different sectors was not seriously covered in any of the early policy documents. The reasoning was that if there was enough attention paid to mitigation, there would be less attention needed for adaptation. A parallel reasoning was evident at the global level, where apart from listing a series of potential adaptation measures; there were no real commitments with respect to adaptation either in the Climate Convention or in the Kyoto Protocol. However, pressure from the developing countries led to reconsideration of the funding rules for adaptation as applied by the Global Environment Facility; and the decision to set up an Adaptation Fund from the proceeds of the Clean Development Mechanism under the Kyoto Protocol; as well as to finance the National Adaptation Plans of Action of the Least Developed Countries. A series of meetings of the Conference of the Parties in Nairobi and thereafter focused on the importance of adaptation strategies for developing countries. The Katrina disaster in 2005 in the United States pointed attention to the fact that even the developed countries could be increasingly vulnerable to the impacts of climate change.

In the Netherlands, near-floods in 1995 and 1998 and several other water problems of the late 1990s increased the awareness of adaptation needs. This led to the establishment of a Commission on Water Management for the 21st century and a series of measures have been taken since then. A study of the adaptation strategies of the Netherlands is not a simple and straightforward exercise (Klostermann et al. 2009). More than 90 documents provide the basic information regarding the evolution of explicit and implicit adaptation strategies. These can be clustered, although not without some difficulty, in terms of general adaptation strategies and adaptation strategies focusing on four specific sectors – nature, spatial planning, agriculture and water. The choice of four sectors is clearly limited as the National Programme for Spatial Adaptation to Climate Change (ARK programme; VROM 2006a) identifies nine sectors of importance to the Netherlands. However, this chapter focuses on the four sectors that are most strongly related to land use. The following sections thus focus on general adaptation strategies, and the strategies that operate in the individual sectors.

3.3 General adaptation strategies

This section divides adaptation strategies into two phases – the pre 2004 phase and the post 2004 phase.

3.3.1 Pre 2004 policy approaches

In the pre-2004 period, three key general measures were taken which have relevance for adaptation. The first is the adoption of the Environmental Management Act of 1993 (EMA 1993), which is a living document and is regularly updated. It did not focus on climate change, but created a number of incentives that can easily be adapted for use and application in an adaptation strategy. These include environmental plans, environmental impact assessments (EIAs), environmental quality standards, environmental permits, and reporting and enforcement rules. It also includes environmental subsidies, taxes and provisions for damage compensation. As a follow-up, in 1998 a law on Compensation of Damage in case of Disasters and Accidents (Disasters Compensation Law 1998) was adopted which provides a financial safety net for damage caused by large-scale events (including weather events). The Ministry of Internal Affairs is empowered to activate this law when a large-scale event happens. Since 2000, an annual Environmental Balance has to be prepared which assesses which environmental goals have been met and which not and where action should perhaps be focused. This document can easily take climate change into account once specific climate related goals are adopted. And although the National Environmental Policy Plan was revised for the fourth time in 2001 (VROM, 2001), it did not explicitly include adaptation strategies.

3.3.2 Post 2004 approaches

In the post-2004 period, there has been a more rapid focus on climate change and adaptation. Key scientific documents in this period include the Climate Change Report of the Dutch Parliament (Rooijers et al. 2004) which although it focuses more on mitigation, does emphasize the need to deal with floods and droughts and to provide adaptation financing to developing countries.

In 2006, the Scientific Council for Government Policy (WRR 2006) argued persuasively that adaptation should be seen as a 'no-regrets' policy; at the national level the focus should be on the water and allied sectors to improve flood defences since existing safety norms in the sector are out-of-date. The Council furthermore argues that adaptation measures can best be developed regionally since they are context relevant. Finally, the document notes that there need to be better links between the water and spatial planning sectors but that spatial planning alone may not be enough. The document also notes that since climate change impacts directly affect individuals, it is essential to involve and engage stakeholders. This they may also lead to them being more willing to take action.

In 2007, the Netherlands Environment Assessment Agency (Mathijssen et al. 2007) organized a conference to reflect on climate change adaptation issues and concluded that there was a need to focus not only on obvious risks in the water sector but also the more latent risks. It pays attention to the need to deal with uncertainty of impacts. Uncertain impacts call for taking risky approaches and evaluating them; for generalized rather than specific approaches; for strong leadership; an understanding of what can be planned in advance and what not; and finally it calls for incorporating multiple problem definitions by building on different stakeholder perspectives.

Also in 2007, scientific work on climate change adaptation was integrated into a research document called the Route Planner (Van Drunen 2007) which identified 96 different measures that can be of relevance to the Netherlands. These measures were classified into different categories, namely: importance, urgency, no-regret measures, additional effects, mitigation effect and complexity (weighted sum of technological,

social and institutional complexity). The Route Planner notes that the maximum available options are in the water sector and the lowest in the health sector; that the biggest challenge is institutional complexity, which often stands in the way of the simplest measures. For example, the policy Room for the River, which tries to provide more space for the river to overflow into at times of flooding, faces a number of institutional challenges especially from Spatial Planning Law. The authors call for flexible institutions that can cope with the new kinds of challenges imposed on them. In the same year, the Council for the Ministry of Housing, Spatial Planning and the Environment (VROM Council 2007) argued that uncertainty in climate science calls for structural, offensive and flexible long-term options. Such options should be robust enough to cope with not just the middle scenarios but also the extreme scenarios. Amongst other issues, it mentioned the need for establishing a watchdog to ensure that policies are implemented and to avoid administrative complexity.

While in various reports and at different conferences the urgency for taking adaptation measures was established, most Dutch environmental policy at the beginning of the twenty-first century did not explicitly include adaptation strategies. IIn 2005 seven Senators under the leadership of Lemstra submitted a motion that existing spatial planning did not adequately take climate change into account and this motion was unanimously adopted (Lemstra 2005). That same year, the Government launched two policies – the Think Ahead Campaign which focused, inter alia, on the potential extreme weather events and floods that may affect the Netherlands and the role of individuals in dealing with these events; and the Agenda for the Future (VROM 2006b) which argues that climate change calls for understanding and revisiting the responsibilities of the different actors and that more responsibility should be passed on to the citizen. A collaboration between various governmental actors - ministries, provinces and municipalities and water authorities - and non-governmental organizations (universities etc.) then adopted in 2006 the ARK programme (National Programme for Spatial Adaptation to Climate Change 2006-2014; VROM 2006a) which focuses on climate proofing nine sectors in the Netherlands through spatial planning.

2007 was a very active year in relation to adaptation policy. In 2007, a collaboration between state and non state actors led to the adoption of the National Adaptation Strategy (VROM 2007a) which focuses on seeing adaptation as primarily a spatial challenge; and tries to limit risks within specific compartmentalized areas within specific dike rings. It also aims to use existing ecological processes to deal with climate change. The document focuses on hard measures (technological measures) and calls for the mobilization of large-scale investments. In April 2007, the National Risk Assessment (Ministry of Internal Affairs 2007) was adopted. This document identifies climate risks such as floods, droughts and health hazards such as flue pandemics and discusses the significance of each. It argues that crisis management involves differentiated roles for government and citizens. In June 2007, the Cabinet adopted a policy on Working Together, Living Together (AZ 2007) which focuses on climate proofing through a spatial framework. In November 2007, the government and the municipalities entered into agreements with each other to develop adaptation measures in the area of spatial planning, water management and health care (VROM 2007b). A central vision of the four Balkenende Cabinets has been “Decentralize where possible, centralize where necessary” and this has been integrated into a number of policy measures.

In February 2010 a Law on Safety Areas was adopted that allocates various responsibilities to deal with calamities. The implementation of this law is still under preparation; later in 2010 this law will enter into force.

Table 3.1 Chronology of general adaptation measures in The Netherlands.

Year/ Type	Institution	Focus
1993 Law	Environmental Management Act	Not on climate change; but can be adapted: includes EIA, standards, permits, reporting, enforcement rules; subsidies, taxes, compensation
1998 Law	Compensation of damage in case of disasters and accidents	Safety net for large scale events
2000 Monitoring	Environmental balance	Takes climate change into account
2004 Science	House of Representatives: Climate Change Report	Mitigation; Adaptation discusses dealing with floods and droughts and an adaptation fund for developing countries
2001 Policy	Ministries: National Environmental Policy Plan – 4	Adaptation inadequately covered
2005 Motion	House of Representatives: Lemstra Motion adopted	Spatial policy should take climate change into account; FES (Economic Structuration Fund) money should be used also for knowledge infrastructure
2006 Policy	Agenda for the Future (VROM 2006b)	Changes responsibilities for climate change; more responsibility on the citizen
2006 Policy	Government: Think Ahead Campaign	Extreme weather events and floods and the role of individuals
2006 Advice	Scientific Council for Government Policy	Adaptation is a 'no-regrets', regional option; link spatial planning to water sector;
2006 Policy	Collaborative programme: ARK	Climate proof Netherlands for nine sectors through spatial planning;
2007 Science	The Netherlands Environment Assessment Agency	Focus on obvious and latent risks; Policy should deal with uncertainty
2007 Science	Collaborative research: Route planner	Lists 96 different options for climate proofing; stakeholder participation
2007 Advice	VROM Council Report	Uncertainty calls for structural, offensive and flexible long term options; need for watchdog
2007 Policy	Collaborative programme: National Adaptation Strategy	Adaptation is a spatial issue; compartmentalize risk; use ecological processes; Hard measures; need for large scale investments
2007 Policy	Cabinet: National risk strategy	Identifies climate risks: floods, droughts, flue pandemic; crisis management involving differentiated roles for government and citizens.
2007 Policy	Cabinet: Working Together, Living together	Climate proofing through spatial framework
2007 Policy	Central government & municipalities: Climate agreement	Adaptation important in spatial planning, water management and health care
2010 Law	Law on Safety Regions	Allocation of responsibilities to deal with calamities

Table 3.1 above provides a chronological listing of measures that have some relevance for adaptation in the Netherlands.

3.4 Adaptation in the agricultural sector

The agricultural sector in the Netherlands is hugely influenced by developments at the international level within the World Trade Organization, the European Union level within the Common Agricultural Policy (EC 2009) and global markets.

The agricultural sector does not formally and explicitly discuss climate change and adaptation. The 1993 Environmental Management Act (EMA 1993) has regulations that have impact on the environmental impacts of agricultural practices. These regulations include damage caused to agriculture through the protection of endangered species. In the last decade of the 20th century, the Dutch agricultural sector increasingly had to deal with extreme rainfall causing damage to crops. Several arrangements administered by different governmental bodies were in place to compensate farmers for their losses. This constellation of arrangements was criticised for its differentiating and non-committal character (Duin and Mesu 1995). The 1998 Disasters Compensation Law intended to centralize all damage compensation regulations into one arrangement; however, other regulations also continued to exist for the agricultural sector. For example, several studies to evaluate the possibilities for agrarian insurances were performed (e.g. LTO-Nederland 1999; IRMA 2000) and now, a few insurance companies offer rain insurances to farmers. This development seems to shift some responsibility to the farmers by requiring them to insure against extreme rain. Next to these private initiatives, there are also some public arrangements that financially support farmers who have to deal with losses due to rainfall.

In 2004, the government's Agenda for a Living Countryside (LNV 2004) emphasized that non-agricultural policies and laws would have to play a critical part in helping address climate related water problems.

In 2005, two research and advisory documents were critical. The Social Economic Council came up with a report (SER 2005) about the opportunities for rural areas and argued that these opportunities can be optimized by linking national with European policies and mobilizing local actors. Climate adaptation is not mentioned in this report. However, the report focuses on the entrepreneurial and adaptive role of the farmer. The Ministry of Agriculture's report 'Choice for Agriculture' (LNV 2005) focused on potential agricultural developments and aims at informing farmers about these potential developments to enhance their adaptive capacity.

In 2006, a Company Premium (LNV 2009) was established and a Fertilizer Law (2006) was adopted. The Company Premium is a follow-up to the changes made to the EU Common Agricultural Policy (EC 2009) and offers income support delinked from production to farmers if they meet some criteria. This premium does not mention climate change adaptation. The Fertilizer law was established also as a follow up to the non-compliance of the Netherlands to the EU Nitrates Directive (Dienst Regelingen 2008) and provides emission standards and rules on the use of fertilizers. This too does not take climate change into account but will perhaps need modification to do so.

In 2007, the government adopted first a strategy on rural development and then a policy. The strategy (LNV 2007a) describes how financial means from the European Agricultural Fund for Rural Development (EAFRD) will be allocated to local projects that combat biodiversity loss and climate change, and maintain water quality and quantity. The policy links up with the goals in the European Rural Development Policy (European Council 2006) focusing on the competitiveness of the agricultural and forestry sector;

improving the environment and the countryside; improving the quality of life in rural areas and encouraging diversification of the rural economy; and building local capacity for employment and diversification through a Leader-approach (i.e. a bottom-up approach stimulating the involvement of local actors). Although climate change is not specified, it is expected that these subsidies will help farmers to adapt. In the same year, the Rural Areas Development Act (WILG 2007) was adopted, which although it does not address climate adaptation could easily be adapted to do so. This Act divides responsibilities between the central and provincial governments with the latter held accountable for achieving rural goals. The key tool used in this document is spatial planning. This Act creates a financial investment instrument (Investment budget Rural Areas (ILG) which provides budget to finance provincial development plans and also includes accountability procedures. It also changes some rules of the Agricultural Land (Transactions) Act (WAG 1981); this act now empowers provinces to rearrange and redistribute land if there is need to do so based on certain principles; and to reconstruct land areas to reduce chemical pollution, acidification and stench.

In 2010, the subsidy scheme for Rural Area Management revised the existing three subsidy schemes for nature management, agricultural nature management and private management of natural and agricultural ground (Dienst Regelingen, IPO, SNL 2009). It includes some EU funds and hence EU criteria. These measures indicate a growing integration of different measures and laws into a common legal and subsidy system.

Table 3.2 provides a chronological listing of measures that are relevant for adaptation in the Netherlands.

Table 3.2 Chronology of implicit and explicit adaptation measures in the agricultural sector in The Netherlands.

Year/ Type	Institution	Content
2004 Policy	Agenda for a Living Countryside	Recognizes climate related water water challenges and the role of non agricultural laws (e.g. NEN) in addressing these. Focuses on decentralization. Spatial planning has a limited role.
2005 Advice	SER: Opportunities for Rural Areas in the Netherlands	Opportunities optimized by linking national with EU policies and mobilizing local actors. Climate adaptation not mentioned and the role of the entrepreneur is emphasized.
2005 Vision	Ministry of Agriculture: The Choice for Agriculture	Describes potential agricultural developments and aims at informing farmers to enhance their adaptive capacity.
2006 Subsidy	Company Premium	Provides income support delinked from production to farmers upon conditions; climate change not addressed.
2006 Law	Fertilizer law	Creates emission norms and use norms for fertilizers; climate change not addressed.
2007 Vision	Dutch Strategy for Rural Development 2007-2013	Describes how the EU EAFRD will be allocated to local projects on biodiversity, climate change and water quality and quantity
2007 Policy	Dutch Rural Development Policy 2007-2013 (RDP2/POP2)	Linked to EU ERDP goals; Although climate change is not mentioned, subsidies could help farmers adapt.

Year/ Type	Institution	Content
2007 Law	Rural Areas Development Act (WILG)	Does not address climate adaptation explicitly but could easily be adapted to do so; Provinces are accountable for achieving rural goals; Creates ILG to finance provinces and WAG to empower provinces to rearrange and reconstruct land if needed based on certain principles;
2007 Policy	Agenda for a Living Countryside 2007-2013	Decentralizes responsibilities to provinces; the multi-year programmes between water authorities and municipalities incorporate WILG and ILG
2010 Policy	Subsidy system for Nature and Landscape Management	Subsidizes public and private nature management on agricultural lands
--	Miscellaneous (public and private) compensation schemes for damage compensation to farmers	Public and private insurances for a contribution in crop damage compensation caused by (extreme) rainfall to farmers, placing more responsibility at the level of farmers.
--	Miscellaneous subsidy schemes on nuts, cattle farms, etc.	There are a number of sector specific subsidies that could perhaps be modified for use to help the sector adapt.

3.5 Adaptation in the nature sector

The Netherlands is a densely populated small country; nature reserves are thus concentrated in relatively small areas. Regulations in this area are of relatively recent origin and quite often regulated from Brussels – e.g. The Habitat Directive (European Council 1992) and the Birds Directive (European Council 1979). In 1967 the Nature Conservation Law (NCL 1967) was adopted and provided the framework for action for the coming decades.

The Forestry Act of 1981, aims at protecting lands currently under forests (areas above 10 acres (where more than 20 trees are concentrated) from land use change until and unless there is a significantly important public good to be served. This Act includes reporting, replanting and compensation obligations and a prohibition on felling.

In 1990 the Ministry of Agriculture, Nature Management and Fisheries adopted the Nature Policy Plan (NPP 1990) and introduced the concept of the National Ecological Network (NEN), a concept that aimed to counter the increasing fragmentation and isolation of species in specific pockets of land, by developing corridors for species to move around. These ecological zones are to be created and achieved by 2018 and are to ensure the resilience of the Dutch species, although at the time climate change was not taken into account. This omission has been remedied in a number of studies undertaken since then (Routeplanner: van Drunen 2007; Vos et al. 2007). This concept (NEN) has been integrated into a number of different laws including the WILG.

Five years later in 1995, the NEN was officially adopted in a Spatial Plan for the Rural Area and its related key planning decision (LNV 1995). Several policy documents after that further elaborate on the NEN, and promote the management of nature, in relation to agriculture and water. In this context, the impacts of climate change are taken into account. The obligations for nature protection in the rural areas are targeted at sub-national government authorities and water authorities. The role of farmers in this is

emphasized. For example, the concept of a National Climate Buffer is proposed as extension for the NEN; this concept is still in a conceptual stage and focuses on creating climate resilient zones or zones that can absorb climate shocks.

In 1998, the Nature Conservation Law of 1967 was amended and focused on protecting areas and landscapes (and not species) through mandating the preparation of nature policy plans with a maximum interval of eight years, the development of vision statements, designation decisions, preservation goals, management plans, permits and compensation rules, and monitoring and enforcement. Also, since 1998, Nature Balances have been made annually that describe the impacts of climate change on nature, but do not discuss potential adaptation options. The Nature Exploration documents focus on how different climate scenarios may impact on the achievement of national target.

Also in 1998 the Flora and Fauna Act (1998) was adopted. This implements the international Convention on Endangered species (CITES) and the EU Birds and Habitat Regulations; and aims at protecting endangered species through rules on hunting, trade and ownership, the 'no-unless' rule and a Fauna fund to finance these activities. The 'no-unless' rules do not allow land use change unless there are no alternatives and the changes are perceived to be in the national interest. This law has not taken climate change explicitly into account.

In 2000, the Ministry of Agriculture, Nature and Food security (LNV) adopted the Nature for People, People for Nature policy (LNV 2000). It draws attention to raising public attention and support for nature as well as emphasizing that Dutch nature is unique. It uses the climate change problem to emphasize the role of nature in contributing to water management and refers to the concept of Room for the River. It promotes the implementation of multi-level regulations, provides financial incentives and a greening of the Dutch tax system and educational incentives. The concept of the National landscape is expected to help integrate the rural and aesthetic functions of the landscape. This document promotes land acquisition and spatial planning of areas for the National Ecological Network. Also, this policy note introduced the concept of robust ecological corridors as additions to the NEN. 13 corridors are envisaged between the larger forests, marshes and other natural areas.

In 2007, the Ministry of LNV published a policy document which provides clear rules with respect to interpreting NEN and explains how the concepts of 'no-unless', 'compensation rule'[12], 'redemarcating the NEN'[13] and 'the NEN balance approach'[14] should be interpreted (LNV 2007b). Some of the NEN areas are also those that come under the Nature reserves. As in other sectors, a coming together of different measures is visible. Table 3.3 sums up the key policies.

12 If spatial developments are allowed, negative impacts on nature should be mitigated and remaining damage should be compensated.
13 Allows changing the borders of NEN areas on a small scale when this has a positive effect on quality or quantity. When it happens for other reasons, the no-unless principle applies.
14 A development approach allowing an integrated approach to NEN areas combining different qualitative or quantitative aims.

Table 3.3 Chronology of implicit and explicit nature measurements in the nature sector in The Netherlands.

Year/ Type	Institution	Content
1967 Law	Nature Conservation Law	Framework for conservation
1981 Law	Forestry Act	Protects forests through reporting, replanting and compensation obligations and a prohibition on felling.
1990 Policy	Nature Policy Plan	National Ecological Network (NEN) to be created by 2018
1995/ 2001 Policy	Spatial Plan for the Rural Area	Elaborates further on NEN; sees water as an organizing principle; Delegates responsibility to decentralized governments and farmers.
1998 Law	Nature Conservation law, amended	Calls for regular nature policy plans, vision statements, designation decisions, preservation goals, management plans, permits and compensation rules, and monitoring and enforcement
1998 Policy	Nature explorations and balances	Annual reports on the nature sector by Netherlands Environmental Assessment Agency
1998 Law	Flora and Fauna Act	Protects endangered species through rules on hunting, trade and ownership, the 'no-unless' rule and a Fauna fund; does not explicitly take climate change into account
2000 Policy	Nature for People, People for Nature	Land acquisition and spatial protection of NEN; incentives and taxes; education; climate change addressed
2000 Policy	Nature Policy Plan	Promotes Robust Ecological Corridors and Climate Buffers
2007	Rules of the NEN	Document that interprets key terms – NEN, compensation, no-unless, NEN balance approach

3.6 Adaptation in the water sector

The Netherlands, as has been mentioned before, lies largely under sea level. It is a delta country with four major rivers (Rhine, Meuse, Scheldt and Ems) and has a coast that needs to be protected by dunes, man-made dikes and other structures. The water sector is perhaps the most regulated sector in the Netherlands. This section only examines the recent and most relevant regulations and policy decisions that deal with this sector.

In 1990, a New Coastal Defence Policy (VenW 1990) for the Netherlands was adopted. It explained that following the 1953 floods, the dikes and dunes along the North Sea were raised to "Delta Height"; and the protection should ensure that regions should be protected from the extremes of a 1 in 10,000 year storm (Annex II of the Water Act 2009). Given the potential impacts of climate change, following several studies, four options were identified – retreat; selective preservation; preservation; and seaward expansion. In the 1990 Coastal Defence Policy, the choice for dynamic preservation was made – dynamic to allow for some 'natural' movement of the shoreline; but the preservation goal aimed at both combating coastal erosion and dealing with sea level rise; primarily through sand nourishments and replenishment and stone revetments in weak locations. Dyke protection was to be undertaken by maintenance while dune coasts were to be allowed some dynamic movement.

In 1996, a programme for testing the flood defences every five years was established – to see if these still meet the safety norms. The last test was conducted in 2006 and revealed that 24% of the flood defences did not meet the norms. This has led to the establishment of a programme (Rijkswaterstaat 2007) with 93 measures that need to be undertaken and are financed at 2.3 billion Euros.

In the second half of the 1990s two floods in the Netherlands led to the establishment of a Commission on Water Management for the 21st Century. The Commission's 1999 report (Commissie Waterbeheer 2000) concluded that the greatest challenges were in integrating and linking the water sector to spatial planning objectives and developments. The Commission recommended a clarification of responsibilities, greater collaboration between the different concerned actors including scientists, the promotion of no-regret measures and the need to raise additional resources to deal with the problem. The report recommended that excess water should be retained upstream and in surface water, and if necessary in temporary basins.

In 2000, the Third Policy Note on Coasts (VenW 2000) was adopted. It focused on strengthening coastal protection by focusing on the weak parts of the coastal protection chain and dynamic maintenance of the coastal boundaries including maintenance through sand replenishment. In 2003, based on an assessment of the weak links in the coastal defence system, the Government adopted a programme focusing on the ten weak links and appropriate policy is being developed in these regions (VenW 2003).

In 2003, the different administrative and social actors came together to adopt the National Administrative Accord on Water (NAW 2003) and decided to develop policies for the areas that fall outside the formal dike protection of the Netherlands; it supported the existing policy line to manage the coastal areas with special attention for the parts of the coast that have weaker protection. The NAW approach was evaluated in 2006 and the evaluation concluded, inter alia, that the approaches adopted were very complex and the financial responsibilities were not always clear. In 2008, the NAW was made up-to-date based on the latest information about climate scenarios and the obligations that flowed from the European Water Framework Directive.

In 2003, a water test was included in the Spatial Planning Act which calls for testing spatial planning for their impacts on water quality and quantity (RIZA 2003).

In 2006, the third policy note (VROM 2007c) focusing on the Waddenzee was adopted. 90% of this area is seen as a National Nature Monument and is also covered by the Habitats Directive of the European Union. The document calls for prevention of pollution discharges into the sea, greater cooperation with Germany and Denmark and appropriate policy with respect to gas and fish exploitation.

A 2006 Policy Document (Policy Guideline for Major Rivers: VenW and VROM 2006) replaced a 1997 policy document to focus on room for the river. This document was drawn up in cooperation with social actors. In 2007, a decision was taken to create 'Room for the River'; this was a major shift in mindset from creating hard protective measures to allowing the rivers space to overflow in selected areas if necessary. This includes 40 context related measures related to the Rhine and the Meuse.

The 2007 evaluation of the Third Policy on Coasts was positive and recommended specific rules regarding areas outside dike protection, weak links in the coastal defence system and sand replenishment. In the same year, a revised law on the water authorities (Water Authorities Modernization Act, 2007) was adopted that changes the

mandate and management system of these authorities. The water authorities are empowered to make water management plans, water ordinances and charge levies.

In 2008, a Delta Commission (led by Veerman; Delta Commission, 2008) came out with its report focusing on the long-term goals for water management. It concluded that the safety levels for water protection should be increased by a factor of 10; and building in risky places should be based on an evaluation of the costs and benefits. It made specific recommendations with respect to the coastal defence system.

In 2008, the government adopted the National Water Plan (NWP) based on a Water Vision published in 2007 (VenW, VROM and LNV 2009). This plan adopts and integrates the existing programmes of coastal protection, Room for the River and river expansion in the Maaswerken, agreements between state and other actors regarding water shortage and excess, and river basin management flowing from the Water Framework Directive. The NWP recommends taking climate change impacts into account in water policy. It creates a multi-level security approach: in the first layer the focus is on prevention of flooding; in the second layer the focus is on sustainable spatial planning; and in the third layer the focus is on crisis management.

Municipal water plans are plans made by municipalities in cooperation with water authorities and social actors and can go beyond their official task of managing the sanitation system to include the broader management issues in relation to water. In 2008, the Act on Municipal Water Tasks (2008) was adopted that amends previous laws and integrates new tasks and although it does not mention climate change, is a result of a recognition of the impacts of climate change at municipal level. The law allocates responsibilities for sanitation and rainwater within municipal boundaries.

In 2009, the Government adopted a Water Act (2009), which replaces and integrates eight other water laws15 and although it does not mention climate change, climate change is one of the reasons behind this new integrative effort. The Water Act discusses water shortage, water safety and water quality. It calls for 12 yearly revisions of the norms and calls for six yearly policy revisions. It bundles the existing system of permits. This Water Act integrates past Acts into one consolidated system.

Table 3.4 shows the development of adaptation measures in the Dutch water sector.

Table 3.4 Chronological implicit and explicit adaptation measures in the water sector in The Netherlands.

Year/ Type	Institution	Content
1990 Policy	New coastal defence policy	Choice for dynamic preservation of dikes (maintenance) and dunes (flexible)
1997 Policy	Policy Directive: Room for River	Room for the River concept
1999 Advice	Commission on Water Management for the 21st Century	The 1999 report requested the Royal Netherlands Meteorological Institute for climate scenarios; greatest challenge linking water to other sectors

15 Among the laws is the Water Management Act which managed both quality and quantity issues; the Flood Defences Act of 1996, the Groundwater Act, the 1969 Surface Waters Pollution Act, the 1975 Marine Waters Pollution Act, the Act of 14 July 1904 containing provisions on land reclamation and construction of dikes, the Public Works Management Act (sections relating to waterways), the Public Works Act 1900 (sections relating to waterways). The Act on Municipal Water Tasks (2008) had partly been integrated in the Water Act.

Year/ Type	Institution	Content
2000 Policy	Third Coastal Policy	Focus on weak parts of the coastal defence system
2003 Policy	National Administrative Agreement on Water (NAW)	Collaboration between all governmental actors to deal with water on ten different weak parts
2003 Law	Water test	Included in existing Spatial Planning Law
2006 Law	Tests of flood defences	The last test in 2006 showed that 24% of the flood defences did not meet the norms and a programme with 93 measures has been adopted
2006 Policy	Evaluation of NAW	Collaboration complex and division of responsibilities not clear
2006 Policy	Policy note on Waddenzee	90% of sea is a nature reserve; measures include international collaboration; and on fish, gas exploitation and discharges.
2007 Policy	Evaluation of Third Coastal Policy	Generally effective; more attention to areas outside the dikes.
2008 Policy	National Administrative Agreement on Water amended (NAW)	Includes implications for Water Framework Directive and clearer division of responsibilities
2006 Policy	Major Rivers Delta Plan, later renamed as Room for the River	Room for the River: includes 40 context relevant measures for the Rhine and Maas
2006 Policy	High Water Security Program	Improving coastal flood defences for ten weak spots and realizing emergency retention areas
2008 Advice	Delta Commission (Veerman)	Water safety levels should be increased by a factor 10
2008 Policy	National Water Plan (NWP)	Integrates existing programmes for coastal protection, river management and implementation of the WFD
2009 Law	Water Act	Replaces and integrates eight other water laws; climate change not explicitly taken into account; calls for 12 yearly revision of norms and 6 yearly water policies.

3.7 Adaptation in the spatial planning sector

In 2006, the Government adopted the Spatial Policy Note that amended previous documents and presented a national policy for the period until 2020 and discusses the period 2020-2030 as well (VROM et al. 2006). The policy calls for shifts from planning to development and towards decentralization. It engages to maximize the participation

of social actors at multiple levels of governance and thereby maximize the opportunities for diverse responses. It aims to strengthen the national economic competitive position of the country, equitably promote vital cities and villages; protect important spatial values and the security of the country including water security. Climate change and its impacts are explicitly taken into account and there are efforts to see the impacts also in terms of how they can improve the living environment. The Spatial Planning Note distinguishes between responsibility for running the system and responsibility for achieving goals. The national government is responsible for ensuring the basic quality of the system. The spatial policy for major rivers and the IJsselmeer fall under the responsibility of the state; the spatial policy for the coast, the National Ecological Network, and the national landscapes fall under the responsibility of the state and provincial governments.

A year later, in 2007, an Urgency Programme for the Randstad was established to promote 35 projects to enhance the resilience of spatial areas within this economically active region (VenW 2007). In 2008, the Spatial Planning Act of 1965 (SPA 1965) was revised (SPA 2008) to provide new procedures, but this Act does not explicitly take climate change into account. All government levels are empowered to make 'structural visions' and this new term encapsulate a number of different terms used in the past. The visions should integrate and provide direction and bind the authority that has designed them. There are also land use plans to be revised once every ten years and these plans will be used for giving permits for buildings and demolitions. Where large-scale projects are being planned that do not fit into the nature of the relatively small-scale land use plans, the Act empowers the state to adopt a project decision. This may call for a revision of the land use plans and that should occur within a year. Finally, the state and the provinces are empowered to make land use plans in case there are national (state) or provincial interest at stake (inpassingsplannen). Legal procedures have been simplified so that the response time is reduced. This Spatial Planning Act amends some existing laws: it modifies the Municipal Priority Right (that calls on land owners to give first priority to the municipality when they sell their property) to ensure that these rights are included into the land use plans. The Act includes the Ground Exploitation Act, enabling municipalities to place restrictions on the use of an area.

A number of other laws are also relevant. An Act on expropriation (1851) allows the state to claim property rights from the owner based on a full compensation to the land owner when there is clear public interest involved; for 'green' reasons such as the National Ecological Network; for 'blue' reasons such as the Room for the River policy or for infrastructure and housing. A Building Decree of 2008 revising a previous Decree of 2003 calls for climate mitigation to be taken into account, but not yet climate adaptation, in building standards. There are plans to simplify the multiple permits needed for construction purposes into one integrated permit that allows for balancing between different interests.

The Environmental Management Act of 1994 calls for environmental impact assessments for specific types of projects. In addition, a European Directive of 2001 calls for strategic environmental evaluations for strategic projects. These instruments have an impact on spatial policy. Furthermore, a Social Cost Benefit Analysis is compulsory since 2000 for all large projects.

Table 3.5 sums up the development of adaptation policy in the Dutch spatial planning sector.

Table 3.5 Chronological implicit and explicit adaptation measures in the spatial planning sector in The Netherlands.

Year/ Type	Institution	Focus
1851 Law	Law on expropriations	Allow expropriation with full compensation when it is in the public interest
1965 Law	Spatial Planning Act	Framework for spatial planning in the Netherlands
2006 Policy	Spatial Policy Note	Amended previous documents and presented a national policy for the period until 2020; shift towards development and decentralization/ participation. Climate change impacts explicit; distinguishes between system responsibility and goal accounttability; delegates responsibilities.
2007 Policy	Urgency Plan for the Randstad	35 projects to enhance the resilience of spatial areas
2008 Law	Spatial Planning Act of 1965 revised	New procedures, but does not explicitly take climate change into account. Tools - 'structural visions', land use plans, project decisions; revises Municipal Priority Right and includes Ground Exploitation Law
2008 Law	Building Decree (revising a previous Decree of 2003)	Takes mitigation into account, but not adaptation, in building standards.

3.8 Analysis

This chapter has tried to give a birds' eye view on national adaptation policy in general and in four of the nine sectors seen as important in relation to climate change adaptation in the Netherlands. It shows that there is an enormous degree of activity in the policymaking sphere in these four sectors in the last four years. The question that rises – is how can this activity be characterised? We identify six key trends in the evolutionary process:

3.8.1 Shift from sectoral to integrated

An evolutionary understanding of the climate change adaptation problem and challenges it poses to society can be culled from the information provided in the last four sections. While clearly the water sector was most aware of the potential consequences of climate change since the early 1990s (VenW 1990), over time the awareness has reached, first, national level and scope (Lemstra Motion 2005) and, second, the awareness has spilt over to other sectors (nature – Policy Note Nature for People, 2000; spatial planning – Spatial Policy Note, 2006; and agriculture, although most policies in this sector deal with climate change implicitly. Third, there is a growing realization of the links between sectors. The lack of linkage, and hence, the need for links between the water and spatial policy sectors grew in significance in the 2000s (Commission on Water Management in the 21st century; Lemstra 2005; WRR 2006; National Adaptation Strategy 2007; Policy note Living Together, Working Together, 2007). The Agenda for a Living Countryside (LNV 2004) recognizes that non-agricultural policies are critical for dealing with climate impacts on the countryside. In 2001 the link between nature, agriculture and water was emphasized (Spatial Plan for the Rural Area 2001). In 2000, the role of nature in water management was

emphasized (Policy Note Nature for People 2000). These growing links and the diversity of instruments being developed in different sectors is now leading to a fourth phase where integration is key. Here, there is a tendency to move towards simplifying pluralistic and competitive procedures into a comprehensive planning process in an effort to provide forums where multiple objectives and concerns can be integrated into decisions. For example, the Water Act (2009) replaces past laws and integrates a number of issues into one document. Similarly the Spatial Planning Law (2008) also aims to integrate different goals and policy instruments. The Rural Areas Development Policy and Law (WILG 2007) also attempts to integrate different goals for the rural areas and their financing instruments (ILG 2007) and land consolidation instruments (WAG).

An interesting link between the Water Act and the Spatial Planning Act has been established. The spatial aspects of national and provincial water plans are also considered as spatial structural visions of the Spatial Planning Act. This link between the two Acts opens the possibilities to implement the water plans with spatial planning instruments.

3.8.2 From not a priority, through no regret to priority

The move from sectoral through national to integrated also reflects changing perspectives on the adaptation issue. As mentioned earlier, although a substantial part of the Netherlands lies below the sea level, it was not seen as vulnerable; there were high expectations from the global emission reduction strategy which would reduce the need for adaptation; and besides, it was not clear how robust policies could be made to deal with uncertain impacts. This led to a general under-emphasis being given to the adaptation process. However, by 1997, it became increasingly evident (a) that a global emission reduction strategy would at best be a very modest one; (b) that physical impacts of the 1995 floods, the 2003 research on the ten weak spots in the coastal defence system and the 2006 research results that 23% of the storm surge barriers did not meet national standards; and (c) that although the Netherlands is not seen as vulnerable, it was soon felt that it will be increasingly exposed to the impacts of climate change as the newer reports of the IPCC continued to predict that climate change could have very serious impacts globally.

By the end of the decade, people were referring to adaptation strategy as a 'no-regrets' strategy (Commissie Waterbeheer 2000) and this acquired a high political and scientific allure when it was repeated in the WRR document of 2006 (WRR 2006). However, it was soon realized that adaptation measures would have to go far beyond no-regrets policy to also include important and urgent measures, measures that have a contribution to make to adaptation as well; and more complex integrative measures (Route Planner 2007). Furthermore, the scenarios developed by the Royal Netherlands Meteorological Institute which downscaled global impacts to national and local level provided a framework within which climate change adaptation could take place. In the meanwhile, a philosophy was developing on how to cope with uncertainty; uncertainty was seen as calling for different institutional skills (MNP Conference, 2006) and approaches (VROM Council, 2007). Adaptation is becoming a national priority; although the current 2010 election discussions show that climate change may be slipping fast from the agenda in the face of the transatlantic recession.

3.8.3 From technological to post-modern concepts

While technological and rationalistic rule-oriented approaches have been dominant in the past, there is an increasing tendency to innovatively design new principles of

management and new instruments to help society cope with a range of new problems and challenges and to meet different goals.

The concept of dynamic protection adopted with respect to the coasts tries to combine the need for national physical security with the need to recognize that coasts are by their very nature dynamic – they move with the ebb and flow of the seas (VenW 2000). While dynamism is essentially applied only to the dune defence system, there are limits to the dynamism and dune replenishment and nourishment are key tools here.

The concept of Room for the River is another such concept that provides rivers the space to grow and contract with seasonal variations (VenW, VROM and LNV 2006). Although this sounds a simple concept, it has major implications for spatial policy and has to be implemented all along the river banks in different provinces and municipalities – and calls for a series of context relevant institutional measures for effective implementation.

A third post-modern concept is that of the National Ecological Network (LNV 1990) and the related concepts of Robust Ecological Corridors and Climate Buffers (LNV 2000). The National Ecological Network allows for linking up ecological zones all over the country by 2018; while the 13 planned Robust Ecological Corridors allows for larger links between the larger ecological zones. Climate Buffers are expected to enhance the ability of the land to cope with the climate change.

The state has in the past mostly focused on rational and efficient measures; but in recent years there appears to be a trend shift in the direction of post modern concepts: redundancy, flexibility and the recognition of multiple rationalities. All of the three above-mentioned concepts have implications for how people live; it calls for recognition that people live with nature and must make space for nature. While this is a theoretically attractive notion, actually implementing it might imply the expropriation of land and will require not only very good quality persuasion, but also remarkable access to resources and a flexible spatial planning system. Possibly some of the difficulties in implementing these have led to a partial return to hard measures in the 2007 National Adaptation Strategy (VROM 2007a).

3.8.4 From top-down consensus through decentralization to a new balance

A third interesting tendency in the policy process is the move from top-down consensus policy to a more bottom-up approach of engagement of civil society and sub-national authorities. The climate mitigation targets of 1988 and 1999 were not achieved, possibly because of a lack of general support for these targets. The need to engage the population and ensure that policies have public support is seen as critical in the Netherlands in this phase. At the same time, there is an increasing neo-liberal interpretation of the role of state as minimal, of passing on responsibilities to other social actors; and the norm of 'individual responsibility' is increasingly seen as a dominant value in Dutch society (Think Ahead Campaign 2005; Agenda for the Future, 2006). The four consecutive Balkenende cabinets that came to an end in June 2010 have adopted the motto of "Decentralize where possible, centralize where necessary". Decentralization and stakeholder participation appear to have become buzz words in the policy discussions. For example, the role of farmers and rural dwellers as entrepreneurs in addressing their own problems is emphasized in a number of documents (SER 2005; LNV 2005; LNV 1995) and subsidies are provided to help them use their own initiative (Rural Development Programme 2, LNV et al. 2008; WILG 2007); while there is a Disaster Compensation Law (1998) that aims to compensate

individuals in the event of an extreme event, newer initiatives try to ensure that farmers take out their own insurance for such events.

However, the trend towards decentralization of responsibilities to the lower levels is subject to so many strategic visions at the central and provincial level that the question of balance and division of responsibility between the levels is critical. This is specially so in the Spatial Planning Sector. In the Nature sector there is a complete clash between the top-down nature of the targets set and the actual physical impossibility to prevent species movements as climate changes, even though the physical boundaries of nature reserves remain static. Furthermore, while it is important to have public support for policies, shifting responsibilities to citizens is an interesting but not always practical suggestion. Although the WRR (2006) claims that individuals will feel more engaged to participate in adaptation measures than in mitigation measures, because it concerns them directly, allocating responsibility to home owners on ground water and storm water is not always practical and the line between state and resident responsibility is difficult to draw (Bergsma et al. 2009). Most home owners in cities, after all, have absolutely no interests in or knowledge of ground water levels under their houses.

3.8.5 Different paradigms in different sectors

A fourth interesting outcome of analyzing the different adaptation policies in the different sectors is that there are vastly different paradigms evident in the different fields. These different paradigms have occurred partly because of the different historical evolutionary processes that these policy fields have undergone. For example, water governance in the Netherlands was traditionally dominated by a Delft University of Technology-oriented approach. This paradigm has been changing under the influence of the trends described above, but still a proper calculation will always be the basis of Dutch water policy. Also, 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. Furthermore, the Dutch have been able to master their environment to such an extent with engineering measures that they are now able to discuss the possibility of social and ecological engineering to provide more space to nature and be more fluid in their protection standards. The Nature regulations of the European Union appear to be more rigid and static, more top-down and unable to cope with the notion of a fluid 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 (in the Netherlands: the nature we had 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 and policy intervention 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 to help them become more adaptive. The spatial planning process is much more densely regulated and has multiple tools and instruments at its disposal – but these can also be experienced as highly constraining when it comes to adaptation to climate change. The paradigm in Dutch spatial planning is to accommodate urbanization processes. Because all the good

building locations are already taken, this results in developing unsuitable and marginalized locations, also from the climate change viewpoint. Attempts to make this sector less rigid are evident in the new Spatial Planning Act (2008) and tools of Project Decisions. Changing this paradigm will not be easy.

3.8.6 From adaptation strategies to adaptive capacity

An examination of the sectoral adaptation strategies leads to the following impression. For more or less certain impacts (the sea is expected to rise) there are hard measures being taken like the strengthening of the coastal defence system. However, for the more or less uncertain impacts, the focus is on creating procedures and tools (e.g. the water test), general public awareness and engagement both at community level and sub-national level in order to mobilize people to come up with their own autonomous adaptive solutions. This is clearly the case in the agricultural sector and to some extent in the spatial planning and water sectors (especially with respect to precipitation) but less so in the nature sector. However, increasingly the nature organizations are arguing in favour of dynamic nature management. A critical element of the adaptive capacity is trying to ensure that institutional complexity and especially the interplay within and between formal and informal institutions is taken to account. While the interplay between formal institutions is being incrementally revised in the last decade especially in response to the understanding that institutional complexity is perhaps the most complex challenge facing adaptation strategies (Route Planner 2007), the interplay between formal and informal institutions seems crucially important and is at the same time unexplored. More research is needed in the role of informal institutions in adaptation to climate change.

3.9 Conclusions

This Chapter has tried to examine the transition in adaptation policy in the Netherlands over the last twenty years in general and with respect to four sectors. The Netherlands has a long history of coping with water problems. This has led to an accumulation of expertise in this area. There is a saying that God made the world and the Dutch made the Netherlands. With engineering marvels such as the 32 kilometre Afsluitdijk that transformed a North Sea inlet into a freshwater lake, the Neeltje Jans and in more recent years the Maeslant Barrier, floating houses along the Meuse, 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, show that the Dutch have a high pedigree when it comes to coping with the vagaries of nature. This to the extent that nature becomes 99% managed and the value of the remaining nature becomes contested. A famous Dutch poem says: ‘And what remains of nature in this land, a forest that has the size of a hand’ (Bloem 1965). Luckily, the paradigm change in the water sector also promises more room for nature.

The above chapter shows that there six major trends in the development of adaptation policy in the Netherlands. On the one hand, this accumulation of expertise creates confidence in the ability of the Netherlands to be able to rise to any challenge; and on the other hand, one can question whether the Dutch have become too over confident. Clearly, climate change is a very complex problem, and the solutions chosen are also complex and pluralistic. The complexity of the entire process raises the hope that society as a whole can be empowered to deal with climate change impacts. However, the fear is that adaptive efforts may be dissipated between different actors and individuals and that the collective action may not amount to more than a sum of the

individual acts. The VROM Council warned of this and called for the establishment of a watchdog to monitor the entire process (VROM Council, 2007).

4 Applying the Adaptive Capacity Wheel to 23 policy documents relevant to climate adaptation

4.1 Introduction

The previous chapter argued that around 93 policy documents are of relevance to understanding the adaptation strategy of the Netherlands in general and in relation to four of the nine sectors in which adaptation is a serious issue. It also provided some information regarding each of these documents and the key incentives and lessons learnt. This chapter goes a step further to (a) select a set of representative policy documents for the Netherlands; (b) to analyze them in further detail and in particular in relation to the Adaptive Capacity Wheel discussed in Chapter 2; and (c) to aggregate the results to see if there are clear lessons to be learnt.

This chapter first discusses, the selection of key policy documents (see 4.2), the adaptation of the Adaptive Capacity Wheel for application to Content Analysis (see 4.3), and then presents a comparative assessment of the information collected with respect to selected key policy documents in each sector (see 4.4 – 4.9), before drawing some conclusions (see 4.10).

4.2 Choice of the most important policy documents

An inventory of policy documents relevant to climate change adaptation revealed 93 documents. In order to make a short list of these documents, the following criteria were applied: (a) Whether the document is seen as influential (e.g. it is often referred to); (b) Whether the document has an overarching character/ or has a national scope; (c) Whether it is the most recent version / near future version; (d) Whether it covers an unlimited time frame; and (e) We limited the documents to 3 to 5 documents per sector.

On the basis of these criteria, the following documents were selected. In the international sector, we selected the United Nations Framework Convention on Climate Change (UNFCCC, United Nations1992) and the Kyoto Protocol (United Nations 1997); and the Convention on Biological Diversity 1992. In the supranational category, we selected the EU Water Framework Directive (European Commission 2000), the EU Directive on Flood Risks (European Commission 2007); the EU Common Agricultural Policy 1962; the EU Natura 2000 and the Birds and Habitats Directives (European Council 2000) and the EU White Paper on Adaptation (European Community 2009). At the national level, two documents were selected - the National Adaptation Strategy: Make Space for Climate (VROM et al. 2007) and the Strategy on National Safety Strategy/ National Risk Assessment (BZK 2007). In the agricultural sector, three policy documents were selected - Agenda for a Living Countryside - Multi-year program 2007-2013 (LNV 2004); the Law on Land Use in Rural Areas (WILG 2007) and two new agrarian insurances. In the nature sector, the choice fell on the National Ecological Network (LNV 1995); the Law for the Protection of Nature and the 1998 Flora and Fauna Law. In the water sector, the National Agreement on Water (2003), the National Water Plan (VenW et al. 2009), the Policy Guideline for Large Rivers (VenW and VROM 2006), the 2009 Water Law and the Water Test (RIZA 2003) were selected. In the spatial planning sector, the short-list consists of the National Spatial Strategy (VROM et al. 2006), the 2008 Spatial Planning Act and Strategic Environmental Assessments. These documents were then made subject to the application of the Adaptive Capacity Wheel.

4.3 Methodological rules for applying the Adaptive Capacity Wheel

Chapter 2 explained the genesis of the Adaptive Capacity Wheel, its dimensions and criteria, as well as the method used for applying the Adaptive Capacity Wheel. In order to apply the Wheel to Policy Documents, the method was further refined.

Assessing adaptive capacity with the Wheel involves normative judgments on whether the researcher thinks a criterion is met or not. We use a scale of five categories to judge each policy document on the different criteria. This scale helps to create a transparent and structured approach to evaluate the different policy documents. The five scores and their explanation are shown in Table 4.1. The scores are also indicated with a relatively simple colour scheme: green is positive and orange or red is negative. The in-between score light yellow indicates that we found no evidence for a positive or a negative score; depending on the instrument it can be defendable that it actually should have 0 as the most optimal score.

Table 4.1 The colour schem of the Adaptive Capacity Wheel.

Green	Lime	light yellow	light orange	Red
Institutional structure enhances adaptive capacity for adaptation	The structure exists, and could be applied but is not (yet fully) applied to adaptation	Neutral score (positive nor negative effect expected)	Gap that needs to be filled to counteract negative effect on adaptive capacity	Institutional structure obstructs adaptive capacity for adaptation
Score 2	Score 1	Score 0	Score -1	Score -2

Our methodology as described in Chapter 2 emphasizes the advantages of not aggregating the information into one number – the criteria are not additive. However, in order to be able to assess how different policy documents score against each other, we have chosen to apply the Adaptive Capacity Wheel in a quantitative manner as well. This analysis should be seen as complementary to the more substantive analysis in Working Document 4 (IC12 Content Analysis Background Document). An advantage of using a numerical scale lies in the good foundation it provides for the aggregated analysis in the final Content Analysis.

In the adaptive capacity wheel, not every criterion can be applied alike. This is caused by a difference in underlying assumptions. Consider, for example, in the dimension 'Learning Capacity' the criterion of trust. The fact that there are no institutional incentives that stimulate trust between parties does not directly obstruct adaptive capacity nor enhance it. The assumption is that when there is nothing in place to enhance trust in institutional arrangements, this does not necessarily mean that parties distrust each other and therefore it would get a neutral score of 0.

Now consider, for example, the criterion of financial resources in the dimension Resources. The fact that the institutional structure does not allocate any financial resources to adaptation does counteract adaptive capacity. Here, the assumption is that no institutional arrangement (or in other words a gap) is a bottleneck to promoting adaptive capacity and it would therefore get a negative score of -1. The category that is even more negative (with a score of -2) is reserved for situations in which the existing institutional structure actually obstructs adaptive capacity. In Table 4.2, our interpretation of scores 0 and -1 are shown.

Table 4.2 Explanation of scores 0 and -.1

Dimensions	Criteria	Explanation
Variety	Variety of problem frames/solutions	Nothing in place = neutral (0)
	Multi-actor, level and sector approach	Nothing in place = neutral (0)
	Room for diversity	Nothing in place = neutral (0)
	Redundancy	Nothing in place = neutral (0)
Learning Capacity	Trust	Nothing in place = neutral (0)
	Double loop learning	Nothing in place = neutral (0)
	Discuss doubts	Nothing in place = neutral (0)
	Single loop learning	Nothing in place = negative (-1)
	Institutional memory	Nothing in place = negative (-1)
Room for autonomous change	Continuous access to information	Nothing in place = negative (-1)
	Act according to plan	Nothing in place = negative (-1)
	Capacity to improvise	Nothing in place = neutral (0)
Leadership	Visionary leadership	Nothing in place = neutral (0)
	Entrepreneurial leadership	Nothing in place = neutral (0)
	Collaborative leadership	Nothing in place = neutral (0)
Resources	Authority	Nothing in place = negative (-1)
	Human resources	Nothing in place = negative (-1)
	Financial resources	Nothing in place = negative (-1)
Fair Governance	Legitimacy	Nothing in place = negative (-1)
	Equity	Nothing in place = neutral (0)
	Responsiveness	Nothing in place = neutral (0)
	Accountability	Nothing in place = negative (-1)

As normative assessments cannot be avoided, in addition to 'scoring' the different elements of a policy document with a number and a colour, we explain why we scored the element in such a way. This makes a qualitative assessment transparent and ensures that potential misinterpretations are avoided in the interpretative phase.

Table 4.3 gives an example of how the system was applied to one of the institutions concerned. The final score for each dimension is calculated here by adding the different scores and dividing by the number of criteria. The total final score is calculated by adding the different scores for each dimension and dividing by 6.

Table 4.3 Allocation of the Adaptive Capacity Wheel to the National Adaptation Strategy

Dimension	Criterion	Score	Explanation
Variety	Variety of problem frames and solutions	0	The document seems mostly oriented towards convincing others of the new problem frame that climate change makes spatial adaptations necessary. Maybe the term 'tailormade solutions' offers some space to negotiate different problem frames.
	Multi-actor, level and sector	2	It tries to involve many actors in planning for the future, especially at other governmental levels but also private companies and citizens.
	Room for diversity	2	There is openness to a diversity of solutions; it is the start of a process and research and development are explicitly planned in a diversity of directions.
	Redundancy	2	The idea is to improve prevention of flooding, and improve reactions if the prevention measures fail. Water safety is the only area in which redundancy is seen as necessary.
	Total	1.5	
Learning Capacity	Trust	1	Trust is mentioned as an important factor; however, there are no measures taken for building trust
	Double loop learning	0	There is no mechanism to reflect on the basic assumptions of this strategy
	Discuss doubts	2	The NAS sees climate change as an unavoidable source of uncertainties and therefore dealing with uncertainties must become part of any adaptation strategy
	Single loop learning	2	The main strategy is to do more research and develop adaptation strategies for all parts of society in an ongoing process of learning.
	Institutional memory	0	The strategy seems project based and is not supported structurally yet. This is in an early stage of institutionalization
	Total	1	
Room for autonomous change	Continuous access to information	0	There is uncertainty in the information available; no plans yet to keep citizens updated.
	Act according to plan	-1	The strategy basically is an agreement among governments to continue their cooperation; it is more visionary than a plan.
	Capacity to improvise	1	Adaptation is seen as an opportunity to innovate, also for the commercial sector
	Total	0	

Dimension	Criterion	Score	Explanation
Leadership	Visionary leadership	2	The adaptation strategy proposes a policy change in many sectors and introduces several concepts for governmental policy: robustness, flexibility and using natural processes
	Entrepreneurial leadership	2	Climate adaptation is presented as an opportunity for innovation and international entrepreneurship in climate adaptation. The NAS proposes Public Private Partnerships (PPP) to implement the NAS.
	Collaborative leadership	2	The strategy is meant to involve other parties, mainly other governments but also citizens and the private sector
	Total	2	
Resources	Authority	2	The document is signed by four ministries, and by the associations of lower governments VNG, Unie van Waterschappen and IPO
	Human resources	0	Nearly everyone involved is working on adaptation as an extra task, project based
	Financial resources	0	No explicit funding yet apart from research budgets
	Total	0.67	
Fair Governance	Legitimacy	2	The document was made in a cooperative process with four ministries and with several other parties involved
	Equity	0	No equity mechanisms or principles included
	Responsiveness	2	Inputs of other parts of society are welcomed
	Accountability	-1	Although there is a clear goal, there is much uncertainty about how to achieve this. No accountability measures
	Total	0.75	
Overall		0.99	

For aggregated scores we also had to decide what count gets what colour. A total score for each criterion of above zero is considered positive and below zero is considered negative (see Table 4.4).

Table 4.4 Explanation of aggregated scores.

Effect of institution on adaptive capacity	Score	Aggregated scores for dimensions and adaptive capacity as a whole
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

4.4 Assessment

The detailed analysis of each of the 23 institutions is provided in Working Document 5. This section only attempts to aggregate the information collected in terms of the Adaptive Capacity Wheel.

At the international level, two institutions have been considered – The Climate Convention and its Kyoto Protocol; and the Convention on Biological Diversity (see Figure 4.1). The application of the Wheel reveals that the Climate Convention instruments focus on cost-effectiveness and do not see redundancy as a critical challenge; furthermore, few rules guarantee accountability for taking adaptation measures. The Climate Convention scores well, especially on Learning. The Convention on Biological Diversity scores rather well on adaptive capacity, especially on the dimensions of Variety (including many actors), Learning and Fair governance. Its weaknesses lie mainly in the implementation of the ideas: the document scores weakly on the criteria Act according to plan, Entrepreneurial leadership and Accountability. It does not provide guidance on how adaptation to climate change can take place.

(1) The Climate Convention/Kyoto Protocol

(2) Convention on Biological Diversity

Figure 4.1 The ACW applied to international instruments – The Climate Convention/ Kyoto Protocol (1) and the Convention on Biological Diversity (2).

At the supranational level, five instruments have been evaluated (see Figure 4.2). The EU Water Framework Directive 2000, the Flood Risk Directive and the European White Paper on Adaptation score rather well, but this is not due to the same strengths in each document. The Water Framework directive is strong on creating Variety and in Leadership, the Flood Risk Directive is strong on Learning, Room for autonomous change and Fair governance. The European Whitepaper scores best on Learning, Leadership and Fair governance. The EU Water Framework Directive 2000 is weak in the area of redundancy, financial resources, in the continuous provision of information and in the area of responsiveness; once targets are set, there is limited room for improvement. The Flood Risk Directive also scores poorly on redundancy, financial and human resources and accountability. Both documents do not say much about learning and especially about discussing doubts, or about stimulating entrepreneurial leadership. The European White Paper on Adaptation does not score well on redundancy but, on the other hand, does quite well in the various dimensions. This is not surprising since the document is directly focused on adaptation and has to take the uncertain nature of the impacts of climate change into account.

In comparison, the Common Agricultural Policy of 1962 does not score well in most areas. However, it does stimulate entrepreneurial leadership, autonomous responses and the capacity to improvise and has considerable authority. Natura 2000 scores poorly in many areas: It has a unitary framework, has specific and static goals; has no provision for discussing doubts, does not encourage improvisation or provide room for visionary or entrepreneurial leadership and scores poorly on responsiveness as it does not have room for modification of the goals and procedures to cope with the impacts of climate change.

(1) Water Framework Directive

(4) Flood Risk Directive

(4) Common Agricultural Policy

(6) Natura 2000/Birds and Habitats Directives

(7) EU White Paper on Adaptation

Figure 4.2 The ACW applied to supranational instruments – Water Framework Directive (3); Flood Risk Directive (4); Common Agricultural Policy (5); Natura 2000/Birds and Habitats (6) and the EU White Paper on Adaptation (7).

At the national level, two major documents were evaluated (see Figure 4.3). The application to the National Adaptation Strategy shows that overall it does reasonably well, and especially so on Variety and Leadership. The document scores poorly on Accountability and Act according to plan. This indicates the policy is in an early stage. It could do better by involving Multiple problem definitions and solutions, trying Double loop learning, creating Institutional memory and Access to information. Human and Financial resources are still lacking and the equity issues are unclear. The National Safety Strategy and National Risk Assessment scores well on Room for autonomous change, and on other dimensions it scores moderately well. Its weaknesses are that it tends to minimize multiple frames and room for diversity; is based on distrust (terrorism), does not provide much room for Double loop learning; surprisingly has low Financial resources and little Accountability. How such a top down safety strategy is to work in practice is not clear.

(8) National Adaptation Strategy

(9) National Safety Strategy and Risk Assessment

Figure 4.3 The ACW applied to national instruments – National Adaptation Strategy (8) and National Safety Strategy and Risk Assessment (9)

In the agricultural sector, three instruments were selected for further study: the Agenda for a Living Countryside, the Law on Land Use in Rural Areas and two new agrarian insurances (see Figure 4.4). The Agenda for a Living Countryside scores well on the left side of the wheel, especially on Resources and Leadership; on Fair governance the main problem seems that it does not say much about how equity issues are to be addressed. On the right side, the picture is more varied. Several criteria of Variety are fulfilled, but the Agenda also focuses on being efficient and does not score well on redundancy. The dimension of Learning shows most weaknesses. Although Single loop learning and Discussion of doubts are integrated into the text; other learning instruments are poorly covered. On Autonomy, the Agenda scores poorly only in terms of not providing information on a continuous basis.

The Law on Land Use in Rural Areas has many resemblances to Agenda for a Living Countryside: its main strengths are on the left side and its main weakness is in Learning. It does quite well in stimulating Leadership and has Resources, but has a tendency to focus on efficiency. There is room for improvement in the area of Double

loop learning, trust and discussing doubts. The law does not provide much access to information on the impacts of climate change on rural areas.

The third type of instrument – new agrarian insurances – is relatively new; its newness is visible in a larger number of weaknesses. As a market based instrument it scores poorly when it comes to providing room for discussing doubts: this would increase the transaction costs too much. It scores quite well on Variety and Fair governance. Its main problem seems, however, that the Resources are still limited.

(10) Agenda for a Living Countryside

(11) Law on Land Use in Rural Areas

(12) New agrigarian insurances

Figure 4.4 The ACW applied to agricultural instruments – the Agenda for a Living Countryside (10); the Law on Land Use in Rural Areas (11) and the new agrarian insurances (12).

In the nature sector, the focus is on the National Ecological Network (NEN), the Law on the Protection of Nature, and the Flora and Fauna Law (see Figure 4.5). When we compare the three wheels for this sector to the wheels for the agriculture sector, we can see that there are many reasons for concern about the adaptive capacity in the nature sector. The National Ecological Network has moderately good scores on four of the dimensions, with optimal scores only on the criteria Legitimacy and Accountability (meaning that it is based on EU legislation and well monitored). The policy documents related to the NEN policy score especially poorly on Variety and Learning capacity. Responsiveness is limited; this is probably attributable to the fact that only nature experts discuss nature policy and there is little input from other sectors. Another important weakness is the lack of Financial resources.

The Nature Protection Law scores worst amongst these three instruments. Contrary to the former wheel, it scores moderately well on learning; mainly because the law is in its implementation phase which leads to a faster process of learning. Its biggest problems lie in the area of Leadership. The regime tries to use its formal legitimacy to promote implementation; there is no attempt at trying to win people over by showing a long term perspective or good examples of implementation. In the dimension Variety it scores poorly on problem definitions and redundancy; and it is relatively unresponsive.

The Flora and Fauna Law also scores generally poorly on four out of the six dimensions: Variety, Learning, Room for autonomous change and Leadership. The picture and also the reasons are comparable to the previous two.

(13) National Ecological Network

(14) Nature Protection Law

(15) Flora and Fauna Law

Figure 4.5 The ACW applied to nature instruments – the National Ecological Network (13), the Nature Protection Law (14), the Flora and Fauna Law (15).

In the water sector, five documents were analyzed: the National Agreement on Water; the National Water Plan, the Policy Guidelines on Major Rivers, the Water Act and the Water Test (see Figure 4.6). In general, these five instruments score well.

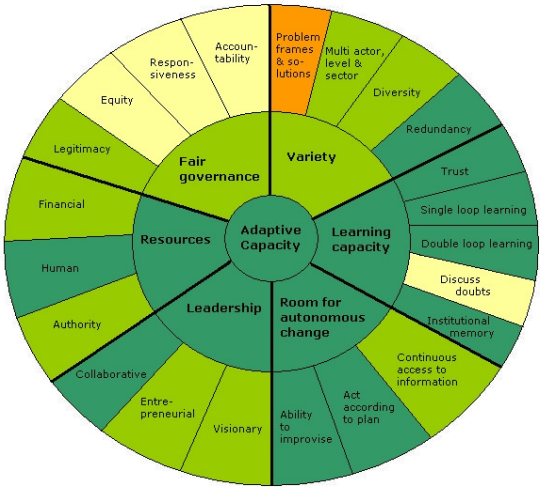
The National Agreement on Water scores well on most issues although it uses a limited number of problem definitions and solutions; and there may be room for improvement in relation to Fair governance issues. The reason for the 'neutral' scores in this area is a lack of communication to other actors than governments; however, an agreement which aligns all Dutch Ministries governments can already be considered a major achievement.

The National Water Plan scores generally well on most issues; it only has a problem with double loop learning because its stays within the dominant paradigm of defending the Dutch population against flooding through hard infrastructure. Other paradigms are recognized, but remain on a paper or are in an experimental phase. It does not do well on promoting entrepreneurial leadership but perhaps that is because of the newness of this document.

The Policy Guideline on Major Rivers scores moderately well on all dimensions. It was meant to create more space for implementation of new ways of water management along the rivers; however, it does so in a rather restrictive way and this explains the surprisingly weak scores on Room for autonomous change. On learning it scores well as it uses experiments. Another main weakness is a limited budget. This document does not say much on equity issues.

The Water Act scores well in general and is well resourced; it relies on strong planning cycles, goals and accountability and does not leave much Room for autonomous change. It doesn't have many provisions on equity issues either.

The Water Test is less developed, has limited Human and Financial resources; scores poorly on Act according to plan (as the outcomes are not legally binding) and Institutional memory (as the process is fragmented). This instrument is relatively new and could use a firmer basis in resources, because it is a promising link between water policy and spatial planning.



(16) National Agreement on Water

(17) National Water Plan

(18) Policy Guidelines on Major Rivers

(19) Water Act

(20) Water Test

Figure 4.6 The ACW applied to water instruments – the National Agreement on Water (16); the National Water Plan (17); the Policy Guidelines on Major Rivers (18); the Water Act (19) and the Water Test (20).

The key spatial planning instruments include the National Spatial Strategy, the Spatial Planning Act and Strategic Environmental Assessment (see Figure 4.7). In general, these instruments have well to moderately well scores.

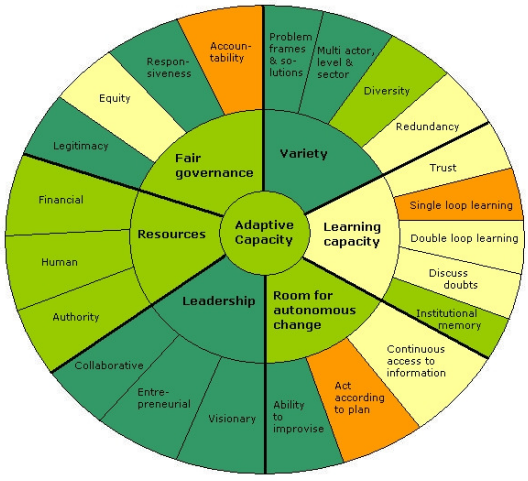
The National Spatial Strategy scores well except on Resources and on the criteria of Accountability and Act according to plan (it is too open ended). It scores well on all criteria of Leadership and Variety; i7 does well on Learning.

The Spatial Planning Act in contrast has enough Resources but scores low on Learning. It is a process law, describing how the national, provincial and municipal levels should make spatial plans that relate to each other. This openness is both a strength because it creates Room for autonomous change, and a weakness because Accountability is

low. The law doesn't have a basic Learning mechanism (no structural evaluation, monitoring or research).

The Strategic Environmental Assessment regulation shows more weaknesses because it is a lighter instrument (in that way it is comparable to the Water test). It has low funding (project developers have to pay for the assessments), does not really facilitate information supply on climate impacts; is rather bureaucratic and there is little room for improvisation.

(21) National Spatial Strategy



(22) Spatial Planning Act

(23 Strategic Environmental Assessment

Figure 4.7 The ACW applied to spatial planning instruments – National Spatial Strategy (21), the Spatial Planning Act (22) and the Strategic Environmental Assessment (23).

4.5 Comparative analysis

This section compares the different instruments at two levels. First, it compares the documents on the basis of their aggregated scores. Second, it compares the documents on the basis of their Adaptive Capacity Wheels.

4.5.1 Aggregated comparisons

Table 4.5 compares the aggregated scores for each instrument and provides a birds' eye view of all the instruments. This aggregation is subject to the following limitations: (a) the criteria are not, in fact, additive; but have to some extent been treated as such for this analysis; (b) the negative and positive scores tend to neutralize each other and one may lead to a biased picture at the end; and (c) some dimensions have more than three criteria and this may lead to a bias towards some dimensions over others when aggregation is undertaken.

Despite these limits, a number of conclusions can be drawn. First, the international and supranational level instruments tend to score quite well as instruments that stimulate the adaptive capacity of humans 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 develop and improve the Water Test. The Agriculture and Spatial Planning Sectors also score well. However, there is considerable room for improvement. Third, the Nature sector tends to do poorly under our Adaptive Capacity Wheel – the EU directives as well as the national policies appear to have a lower ability to promote the adaptive capacity of society. Fourth, the reason that some sectors score better than others – is that the instruments in those sectors tend to have a more enabling character – they open up space for adaptation to climate change; while those that are more rigid and do not take climate change adaptation into account tend to fare poorly. The institutions in the nature

sector focus more on a) in-situ conservation as the main goal, but this does not take into account the changing climatic zones; and b) the decision-making procedures in this sector are not open to stakeholders other than ecological experts.

Table 4.5 A comparative assessment of the various instruments.

Climate /general	UNFCCC, 1992; Kyoto Protocol 1997	1.02
	EU Whitepaper on adaptation	1.12
	National Adaptation Strategy: make space for climate!	0.99
	Strategy National Safety and National Risk Assessment	0.62
Nature	Convention on Biological Diversity	0.91
	Natura 2000 and the Birds and Habitats Directives	-0.49
	National Ecological Network	0.08
	Law for the Protection of Nature	-0.16
	Flora and Fauna Law	-0.33
Water	EU Framework Directive on Water	1.04
	EU Directive on Flood Risks	1.00
	National Agreement on Water	1.16
	National Water Plan 2008	1.23
	Policy Guideline Large Rivers	0.86
	Water Act	1.03
	Water Test	0.49
Agriculture	Common Agriculture Policy (CAP)	0.38
	Agenda for a Living Countryside - Multi-year programme 2007-2013	1.04
	Law on Land Use in Rural Areas	0.98
	New agrarian insurances	0.56
Spatial planning	National Spatial Strategy	0.89
	Spatial Planning Act	0.89
	Strategic Environmental Assessment	0.53

4.5.2 Comparisons with respect to dimensions

The table above provides an abstract and limited perspective of the information provided. The individual Adaptive Capacity Wheels for the 23 instruments yields a wealth of information which can be summed up as follows.

Variety

The water instruments in general score well (the National Water Plan, The Water Act); although there is considerable room for improvement in the Water Test. The EU Nature Directives (Natura 2000, Birds and Habitat Directive) and the Dutch national nature policy and law documents (the National Ecological Network, the Nature Protection Law, the Flora and Fauna Law) score poorly on Variety in general. Most instruments have used multiple problem definitions. Exceptions are the Common Agriculture Policy; the

National Adaptation Strategy and the National Safety Strategy; the National Agreement on Water and the Policy Guidelines on Major Rivers. Most instruments tend not to score very well on redundancy (e.g. UN Framework Convention on Climate Change; Water Framework Directive; Flood Risk Directive; EU White Paper on Adaptation; the Agenda on a Living Countryside; The Law on Land Use in Rural Areas and Agricultural Insurances).

In general, this tells us that while the water instruments are moving towards a greater engagement of social actors in addressing the many uncertain aspects of the climate change; the EU agricultural policy focuses more on free trade approaches and the National Safety Strategies focus more on risk minimization. However, almost all instruments focus on efficiency and minimizing redundancy, except the National water Plan and the Water Act.

Learning

In general most international (UN Framework Convention on Climate Change; Convention on Biological Diversity), European and national instruments do well on the various criteria of learning. Double loop learning, however, is something that is probably difficult to realize in all institutions, even in the water sector (e.g. National Water Plan). The EU Nature Directives (Nature 2000; Birds and Habitat Directives) and the national nature policies (the National Ecological Network, the Flora and Fauna Law) do not score well here while the Spatial Planning Act does not arrange for any monitoring or evaluation. The lack of learning institutions built into these policy documents of the nature and spatial planning sectors is a serious weakness. The National Safety Strategy is built on the idea of distrust so trust scores poorly in this instrument; this is probably logical in such a strategy and may not necessarily be seen as a weakness.

Room for autonomous change

In relation to the room for autonomous change, there are three distinct dimensions – Access to information, the need to Act according to plan, and the Room provided to society to adapt autonomously. Access to information is not well arranged in the Water Framework Directive, the Common Agricultural Policy, Natura 2000/Birds and Habitat Directive, Strategic Environmental Assessment, the Agenda for a Living Countryside; the Law on Land Use in Rural Areas and the New Agrarian Insurances.

Several instruments score well in relation to Act according to plan (Water Framework Directive; Flood Risk Directive; EU White Paper on Adaptation, National Safety Strategy, The Agenda for a Living Countryside; the Law on Land Use in Rural Areas; National Ecological Network, the Nature Protection Law, the Flora and Fauna Law; strategic Environmental Assessment, National Spatial Strategy, Spatial Planning Act), while others don't (Convention on Biological Diversity; National Adaptation Strategy). Other instruments provide room for society to adapt (UN Framework Convention on Climate Change; Convention on Biological Diversity; National Spatial Strategy; Spatial Planning Act); but the nature plans are very restrictive.

The water instruments generally score well on this dimension (the National Agreement on Water; the National Water Plan), although there is room for improvement (the Water Test).

Leadership

The dimension of leadership scores well in many instruments (UN Framework Convention on Climate Change; Convention on Biological Diversity; EU White Paper on Adaptation, National Adaptation Strategy, Agenda for a Living Countryside, the Law on Land Use in Rural Areas; the Water sector; Spatial Planning Act) but less so in others (Natura 2000; Birds and Habitat Directive, Nature Protection Law, Flora and Fauna Law). Some don't score well in entrepreneurial leadership (Convention on Biological Diversity; Water Framework Directive; Flood Risk Directive, Nature Protection Law, the Strategic Environmental Assessments, National Water Plan), but this may also be because these instruments are not very compatible with market instruments. The National Safety Strategy and Risk Assessment do not score well on Visionary leadership.

Resources

Some instruments raise resources for problem solving; and some call on social actors to raise their own resources. Some instruments have the resources (Agenda for a Living Countryside; the National Agreement on Water, the National Water Plan, the Water Act); some don't (Flood Risk Directive; Agrarian Insurances; Water Test and the National Spatial Strategy).

Fair governance

Most instruments score well here; those not doing well are Natura 2000; Bird and Habitat Directive, the Nature Protection Law, the Flora and Fauna Law. In general the challenging features here are accountability (e.g. UN Framework Convention on Climate Change, Convention on Biological Diversity, Flood Risk Directive, Common Agricultural Policy, National Adaptation Strategy and National Safety Strategy and Risk Assessment, Nature Protection Law, Flora and Fauna Law, National Agreement on Water, National spatial Strategy and the Spatial Planning Act). Most instruments do not say much on equity issues. Some instruments score poorly on responsiveness (the Birds and Habitat Directive, the Nature Protection Law, the Flora and Fauna Law).

4.6 Conclusions

This chapter has applied the Adaptive Capacity Wheel to 23 instruments and leads to the following conclusions. First, the formal Dutch institutions generate a fair level of adaptive capacity to climate change. In two sectors, water and climate, this is enhanced because these sectors take climate change explicitly into account, which nearly always has a positive effect on the dimension of Learning. In the sectors of agriculture and spatial planning the relatively high scores came somewhat as a surprise. The inventory of 93 policy documents had shown that these policy sectors hardly address climate change in an explicit way, but still they provide a good or at least moderately high level of adaptive capacity. How can we explain this? We think it is partly due to the fact that these policy sectors have a long history and, therefore, policy elements that need time to develop such as Resources and Fairness, are in place. Especially for agriculture it is clear that the left side of the wheel scores well. More importantly, both sectors score relatively well on the right side too: somehow their instruments create Variety, Learning, and Room for autonomous change. Their institutions enable people to act, more than restricting them. This is exactly the opposite in the nature sector. The Wheel indicates several problems for nature institutions in the areas of Variety, Learning and Leadership. The sector lacks broad involvement in the debate on policy goals and the institutions seem to prevent

experimentation and tailor-made solutions. The only criterion with a good score is Legitimacy: top down implementation of EU rules is legally fine. Even so, there is a serious lack of adaptive capacity in this sector.

Second, in terms of dimensions, there is no specific dimension in which all instruments score poorly. This means that sectors can potentially learn a lot from each other's instruments. For example, institutions within the adaptation policy domain allow actors to autonomously adapt and improvise, while institutions in the nature sector obstruct autonomous change, hindering adaptive capacity.

Third, the criteria point to a number of key issues:

a. The focus on efficiency may imply climate risks in the long-term. This means that in terms of criteria, many of the instruments score poorly in relation to redundancy. Efficiency may not be the best way to address an uncertain challenge such as climate change. The National Adaptation Strategy and instruments in the water sector – The National Agreement on Water, the National Water Plan and the Policy Guideline on Major Rivers do promote redundant measures.
b. Although climate change is likely to have major equity issues for different people and sectors in the country, this is an issue that has not been taken explicitly into account. The national documents tend to ignore equity except to some extent the National Safety Strategy, the Law on Land Use in Rural Areas, the Water Test, and the National Spatial Strategy. We think because the Dutch culture is rather equitable no one feels the need to make this challenge more explicit.
c. Problems often arise in the area of resources. Long-term resources may be in short supply.

5 Applying the Adaptive Capacity Wheel in four case studies

5.1 Introduction

While the previous chapters examined individual policy documents and compared them, this chapter undertakes four case studies of adaptive capacity. The aim of these case studies is to test the applicability of the Adaptive Capacity Wheel in empirical research on the one hand and, on the other hand, to assess the institutions analyzed in the case studies on adaptive capacity. We have chosen four case studies, the reasons for which are explored further in section 5.2. Our case studies focus on different levels of governance – the individual, local, regional and national level. They focus on the important issues of individual responsibility, water safety, climate-proof spatial planning, and the protection of ecosystems.

Following an explanation of the choice of the case studies (see 5.2), we briefly explain the different case studies (see 5.3) and then move on to a comparative assessment (see 5.4) before drawing conclusions (see 5.5).

5.2 Case study selection

5.2.1 Criteria for case studies

As we cannot analyze the adaptive capacity of every single Dutch institution in-depth, we have identified four case studies for more detailed research as part of the empirical analysis in this project. In order to identify suitable case studies to attain both objectives, we formulated several criteria that the selected case studies should meet:

1. The case study should reflect a combination of innovative adaptations to climate change (new approaches not tried in the past) and non-innovative solutions (extension or relabeling of existing approaches as adaptation options);
2. The events to be studied should be in different stages of execution (time variable);
3. The case studies should take place at different levels of the spatial scale;
4. Some case studies should be linked with existing projects financed by BSIK and some should be independent of such projects;
5. The case studies should be potentially useful for an institutional analysis of the polity, policy and politics;[16]
6. The case studies should allow for spread between the sectors - agriculture, nature, water and urban and each case study deals with more than one sector;
7. The problem should be important for the Netherlands and the Dutch stakeholders; and
8. The case study should have a potential for testing the tension between governance and government.

Following these criteria, we made an inventory of different possible interesting case study topics,[17] within the different sectors and with varying geographical levels. This

16 Polity = political structures; policy = political content; politics = political processes.

inventory was presented to the members of our Advisory Committee who commented on our first selection and submitted new ideas for case studies.

5.2.2 Case study design

To select cases for research, we have considered various approaches. On the one hand, cases can be selected using independent variables like geographical scale and the sector involved; cases are then identified based on empirical variety. On the other hand, cases can be selected using dependent variables – in our case the dimensions of the ACW; cases are then identified based on methodological variety to explore one dimension in great detail. Those options are depicted in Table 5.1.

Table 5.1 Different case study approaches.

Qualities AC / Scale variable	All cases: integrated analysis of the AC qualities (methodological uniformity)	Each case: in-depth analysis of 1 AC quality (methodological variation)
All cases: focus on regional / local scale (empirical uniformity)	Case study approach I	Case study approach II
Each case: focus on a different scale (empirical variation)	Case study approach III	Case study approach IV

As this project does not intend to make an in-depth theoretical analysis of the different dimensions of adaptive capacity, but instead aims to provide an overview of the adaptive capacity of Dutch institutional structure and to deliver practical recommendations on where to improve the adaptive capacity, we have chosen to use the same methodology in every case and to differ in time and scale. Therefore, we used Case Study Approach III (see Figure 5.1) in our research.

5.2.3 Selected case studies

Based on the choices made in the previous two sections, we made a selection of four case studies. This selection is presented in Table 5.2. The selection has the consequence that agriculture does not have its 'own' case study; the reason for this is that we did not find agricultural cases with a strong enough link to climate change adaptation.

17 This inventory includes: Distribution of public and private responsibilities; Practices of selecting sites for urban expansion; Practices of accommodating higher river discharges; Practices of blue services; Re-defining public and private responsibilities in flood management; The new legal regime for spatial planning; Implementation of plans for a 'Climate Landscape'; To build or not to build in riverbeds; The Hot Spots project Zuidplaspolder, Saline agriculture.

Table 5.2 Case study selection.

	Individual Responsibility	Wadden Sea	Building in low lying areas	Water Safety
Different spatial scales	Local	National	Regional and local level	National
Spread between the sectors	Water, urban, agriculture, spatial planning	Nature, water, spatial planning	Water, spatial planning	Water, nature, agriculture, spatial planning
Innovative (new approaches not tried in the past)	Innovative	Partly innovative	Innovative	Partly innovative
Related to the CCSP[18] programme	Non-CCSP	CCSP	Zuidplaspolder is hotspot project in CCSP	Non-CCSP
Important for stakeholders	Yes	Yes	Yes	Yes
Potential for testing the stress between governance and government.	Yes	Yes	Yes	Yes

5.3 Summary of the four case studies

This section sums up the results of every case study. Each case study section first describes the key problem and focus, then explains the methodological steps that were followed, and finally summarizes the conclusions of the case studies at three levels; first on a substantive level, subsequently on the level of the dimensions of adaptive capacity, and after that it draws conclusions on the use of the adaptive capacity wheel.

Case study 1 elaborates on the distribution of public and private responsibilities for ground water management at the local level; case study 2 focuses on the Dutch water sector and assesses the adaptive capacity of Dutch water safety institutions more in particular; case study 3 focuses on climate-proof spatial planning for flood prone areas; and case study 4 assesses Dutch institutions within the nature sector and analyses their capacity to adapt the Wadden Sea region to climate change.

In the four case studies the research sub teams were given relative freedom in their methods (a mixed methods design). This allowed for more variety, a tailor-made approach for each case study, and an opportunity to learn from each other's methods. It increased our experience with applying the adaptive capacity wheel. In the conclusions we will reflect on the results of this methodological experiment.

18 National Research Programme Climate Changes Spatial Planning.

5.3.1 Case study 1: Individual responsibility in Dutch local water management[19]

Problem

Climate change will probably have major impacts on the hydrological cycle. The impacts of climate change require societies to adapt to these new circumstances. Amongst others, it will lead societies to decide how to allocate responsibilities on, inter alia, water management between different social actors. Several studies indicate that sharing responsibilities for local water management will become problematic under the influence of climate change (e.g. Huber 2004, Naess et al. 2005, Koch et al. 2007). Increasingly, national and regional governments all over the world are incorporating a shift in responsibilities from the state to the individual – encapsulated in the notion of 'individual responsibility' – as a key element in their adaptation strategies (NWP, VenW et al. 2009; DEFRA 2008; The Danish Government 2008; Ethiopian Ministry of Environment and Forest 2005).

This strategy has also been adopted in the Netherlands. There are two reasons for this shift in responsibility. First, it should lead to greater efficiency if part of the government's task is taken up by private companies. Private companies are assumed to compete and, therefore, they should 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. For example, if people cover their garden with stone or plastic foil, infiltration of rainwater into the soil is blocked, and if individual effects add up sufficiently it can lead to more frequent flooding.

Focus

This case study 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.

Method

In this case study, we systematically implemented the research protocol. Data was collected through in-depth interviews with nineteen stakeholders involved in the region's local water management. As background information, different policy documents on local water management in all three regions were studied. Interviews were typed out and stored in a separate background document.

In the data analysis process, the arguments of the stakeholders were used to score the different criteria of adaptive capacity. We clarified the underlying arguments based on the opinions of interviewees. Figure 5.1 shows the adaptive capacity wheels for every region.

19 For details on this case study see Bergsma et al. (2009).

ACW for Zaandam ACW for Delft ACW for De Wijde Wormer

Figure 5.1 Adaptive Capacity Wheels for Zaandam, Delft and Wijde Wormer.

Key conclusions on adaptive capacity

Variety: Variety has different facets. On the one hand, variety calls for engaging different actors in the policy process. The collaborative approach adopted in Wijde Wormer has achieved this; however, in Zaandam respondents experience a top-down approach from the municipality. Notable is that in the cities, individuals are satisfied with the variety in solutions to water problems for which they are responsible. On the other hand, variety calls for multiple problem frames and solutions. Institutions in Wijde Wormer do not perform well on this aspect, since the focus is on the problem of water retention and the solution of land consolidations; the approach stimulates the search for optimal, time and place specific solutions. This implies also that redundancy is especially not the aim.

Learning capacity: The collaborative approach in Wijde Wormer, in which people are looking for positive solutions, enhances trust and information sharing and increases the capacity for learning. Crucial for such an approach, however, is to make sure that the knowledge that is produced within a group is institutionalized so that others can repeat the successes. Enhancing learning in cities is more difficult, because water management is not an integral part of residents' lives and different actors are highly dependent of each other for living up to their responsibilities.

Room for autonomous change: Information on local water aspects, especially groundwater, is not easily available to individuals in cities. The unclear division of responsibilities with regard to groundwater furthermore reduces the Room for autonomous change of local actors. City residents do not feel they have much room to come up with innovative solutions themselves. Most also feel that this is unnecessary, as the expertise of others is sufficient to perform their tasks adequately. In Wijde Wormer, despite the fact that there is no outlined plan for action, individuals feel that they can act autonomously.

Leadership: Collaborative leadership in Wijde Wormer is very strong. The open approach allows for the rise of visionary ideas. However, actors experience difficulties with leadership in the restructuring process of the polder, in the sense that it seems to be difficult to actually get things done. In the cities of Zaandam and Delft, people expect the municipalities to take the lead in local water management, especially in the areas of information supply and accountability rules. This leads to a negative score on leadership.

Resources: Human resources score high across all cases; the Netherlands has expertise in water management. Authority is lacking in Wijde Wormer; as a result of the collaborative approach, no one takes the lead. This also limits the capacity of institutions to generate sufficient funding.

Fair governance: Overall, the division of responsibilities for local water management is considered to be fair in all case study regions. A lack of accountability mechanisms especially with regard to groundwater is indicated. However, the question 'who will pay?' will remain a difficult one, especially with more parties collaborating.

Key conclusions at the substantive level

Three kinds of conclusions can be drawn. At a substantive level, we identified four challenges for adaptive capacity.

- Responsibilities for local water management are not clearly defined and demarcated in the three regions while structural water nuisance, as expected as a result of climate change, does call for a clear division, especially in cities; this leaves individuals unlikely to be able to act on their responsibility, which decreases the adaptive capacity of society.
- All case studies show the importance of information on local groundwater aspects; the case studies also show that this information is available but not comprehensible and accessible to individuals. The information would help individuals to carry out the tasks accompanying their responsibility and provide a basis for assigning accountability for groundwater problems. The 'clearinghouse function' introduced in the Municipal Water Tasks Act, which obliges municipalities to serve as an 'information bureau' for its residents, helps in this respect.
- There is an overlap between the individual responsibility for resolving water nuisance on a property and the municipal responsibility for maintaining the quality of the environment. After an incident of water nuisance, the municipality often steps in to solve the problem. This gives the residents the impression that it is the municipality's responsibility and they are covering up for past lapses. Furthermore, it reinforces their belief that the government should be held responsible for addressing these issues. This contradicts the recent trend set by the Dutch government to emphasize individual responsibilities in local water management.
- The fourth challenge is that the shift to individual responsibility has different implications for adaptive capacity in different contexts. In agricultural areas, where the population density is low and those who live or work there are used to taking the water system into account, a horizontal and collaborative approach could increase the adaptive capacity; however, drawbacks could be a lack of steering, insufficient resources and the risk of stagnation. On the other hand, increasing the adaptive capacity in the complex structure of cities may call for centralized management of information, responsibilities and accountability; this approach might hamper variety, learning capacity and autonomous adaptation. Leadership can play a critical role in tackling these contextual challenges.

Key conclusions on the method

In this case study, we have used the Adaptive Capacity Wheel to structure the interviews with stakeholders. A large part of the interview questions directly addressed the six dimensions of the adaptive capacity wheel. In the first three interviews, we explained the Adaptive Capacity Wheel to the interviewees. This, however, proved to be time consuming and confusing to respondents. Moreover, they often saw overlap in their answers on the questions related to different dimensions – especially between

variety, learning capacity and leadership. After the first three interviews, we decided to not explain the Adaptive Capacity Wheel but still ask the questions related to the dimensions so we could assess the applicability of the Adaptive Capacity Wheel in local case study research.

These conclusions show that it is difficult to clearly explain all dimensions and criteria to stakeholders on an abstract level. Many concepts are well-known to academics, but need clarification in practice. Moreover, while the dimensions are distinct on paper, in practice many dimensions relate to each other. Therefore, asking respondents to comment on every dimension in their view is a repetition of what has already been said.

The Adaptive Capacity Wheel was a very useful tool for analyzing the adaptive capacity of local institutions. The different dimensions are able to capture the relevant information on adaptive capacity at the local level and structure this in such a way that general conclusions can be drawn. The Adaptive Capacity Wheel has also proved to be an attractive model to present the conclusions of the case study. The use of five main colours to communicate the strengths and weaknesses of each dimension is a useful way to summarize the results of the research; this does not lose out on the richness of the results. For example, in the case of Wijde Wormer, the dimension of leadership has been given a positive score: collaborative leadership is very strong, but this is counteracted by a lack of entrepreneurial leadership. This provides practical information to people (e.g. policy makers, civil actors etc.) who want to increase adaptive capacity.

5.3.2 Case study 2: Adaptive Capacity of Nature Institutions for the Wadden Sea[20]

Problem

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?

Focus

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.

20 For details on this case study see Klostermann, J. and E. Bergsma (2010).

Method

Eleven stakeholders representing different nature, leisure and governmental organizations were interviewed in this case study (data collection). The research compares the ACW with other methods to assess the adaptive capacity of institutions to identify the strengths and weaknesses of the Adaptive Capacity Wheel as a methodological tool. In the first set of questions, the respondents were asked directly for their opinion on the adaptive capacity of the nature institutions for the Wadden Sea as well as on how this can be improved. In the second set of questions, the respondents were asked to assess each dimension of the ACW. Both methods are compared in the conclusion.

The interviews were analyzed using Atlas-ti software; answers of respondents were coded and sorted by code (i.e. dimension), to facilitate comparison. This data is recorded in different tables, one table for each question.

In the data analysis process, the data sorts were interpreted for their meaning in terms of adaptive capacity by the researchers. In case of the questions related to the adaptive capacity wheel, substantiated scores and colours were assigned to each criterion; and aggregated scores and colours to each dimension of adaptive capacity (see Figure 5.5).

The application of the Adaptive Capacity Wheel to the case study is presented in Figure 5.2.

Figure 5.2 Adaptive Capacity Wheel applied in the Wadden Sea case.

Key conclusions on adaptive capacity

Variety: The Wadden Sea institutions embed a great deal of variety with respect to different kinds of businesses, policy visions, organizations and governmental and non-governmental actors in the governance process. Moreover, the Wadden Sea region offers room for innovative governance experiments like the Mussels Covenant and the Wadden Sea Fund. Some respondents do not experience the variety as positive; however, they think large differences in opinion hinder effective governance progress. There is not much variety with respect to different practical options for adaptation in the region: as of now the focus is on sand supplementations. Thus, there is variation in opinions, not in solutions. This could indicate that variety only 'works' when there is a lot of local autonomy and everyone can use his or her 'own' solutions.

Learning capacity: The Wadden Sea institutions score high on the dimension of learning. They provide for learning in four different ways:

- Introduction of new legislation;
- Social dialogue: conflicts are decreasingly managed through legal processes and increasingly through social dialogue with different actors on regional level;
- Knowledge development and development of new technologies, monitoring, providing budgets for sustainable development and climate change adaptation. The 'Wadden Academy' (Waddenacademie) collects and collates knowledge products on the Wadden Sea. Knowledge producers have for a long time not looked beyond the borders of their discipline; only recently, questions related to the whole system of the Wadden Sea are being posed.
- Education and awareness of civilians, youth, tourists, leisure and nature organizations.

Overall, respondents think the institutions for the Wadden Sea embed a high learning capacity. Problems and structures are complex so the learning process is difficult; however, not much more can be done to increase learning.

Room for autonomous change: Traditionally, Dutch society is egalitarian and hence, Dutch society is characterized by a high degree of independence for its citizens. On the one hand, the people living close to the Wadden Sea have their own specific culture; they are familiar with occasional extreme weather patterns in the region. On the other hand, the nation-wide trend to fully trust the national government to provide protection measures against such patterns is also visible in the Wadden Sea region.

The institutional Room for autonomous change is limited with respect to the Wadden Sea because many rules originate from national and European policies. However, regional and local organizations (water authorities, emergency organizations, water leisure associations, ferry services and governmental bodies) have all implemented their own measures to cope with rising waters. Moreover, some respondents think that the fragmented policy interference in the area together with little authority and control do create room for autonomous actions.

Leadership: The main conclusion on this dimension is that there is no central form of steering for the Wadden Sea region. There are 31 different governmental bodies involved in the governing of the Wadden Sea region; the Regional Committee Wadden Area (Regionaal College voor de Wadden) was installed to manage this diverse government process in a united process; however, this body has little formal authority compared with the 31 governments it is working for.

Respondents hold different opinions on the lack of leadership qualities in the Wadden Sea region. Most perceive the lack as a problem, causing chaos and a lack of authority. This is especially a problem under changing climatic conditions where leadership may serve to guide a long term transition. Others see the benefits of a lack of leadership. They argue that individuals are provided with more room to enter into innovative coalitions.

Collaboration is deemed to be necessary to solve future problems in the region; and there is a lot of collaboration in the Wadden Sea region. Conflicts are often drivers for collaboration, for example, in the case of a verdict from the Council of State that caused actors to look for cooperation instead of confrontation, which resulted in the Mussels Covenant. According to this covenant, the fishermen, nature organizations and the Ministry of Agriculture, Nature and Food Security will look for sustainable options for mussel seed fishing in the Wadden Sea. Collaboration takes place in several other ad-hoc regimes, there is no central or organized form of collaboration covering nature management in the whole region.

Resources: Financial resources are perceived to be lacking, especially where it concerns management of the wet nature parts for which no funding is available. Moreover, there is no structural financial resource for obligations following from national and European policies, like the development of a management plan that is obligatory under the Nature Protection Act and Natura 2000. The most important financial resource at this point is the Wadden Fund, which is used only on a very limited basis for adaptation. The Delta Fund and the Law on Land Use in rural Areas are other budgets potentially available for adaptation in the Wadden Sea region.

Human resources are also limited; few people have been appointed for nature management or for enforcement of regulations, so control is weak and fragmented. As explained before, there is a lack of authority.

Fair governance: Overall, Dutch institutions are considered to be fair; corruption and violence are limited and there is room for open and honest discussions. Different governmental bodies increasingly cooperate with each other, and increasingly involve stakeholders from society into the governance process.

A perceived shortcoming in the Wadden Sea region is an overrepresentation of economic concerns over nature concerns. Another identified shortcoming is the strict management of nature organizations; they tend to close off a nature area completely and ban all recreational activities, even though they often initially promise some room for leisure activities.

Key conclusions at the substantive level

First, conclusions can be drawn on a substantial level. Four problems with increasing the adaptive capacity in the Wadden Sea region can be identified.

- Policy in the Wadden Sea region aims at implementing recent national and international regulations, like the Nature Protection Law and Natura 2000. The main policy question posed in the region is therefore not how robust policies are over a timeframe of one hundred years, but rather how can policymakers cope with recent developments in the coming five years. The local communities and policymakers have not formulated an ideal future scenario for the Wadden Sea; there is only a worst-case scenario of the 'drowned Wadden Sea'. As a result, adaptation goals have not been made clear and, hence, institutions are not fitted with attributes to guide a desirable adaptation process.
- A second problem is whether nature can be fully safeguarded from the impacts of climate change, not just in the Wadden Sea region, but also in other Dutch and international nature reserves. As of 2010, the policy instruments applied in this region have had no more effect than slowing down the process of degradation. It is not clear whether this is caused by dominant economic stakes or by failing instruments in the nature sector (i.e. there are mostly rules that prohibit ecosystem damaging behaviour and no rules promoting ecosystem strengthening behaviour).
- Third, governmental interference in the Wadden Sea region is fragmented and complex. Many different governmental bodies at several levels of governance are involved in governing the Wadden Sea region. At the global level, the area is designated as a cultural heritage by UNESCO. At the European Union level, regulations like Natura 2000 and the Water Framework Directive have implications for the management of the region. At the national level, five Dutch ministries have a stake in the region (Ministry of Spatial Planning, Housing and the Environment; Ministry of Agriculture, Nature and Food Security; Ministry of Transport, Public Works and Water Management; Ministry of Economic Affairs; and Ministry of Defence). At the regional level, the provinces of Noord-Holland, Friesland and

Groningen are developing policies with regards to leisure and coastal management. At the municipal level, agricultural, harbour and other business concerns play a role, as well as tourism and depopulation of rural municipalities along the coast. At the level of households, farmers, fishermen, and other businesses, there is a strong connection with (and love for) the nature in the area, while at the same time it is their most important source of income. This governance structure allows for shifting responsibilities for transitions from one governance actor or level to the other. While most stakeholders agree that policies should allow for more natural dynamics and should favour nature over economic concerns, no one seems prepared to take action and everyone shifts responsibilities to do so to other parties.

- Last, developing institutions for a dynamic system is difficult. Institutions traditionally aim to create stability in chaos. This leads to questions such as: What kind of institutions are necessary to create a dynamic landscape? Should nature areas be transferred from private ownership to public or shared ownership? Should the system of ownership be 'scaled-up' to the regional level, so that the owner can take the systemic characteristics of the region into account? Should ownership be given to those who are interested in natural dynamics (nature organizations)? Or can and should we expect private owners to take nature concerns into account and to assure fair and decisive management?

Key conclusions on the method

The results of direct questioning and the application of the Adaptive Capacity Wheel are broadly similar. However, the results as they emerge from the application of the Adaptive Capacity Wheel are more structured and give better insights into the dilemmas in relation to the promotion of adaptive capacity. Too much variety may imply that there is inconsistency in policy and fragmentation of policy processes and this may hamper effective visionary policy, policymaking and authority. At the same time, this variety provides room for autonomous behaviour at local level and this fits in well with Dutch culture and promotes the adaptive capacity of society. Variety seems problematic because it does not steer society; but it is productive in that it mobilizes society. These tensions become painfully obvious with the application of the wheel.

The direct line of questioning also brought to the fore the argument that actors influence institutions which in turn influence actors; there is a complex interplay between these actors and institutions. Our assumption in this project was that there is a one-way influence of institutions on actors. This assumption oversimplifies the process.

The application of the Adaptive Capacity Wheel in a case study is complicated because for each criterion different kinds of evidence can be generated. For example, is a recent development or a historical development more significant for a specific criterion? Should equity be researched in relation to humans or in relation to nature? The researcher has to decide which evidence is more important and should be used for determining the score. In that sense, the Adaptive Capacity Wheel should be seen more as an instrument that stimulates discussion with stakeholders and leads to more analysis; rather than as a rigid, objective instrument. Its strength is in its qualitative analysis.

5.3.3 Case study 3: Climate proof spatial planning for flood prone areas[21]

Problem

The concept of 'multi-layered safety' has been adopted as a central concept of Dutch water safety policy. Based on the flood risk approach[22], this concept introduces a distinction between three different safety layers. The first and most important safety layer is flood prevention: the reduction of flood probability and the implementation of safety standards by taking both technical and spatial measures. The second safety layer aims at reducing the potential impacts of flooding. The third and final 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 (see also van den Brink, Termeer & Meijerink, 2010).

Focus

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 and exposure reduction involves the location choice debate: where do we (not) want to build in anticipating the effects of climate change? Against the background of the national debate on building – or not building – in the west of the Netherlands, the 'drain of Europe', 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?

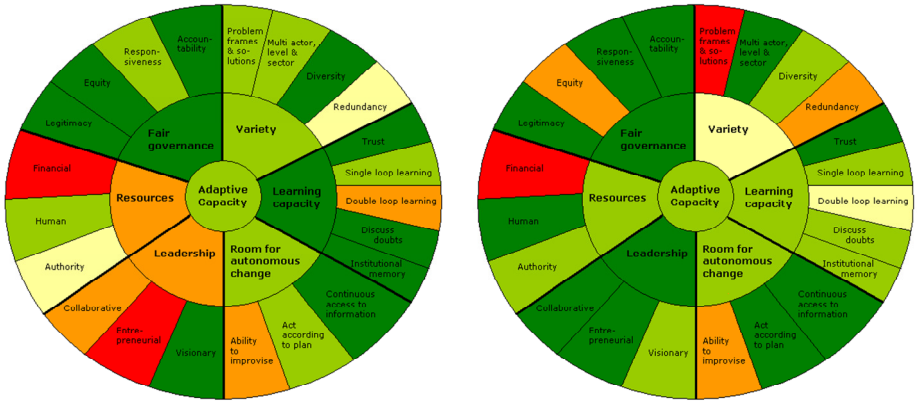
Method

This case study assesses the adaptive capacity of the Dutch institutions for sustainable and climate-proof spatial planning. The research protocol was systematically implemented. Data was collected through in-depth interviews with ten key stakeholders, either involved in the planning process for the Zuidplaspolder project or in the planning process for the Westergouwe project. The interviews were transcribed and analysed in detail. In addition, a large variety of policy documents was analysed and the archives of several national and regional newspapers were studied.

For each level and project, an Adaptive Capacity Wheel has been drawn, representing the adaptive capacity of the institutions on that specific level (see Figure 5.3).

21 For details on this case study see Brink, M. van den, C. Termeer & S. Meijerink (forthcoming).

22 The basic idea of the flood risk approach is that the legal safety standards are no longer based on the probability of flooding, but on the risk of flooding, defined as the probability of a flood times the potential impact of flooding (risico = kans * gevolg) (see for more information also the water safety case study report: van den Brink, Termeer & Meijerink, 2010).



ACW for the Zuidplaspolder ACW for Westergouwe

Figure 5.3 The Adaptive Capacity Wheel applied to the Zuidplaspolder project and Westergouwe.

Key conclusions on adaptive capacity

Variety: Whereas there is not much variety with regard to exposure reduction, there is much variety in the adaptation measures and strategies that were developed to climate-proof the Zuidplaspolder and Westergouwe. Examples are the implementation of the concept of multi-layered safety (in the Zuidplaspolder) and the introduction of different living environments and innovative building constructions in Westergouwe. Hence, there is no variety in *where* to build, but there is variety in *how* to build.

Learning capacity: Again, when it comes down to location choice, the learning capacity of institutions is limited. The spatial planning institutions demonstrate a strong path dependent development. However, at the regional and local level the institutions promote learning in various ways. Explorelab played an important role in encouraging these learning processes to take place, both in the Zuidplaspolder and in Westergouwe.

Room for autonomous change: Information on climate-proof spatial planning is available to different social actors. The parties involved are also able to act according to plan. However, both in the Zuidplaspolder and in Westergouwe the plans that were developed are not flexible, they do not take into account future climate scenarios. Moreover, because of a unidirectional focus on a reduction of the flood probabilities (which is a governmental responsibility), the room for autonomous adaptation at the local level will probably not increase. While there are strategies for action for different parties in times of crisis, the division of responsibilities for dealing with climate risks is not clear.

Leadership: There is a lack of rules regarding how to incorporate climate change in the practice of spatial planning. The initiative to do this is with the provincial governments. In the Zuidplaspolder, the Zuid-Holland Provincial Executive is clearly a leader. In Westergouwe, there is strong leadership of the Gouda Municipal Executive. However, whereas the institutions promote visionary leadership in both cases (in particular by Explorelab of Zuid-Holland Provincial Council), the Zuidplaspolder lacks entrepreneurial and collaborative leadership. These types of leadership only seem to develop in case of a strong sense of urgency, as in the case of Westergouwe.

Resources: Not much financial resources are available for climate-proof spatial planning. The Zuidplaspolder has some financial resources because this is seen as an

exemplary project with international status. However, when it comes down to implementing paper plans, there is much more uncertainty about the availability of resources. This also goes for the Westergouwe project.

Fair governance: Equity is an important issue in climate proof spatial planning at all levels. Who will pay when the approach fails? And how safe is safe enough when there are no legal norms for the water safety of a residential area constructed at the lowest point of the Netherlands? However, the policy processes are legitimate and accountable.

Key conclusions at the substantive level

First, at a substantive level, the following conclusions regarding the adaptive capacity of Dutch spatial planning institutions can be drawn.

- In view of the dominant focus on probability reduction (the first layer of the concept of multi-layered safety), the regional and local planning institutions that were analysed show a relatively high adaptive capacity and seem to promote climate-proof spatial planning for flood prone areas. For instance, the institutions demonstrated much variety in the development of innovative adaptation measures and strategies, and they promoted learning processes to take place, that is, created the room to do things differently such as in the Westergouwe project.
- However, there is a gap between the formulation of plans and policies and the actual implementation of these plans and policies. In the Zuidplaspolder, the hotpot organised by Explorelab and the planning project organised by Zuid-Holland Provincial Executive are parallel and separate processes. Due to the lack of financial resources and entrepreneurial and collaborative leadership, it turned out to be very difficult to implement the innovative measures and adaptation strategies developed by the hotspot. Although in Westergouwe, the situation is more positive due to the public-private partnership (and entrepreneurial leadership) between Gouda Municipal Executive and two private construction companies, it remains to be seen to what extent the current economic and financial crisis will influence the construction of the new residential area.
- Another important reason why there is a gap between the formulation of plans and policies and their actual implementation is the strong path dependent development of the spatial planning institutions (in particular the power of the local and regional plans). Decisions once taken, such as the decision to develop a new residential area west of Gouda (part of both the local and the regional plan), are almost impossible to turn back, in favour of another decision or location choice.
- Last, a key question that was posed at every level of governance is: Is building in low-lying areas a good or a bad example of adaptation to climate change? And how safe is safe enough? These normative questions play an important role and are answered differently by the stakeholders involved.

Key conclusions on the method

The case concludes that the Adaptive Capacity Wheel offers a detailed analytic framework that is able to capture different aspects of discussions on adaptation in the spatial planning sector at different administrative levels. Moreover, it helps to structure these debates, and study the implications of this structure for the adaptive capacity of institutions. The ‘scoring’ of the dimensions and the criteria remains a subjective enterprise. Challenges for the further development of the Adaptive Capacity Wheel concern the issue of the weight of the different dimensions (do we want to differentiate between the different dimensions? Some dimensions are perhaps more

important for adaptive capacity than others?). Some criteria are more challenging to operationalise and hence to assess, such as in particular trust, authority, discuss doubts, and diversity.

5.3.4 Case study 4: National Water Safety[23]

Problem

The name 'The Netherlands' already refers to its geographical location in a low-lying delta. Around 50% of the land is below sea level, and this 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.

Focus

Dutch water safety institutions are the product of times in which the climate issue, as we now know it, was hardly of any importance. This case study therefore deals with the question: To what extent do the historically evolving Dutch water safety institutions have the capacity to cope with the 'new' challenges of climate change? Since the Netherlands is a low-lying delta area, threatened by floods from the sea and the rivers, the water management sector – in close cooperation with other policy sectors – has been given the task and initiative to develop and implement the major part of the adaptation measures that are part of the Dutch Adaptation Strategy. Furthermore, as this sector, and in particular the Ministry of Transport, Public Works and Water Management, has proven to be relatively successful in protecting the Dutch against floods in the past, it can be expected that this sector is most geared to adapting to the potential effects of climate change. Hence, this case study focuses on the Dutch water management sector and attempts to assess the ability of Dutch water safety institutions to promote the adaptive capacity of society.

Central in this case study is the Dutch water safety policy domain, which, as a result of its relatively successful implementation of large water works in the past – such as the Delta Works – is generally considered exemplary for how the Dutch anticipate the effects of climate change and for the adaptive capacity of the Dutch institutional framework with respect to the effects of climate change.

Method

To demarcate our object of study, the Dutch water safety domain, we decided to analyze the three most important recent transformations in the Dutch water safety policy domain, namely the development and implementation of the Room for the River project, the flood risk approach, and the Second Delta Plan, respectively (see also Chapter 3, section 3.6). The Room for the River project aims at improving the water safety of the Dutch riverine area through creating more space for water. It is an important example of the development of spatial measures to reduce flood probability. In addition, Dutch water managers now try to introduce a flood risk approach – 'flood risk' is defined as the probability of a flood times the potential impact of flooding – and develop policies to reduce the potential impacts of flooding. Careful planning of evacuation routes, developing early warning systems, and adapting houses and

23 For details on this case study see Brink, M. van den, Termeer, C. and Meijerink, S. (2010). This paper has been submitted to and is under review by the Journal of Water and Climate Change.

infrastructure to prepare urban areas better for flooding are some examples. Finally, in anticipation of the projected effects of climate change, a state committee was established in 2007 to develop a more general and coordinated course of action to 'climate-proof' the Netherlands. In September 2008, this 'Second Delta Committee' (the first one was established after the flood disaster of 1953 and led to the construction of the large scale Delta Works) – published its advice 'Working together with water: a land that lives is building its future' (Deltacommissie 2008), also referred to as the 'Second Delta Plan'. We assume that these policies can best inform us about the extent to which Dutch water safety institutions enable climate change adaptation.

Subsequently, data was collected by making use of the following three data sources: 1) various types of documents, such as newspaper articles, press releases and policy reports; 2) previous extensive research of the authors, based on a large amount of semi-structured interviews and participatory observations (e.g. van den Brink & Meijerink, 2006; Meijerink & Dicke, 2008; Huitema & Meijerink, 2009; Termeer & Meijerink, 2009; van den Brink, 2009); and 3) analyses of existing accounts of current developments in the Dutch water safety policy domain (e.g. Wiering & Driessen 2001; Disco 2002; van der Brugge et al. 2005; Wiering & Immink 2006; Woltjer & Al 2007; Hidding & van der Vlist 2009). Together, these three data sources provided sufficient material to assess the capacity of Dutch water safety institutions to deal with the climate issue.

The next step of our research protocol involves the qualitative analysis of the data that we had collected, that is, the 'scoring' of the six dimensions and 22 criteria of the Adaptive Capacity Wheel (see figure 5.4). In addition, special attention was paid to the registration of the underlying arguments leading to a specific score. Finally, we drew conclusions on the capacity of the Dutch water safety institutions to promote adaptation to climate change, and we reflected on what could be done to improve this capacity.

ACW Room for the River ACW Flood Risk Approach ACW Second Delta Plan

Figure 5.4 The Adaptive Capacity Wheel applied in the case study on water safety

Key conclusions on adaptive capacity

Variety: Traditionally, the established institutions for water safety hinder the development and implementation of a variety of policy options. Dutch water safety policies are primarily aimed at 'fighting the water', at flood prevention, by building and strengthening dikes, dams and other flood defences. Nevertheless, during the past years the variety of ideas and policy measures for climate adaptation has increased greatly. Various new technological and spatial measures have been introduced to reduce flood probability, for example the 'Delta Dike' and the river-widening measures

of the Room for the River project. Also, various policy measures have been developed to reduce the potential impacts of flooding, addressing the whole safety chain.

Although a large variety of problem frames and potential solutions and measures has been developed over the last decade, the actual implementation of these measures remains problematic. The same is true for the inclusion of non-governmental parties in the development of these measures. The Dutch government still explicitly and primarily focuses on flood prevention – the reduction of the flood probability – as that has proven to be the most effective strategy in the past (Deltacommissie 2008: 41). This is also the dominant perspective of the Second Delta Plan. Measures for vulnerability reduction were only stimulated next to, rather than instead of, measures for probability reduction. On the positive side, redundancy in measures was promoted with regard to flood prevention.

Learning: In line with the focus of the Dutch government on flood prevention, continuous learning still mainly takes place on the existing institutional path, which can be interpreted as single loop learning. Reinterpreting and changing existing routines and taking a new institutional path, also referred to as double loop learning, turns out to be rather difficult. Although various new and innovative policy strategies have been developed, in particular the strategies to reduce the potential impacts of flooding and the strategies to create more room for water, conflicting problem frames hinder the actual implementation of these strategies (van den Brink & Meijerink 2006).

Room for autonomous change: The water safety institutions allow actors continuous access to information on the impacts of climate change, and enable them to make adjustments in project plans and governance structures. The programmatic approach of the Room for the River project with its continuously changing organisational structure and the corresponding division of roles and responsibilities is a good example (Hufen & Lotze, 2004; ten Heuvelhof et al., 2007).

The capacity to improvise remains rather underdeveloped. The Second Delta Plan emphasises that flood safety will continue to be a public interest, for which the central government has – and will continue to have – the primary responsibility (Deltacommissie 2008: 89). Private parties are only invited to invest in or co finance measures when their interests can be realised at the same time. As a result, it is likely that the 'control paradox' (Remmelzwaal & Vroon 2000) will remain to exist and will even increase.

Leadership: The Dutch Ministry of Transport, Public Works and Water Management, and in particular *Rijkswaterstaat*, its policy-implementing agency, are generally valued for their ability 'to get things done' and for their ability to lead by taking action – that is, for their entrepreneurial leadership (van den Brink 2009). The Second Delta Committee, in particular, has demonstrated visionary leadership, that is, its ability to connect different time scales and create a sense of urgency. Moreover, the chair of the Committee has played an important role in putting the climate issue on the Dutch political and societal agenda.

However, the vision that was presented was one-sided, focusing on flood prevention rather than the reduction of the potential impacts of flooding. One important reason for the one-sidedness of the Second Delta Plan and the still very marginal implementation of the flood risk approach is the fear that more attention for vulnerability reduction may come at the cost of attention for flood prevention. For this reason, the development and institutionalisation of a more collaborative leadership style is not stimulated. Hence, the dominant focus on probability reduction rather than the lack of leadership skills is the issue.

Resources: Although the Ministry of Transport, Public Works and Water Management possesses good institutional arrangements to generate the necessary resources for water safety, these resources, in particular the financial budget for the development and implementation of adaptation strategies, are also highly dependent on the political and public climate. In this respect, important complicating factors are the dominant focus on the development of cost-effective packages of measures and the low water awareness of Dutch society, as a result of which there is always a danger that the budget that is needed to maintain water safety is allocated to other – more appealing – purposes, such as public health or education. It is exactly for this reason that the Second Delta Committee has recommended the establishment of a 'Delta Fund'. Although the Dutch government has recently approved a proposal for such a fund, which guarantees that 1 billion euro will be made available annually as of 2020, it remains to be seen how this idea will be implemented in practice. The latest plans are to make the Delta Fund a specific part of the existing investment budget for infrastructure, but it is unclear whether this fund will actually generate additional resources for climate change adaptation.

Fair governance: The Dutch water safety institutions seem to allow for and encourage a legitimate policy and implementation process. For instance, following the example of the Room for the River project, local and regional parties will also be involved actively in the development and implementation of the various measures that are part of the Second Delta Plan. The protection of basic rights and equity seems to be provided for: every Dutch citizen will be equally protected against flooding; the legal safety standards will not be further differentiated. Finally, as the institutions allow for legitimate policy processes, it can be expected that they will also support responsiveness. And in line with the recently introduced strict procedures for large public projects, it can be expected that the institutions will promote accountability.

Key conclusions at the substantive level

This case study identifies six strengths and five weaknesses of Dutch safety institutions to promote adaptive capacity.

The following six institutional strengths could be identified. First, in general, the water safety institutions allow for and encourage the development of a large variety of adaptation strategies. During the last years, the variety in ideas and policy measures, or the variety in potential adaptation strategies, has increased greatly. Second, the Dutch water safety institutions allow for an active involvement of local and regional (government) parties in the development and implementation of these adaptation strategies. Third, they allow for and encourage an increasing awareness of water safety issues in other policy domains, such as the domain of spatial planning. Fourth, Dutch water safety institutions generate room for experimenting and learning on the existing institutional path of flood prevention. Fifth, they promote entrepreneurial leadership: the Dutch water sector is well known for its ability to lead by taking action, and to realise major public works. In particular the Delta Works, closing off the sea inlets in the southwest of the Netherlands, brought the Dutch worldwide fame. Finally, the Dutch water safety institutions allow for and encourage the introduction and establishment of unique arrangements to generate resources for realising water safety. The Delta Fund is only one example of such an arrangement.

The case study also identifies five institutional weaknesses. First, institutions embed a dominant focus on technical measures of flood prevention, causing an institutional lock-in. Because the development and implementation of climate adaptation strategies implies new policy practices and the crossing of sectoral borders, it requires the choice

of a new institutional path (North 1990; Hall & Taylor 1996). Second, as the Dutch central government has defined flood protection as a public responsibility and has taken over the responsibility for the water safety of the Netherlands, the Dutch water sector runs the risk of continuing and even increasing the control paradox (As people feel safe behind dikes and trust that the government will take care of them, they will not develop the capability (i.e. knowledge and authority) to improvise in times of crisis). Third, the one-sided reliance on scientific experts regarding uncertainties is an institutional weakness. The involvement of local and regional authorities, citizens and NGOs is necessary to develop and implement tailor-made solutions. Fourth, the dominant focus on probability reduction hinders the development and institutionalisation of a more collaborative leadership style and, hence, the development of shared and more integrated problem perceptions and solutions. Finally, unique institutional arrangements generate resources for water safety, the Dutch water safety institutions do not generate resources for innovative and more spatial adaptation strategies. These are still viewed as 'something extra' instead of as a more efficient, multifunctional solution.

Key conclusions on the method

The case study on water safety reveals a number of issues with respect to the methodology. It concludes first of all that the Adaptive Capacity Wheel and its research protocol provides good opportunities for integrating aspects into a qualitative research approach that enhances reliability and transparency and that properly deals with biases. It does so, for example, by prescribing the development of a background document in which all arguments are stored. Moreover, the research protocol encourages 'testing' the scores and reflecting upon the scores in different settings to see if others arrive at the same score on criteria as the researchers do. In this case study, the assigned scores were judged and improved by other team members and in workshops with key stakeholders within the Dutch water safety domain. The methodology creates room to discuss differences of opinion, if any, on a specific quality or criterion. Several rounds of scoring and discussion led to a more and more robust result.

Additionally, the Adaptive Capacity Wheel has been useful to present the results. By providing an overview with obvious colours for each criterion, the wheel immediately suggests where there might be room for reform. Detailed explanation and interpretation by the researchers may provide the first ideas on how this reform could take place.

5.4 Comparative analysis of the case studies

The four case studies, which were summarized in Section 1.3, enable us to assess the institutions of three policy sectors which are crucial to climate adaptation: spatial planning, water management and nature management. Moreover, these cases encompass multiple scales and levels of governance, from the scale of one single house to the scale of a river basin or sea, and from the level of the individual to the level of the state. Table 5.3 presents an overview of the four main cases, the various sub-cases and their levels of analysis.

Table 5.3 Case studies on adaptive capacity in The Netherlands.

	Case 1	Case 2	Case 3	Case 4
Focus on institutions for:	Individual Responsibility	Nature management	Building in low-lying areas	Water Safety
Spread between the sectors	Water, urban, agriculture, spatial planning	Water, nature, agriculture, spatial planning	Water, spatial planning	Nature, water, spatial planning
Case study area	Delft Zaandam Wijde Wormer	Wadden Sea	Zuidplaspolder Westergouwe	Riverine areas Main rivers, coast
Level of analysis	Individual Local	National	Regional Local	National
Sub-cases	Delft Zaandam Wijde Wormer	None	Regional development: Zuidplas polder; Local development: Westergouwe	Room for the River; Flood risk approach; Second Delta Committee

In the following sections, we present the main research findings across the case analyses. After a cross-case comparison for each dimension, we compare the overall results for each case study. For detailed assessments of the relevant institutions in the separate cases, we refer to the case study reports (Bergsma et al. 2009, Van den Brink et al. 2010 and forthcoming; Klostermann & Bergsma 2010).

5.4.1 Variety

According to many theories, variety is very important for adaptive capacity. It follows from our assessments that practices of climate adaptation as they are unfolding in the Netherlands now display a relatively low level of variety of problem definitions, policy measures, institutional arrangements, levels of government and actors involved. Except for the case study of regional planning in de Zuidplaspolder, where a large variety of policy options have been developed and partly been implemented, the case studies have a slightly positive score at best. The Room for the River case study scores negatively on the dimension of variety.

Traditionally, institutions for water management have hindered the development of a variety of policy options to deal with water management issues. Dutch water policies traditionally aim at reducing flood probability through the building and strengthening of dykes and other flood defence infrastructure primarily. Only recently, institutions seem to allow for and even encourage more variety. First, the range of substantive policy options has broadened. New strategies have been developed to reduce the probability of flooding, such as the room for the river policies and the building of climate proof dykes. Moreover, the new risk discourse has attracted attention to an entirely new set of strategies, which either aim at reducing exposure to or at reducing vulnerability to flooding. These strategies include planning for disasters (e.g. evacuation), and water proofing urban areas. Most of the new policy ideas, however, have not yet been implemented. Institutions for water management and spatial planning seem to allow for and encourage a variety of problem frames, solutions and of institutional arrangements and this increasing variety may be interpreted as an increase in the adaptive capacity of Dutch society. Looking at the actual implementation of the newly developed adaptation strategies, however, we must conclude that variety is still rather limited. The case studies on planning for water

safety and on climate proof spatial planning indicate that the bigger part of the budgets for water safety are used for realizing and maintaining flood protection infrastructure, i.e. for reducing the probability of flooding, and not for climate proofing urban areas. Government prioritizes the classic strategy of reducing flood probability.

In spite of the new responsibilities for home owners and citizens in water management, water safety and water management still are an almost exclusive responsibility of the government, and despite a debate on the potential benefits of introducing possibilities for flood insurance in the Netherlands, the Dutch government has not created necessary conditions for the insurance industry to play a role in flood risk management. Finally, the case study on climate proof spatial planning demonstrates that new urban areas continue to be planned in flood prone areas. This is consistent with a series of evaluations of the water assessment, which all show that water managers have hardly succeeded in influencing spatial planning so far.

The only case study with a clear positive score is the regional planning process in the Zuidplaspolder. The parties involved have developed a plethora of strategies that might be used for flood proofing the new urban areas, and have started to implement these strategies as well. Clearly, the regional informal institutions allow for variety.

The Wadden case raises the point when and how a variety of problem frames is helpful. Many stakeholders are involved in the Wadden Sea debate and a lot of variety exists in problem frames, but respondents give this a negative value. They see the variety as a barrier to agreeing on a solution.

5.4.2 Learning capacity

There are remarkably large differences between the scores for the various case studies. The Wadden Sea has a very high score for learning capacity. There are data on the Wadden Sea available and accessible; there is intensive monitoring and a cautiously growing level of trust between the parties. Finally, in the Wadden Sea area, fundamental assumptions are being questioned. As a result most parties involved in adaptation practices in the Wadden Sea area have up-to-date information on the seriousness of various problems in this area.

In spite of its relatively high overall score for learning capacity, the Room for the River case has a low score for double loop learning. The reason for this is that the fundamentals of Dutch flood risk policies were not questioned and discussed. Although the Room for the River policies were very different from traditional policies of building new and improving existing dikes, the policies focused exclusively on a reduction of the probability of flooding, and did not include strategies to reduce flood exposure or flood vulnerability (see also the previous section on Variety).

The scores for the Zuidplaspolder and Westergouwe projects are neither quite negative nor quite positive. When it comes down to location choice, the learning capacity of the spatial planning institutions is limited. They demonstrate a strong path dependent development. Even though many experts had argued that, from the perspective of water safety, Westergouwe is a bad location for developing a new urban area, the development of this new residential area continued. Apparently, the institutions did not offer much room for learning. Because of a decision which had been taken in the past, Westergouwe had to be developed no matter the consequences for water management or safety. As a consequence, learning was confined to the question of how to climate-proof the new neighbourhood (without questioning the location). Explorelab, established at Zuid-Holland Provincial Council, played an important role in

encouraging these learning processes to take place, both in the Zuidplaspolder and in Westergouwe.

For the case studies on individual responsibilities the overall score for the learning dimension is neutral. Still, there are some interesting differences between the scores on the criteria of trust, ability to discuss doubts and institutional memory. Whereas in the rural case of the Wijde Wormer there is a culture of trust and a culture which allows parties to discuss doubts, in the urban case studies of Delft and Zaandam trust and possibilities to discuss doubts are lacking. This could be explained partly by the informal networks in the Wijde Wormer, where people and organizations all know each other very well, but may also be explained partly by the open and integrated area approach followed in Wijde Wormer.

5.4.3 Room for autonomous change

The three case studies on water safety score relatively high on the dimension room for autonomous change, mainly as parties do have access to relevant information, such as information on water safety standards, flood risks and policy options, and because parties are able to act according to plan. In spite of these positive scores, the capacity to improvise scores relatively low for two of the three case studies on water safety. The literature suggests that the capacity to improvise decreases if government takes over all responsibilities from society. As was discussed before, the Dutch government still plays a crucial role in realizing climate adaptation, and in spite of some policy statements referring to the need for raising water awareness and stressing the responsibilities of societal actors in realizing climate change adaptation, it seems that Dutch government continues to bear responsibility for flood safety in the long run.

The question how this development should be judged from a perspective of adaptive management is a difficult one. Full government responsibility for water safety reduces the room for autonomous change. However, it can also be argued that the Dutch tradition of framing the water safety issue as a collective action problem which needs to be solved by government intervention has been very effective so far, and that there is no reason yet to abandon this policy path.

In all other cases, the room for autonomous change is relatively low, mainly as non governmental actors and civil society do not have access to the relevant information. In all three case studies on individual responsibilities, Delft, Zaandam and Wijde Wormer, information is diffused among different parties, not organized and therefore not easily communicated to individuals. It is only a relatively small group of insiders which has access to the relevant information. It is interesting to see that even though individuals lack access to relevant information, they are satisfied with their capabilities to act, and generally feel there is much space to manoeuvre.

The case studies on spatial planning also have low scores for the room for autonomous change. Actors do have access to the relevant information, but the national policies focusing on a reduction of flood probability and facilitating an ongoing development of flood prone areas do not enhance possibilities for autonomous adaptation at local level. In the Zuidplaspolder plans were developed for crisis management, which, among other things, address evacuation strategies. At the same time, there are many uncertainties about the distribution of responsibilities between national, regional and local levels. In the Westergouwe case possibilities for autonomous adaptation are relatively limited since the decision to build the new neighbourhood has been taken. The municipality, however, does have access to the relevant information and tries to prepare the new inhabitants of the neighbourhood for disasters.

Finally, in the Wadden sea case study, there are many plans for crisis management, which are being practiced and tested regularly. Moreover, local and regional governments and NGOs do have a lot of knowledge which they can use for autonomous adaptation. At the same time, it should be noted that this information is only available to a relatively small group, and that many inhabitants of the mainland and many tourists on the islands are lacking such information. Very similar to the results of the three case studies on water safety policies, the case of the Wadden Sea reveals that inhabitants rely on the dikes, and are confident this infrastructure will protect them from flooding.

5.4.4 Leadership

It was suggested in Chapter 2 that we need several leadership styles to be adaptive. First we need visionary leaderships. i.e. leaders who have the skills and capabilities to relate the short term to long term developments. Second, there is a need for entrepreneurial leadership, which is a type of leadership which is able to find resources and secure realization of adaptation measures. Finally, we need collaborative leadership, which is aimed at connecting and bridging between different policy sectors, levels of government, and between government, civil society and the private sector.

The case studies of Delft, Room for the River, the Second Delta Committee and Westergouwe have a positive score; in these cases there is a relatively good balance between various leadership styles. In Westergouwe, the division of leadership between the government authorities involved was even emphasized by the interviewees as one of the most important strengths of the planning process.

There are few rules regarding how to incorporate climate change in the practice of spatial planning. The initiative to do this is with the provincial governments. In the Zuidplaspolder, the Zuid-Holland Provincial Executive is clearly a leader. In Westergouwe, there is strong leadership of Gouda Municipal Executive. However, whereas the institutions promote visionary leadership in both cases (in particular by Explorelab of Zuid-Holland Provincial Council), the Zuidplaspolder lacks entrepreneurial and collaborative leadership. These types of leadership only seem to develop in case of a strong sense of urgency, as in the case of Westergouwe.

Traditionally, the water sector is relatively strong in visionary and entrepreneurial leadership. Most plans and projects which have been developed, such as the Delta plan and Delta project and the new space for river policies clearly use a long term perspective. Moreover, the engineering culture of the sector has a strong problem solving orientation. Collaborative leadership, however, is of a more recent date. Because the space for water and risk discourses have gained importance now, collaborative leadership is more important than ever. Water managers need to cooperate with spatial planners, land owners and so on to be able to realize their new policies.

The case study on climate adaptation in the Wadden Sea underscores the need for leadership to realize adaptation to climate change. It is shown that there is a huge variety of actors involved, each having different frames of the adaptation issues at stake, and different preferences about adaptation strategies. Because of a lack of collaborative and visionary leadership, however, the parties involved are rather negative about the progress that has been made in the Wadden Sea so far. They all tend to complain about the complexity, which is caused by the levels of government and number of actors involved, and the lack of leadership. Exactly because of the fragmentation of resources, parties are highly dependent on each other for realizing

their objectives, and are hardly able to experiment with new policy strategies on their own. The lack of local autonomy in combination with a lack of leadership may explain why the variety of policy ideas and strategies generated has not been very productive so far.

5.4.5 Resources

The capacity of society to adapt to climate change is largely dependent on the availability of the necessary resources, such as financial resources. The case studies of Room for the River, and the second Delta committee have a positive score. The case studies of regional and local spatial planning and the Wadden Sea have a negative score. The Zuidplaspolder has some financial resources because this is seen as an exemplary project with international status. However, when it comes down to implementing paper plans, there is much more uncertainty about the availability of resources. This also goes for the Westergouwe project. The case studies on individual responsibility in the three municipalities show a negative score for the rural area (Wijde Wormer) and a positive score for more urbanized areas (Delft and Zaandam).

A comparison of the various case studies and policy sectors reveals that the water sector possesses some unique institutional arrangements to generate the necessary resources for realizing water safety. On the regional level, the Dutch water boards have competencies to raise specific taxes for water management purposes. This specific competency enables the water boards to always generate sufficient financial resources for maintenance of dykes and other water management infrastructures. On the national level, such institutional arrangements are lacking, and there always is a danger that the budget which is needed for maintaining water safety in the Netherlands is allocated to other purposes, such as public health or education, since these sectors tend to be more appealing to both the electorate and politicians. It is exactly for that reason that the second Delta commission (Commission Veerman) has recommended the establishment of a so called Delta fund. Although the Dutch government has recently approved a proposal for such a fund, which guarantees that 1 billion euro will be made available annually as of 2020, it remains to be seen how this idea will be implemented in practice. The latest plans are to make the Delta fund a specific part of the existing investment fund for infrastructure, and it is not clear yet whether this fund will generate *additional* resources for climate adaptation. Unlike water managers, spatial planners and nature managers have few possibilities to generate the necessary resources. In projects such as the spatial core decision on Space for the river, other policy sectors are highly dependent on Rijkswaterstaat for realizing their objectives.

There is a lack of financial resources for adaptation in the case studies on possibilities for individual adaptation (Zaandam, Delft and Wijde Wormer). Existing arrangements, such as the *Investeringsbudget Landelijk Gebied* (ILG) or the financial arrangements to compensate farmers for water storage capacity on their land are not sufficient for realizing the necessary adaptation measures. Still, the cases of Zaandam and Delft have a rather positive score on the dimension of resources. This is explained by the availability of sufficient human resources and the authority of key-actors involved. In the case of Wijde Wormer none of the actors involved have sufficient authority to realize adaptation measures.

The case study on climate adaptation in the Wadden Sea area also demonstrates that few financial resources are allocated to nature development. Rijkswaterstaat used to take the responsibility for nature management in the Wadden Sea but has begun to focus on its core business. The Ministry responsible for Nature Management does not

have a sufficient budget for nature management in the Wadden Sea area. The Wadden fund (*Waddenfonds*), Delta fund and WILG are helpful to some extent. On the availability of human resources, many respondents refer to a lack of enforcement of existing nature policies and regulations.

5.4.6 Fair governance

Fair governance is the only dimension where all case studies have a neutral or positive score. The criteria for fair governance hardly discriminate between the various case studies. In general, respondents were of the opinion that governance processes are fair. The only exception is the issue of accountability. The case studies on individual responsibility (Delft, Zaandam and Wijde Wormer) and the case study on the Wadden Sea have negative or neutral scores for accountability. There are two main reasons why accountability is an issue in the case studies on individual responsibility. The first one is that there are many different organizations involved in ground water management, and that individual households often do not know which organization is responsible, and can be held accountable. The second reason is that the government increasingly expects households to take their own responsibility, and it is unclear who is responsible for what.

In the Wadden Sea case, some of the respondents from NGO's argued that there may be enough equity for humans, but not for other life forms. As a consequence of this view, they left the negotiating tables behind and went to court, where they won their case. For the remaining parties, leaving the negotiating table was seen as unfair. This shows how views on fair governance can also differ. Possibly, the adaptive capacity wheel can bring to surface such differences in views which in turn may help the debate on adaptation in the Wadden Sea.

The other criteria of fair governance possibly are more discriminating in international comparative case studies, but they might also be less relevant for adaptive capacity than we assumed. Recent work by Huitema and Meijerink (2009) on the role of policy entrepreneurs in 15 countries around the globe has revealed that policy change and adaptation (including implementation) is possible in any institutional context, including ones that do not meet the criteria of fair governance. These criteria, therefore, might be more relevant from a normative point of view than from a perspective of adaptability.

5.4.7 Conclusion and reflection

Table 5.4 presents the overall results of the cross-case comparison. The assessment shows that the adaptive capacity of the water sector (case studies of Room for the River, Second Delta Committee and flood risk approach) and the spatial planning sector (case studies of Zuidplaspolder, Westergouwe) is relatively high, although the flood risk approach has not yet been implemented and the construction of, for example, Westergouwe is threatened by the potential lack of financial resources. The adaptive capacity in the Wadden Sea case (sector of nature management) is negative for all dimensions except for the dimension of learning capacity. In this case study, there clearly is a lack of leadership and of financial resources. The overall-scores for the case studies on individual responsibilities are neutral (they score either slightly negative or positive).

Apart from the results of the assessment of the various criteria and dimensions, the case studies have also produced information on some tensions or dilemmas between the criteria and dimensions.

From a 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, i.e. the use of one policy strategy may negatively affect the effectiveness of another. As an 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 Government tries to stimulate forms of self-organization in finding and implementing adaptation measures. 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 infrastructure projects, such as the construction of 'unbreakable' delta dikes, or a range of technical measures needed to raise the water level in the freshwater lake IJsselmeer. This, of course, would decrease water awareness even further. After all, why should citizens bother about water safety if government takes care? Clearly, the adaptation issue is framed ambiguously. On the one hand, it is framed as an issue for which societal actors should bear responsibility themselves; on the other hand, it is framed as a classical collective action problem that needs to be solved by government. The interesting thing, of course, is that there may be a tension between the two. A government which demands support for the realization of large scale infrastructure projects suggests it has accepted full responsibility for the water safety issue. Sometimes this governmental responsibility is flagged for strategic reasons, for example, by presenting the Netherlands as the 'safest delta in the world'[24]. This is done both to attract foreign investments in an area below sea level, and to sell Dutch water technology all over the world.

The case studies on individual responsibility in urban water management have revealed a related tension. It is shown that the government tries to make citizens and home owners responsible for certain aspects of water management, such as drainage of rainwater, but that the parties involved do not have the same perception of the distribution of responsibilities between the local authorities and land owners. This case study shows that, after intensive rainfall and urban flooding, this may easily lead to a situation in which the government argues that land owners and citizens should have taken their responsibilities, whereas the latter hold the former accountable. If an 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.

It turned out that the dimension of variety is strongly related to the dimensions of learning capacity and room for autonomous change. Because the variety of policy strategies was often restricted to a particular institutional path (for example, the decision to build in low-lying polders), learning was restricted to that particular policy path as well (deciding how to build in Westergouwe, but not in what other location houses could be built instead). And as the case studies have also shown that the government is still the dominant actor in adaptation to climate change (there is a limited variety of actors involved), we might argue that the room for autonomous change for societal actors still is relatively low.

Both leadership and resources are crucial conditions to adaptive capacity. Whereas the Dutch water sector possesses relatively successful institutional mechanisms for

24 See for example: (in Dutch) http://www.rijkswaterstaat.nl/images/Mooiste%20en%20Veiligste%20Delta%20(folder)_tcm174-279903.pdf

generating the necessary resources, such as 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 5.4 Cross-case comparison adaptive capacity.

Case Studies	Variety	Learning	Room for autonomous change	Resources	Fair governance	Leadership	Total
1.1 IR: Delft	+0,25	+0,2	-1,0	+0,67	-0,25	+1,0	+0,14
1.2 IR: Zaandam	-0,75	-0,40	-0,67	+0,67	0,0	+0,33	-0,14
1.3 IR: Wijde Wormer	+0,25	+0,4	+0,33	-1	+1	+0,33	+0,22
2 Wadden Sea	-0,25	+1,5	-0,67	-1,0	-0,25	-0,67	-0,22
3.2 BLA: Zuidplaspolder (regional)	+1	+1,20	+0,67	-0,33	+1,75	-0,33	+0,66
3.3 BLA: Westergouwe (local)	0	+1,00	+1,00	+0,33	+1,25	+1,67	+0,88
4.1 WS: Room for the River	-1,0	0,6	+1,67	+1,33	+1,75	+1,33	+0,95
4.2 WS: Flood risks approach	+ 0,25	-0,2	+0,67	-1,0	0,0	-0,67	-0,16
4.3 WS: Second Delta Committee	0,0	+0,4	+0,67	+1,0	+2,0	+1,33	+0,90

Furthermore, we have seen that variety can only lead to actual implementation of solutions once it is accompanied by strong collaborative and visionary leadership, that institutional variety may easily lead to issues of accountability, and that some policy strategies may be incompatible. In sum, there are good reasons for cherishing variety, but the implementation of this concept in practice surely is not unproblematic.

This chapter has used the adaptive capacity wheel to assess some practices of climate adaptation as they are unfolding in the Netherlands now. During the case studies, we have learned that the various dimensions and criteria of the adaptive capacity wheel are a useful means to discuss the strengths and weaknesses of particular institutions, but that it is sometimes difficult to present 'hard' scores for each criterion separately. We have learned that just presenting the scores on the various dimensions would not make much sense, as the main results of the assessment can only be understood in combination with the 'story' behind the assessment. Moreover, information is lost when the scores for the criteria are aggregated for a score on a dimension, and when the scores for the dimensions are aggregated for an overall score. That is why aggregated results should always be interpreted with care.

The assessment inevitably involves interpretations by both the interviewees and the case study researchers. Exactly because of the different interpretations of adaptation practices and because of the inherent tension between some of the dimensions and criteria, it is rather difficult if not impossible to formulate 'objective' final conclusions

and recommendations about the adaptive capacity of institutions. The assessment tool, however, has proven useful to disentangle key dimensions of adaptive capacity as well as their inherent tensions.

The finding that the actual implementation of adaptation strategies and learning are often restricted to a particular institutional path, raises a theoretically and practically relevant question: how much variety do we actually need to be adaptive, or in other words: what exactly is the 'requisite variety' in a particular case. Complexity theory and literature on adaptive governance for good reasons point to the need for cherishing variety. The concept of 'requisite variety', however, suggests that there is some optimum of this variety. A crucial yet unanswered question then is where this optimum is. As an example: How can we know whether an increase in the variety of policy options to reduce flood probability is sufficient or whether we really need to change our practices of spatial planning, and should no longer build in low-lying areas?

6 Integrated analysis: the Adaptive Capacity Wheel[25]

6.1 Introduction

The first key question of this research project was: How can the adaptive capacity of Dutch Institutions from local through to national level to deal with climate change be assessed? This implied three steps: (a) the development of a model for assessing how institutions promote the adaptive capacity of society; (b) the testing of this model within the project; and (c) improving this model. This wheel has also been applied outside the project by two MSc Students and two post-docs are also currently applying the wheel in China and Thailand on the Mekong. This chapter now tries to draw some major conclusions regarding the usefulness of this Adaptive Capacity Wheel. It does so inductively, building on the experiences in applying the Wheel.

6.2 The Adaptive Capacity Wheel

Based on an extensive literature survey, the project team concluded that there were few assessment programmes (Polsky et al. 2007); and practically none for application to institutions. Therefore, an Adaptive Capacity Wheel was designed as a tool for assessing to what extent institutions enhance the adaptive capacity of society (see Figure 2.1 on page 46 of this report). Based on a literature review, brainstorm sessions and discussions with social actors, we have identified six dimensions of adaptive capacity that are important for assessing institutions: Variety, Learning capacity, Room for autonomous change, Leadership, Resources and Fair Governance. We have furthermore identified and defined 22 criteria as indicators for the six dimensions (see Table 2.1 at pages 41-42 of this report). Chapter 2 explains in considerable detail the development of, and method to apply, the Adaptive Capacity Wheel.

In order to test the applicability of the wheel, we have applied it (a) within our project and (b) outside of it. Those who applied the Wheel within our project have internalized the process and probably are more committed to making it a success – a logic inherent in research. Those who applied the Wheel outside our project have no inherent commitment to the Wheel, have taken a critical approach, but have nevertheless come up with some results. This section aims to analyse these different results in terms of methodological issues.

The IC-12 project aimed to test the wheel by applying it to content analysis of 23 selected policy documents quantitatively and qualitatively (see Chapter 4). It also decided to test the wheel by applying it to four case studies (see Chapter 5).

The Adaptive Capacity Wheel has also been tested outside the project. The goals of doing so are: (a) Is the method and research protocol usable by other researchers? (b) How does it relate to their own perspectives on doing such research? And (c) Can it be applied to other countries? (d) What can one learn from such research applications? Results are shown in paragraph 6.3.4.

25 Parts of this chapter are based on Gupta et al. (2010); Ki-Yong Do (2010); and Leusink (2010); Klostermann et al. (2009); Meijerink et al. (2010); van den Brink et al. (submitted).

6.3 Testing the Adaptive Capacity Wheel

6.3.1 Application to a Content Analysis of adaptation policies

The Adaptive Capacity Wheel can be applied to assess policies and regulations. Where one is comparing many institutions, it may seem more relevant to undertake an additional step and aggregate the information into single quantitative scores. We have argued that the criteria are not additive (see Chapter 2) and, hence, this step should be undertaken with caution. This implies that the optional fifth step under 'Analyzing the Data' should be undertaken (see Chapter 2). One can aggregate the information on the different criteria into one value and again aggregate the data on the six dimensions into one score on a specific institutions' ability to promote the adaptive capacity of societies.

We have applied this technique in an assessment of the formal Dutch institutions (governmental policies and regulations) ability to enhance the adaptive capacity of society. We have focused on four sectors (nature, water, agriculture and spatial planning) and policies that specifically address climate change adaptation. For data collection, we have read all the policy documents and stored this in a background document. For data analysis, scores were assigned in three rounds by three different researchers, individually and then jointly. We kept a record of why we scored a criterion in a particular way in order to make the arguments transparent. Quantitative scores were assigned to the different criteria, which were then tallied to get a single value for each institution. To interpret the results, we have compared the scores. The results, for example, demonstrate that the nature protection arrangements foster the least adaptive capacity, while those focusing on water score quite well in the Netherlands. Table 6.1 below presents the results of the assessment, which are elaborated in a separate paper (Klostermann et al. 2010a).

Table 6.1 Application of the Adaptive Capacity Wheel to a comparative content analysis.

Issue	Instrument/institution	Score on AC
Climate /general		
	National Adaptation Strategy: make space for climate!	0.85
	Strategy National Safety and National Risk Assessment	0.64
Nature		
	National Ecological Network	0.14
	Law for the Protection of Nature	-0.21
	Flora and Fauna Law	-0.44
Water		
	National Agreement on Water	1.09
	National Water Plan 2008	1.27
	Policy Guideline Large Rivers	0.79
	Water Law	0.98
	Water Test	0.49
Agriculture		
	Agenda for a Living Countryside - Multi-year programme 2007- 2013	1.00

	Law on Land Use in Rural Areas	1.19
	New agrarian insurances	0.61
Spatial planning		
	National Spatial Strategy	0.64
	Spatial Planning Act	0.85
	Strategic Environmental Assessment	0.64

Such a quantitative analysis allows us to see through an assessment of the scores which policy instrument appears to score the highest according to our model. Clearly the nature instruments score the worst.

However, such an application implies a high level of aggregation and loss of information. The information could also be presented as follows in Table 6.2 and 6.3 below. Here we can still capture all the information if the Adaptive Capacity Wheels are presented next to each other. This immediately shows the reader/ viewer:

a. How each policy scores in terms of different dimensions and criteria;
b. The patterns of strong points and weak points in each sector; this can point to the existence of specific paradigms in each sector that lead to specific choices.
c. Communicates vast amounts of information (see Working Documents 4, 5 and 6), in a very telegraphic manner.

At the same time, there is a risk of not being able to apply certain criteria (e.g. trust) to policy documents; there is a risk of multiple researchers interpreting the information in different ways; and there is a risk of overlap.

The bottom-line is that (a) the Adaptive Capacity Wheel can be applied to a content analysis, and (b) it is useful for showing differences between policies/laws on specific criteria.

Table 6.2 Comparative assessment policies relevant for adaptation at different governance levels.

International	European	National
Natura 2000	Water Framework Directive	National Adaptation Strategy
		
Common Agricultural Policy	Flood Risk Directive	National Safety Strategy
		
	EU White Papter on Adaptation	
		

Table 6.3 Comparative assessment of sectoral policies relevant for adaptation.

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

6.3.2 Qualitative application to Case Studies

The Wheel has also been tested in case studies. These case studies have been discussed in detail in Chapter 5. Here we only focus on (a) whether it can be applied; (b) whether it delivers useful information; and (c) whether we have overlooked some criteria or over emphasized other criteria. Here, discussions with interviewees play an important role.

Table 6.4 below shows that the ACW can be applied through case studies.

Table 6.4 Application of the Adaptive Capacity Wheel to case studies.

Case	Application
Individual responsibility	 ACW for Zaandam  ACW for Delft  ACW for De Wijde Wormer
Wadden Sea	 ACW for the Wadden Sea Region
Building in low lying Areas	 ACW for the Zuidplaspolder  ACW for Westergouwe
Water Safety	 ACW Room for the River  ACW Flood Risk Approach  ACW Second Delta Plan

Chapter 5 examines the substantive content of these case studies, and we believe that the information generated through these ACW's delivers useful information (see 5.3 and 5.4.7).

The next question is – what did the interviewees think of our methods? The lessons learnt are:

- It is difficult to explain all the abstract terms and their meanings to interviewees. Implication: the interview questions have to be simple;
- Many dimensions and criteria are difficult to separate from each other and this may lead to confusion. Implication: these relationships need to be drawn out and assessed in the qualitative analysis accompanying the wheels.
- Interviewees often repeat information provided to other questions. Implication: the interviewer has to skilfully disentangle this information in the analysis.
- The information helps to structure the knowledge of the interviewee. Implication: this aspect is a critical advantage of the process.
- There is an implicit assumption that institutions influence behaviour more than behaviour influencing institutions. Implication: This is a correct implicit assumption and the ACW is meant as a diagnostic tool. Sometimes interviewees provide possible solutions to perceived shortcomings which can be taken into account.
- In practice, everything is moving – there is certain dynamism. The Adaptive Capacity Wheel is unable to capture the dynamic aspects and tends to focus on specific issues at specific moments of time. Implication: The Adaptive Capacity Wheel is meant to provide an indication of how society is coping with climate change. Possibly regular applications of the wheel over time may provide a more dynamic picture.
- Is the wheel an assessment/ ranking or is it an instrument to promote discussion? Implication: the Adaptive Capacity Wheel is meant less as a report card and more as an instrument that can help scientists engage in policy discussions with policymakers.

6.3.3 Application of the Adaptive Capacity Wheel to ongoing debates

The adaptive capacity wheel has also been applied to the draft National Water Plan (Klostermann et al. 2009). The application reveals that the draft did not score well in terms of entrepreneurial leadership and providing room to social actors for autonomous change. The draft was more focused on ensuring that the state takes responsibility to guarantee the safety of the citizens – and did not transfer much responsibility to individuals or allow for engaging the market. The generally high score is consistent with the policies and laws in this sector which have clearly learnt over time and tend to do well from the perspective of the Adaptive Capacity Wheel (see figure 6.1)

Figure 6.1 Applying the Adaptive Capacity Wheel to the draft National Water Plan (source: Klostermann et al. 2009).

6.3.4 Applications of the Adaptive Capacity Wheel outside the IC12 project

The Adaptive Capacity Wheel has also been tested outside the project. The goals of doing so are: (a) Is the method and research protocol usable by other researchers? (b) How does it relate to their own perspectives on doing such research? And (c) Can it be applied to other countries? (d) What can one learn from such research applications?

Qualitative application to a Water Board in The Netherlands

The Adaptive Capacity Wheel has been applied to a Water Board in the Netherlands by a student (Leusink, 2010) (see Figure 6.2). The Stichste Rijnlanden is one of the largest Water Boards in the Netherlands. At present it is not actively engaged in developing a climate change strategy or an adaptive capacity strategy, although it is developing a strategy on Corporate Social Responsibility. However, their core business is controlling water quantity and quality, protection of the dikes, and as such they are examining issues that are likely to be affected by climate change. The research followed the method mentioned in Chapter 2, but combined a qualitative and quantitative approach – in that first open questions were asked followed by a joint scoring of the question. Twenty interviews were conducted. The results show that the organization scores well in general on adaptive capacity although there is room for improvement. In particular, the organization scores well on Variety, Room for autonomous change, Learning and Resources. Their ability to raise resources as needed is strong and makes this institution remarkable in a world-wide context. However, the interviews revealed that leadership was in general weak and equity and legitimacy issues did not do well.

Figure 6.2 Application of the Adaptive Capacity Wheel to Stichtse Rijnlanden (source: Leusink 2010).

The research revealed that (a) the method and research protocol is usable by other researchers. (b) The researcher made a link between the Adaptive Capacity Wheel and Corporate Social Responsibility. He concludes that an organization with high Corporate Social Responsibility may have better labour laws and procedures; but may not focus on coping with new environmental problems or with learning from past mistakes. Furthermore, authority with respect to spatial choices and with respect to decisions made on water levels is often confusing but this is not taken into account in Corporate Social Responsibility, while this does become apparent in adaptive capacity studies. (c) The researcher concluded that in an organization composed of many technical experts and technocrats, social science terms such as adaptive capacity, learning and responsibility are often difficult to understand and internalize.

Quantitative application to South Korea

The Adaptive Capacity Wheel has also been applied through a closed questionnaire to assess the adaptive capacity of South Korea by an MSc student (Ki-Yong Do 2010). Closed questionnaires in Korean were sent to stakeholders in South Korea in order to ascertain information regarding the adaptive capacity of the country. The reasons for undertaking closed questionnaires are that the researcher, a former official of the Ministry of Environment in South Korea, was unable to conduct face-to-face interviews and was afraid that 22 open questions might lead to reduced participation in the questionnaire. The approach was also undertaken to be able to assess the pros and cons of applying a questionnaire.

South Korea is an interesting case study. While it is the 9th largest emitter of greenhouse gases in the world, and is a member of the OECD; under the Climate Convention it is viewed as a developing country. As a result climate change has only recently been prioritized in national politics, and although the country promulgated a Master Plan of Adaptation to Climate Change in 2008; it remains a general and poorly financed plan. In 2010, the Government decided to establish a long term adaptation plan but this has still to be implemented.

Based on 38 questionnaires collected from government officials, research institutes, consultancies and NGOs, the data analysis showed that the institutions in the country

neither inhibited nor encouraged the adaptive capacity of society. The country scored well on resources, authority, visionary leadership and continuous access to information; others dimensions and criteria were graded as neutral (see figure 6.3).

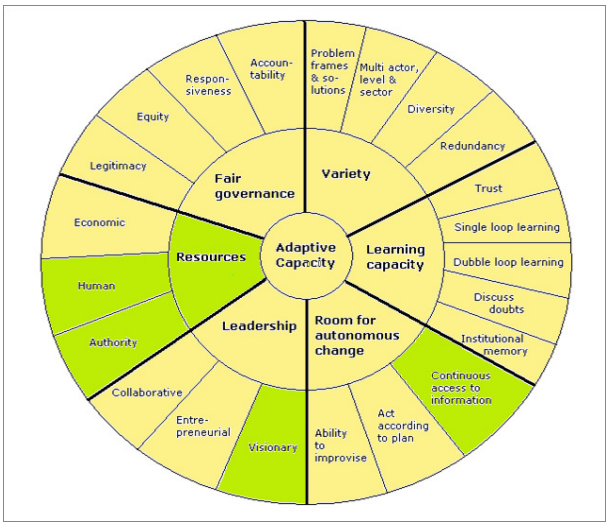


Figure 6.3 Application of the Adaptive Capacity Wheel to South Korea (source: Ki-Young Do 2010).

In interpreting the research results, the researcher argued that government officials in South Korea tend to be more positive about assessments and have a degree of nonchalance. Based on an assessment that respondents have tended to be more positive than negative and that they have tended to be neutral on issues that were not always clear to them, the assessment was modified by the South Korean researcher and his modification leads to the following corrected assessment (see figure 6.4).

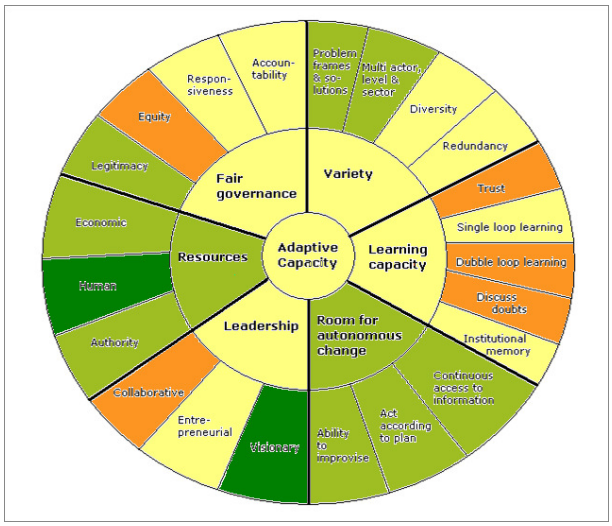


Figure 6.4 Reconstructed Adaptive Capacity Wheel for South Korea (source: Ki-Young Do 2010, IVM).

This reconstruction provides a more nuanced picture. It shows that Learning capacity is the weakest characteristic of institutions in South Korea. Leadership tends to be hierarchical and not collaborative; and equity fares poorly. South Korea is seen as

having resources and good hierarchical leadership skills and has room for autonomous change.

In the research, respondents were also asked whether they felt the criteria as appropriate for evaluating the adaptive capacity of institutions in South Asian countries. Respondents were neutral towards redundancy, single loop learning and authority; other dimensions and criteria were valued as important (see figure 6.5).

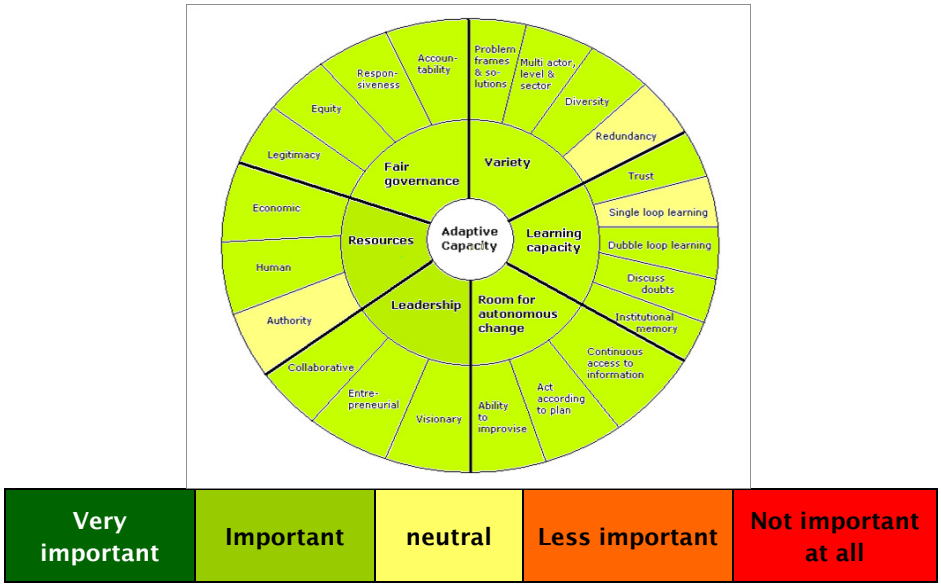


Figure 6.5 Relative importance of criteria of Adaptive Capacity Wheel (source: Ki-Young Do 2010, IVM).

The research indicates that a) the method and research protocol is usable by other researchers and (b) that it can be applied to other countries. The researcher argues further that (i) if he compares the ACW model to the Moss et al model – our model has more detail and more nuance in it; (ii) Some terms in the wheel may have a different connotation to people in other countries – authority is seen as a negative term in South Korea and is probably associated with military rule; the concept of redundancy was difficult to understand – most had not heard of it; single loop was seen as unimportant as South Korea apparently goes for double loop learning; (iv) a questionnaire provides limited scope for the interviewee to interpret the results and create a story line. The researcher also suggested that his analysis showed that the strength of the wheel was first its comprehensive approach; its ability to help policymakers identify vulnerable parts of the system and is an effective tool for communication. However, he argues that the criteria may be more "western" than "eastern" in that discussing doubts, double loop learning and entrepreneurial leadership are more consonant with Western culture than Confucian culture, that it is not clear how applications at different scales can be aggregated, that some indicators could be made stronger through the inclusion of references to country specific data (e.g. the literacy rate could be seen as important with respect to continuous access to information; the Gini coefficient[26] in relation to equity, etc. In other words, the researcher suggested expanding the Adaptive Capacity Wheel to include indicators for each criterion (see table 6.5 below).

26 The Gini coefficient is an indicator for economic inequality

Table 6.5 Possible indicators for the Adaptive Capacity Wheel (source: KiYoung Do 2010)

Dimension	Criteria	Indicators	Literature
Variety	Variety of problem frames	Level of local organization Micro-finance institutions Degree of democratization	AfDB et al (2003), Lonergan et al (1999)
	Multi-actor, multi-level, multi-sector		
	Diversity of solutions		
	Redundancy (duplication)		
Learning capacity	Trust		
	Single loop learning		
	Double loop learning		
	Discuss doubts		
	Institutional memory		
Room for autonomous change	Continuous access to information	Literacy rate Level of local organization	
	Act according to plan		
	Ability to improvise		
Leadership	Visionary		Brooks et al, 2005
	Entrepreneurial		
	Collaborative	Voice and accountability	
Resources	Authority	Political stability Rule of law	Brooks et al (2005), Moss et al (2001), AfDB et al (2003)
	Human	Dependency rate Literacy rate Enrolment in education Education expenditure as % of GNP Scientists and engineers in R&D per million population	
	Financial	GDP per capita GINI coefficient Debt repayments (% GNI, averaged over decadal periods) GNI (total, PPP) GDP growth Incidence of poverty	
Fair governance	Legitimacy	Control of corruption Rule of law	Brooks et al, 2005
	Equity	GINI coefficient Political rights Civil liberties Literacy ratio (female to male)	
	Responsiveness	Government effectiveness	
	Accountability	Voice and accountability	

Finally, the author recommended extending the wheel to specific impacts. Figure 6.6 shows two examples.

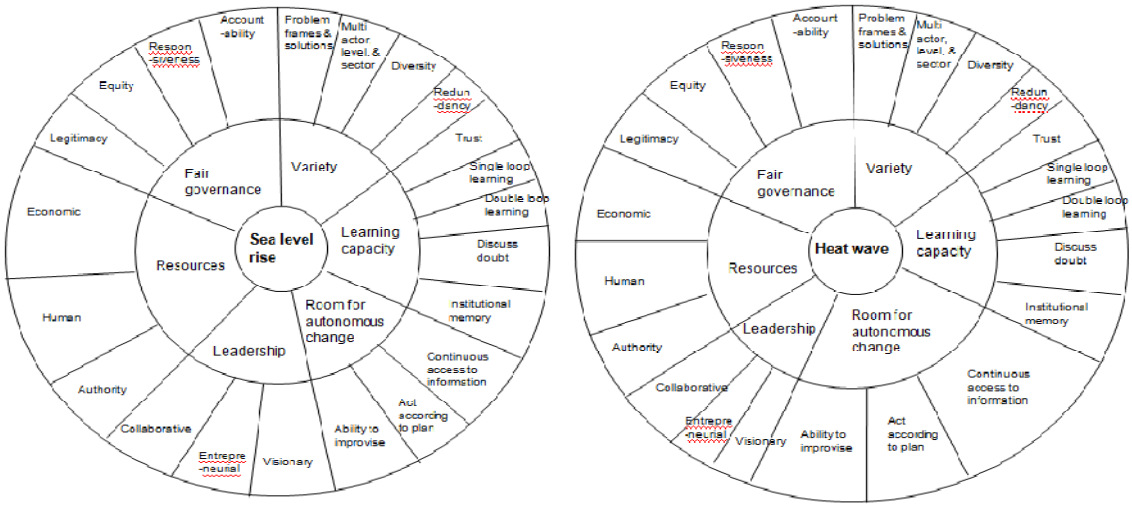


Figure 6.6 Recommended extensions to the Adaptive Capacity Wheel (source: Ki-Young Do 2010, IVM).

Qualitative application in the Bremen-Oldenburg-region

In 2010, the Adaptive Capacity Wheel was applied to assess institutions for regional planning in the Bremen-Oldenburg-region, by Maik Winges from the Oldenburg University, Germany. Interviews were held with experts, local stakeholders and decision makers. In addition, a content analysis of relevant policy documents was conducted. The Adaptive Capacity Wheel was used to sketch a profile of the strengths and weaknesses of institutions with regards to adaptive capacity. Figure 6.7 shows the results of this study. In this case, the researcher decided to add two dimensions/ criteria related to the motivation and confidence of experts to implement measures. It is also interesting to see how the concepts were translated to German. For example, authority is translated into 'macht', which equals the English concept of power.

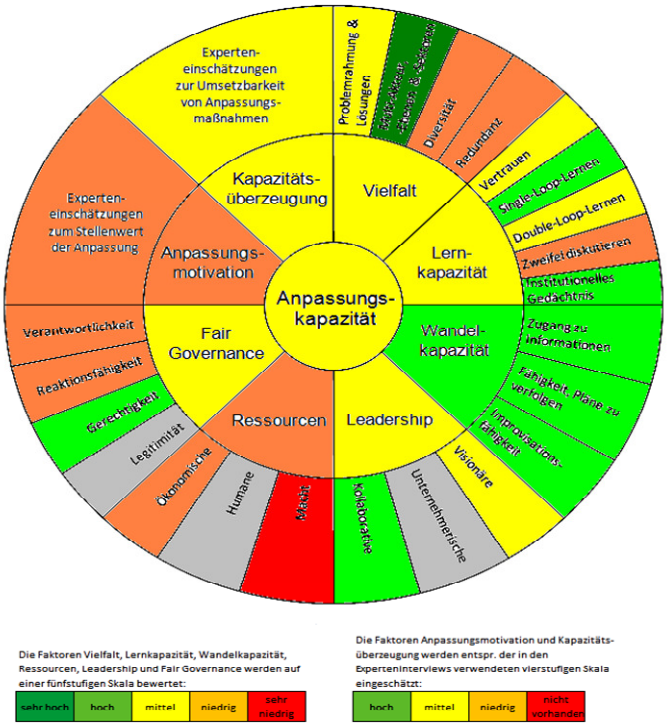


Figure 6.7 Application of the Adaptive Capacity Wheel to the Bremen-Oldenburg-region (source: Winges 2010).

6.4 Advantages and disadvantages of the Adaptive Capacity Wheel

6.4.1 Advantages

There are clear advantages to using the Adaptive Capacity Wheel. First, its elements provide a comprehensive idea overview 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. From the use of the method by people outside of the project we conclude that they generally prefer the traffic light version.

Third, the Adaptive Capacity Wheel can be used to generate semi-quantitative results. Semi-quantitative results can be used to rank, for example, 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 only become clearer when the results of the analysis with the adaptive capacity wheel are discussed in detail with the relevant stakeholders.

Fourth, the Adaptive Capacity Wheel can be used by other researchers and applied in different contexts. It can be re-interpreted within a new context and still remains recognizable.

Fifth, it can be potentially expanded to include indicators for each criterion.

Sixth, it can be tailor-made to fit specific impacts – as our case studies show.

Finally, this 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; not necessarily weakness. A concern may not be critical to the adaptive capacity of the institution – this calls for interpretive analysis. But, if it is, it needs attention.

6.4.2 Disadvantages

A disadvantage of the method is that certain terms may be perceived as 'loaded' in a particular culture (e.g. authority in South Korea); terms can also be unfamiliar in a non-social science context (e.g. learning, redundancy); or confusing (e.g. the difference between legitimacy and authority; single and double loop learning). In general it calls for term-sensitivity on the part of the researcher;

Second, can the Adaptive Capacity Wheel be applied irrespective of the scale or the target of discussion? Do different scalar levels call for different approaches? This has not become clear yet, as we did not go beyond the national scale.

Third, the Adaptive Capacity Wheel also has some interesting paradoxes: for example, we hinted before at 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.

Other critical questions are: How objective is the evaluation? Are the equal shares for each dimension and criteria in the Wheel reflective of equal weights? In response to the first question, a comprehensive coding system allows for enhanced transparency of the evaluation; even though there will always be a subjective element in it. In response to the second question, we have implicitly assigned equal weights to the 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.

Finally, some dimensions may always lead to specific outcomes. For example, the lack of resources may always imply poor adaptive capacity, but the issue is to assess this is in a relative manner and to point to the potential for change. A lack of fair governance may imply poor adaptive capacity; however, most of our cases were within one country and there were no large differences between these cases. Alternative systems of governance may be compatible with enhanced adaptive capacity.

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.

6.5 Conclusions

The aim of this research was twofold. First, this research aimed to elaborate on a method to assess the inherent characteristics of institutions to promote the capacity of society to adapt to climate change. Second, this research aimed to apply this method to the institutional context in the Netherlands to evaluate the extent to which Dutch institutions enhance (or hinder) the adaptive capacity of Dutch society. This chapter reports and concludes on the first aim, i.e. the method. It provides an answer to the first research question: How can the adaptive capacity of Dutch institutions from local through to national level to deal with climate change be assessed?

The project team has developed an analytic tool to assess the inherent characteristics of institutions in terms of adaptive capacity: the Adaptive Capacity Wheel (see chapter 2). This wheel was tested within the research project in a semi-quantitative content analysis of policy documents that assessed the formal institutional context and in four qualitative case studies that assessed the informal institutional context. The Adaptive Capacity Wheel has also been applied in research outside of this project.

On the whole, the research concludes that the Adaptive Capacity Wheel provides a sound qualitative method to assess institutions in terms of adaptive capacity. The wheel is able to capture the institutional factors determining the adaptive capacity of a society. It does not aim for objective results, but like many other methods in social sciences, it provides a transparent research approach and verifiable results.

The Adaptive Capacity Wheel can be used as a representative tool as well. 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. Comparing the results of policy sectors in an aggregated way may stimulate cross-sectoral learning on how institutions in each sector are built. However, the Adaptive Capacity Wheel alone should not be left to the reader's interpretation The coloured wheel should always be accompanied by an explanation which provides meaning to the analysis.

The Adaptive Capacity Wheel may be used beyond the problem of climate change. It could be expanded to assessing the capacity to deal with other long-term unstructured problems and can be tailor-made to fit specific problems.

7 Integrated analysis: The ability of Dutch institutions to enhance the adaptive capacity of society

7.1 Introduction

The scientific evidence shows that climate change is an ongoing process and society will have to continuously adapt to cope with the impacts of climate change. We chose to study this phenomenon through the concept of adaptive capacity. Our empirical focus was on the institutions in the Netherlands in four sectors – agriculture, spatial planning, water and nature.

We identified three key questions:

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

Chapters 2 and 6 have dealt with the issue of methodology and thereby answer the first question and related sub-questions on the criteria for an institutional infrastructure that is able to respond adequately to climate change. Chapters 3 and 4 dealt with the second question through sub questions: - How can one map the institutional context in the Netherlands; what are the most important adaptation strategies that should inspire changes in the institutional framework; and what are the various institutions that should deal with climate change, and which ones actually do so? Chapter 5 dealt with the following set of sub-questions: How can regional and local actors use and interpret the institutional framework of spatial planning to implement climate adaptation strategies? How do private and public actors deal with the possibilities and restrictions in practice and to what type of autonomous developments may this lead? What are the underlying patterns in the Dutch context? How does horizontal and vertical cooperation work in practice? Are citizens and the private sector involved? Are there indications that resources are taken care of (financial, knowledge)?

This chapter aggregates all previous results to answer the third research question. It assesses the policies and the results of the case studies (see 7.2) This section 7.2 first provides an overview of the evolution of adaptation policy in the Netherlands (see 7.2.1). It elaborates on the barriers in the development of such policies (see 7.2.2). It goes on to comparatively assesses formal adaptation policies (see 7.2.3), and assesses adaptation practices in four case studies (see 7.2.4). Then it tries to see how the policy assessment relates to the case study assessment (see 7.3). Finally this chapter draws conclusions (7.4) and provides recommendations how the institutional framework could be improved (7.5).

7.2 Assessment of Dutch adaptation policy

7.2.1 Development of adaptation policies

The low-lying Netherlands have been coping with the sea-level since the 12th century and hence dealing with water related issues is institutionalized into the psyche of the

country and its citizens. As a relatively small, highly organized and developed country, the Netherlands have a history of active policymaking in arenas that are akin to climate change policy.

Table 7.1 below shows that most European countries have adopted adaptation policies in the period 2005-2009. The Netherlands was the fourth country to adopt a formal adaptation policy in 2007.

Table 7.1 Overview of the national adaptation strategies of Europe (source: Biesbroek et al. 2009).

Country	National Adaptation Strategy (NAS)	Year	Responsible for the development of the NAS
Denmark	'Strategi for tilpasning til klimaændringer i Danmark'	(2008)	Ministry of Environment, shifted in 2008 to Ministry of Climate and Energy
Finland	'Finland's National Strategy for Adaptation to Climate Change'	(2005)	Working group for preparing the NAS under the Ministry of Agriculture and Forestry
France	'Stratégie nationale d'adaptation au changement climatique'	(2007)	National observatory dedicated to the effects of climate warning (ONERC); Interministerial delegate for sustainable development
Germany	'Deutsche Strategie zur Anpassung an den Klimawandel'	(2008)	Environmental Ministry supported by the Federal Environmental Agency
Hungary	'Nemzeti Éghajlatváltozási Stratégia'	(2008)	Not included in study
Netherlands	'Maak ruimte voor klimaat!'	(2007)	Adaptation to climate change in spatial planning (ARK) programme, co-ordinated by the Ministry of Housing, Spatial Planning and the Environment
Romania	'Ghid privind Adaptarea la Efectele Schimbărilor Climatice'	(2008)	Not included in the study
Spain	'Plan de nacional de adaptición al cambino climático'	(2006)	Environmental Ministry; National Office for Climate Change
United Kingdom	'Adapting to climate change in England. A framework for Action'	(2008)	Department for Food, Rural Affairs and the Environment (DEFRA)

Adaptation strategies are not limited to one or two policy documents but are integrated into a number of sectoral documents and the Netherlands has been actively engaging in different types of adaptation strategies since the early 1990s. Table 7.2 provides an overview of general adaptation measures in the Netherlands (Chapter 3 has discussed 93 adaptation policies extensively). Dutch adaptation policy has taken twenty years to reach a certain degree of maturity and while early documents in the water sector did mention climate change, the other sectors have only slowly taken climate change into account, while the nature sector still has to do so. It is a sector with outdated laws, mostly springing from the European Union Directives.

Table 7.2 Chronology of general adaptation measures in The Netherlands.

Year/ Type	Institution	Focus
1993 Law	Environmental Management Act	Not on climate change; but can be adapted: includes EIA, standards, permits, reporting, enforcement rules; subsidies, taxes, compensation
1998 Law	Compensation of damage in case of disasters and accidents	Safety net for large scale events
2000 Monitoring	Environmental balance	Takes climate change into account
2004 Science	House of Representatives: Climate Change Report	Mitigation; Adaptation discusses dealing with floods and droughts and an adaptation fund for developing countries
2001 Policy	Ministries: National Environmental Policy Plan – 4	Adaptation inadequately covered
2005 Motion	House of Representatives: Lemstra Motion adopted	Spatial policy should take climate change into account; FES (Economic Structuration Fund) money should be used also for knowledge infrastructure
2006 Policy	Agenda for the Future (VROM 2006b)	Changes responsibilities for climate change; more responsibility on the citizen
2006 Policy	Government: Think Ahead Campaign	Extreme weather events and floods and the role of individuals
2006 Advice	Scientific Council for Government Policy	Adaptation is a 'no-regrets', regional option; link spatial planning to water sector;
2006 Policy	Collaborative programme: ARK	Climate proof Netherlands for nine sectors through spatial planning;
2007 Science	The Netherlands Environment Assessment Agency	Focus on obvious and latent risks; Policy should deal with uncertainty
2007 Science	Collaborative research: Route planner	Lists 96 different options for climate proofing; stakeholder participation
2007 Advice	VROM Council Report	Uncertainty calls for structural, offensive and flexible long term options; need for watchdog
2007 Policy	Collaborative programme: National Adaptation Strategy	Adaptation is a spatial issue; compartmentalize risk; use ecological processes; Hard measures; need for large scale investments
2007 Policy	Cabinet: National risk strategy	Identifies climate risks: floods, droughts, flue pandemic; crisis management involving differentiated roles for government and citizens.
2007 Policy	Cabinet: Working Together, Living together	Climate proofing through spatial framework
2007 Policy	Central government & municipalities: Climate agreement	Adaptation important in spatial planning, water management and health care
2010 Law	Law on Safety Regions	Allocation of responsibilities to deal with calamities

The assessment of the sectoral policies reveals that there is a major shift in the trends in adaptation approaches in the Netherlands. Five shifts can be identified (see section 3.8 for details):

- From ad hoc incremental sectoral policy to sectoral-integrated: policies in the four sectors led to incremental ideas introduced through new strategies, policies and laws but these are being increasingly integrated in, for example, the National Water Law and the Rural Areas Development Policy and Law. Possibly the next step is cross-sectoral integration.
- From not a priority through no regrets to priority: while initially sectors took cognizance of the climate change problem, adaptation was not a priority. This is changing as more and more policies are adopting no regrets adaptation measures (CWM 1999; WRR 2006) and are moving towards prioritizing such adaptation measures (van Drunen 2007);
- From technological and technocratic to post-modern concepts: the Netherlands is well known for having created its own land and the relative success of engineering and social engineering concepts in keeping people's feet dry has been successful in the past; there is a shift towards dynamic post-modern concepts – dynamic coasts (V&W 2000); room for the river (V&W 2000); ecological corridors (EHS); climate buffers and multi-level security.
- From top-down, paternalistic through decentralization and individual responsibility to a new balance: While policies tended to be top-down with government being paternalistic, there is a shift towards emphasizing decentralization and/ or individual responsibility where this is possible (Think Ahead Campaign, 2005; Agenda for the Future 2006).
- From adaptation strategy to adaptation capacity: Finally, there is a noticeable shift from a focus on individual adaptation measures to moving towards establishing adaptive capacity.

Table 7.3 Trends in national adaptation approaches.

Trends	1990s	2000s	Post 2000s
1	Ad hoc incremental sectoral policy	Sectoral integrated	Multi-sectoral integrated?
2	Non-priority	No-regrets	Priority
3	Technological and technocratic	Combined with post-modern concepts (at least in terms of rhetoric)	?
4	Top-down consensus	Decentralization – more responsibility for the citizen	New Balance?
5	Adaptation strategies	Adaptive capacity	Adaptive and Mitigative capacity?

7.2.2 Barriers in the development of adaptation policies

There are clearly a number of barriers in the development of adaptation policies (Biesbroek (forthcoming). A questionnaire to assess these barriers in the water, spatial planning and energy sectors was sent to 890 experts in the field in the Netherlands (and the UK) and based on a 30% response from 200 men and 64 women certain results were ascertained.

- The ten biggest barriers are first, short-term thinking and attitudes of policymakers related to the long-term scope of the problem (3.26); second, a conflict of interests

of policymakers (2.89); third, unclear social costs and benefits of different measures (2.88); fourth, lack of resources (2.83); fifth, lack of climate awareness (2.82); sixth, competing short-term problems (2.77); seventh, no long-term caretaker of the climate risk (2.71); eighth, dependence on other actors (2.67); ninth, the reactive approach of policymakers (2.65); and tenth, low interest in long term impacts (2.65).

- There are noticeable differences between the different actors interviewed as to the degree of importance they give to a specific barrier. Policymakers see the second to fourth, seventh and eighth issues as more important than other categories; the private parties see the first, fifth and tenth and as most important and scientists see the sixth and ninth as most important.
- The least important barriers are scientific jargon (1.91); turf battles between ministries on adaptation policy (1.89); distrust in the adequacy of adaptation policy (1.88); lack of science (1.77); too many experts in the field (1.74); too little time (1.73); too many actors in the field (1.68); too few policy options (1.60); large difference of views between actors (1.68); and the lack of technological options (1.45).

7.2.3 Comparative assessment of formal policies and instruments

An important part of the IC12 research is formed by a comparative assessment of 23 Dutch policies and policy instruments (laws, regulations, etc.) to analyze the formal institutional context in the Netherlands on the extent to which the institutional context enhances the adaptive capacity of society. The 23 policies and policy instruments were selected based on their relevance for adaptation to climate change in the Netherlands. All 23 policies and policy instruments were assessed along the the Adaptive Capacity Wheel and then comparatively analyzed.

Table 7.4 depicts the Adaptive Capacity Wheels for different levels of governance, Table 7.5 shows the Adaptive Capacity Wheels for different sectors in the Netherlands.

Table 7.4 Comparative assessment of policies relevant for adaptation at different governance levels.

International	European	National
Natura 2000	Water Framework Directive	National Adaptation Strategy
		
Common Agricultural Policy	Flood Risk Directive	National Safety Strategy
		
	EU White Papter on Adaptation	
		

Table 7.5 Comparative assessment of sectoral policies relevant for adaptation

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

The conclusion is confirmed that in each sector, specific paradigms are present that determine the nature and focus of the policies and laws in each sector. The water sector scores generally well reflecting the century long experience in coping with water related issues as well as significant learning and implementation of new paradigms. The agricultural sector tends to focus on providing the farmers the tools and knowledge to be able to effectively operate in the market and cope with the impacts of climate change and is more decentralized compared to the more centralized steered process of water management. The nature sector is more rigid and focused on in-situ preservation and takes little account of the dynamics of nature and the impact of climate change on natural habitats. 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.

In terms of the different dimensions, the majority of regimes use multiple problem definitions except the nature and agricultural sector – the former because of its faith in nature reserve systems; the latter in free markets. All tend to focus on efficiency at the cost of redundancy – while redundancy is a key element of any adaptive strategy that has to deal with uncertainty.

In terms of learning, most regimes have made place for doubts and single loop learning; double loop learning is a challenge even in the water sector.

In terms of room for autonomous change, access to information is not well organized in many EU directives, and the nature and agricultural sector. Documents with sufficient rules and procedures do provide room to act according to plan; but may have less room for autonomous adaptation.

In terms of leadership, most score well in terms of visionary leadership, but only few do well in terms of entrepreneurial leadership, possibly because of the incompatibility between the subject matter and the type of leadership. The National Safety Strategies does not score well on visionary leadership.

In terms of raising resources, this does not appear to be a key bottleneck; particularly the Water sector appears well equipped to deal with these issues.

In terms of good governance, most policies score well except in the nature sector. Nature policies are legitimated with EU directives and structural monitoring of results provides a level of accountability; however, responsivity to society is low. Accountability appears to be a challenge in other sectors. Equity issues could be an issue – but the research does not provide adequate indications one way or other.

7.2.4 Comparative assessment of the practices – the case studies

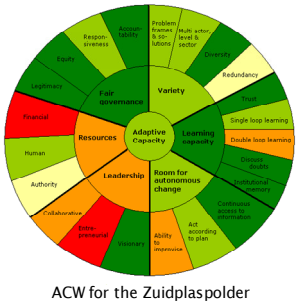
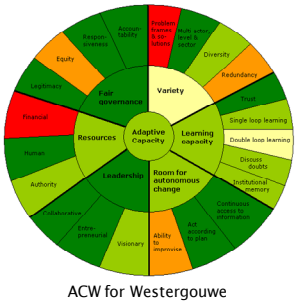
In order to assess informal institutions and the translation of policies into practice four case studies were analyzed (see Chapter 5 for details). Table 7.6 provides a brief overview of the case studies.

Table 7.6 Case study selection.

	Individual Responsibility	Wadden Sea	Building in low lying areas	Water security
Different spatial scales	Local	National	Local to regional	National
Spread between the sectors	Water, urban, agriculture, spatial planning	Nature, water, spatial planning	Water, spatial planning	Water, nature, agriculture, spatial planning
Main focus	Individual responsibility in water management	Protection of ecosystems and biodiversity	Multi-layered safety	Environmental security

The comparative assessment of the Adaptive Capacity Wheel of the four case study areas is provided in Table 7.7 below.

Table 7.7 A comparative assessment of case study material.

Case	Application
Individual responsibility	 ACW for Zaandam  ACW for Delft  ACW for De Wijde Wormer
Wadden Sea	 ACW for the Wadden Sea Region
Building in low lying Areas	 ACW for the Zuidplaspolder  ACW for Westergouwe

Case	Application
Water Safety	 ACW Room for the River  ACW Flood Risk Approach  ACW Second Delta Plan

7.3 How policies relate to practice: Some cross-cutting issues

7.3.1 From government to governance

At the start of the project we asked the question: What role does the development from government to governance play with regards to climate change adaptation? What are the general expectations of 'governance style' public management? Is multi-level governance applicable to the issue of climate change? How can the governance style best be applied? A related question is: How does the concept of decentralisation in Dutch spatial policy relate to the centralised approach in climate policy? What are the differences between short-term and long-term policy goals?

The research shows that uncertainty calls for a variety of problem definitions and solutions and multiple actors. However, where there is too much variety, there is often inadequate steering and leadership. In such situations the implementation of long term adaptation strategies may be incomplete and there hence the adaptive capacity may be low. Furthermore, the exclusive focus on cost-effectiveness over and above redundancy tends to ignore the fundamental nature of the uncertainty of the problem. There needs to be strong leadership to ensure (a) comprehensiveness of the response; (b) redundancy in the process; (c) access to information and (d) that stakeholders are able to act to protect their own interests. In other words that the sum of the individual parts adds up to more than the total needed. This problem is specifically brought to the surface by the Wadden Sea case study.

7.3.2 Spatial claims

We were also concerned to understand what an effective and efficient climate policy in the sectors - water, nature, agriculture and urban development - imply for the development of spatial policy? Our research tends to show that the tendency to be efficient and optimal implies that we want to use every single inch of the available land and that discussion of – should we build in vulnerable areas – is taboo in the Netherlands. The multi-layer case study on spatial policy reveals this clearly. At the same time, the efficiency drive leads to innovative ideas such as the room for the river concept – which leads to multiple goals for specific land areas; ecological corridors and dynamic coasts. The question of course is: to what extent will this be implemented in practice?

7.3.3 Sectoral priority to climate change

A third set of questions focused on: How do (European), national, regional and local actors interpret climate policy? In which organizations is climate change on the agenda, one way or another? How do different stakeholders deal with possible risks? Are they using climate change scenarios? What time horizon do they use in their planning? Which actors are trying to integrate climate policy and spatial policy into existing institutions, and what are their strategies (for example, at which administrative level, with what type of instruments)? Who is formally responsible for implementation of the most important adaptation strategies? Are there regional differences, for example regions in which climate change is higher on the agenda, or regions with innovative network approaches? Is there a consensus, or a structured debate towards consensus, about policy goals?

The short answer to these questions is that the nature sector has to go a long way in trying to incorporate climate change adaptation into its strategy. Its focus on *in situ* protection will fail, unless one converts nature reserves into zoos. Species are moving northwards and action has to be taken to take this into account. The water sector (coastal defence and river management) tends to have a long history of institutionalization and experience and the state takes a paternalistic role here. In terms of storm water and ground water, there is an effort to transfer responsibilities to the citizen but these are inadequately delineated. Agriculture can adapt continuously to climate change with the same institutions that allow it to adapt to changing markets. Institutions of spatial planning are formally meant to generate tailor made solutions; however, decision processes often are so slow that it is hard to incorporate new ideas.

7.4 Conclusions

This chapter has focussed on answering the third research question guiding the IC12 research: This leads to the identification of the overall research questions: How can the adaptive capacity of Dutch institutions from local through to national level to deal with climate change be assessed? What are the key implications of undertaking such an assessment? *What general and specific recommendations flow from such an assessment, both in terms of institutional design theory and in terms of policy?*

Our research comes to the following conclusions.

First, the Netherlands has a long history of coping with water problems. This has led to an accumulation of expertise in this area. There is a saying that God made the world and the Dutch made the Netherlands. With engineering marvels such as the 32 kilometre Afsluitdijk that transformed a North Sea inlet into a freshwater lake, the Neeltje Jans and in more recent years the Maeslant Barrier, floating houses along the Meuse, 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, show that the Dutch have a high pedigree when it comes to coping with the vagaries of nature. This to the extent that nature becomes 99% managed and the value of the remaining nature becomes contested. A famous Dutch poem says: ‘And what remains of nature in this land, a forest that has the size of a hand’ (Bloem 1965). Luckily, the paradigm change in the water sector also promises more room for nature.

Second, five trends are clearly visible in the evolution of national adaptation policy: (a) a shift from ad hoc incremental sectoral policy to more sectoral 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 more transfer of responsibility to individual residents and (e) a shift from adaptation to building on adaptive capacity.

Third, the comparative assessment of the sectoral policies leads to the identification of different paradigms in different sectors. These different paradigms have occurred partly because of the different historical evolutionary processes that these policy fields have undergone. For example, water governance in the Netherlands was traditionally dominated by a Delft University of Technology-oriented approach. This paradigm has been changing under the influence of the trends described above, but still a proper calculation will always be the basis of Dutch water policy. Also, 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. Furthermore, the Dutch have been able to master their environment to such an extent with engineering measures that they are now able to discuss the possibility of social and ecological engineering to provide more space to nature and be more fluid in their protection standards. The Nature regulations of the European Union appear to be more rigid and static, more top-down and unable to cope with the notion of a fluid 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 and implementing them in national legislation 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 (in the Netherlands: the nature we had 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 and policy intervention only when a social and/ or ecological problem was signalled. The farmers have traditionally coped with climate variability throughout history. The paradigm in the agricultural sector appears to be to provide farmers with information inputs and financial incentives and to help them become more adaptive. The EU Common Agriculture Policy, however, has been quite rigid in stimulating certain crops and products; this is now under reform and may reflect more knowledge of climate change from 2013 onwards. The spatial planning process is much more densely regulated and has multiple tools and instruments at its disposal – but these can also be experienced as highly constraining when it comes to adaptation to climate change. The main paradigm in Dutch spatial planning is to accommodate urbanization processes; developing new locations is an important source of income for most municipalities. Because all the good building locations are already taken, this results in developing unsuitable and marginalized locations, also from the climate change viewpoint. Attempts to make this sector less rigid are evident in the new Spatial Planning Act (2008) and the tools of Project Decisions. Changing the urbanization paradigm will not be easy.

Fourth, the comparative analysis reveals that in general, the formal Dutch institutions can be expected to perform quite well in enabling Dutch society to adapt to climate change, even when climate change is not explicitly taken into account, like in agriculture and spatial planning. When climate change is taken into account, this improves adaptive capacity even further, as the water sector shows. The nature institutions are the weakest in adaptive capacity; it scores low on many dimensions and criteria.

Fifth, the comparative analysis also reveals that there also are some weak points in the overall picture: (a) redundancy is given less priority than efficiency in most sectors; (b) although climate change adaptation is likely to have major equity implications within the country, this has not so far been taken into account; and (c) long term resources may be in short supply. .

Sixth, there is no comprehensive approach to dealing with adaptation in the Wadden sea; and the sum total of individual ad hoc efforts combined with a more rigid European and national legislation in this field indicates that this is a neglected area of nature management in the Netherlands, despite the uniqueness of the ecosystem and despite all that is said and written about the Wadden Sea.

Seventh, the assessment of water safety in the Netherlands examining the room for the river project; the flood risk approach; and the second Delta plan reveals a number of strengths: there is a lot of variety in problem definition and solution, greater engagement of social actors, the willingness to experiment, the creation of awareness in and relations with other sectors including spatial policy; and the establishment of unique instruments including the Delta Fund to deal with water safety. However, there are also a number of weaknesses – the successful experience with and reliance on technological and technical methods implies that other more experimental approaches are not adequately implemented – creating an institutional lock-in. (ii) The state has assumed a paternal role of guaranteeing the safety of the citizens and this may lead to a certain degree of 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. (iv) An exclusive focus on probability reduction has implied less synergies between collaborative and entrepreneurial leadership. Finally, although there are resources for state run water safety; there are few resources for other types of inclusive approaches to water safety.

Eighth, in relation to storm water, there is a strong emphasis on transferring responsibilities to house and land owners; in practice this creates a lot of confusion. Such confusion relates (a) to the lack of awareness of home and land awareness about the existence of such a rule; (b) the lack of awareness on ground water level on non-farming land owners; (c) the inability to actually take action on the part of non-farming land owners and (d) the willingness of municipalities to sometimes step in and solve the problem, which further creates new confusion in the minds of residents as to who is responsible.

Ninth, the case study about building in low-lying areas builds on the flood risk approach and the concept of multi-layered safety. Its examination of spatial planning institutions at national level, the Zuidplaspolder and Westergouwe reveals that spatial planning institutions are highly path dependent. There is a strong focus on technological climate proofing of spatial structures rather than encouraging the development of tailor made solutions and moving out of the more vulnerable areas. At regional and local level there is a much greater space for and use of variety – variety of problem definitions and solutions; however, synergies with national level are low. The key question: should we be building in the most vulnerable areas is still implicitly answered with: yes.

Tenth, the application of the Adaptive Capacity Wheel by project member and non project members (to the Stichtste Rijnland in the Netherlands and national policy in South Korea) have revealed that this is an interesting science-policy instrument with considerable potential. Most of its weaknesses can be dealt with through methodological thoroughness in the tradition of good social science.

At the start of this project, the research team has identified eight assumptions. Below, we reflect on these assumptions and identify the lessons learned in this project. Our assumptions at the start of this project were:

1. The need to adapt to climate change requires changes in the Dutch system of institutions for governing land use, nature, agriculture and water.
    - This assumption is partly true; considering the conclusions above, some sectors might need to change more than others to be able to cope with the impacts of climate change
2. Which institutions this concerns, and how they should be changed, is not yet known, and there is no assessment method for it.
    - This assumption was correct and therefore we have designed the Adaptive Capacity Wheel as a method to assess institutions in terms of adaptive capacity.
3. A method to assess the degree to which Dutch institutions are climate-proof can be developed, and is useful for prioritizing institutional changes in order to adapt to climate change.
    - As the above conclusions show, the Adaptive Capacity Wheel can be used as a diagnostic tool and is able to indicate where there is a need for improvement. The use of colours (green to red) enhances this diagnostic function.
4. Such an assessment method could, in principle, be also useful for other nations around the world.
    - The application of the Adaptive Capacity Wheel in South Korea and Germany show that in principle, the wheel can be globally applied; however, the application in South Korea did indicate some western biases. The method itself is adaptive, hence can be tailor-made to fit specific problems or contexts.
5. An institutional system that aims to deal with the problem of climate change needs to be a multi-level system: from local to global, aiming at short and long term impacts, with complementary and mutually consistent action taken at different levels.
    - Especially the case studies show that this assumption is true. However, the formation of an effective multi-level governance structure takes many years (even decades) as is shown by nature and spatial planning cases.
6. Climate change can be characterized as a complex, ill structured or wicked problem. Therefore, more horizontal forms of governance, inter-organizational cooperation and interactive policy processes are needed to deal with the growing complexity of such an ill-structured problem in an effective way.
    - We have aimed to identify criteria to deal with complex and unstructured problems, like multiple problem frames, the involvement of different actors, a diverse range of solutions and redundancy, but the future has to show if these criteria are sufficient.
7. The shift from government to governance causes threats, and at the same time it offers opportunities for adaptation to climate change.
    - The case studies show that with the shift from government to governance, more social actors are involved in adapting to the impacts of climate change. This creates opportunities in terms of enhancing variety, human resources, financial resources and learning; however, pitfalls are confusing governance rules on responsibilities and accountability, no clear authority and difficulties with institutionalizing learning processes.
8. Smart or clumsy combinations of more informal adaptive bottom-up governance strategies and formal top-down government strategies provide good opportunities to deal with climate change.

- The Adaptive Capacity Wheel incorporates the idea of a balance or tension between dimensions and criteria of adaptive capacity. For example, both authority and collaborative leadership, and both the ability to act according to plan and a variety of solutions, are seen as important factors in determining the extent to which an institution enhances the adaptive capacity of society. Again, the future has to prove whether the Adaptive Capacity Wheel has identified all important factors.

7.5 Recommendations

Based on our conclusions and lessons learned about adaptive capacity in the Netherlands, the project comes up with a number of recommendations.

In terms of the usability of the Adaptive Capacity Wheel it concludes that:

- The use of 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. It can help further professionalize and internalize the learning capacity, mobilizes practical knowledge from the policymakers themselves and may generate more support for the implications of these analyses.
- The ACW can be a useful tool for international benchmarking, for structuring information to facilitate comparison.

In terms of general policy recommendations, we recommend 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' (a higher level law that threatens to intervene when social actors do not come up with solutions themselves); There is 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 as an indiscriminate reflex and embrace redundancy as a principle in some cases. Redundancy is expensive and politically challenging especially in times of recession where duplication of services is minimized and public bureaucracies streamlined. We recommend that 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 the kind of leadership which ensures that variety and multiple levels of governance are optimized to and focused to address the challenge of adaptation. There needs to be room for leadership to emerge at different levels of governance that encapsulate visionary, collaborative and entrepreneurial leadership.
- Single loop 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. Such learning can be promoted through the shadow of hierarchy such as a Climate Act.
- There is a need for clear framework conditions for climate adaptation 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 also has to accept the fact that it cannot address all adaptation challenges alone, and needs to create institutionalized support for civil society to take action. It is not enough to transfer responsibility formally to citizens; there is also a need for support and capacity building to ensure that residents can take action through 1) giving residents access to relevant climate adaptation information; 2) assessing new policies on the potential negative effects on reducing the room for autonomous change and improvisations and 3) enabling self organizing communities.
- The long-term nature of the problem of climate change calls for a reserve of 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 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 and national 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 building and to reconsider the need for continuous expansion of urban areas.
- 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 also reduce flood exposure and flood vulnerability at the same time; good evacuation strategies and flood proofing urban areas are critical recommendations.
- 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.
- The confusions regarding individual responsibilities in local water management should be removed. Although recent legislative changes have clarified responsibilities in local water management, there is still lack of clarity. There is a clear role for municipalities to take the lead in negotiating and communicating the differences in responsibilities and in creating the circumstances under which these can be improved.
- The accumulation of expertise creates confidence in the ability of the Netherlands to be able to rise to any challenge. On the other hand, one can question whether the Dutch have become over confident. Clearly, climate change is a complex problem, and the solutions chosen are also complex and pluralistic. The complexity of the entire process raises the hope that society as a whole can be empowered to deal with climate change impacts. However, the fear is that adaptive efforts may be dissipated between different actors and individuals and that the collective action may not amount to more than a sum of the individual acts. The VROM Council warned of this and called for the establishment of a watchdog to monitor the entire process (VROM Council, 2007). Interaction with foreign initiatives in climate adaptation may keep the Dutch alert and self-reflexive.

Finally, we recommend some topics for future research:

- Further use of the tool and evaluation how this changes practices: does it lead to enhanced adaptive capacity?
- A similar study of the adaptive capacity of sectors that are important but were not included in this project, such as industry, energy, and transport.
- More research is needed in the role of informal institutions in adaptation to climate change.

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Chapter 1

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