

2009 Amsterdam Conference on the Human Dimensions of Global Environmental Change
'Earth System Governance: People, Places and the Planet'
<http://www.earthsystemgovernance.org/ac2009>

Provisional panel and time slot for presentation:

**Adaptiveness, Panel 7: Regional Adaptation to Climate Change 17.30 – 19.00 Adaptiveness,
Thursday, 3 December 17.30 – 19.00, Room: 7, Volendammerzaal
Chair: Victor Galaz (tbc), Stockholm Resilience Centre, Sweden**

Disclaimer: Dear reader, **this is a draft paper.** The paper summarises main finding without (cl)aiming to be a comprehensive overview of development in the Dutch Delta Program or a full research paper.

At the ESG Conference, the authors suggest to discuss with the conference participants:

- What is the involvement of social scientist in the contemporary creation of governance?
- What are opportunities to strengthen in particular the **adaptiveness** of Dutch water governance (in relation to the case study presented below: the implementation of the Delta program)

Mainstreaming climate adaptation into water management in the Netherlands: The governance of the Dutch Delta Program

Authors

Saskia E. Werners (werners@mungo.nl; saskia.werners@wur.nl), Kaj van de Sandt, Fons Jaspers

Team ESS-CC (Earth System Science-Climate Change)
Wageningen University and Research Centre
PO Box 47, 6700 AA Wageningen, the Netherlands

Abstract

Whereas the literature on adaptation is rich in detail on impacts, vulnerability and limits to adaptation, less is known about governance systems that facilitate adaptation in practice. This paper offers preliminary conclusions on the constraints and opportunities for mainstreaming adaptation to climate change into water management in the Netherlands. We use the term mainstreaming for the integration of adaptation actions into ongoing sectoral planning to reduce climate vulnerability. In particular we look at the integration of climate adaptation and water management, currently underway in the implementation of the Dutch Delta Program. The Delta Program is an integral policy program executed by the Dutch Ministry of Transport, Public Works and Water Management, the Ministry of Agriculture, Nature and Food Quality and the Ministry of Housing, Spatial Planning and the Environment. The paper analyses the current implementation of the Delta program in the Netherlands according to the dimensions of the Earth System Governance framework: Architecture, Agents, Adaptiveness, Accountability, Allocation and Knowledge. The analysis suggests that all five governance dimensions are considered to capitalise on opportunities for successfully planning and implementing the Delta Program and its subprograms. Architecture gets most attention at present, but the implementation depends on the subprograms and varies over time. Program bodies generally bring together government agencies from different levels of government (national, provincial, municipal and water boards). A challenge for the new emerging program bodies is to move towards legitimate, accountable and adaptive governance. The program so far has little attention for coalitions of government actors and non-government actors or conferring accountability to stakeholders. One of the aims of the Delta Program is innovation of water management. At present science has few strategies analysed or tested to support this innovation. Typical advice includes encouraging innovation through a rich variety of experiments and transition approaches that probe possible directions. Although the Delta Act provides in setting up experiments, financial support is conditional on co-financing and so

far subprograms do not plan for such experiments. The fragmented implementation of the delta program could be turned into advantage by recognising different subprograms as a set of experiments, from which actors can learn. The analysis suggests more attention could be given to experiments that test and debate new ideas through collaboration between recognised actors from civil society, policy and science. Promising options for pilots could be the integration of agro-environmental land use systems that regulate regional climate impacts on water systems with new technologies, organisational responsibilities and financial instruments. Here governance faces creating flexible financial instruments that facilitate benefit- and burden-sharing, social learning and that support potentially better-adapted new strategies rather than compensate for climate impacts on existing activities. A challenge remains how to scale up regional pilot results to what is required for long-term national safety.

1 Introduction

In 2007 the Dutch government appointed a committee -- the second¹ Delta Committee -- with a broad mandate and long term time horizon (2100-2200). The Delta Committee was established as part of the government's Vision for Water (approved by Cabinet on 7 September 2007). Chaired by former minister Prof. Cees Veerman, the committee was asked to evaluate the potential effects of climate change in the Netherlands and to propose measures to "climate-proof" the country: to keep it safe from flooding, while preserving its status as an attractive place to invest in, work and live (Kabat *et al.*, 2005; New Delta Committee, 2008; Kabat *et al.*, 2009).

In view of climate change, the committee concluded that for safety precaution a regional sea level rise of 0.65 to 1.3 meters by 2100 and of 2 to 4 meters by 2200 should be taken into account. The sea level along the Dutch coast has already risen by approximately 20 centimetres over the past century. "Climate change is now forcing itself upon us: a new reality that cannot be ignored," the committee wrote in its report (New Delta Committee, 2008).

The Dutch population generally has great faith in the capacity of its engineers and its government to protect them against flooding. The committee concluded that the Dutch can continue to live in their flood-prone delta region, yet urgent action is needed to improve protection, as current standards of flood protection will become out of date, and in some places, even the current standards are not met. The committee formulated a list of recommendations that were discussed in Parliament and various levels of government (Ministerie van Verkeer en Waterstaat, 2008). It recommended measures such as raising flood protection levels in all diked areas by a factor 10 and creating a special delta fund to be supplied from loans and the transfer of some of the country's natural gas revenues, to a total amounting to one percent of gross national product. The cost of the Delta Program is estimated at EUR 1200 million to EUR 1600 million per year until 2050.

The Committee emphasised that the challenges ahead offer significant opportunities to integrate water safety with economic development, spatial planning and the development of the natural environment. Here the committee builds on present national adaptation strategy (ARK, VROM, 2007) and the water management policy 'Room for the River' (Ruimte voor de Rivier, V&W, 2006). The Room for the River policy from the 1990s had already asked civil engineers and water managers to change their routines. Near floods the 1990s and the first projections of climate change, underlined that raising dikes and driving out water would not bring about sustainable safety. This realization led to the adoption of the new policy aimed at giving more space to water through solutions that seek not only to increase safety levels, but also to garner social, environmental and economic benefits.

The government has responded to the Committee's recommendations in drafting the Coastal Vision (Kustvisie) and the National Water Plan (Ministerie van Verkeer en Waterstaat, 2008). The National Water Plan calls for the design and implementation of the so-called Delta Program along with a Delta Act and a Delta commissioner.

¹ The first Delta Committee had been installed after a devastating flood of 1953, which killed about 2,000 people and had resulted in a spectacular reinforcement of the coastal protection system.

This paper analyses the current implementation of the Delta program in the Netherlands as a case of mainstreaming climate adaptation into water management. In accordance with the dimensions of the Earth System Governance framework (Biermann *et al.*, 2009) that underlies the 2009 Amsterdam Conference, it asks:

1. **Architecture:** How is the implementation of the Delta Program organised? What governance system emerges and what is the integration of (inter-) national, regional and local governance?
2. **Agents:** What actors (governments, state agencies and beyond) are involved in the implementation of the Delta Program? What are the influence, roles and responsibilities of actors? In which way is authority granted to agents apart from national governments, such as business and non-profit organisations, and how do they exercise authority?
3. **Adaptiveness:** What mechanisms are suggested to allow agents to respond internally and externally to the inherent uncertainties in human and natural systems and to react to new findings and developments?
4. **Accountability and legitimacy:** What mechanisms and institutions are designed to confer legitimacy and accountability to stakeholders and constituencies in particular?
5. **Allocation:** What mechanisms are proposed for the allocation and distribution of resources and values. Level of justice, fairness, equity.
6. **Knowledge:** What knowledge is developed? Who is involved?

The analysis is based exclusively on the documents made available by the program bureau of the Delta Program and the instructions (in Dutch: *opdracht*) that have been prepared for the work to be carried out in the various subprograms of the Delta Program in the coming years.

The paper first introduces the objectives and background of the Delta program. Next it discusses communalities and differences in how the subprograms address the dimensions of the Earth System Governance framework.

2 The Delta program

2.1 Objectives and background

The overall objective of the Delta Program is to warrant water safety in the Netherlands and capitalise on opportunities that water offers. This overall objective is translated into more specific objectives that are being explored in a series of subprograms (Table 1). The different subprograms add topical and regional flavour to the Delta program. Most subprograms focus on a particular long-term strategic decision that water managers will have to consider. Three base values (solidarity, sustainability, flexibility) and three starting points (integral, coherent, transparent) have been defined for the Delta Program.

2.2 Architecture & Agents

A Ministerial steering group chaired by the Prime Minister has been created to head the implementation of the Delta Program. Represented in the steering group are the ministries of Transport, Public Works and Water Management (VenW), Housing, Spatial Planning and the Environment (VROM), Agriculture, Nature and Food Quality (LNV), the Interior and Kingdom Relations (BZK), Economic Affairs (EZ) and Finance (FIN). The political responsibility and coordination of the Delta Program is in the hands of the State Secretary² for Transport, Public Works and Water Management.

The Delta Program is organised in ten subprograms. Four of these are generic subprograms and six are regional subprogram (see Table 1 and Figure 1). The Delta Act subprogram started ahead of the other subprograms to provide the legal foundation for the Delta programme, define the authorisations of a Delta commissioner to be appointed for the program, and set out the plan for financing the measures to be taken in the Delta Program.

² Within the Ministry of Transport, Public Works and Water Management the State Secretary is responsible for the Theme Water. Hence the State Secretary coordinates the Delta Program rather than the Minister.

To support the start-up of the Delta program and to prepare a comprehensive work plan for a new Delta commissioner, a quartermaster team (Kwartiermakers team) was installed. The quartermaster team consists of civil servants from the ministry of VenW and the ministry of VROM. It is chaired by the civil servant who previously led the secretariat of the Delta Committee. The Director General of the Water Department of VenW commissioned the quartermaster team's work. The work plan for the Delta commissioner details what agents will undertake what activities when, in order to realise the individual subprograms. In addition the work plan will progressively map the political, organisational and topical consistency between subprograms.

Table 1 lists the Delta Subprograms and their main objectives. The regions are illustrated in Figure 1.

Table 1: Delta Subprograms and responsible executive agents

<i>Generic subprograms</i>	<i>Objective / Strategic decision</i>	<i>Responsible executive</i>
Delta Act (<i>Delta wet</i>)	Provide the legal foundation for the Delta programme, define the authorisations of a Delta Manager, and set out the plan for financing the measures to be taken in the Delta Program	State Secretary VenW
Watersafety (<i>Waterveiligheid, incl. Buitendijks</i>)	Develop policy to reach and maintain flood safety of a societal and political accepted risk level	State Secretary VenW
Freshwater supply (<i>Zoetwatervoorziening</i>)	Develop and explore strategic alternatives for the long-term freshwater supply (incl. salinisation)	State Secretary VenW
(Re)development plans (<i>Nieuwbouw en herstructurering</i>)	Develop an appraisal framework and stimulate decision making and investment in (re-) development that prevents -in time- passing on costs, risks and impacts of climate change	Minister VROM
<i>Regional subprograms</i>		<i>Responsible executive</i>
Coast (<i>Kust</i>)	Explore the conditions for maintaining long-term coastal safety and the desirability, feasibility and costs of seaward expansion of the coast	Minister VROM and State Secretary VenW
Rijnmond / Drechtsteden	Securing long-term water safety and creating boundary conditions for sustainable water supply in the region as a contribution to sustainable and dynamic spatial development. Focus Sea - River Rhine interface.	Minister VROM and State Secretary VenW
Wadden Sea region (<i>Wadden</i>)	Sustain the long-term water safety of the islands and the coast along with the region's natural value	Minister LNV
Southwest Delta (<i>Zuidwestelijke Delta</i>)	Secure and climate-proof the long-term water safety and the conditions for freshwater supply to strengthen the region's economy and ecology	Minister LNV
Rivers (<i>Rivieren</i>)	Integral long-term (2100) problem analysis for the major rivers including (spatial) strategic alternatives and decisions	State Secretary VenW
Lake IJsselmeer	Explore the effects of raising the lake water level and the alternative futures for its seaward closure dam (<i>afsluitdijk</i>)	State Secretary VenW

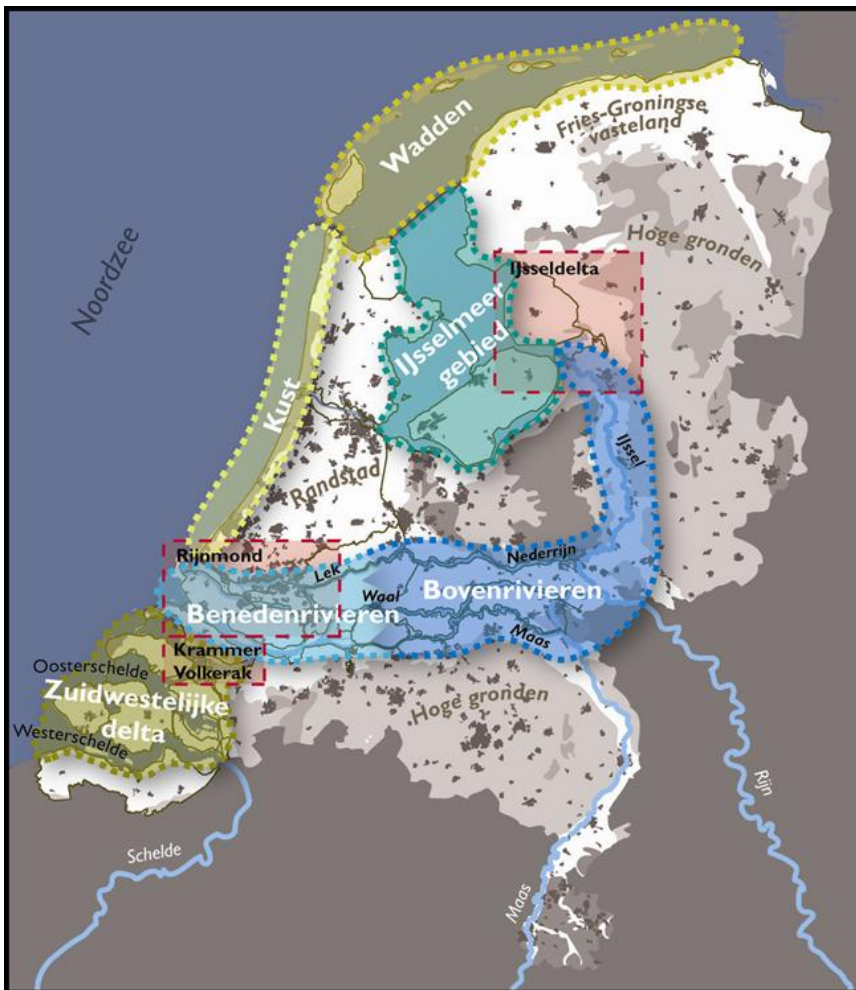


Figure 1: Map of the Netherlands with indicative location of regional subprograms

The subprograms are supported with guidelines and a general time schedule, offered by. Beyond this the subprograms operate relatively independent and can design their own sub-bodies and responsibilities for the implementation. The political responsibility for each subprogram lies with one or two ministries and its responsible minister or state secretary (called *executive* in this paper (in Dutch: *opdrachtgever*)). In practise, two ministers (of VROM and LNV) and one state secretary (of VenW) together act as the executives for all subprograms. Interestingly and somewhat atypical for water management, all three are female. The instruction to organise a subprogram is for each subprogram commissioned to a high level administrative agent in the responsible Ministry (typically a Director General or a Department Director, called *controller* here (in Dutch: *gedelegeerd opdrachtgever*)). Together the administrative controllers form the Director General Council that prepares the Ministerial Steering Group. The controllers are also responsible for overseeing the process in the subprograms and contracting an agent for the implementation (called *contractor* in this paper (in Dutch: *opdrachtnemer*)). In practise the contractors of the subprograms are civil servant from the national government.

By November 2009, each subprogram had prepared its instruction and had put it before the Director General Council for approval. These instructions are the base for the analysis in this paper.

Comparing the instructions it is concluded that the regional subprograms are similarly organised (see Figure 2) with some noteworthy exceptions (see Table 1).

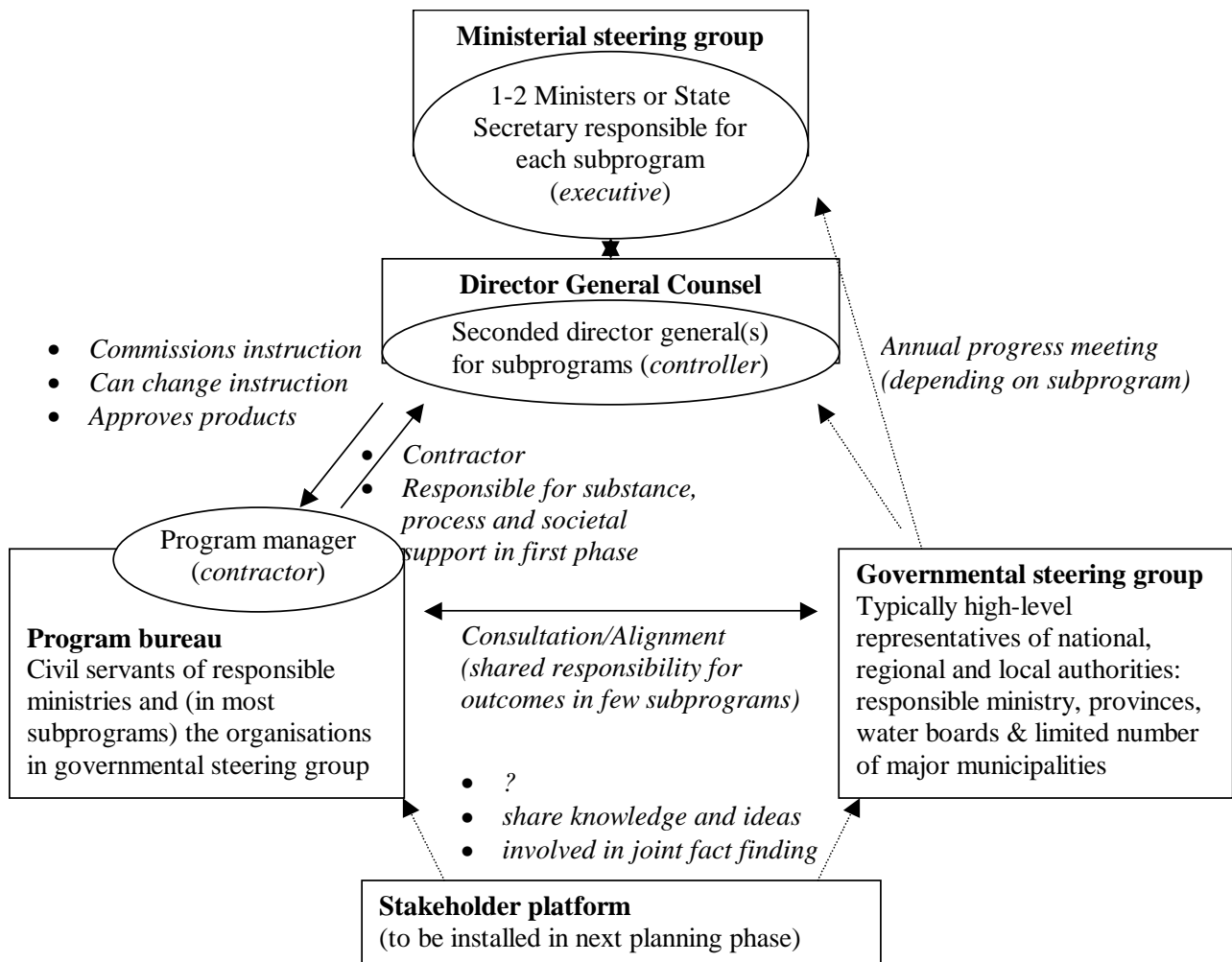


Figure 2: Typical governance architecture and new governance bodies in subprograms

Table 2: Notable details of the Architecture of the Delta Subprograms

<i>Generic subprograms</i>	<i>Notable details of the Architecture of the subprogram</i>
Delta Act	The Delta Act subprogram that was prepared ahead of the other subprograms with minimal involvement of agents other than the Director General Council, the Quartermaster team and civil servants from VenW. Already in 2009 the Cabinet plans to submit the concept for the new Delta Act (a change in the existing water act) to assist in implementing the Delta Program.
Water safety Freshwater supply	The program teams of the generic subprograms Safety and Freshwater supply consist of civil servants of the Ministry of VenW only. No other new bodies are created for these subprograms. For governmental consultation these subprogram propose to use the existing National Water Council (<i>National Water Overleg</i>). For societal participation the instruction proposes a central role for the existing Water and North Sea Counsel (<i>Overlegorgaan Water en Noordzee</i>). No further details are provided on roles and responsibilities of societal agents. Under societal agents the instructions refer to other government agencies rather than interest groups. The Safety and Freshwater supply subprograms provide boundary conditions for the region subprograms and organise national evaluation of interests, aiming for a 'national optimum'. The Safety subprogram provides a detailed description of key tasks and roles of the Water Department Director responsible for national policy coordination.

New construction & restructuring plans	Discerns an advisory role for the Delta commissioner. Project team consist of civil servants of five ministries (including FIN and BZK) and the three umbrella organisations of the provinces, municipalities and water boards
<i>Regional subprogram</i>	<i>Notable details of the Architecture of the subprogram</i>
Coast	Shared responsibility of two ministries. Executive can change instruction after consultation with the program bureau OR governmental steering group
Rijnmond	Shared responsibility of two ministries. Regional authorities cooperated with the national government to prepare the instructions. Contractor is to be independent and concerned with societal participation. The instruction explicitly calls for a stakeholder analysis and lists non-governmental agents to be involved.
Wadden Sea region	The program manager is to be independent. Regional steering group organised before program organisation. It was actively consulted in writing the instruction and has a shared responsibility in process. Instruction orders a stakeholder analysis
Southwest Delta	The architecture of the implementation is left to the next phase and is to be detailed in the implementation plan. The subprogram is expected to rely on an existing regional program organisation and steering group.
Rivers	Program bureau and manager are still to be appointed in consultation with the regions. Regional authorities have expressed strong preference to build on existing governmental river basin consultation bodies. International consultation will rely on the transboundary river basin organisations.
Lake IJsselmeer	Specifies role and responsibility of executive in detail. Stresses legal conditions and feasibility (incl. spatial reservations, compensation, buy-out, EIA obligation)

The Delta Program aims for national government leadership for strategic long-term decisions. The guidelines for the implementation process follow a recent policy advice 'Faster and Better' (*Sneller en Beter*, Commissie Elverding, 2008) to speed up decision-making processes by exploring strategic alternatives and early selection of one development direction to be advanced in an implementation plan. Such early strategic guidance differs from the prevailing Dutch infrastructural planning practice that typically postpones decision making until several (regionally negotiated) alternatives have been developed and appraised in greater detail (cf. Deelstra *et al.*, 2009). So far, the involvement of agents from civil society and business in the Delta subprograms is very limited. Here the implementation diverts from the advice 'Faster and Better' that recommends early active involvement of these agents in exploratory regional development activities (Commissie Elverding, 2008).

2.3 Adaptiveness

Flexibility is one of the base values of the Delta program. The Quartermaster team has offered guidelines to realise flexibility. Reasons to promote flexibility include:

- New insights with respect to climate change
- Socio-economic development
- Emergence of innovative methods to address water safety
- Changing public perceptions of water safety and freshwater supply

The design of the subprograms is to allow for changing both contents and process. Apart from recognising the guidelines in the instructions, few concrete steps are proposed in the instructions. Rather it is instructed that the implementation plans will describe how flexibility and innovation will be attained to. Noteworthy exceptions contributing to adaptiveness are:

- Delta Act: changes in the act follow regular legislative procedures. No provisions are made for flexibility
- Water safety: in 2017 new safety norms will apply. Thereafter safety norms will be evaluated every 12 years
- Freshwater supply: solutions are to be robust for different futures or adaptable over time. Use of natural processes is encouraged.

- New construction & restructuring plans: develops draft flood risk zoning. Advises on climate proofing existing instruments (e.g. procedures for cost benefit analysis, environmental impact assessment, water impact assessment (*watertoets*)). Aims to develop and promote a suit of instruments for climate proof building and design principles that assure robustness, resilience and flexibility. Commits to a dialogue with practitioners and researchers to gain practical experience implementing the new instruments. This experience is to tighten instrument design.
- Rijnmond: executive and contractor can change planning based on a shared vision. Partners choose to first work on a shared problem analysis and possible strategic alternatives before starting the official planning procedure (*MIRT*). The instruction allows for changes in the architecture, roles and responsibilities. The instruction calls on the subprogram to allow for iteration between the alternatives once these become articulated by different parties
- Southwest Delta: the instruction strongly relies on exploring alternatives (possibly of stakeholders) as a basis for a long-term vision shared by national government and the region. The vision in turn is planned to be guiding for policy alternatives. The region already has experience with vision development (Zuidwestelijke Delta Provincies, 2006; redactie H₂O, 2009). Following the National Water Plan, the instruction calls on regional water users to aim for regional water self-reliance, thereby making the region less dependent on the main national fresh water system. Users are expected to adapt. The instruction calls for a pro-active open attitude towards innovation and changes in the way that people think and act
- Rivers: The executive can change the instruction after consulting the program director and the regional steering group(s). The decision support system that is to be developed has to be adaptable to new plans and regional development. The instruction recognises the possibility to adapt the starting points of the subprogram in cooperation with the other subprograms. The implementation plan has to include a risk assessment. The instruction suggests using region development projects as pilots for the delta program. Conditional on regional urgency these pilots can be brought forward in the planning. This approach aims to establish whether regional development can offer a robust solution for long-term water safety. Notwithstanding this interest in flexibility and regional development the subprogram's planning appears to focus on exploring mainly technical measures and model studies
- Lake IJsselmeer: composition of the regional steering group can be adjusted during implementation

2.4 Accountability

The Delta program relies strongly on parliamentary accountability. At present no mechanisms are designed to confer legitimacy and accountability to non-state agents or constituencies. Direct contact between executive and stakeholder platforms is debated and in some subprograms discouraged. Provisions to strengthen regional cooperation and stakeholder involvement so far include:

- Water safety: Water Department Director responsible for national coordination and the development of goals and national policy instrument for water safety. The subprogram poses norms and conditions for the subprograms to operate within.
- Freshwater supply: stakeholders of other subprograms are invited to contribute
- New construction & restructuring plans: include results in regional planning regulation
- Coast: actors can become a member of a societal platform in their individual capacity not as representatives of an organisation. Platform members are expected to inform their own organisation about progress. No contact is foreseen between stakeholder platform and executive
- Rijnmond: Program manager is entitled to couple regional goals to the national assignment
- Wadden Sea region: Regional steering group appoints societal platform in which interest groups and business will be represented
- Southwest Delta: the implementation may rely on existing bodies. Participation of business and inhabitants is foreseen, yet the organisation is left to the implementation plan.
- Rivers: stakeholders co-create knowledge agenda and oversee knowledge development and partnerships
- Lake IJsselmeer: early engagement in rounds of stakeholder consultation. Actively communicates all options are on the table.

2.5 Allocation

Solidarity and sustainability are base values of the Delta program. The Quartermaster team has offered guidelines to realise these base values. Apart from recognising the guidelines in the instructions, few concrete steps are proposed in the instructions. The instructions provide no or very little detail on interaction with societal agents. Typically the instructions postpone detailing 'who to involve when' to the next planning stage when the implementation plans are prepared. Financial resources differ substantially between subprograms. The generic programs have more resources available and allocated in supporting research than the regional subprograms. The regional subprograms mostly rely on the financial resources made available by the national government for implementation of the Delta Program. No attention so far is paid to cost-benefit sharing between regions or transboundary. Examples of resource and value allocation in the instructions are:

- Delta Act: Warrants long-term budget reservations and allocation to water safety related measure. Other measures and integral planning subject to co-funding. Conditionally allocates resources to experiments
- Water safety: By far most resources (financial and personal). Will develop guidelines and norms for other subprograms
- Freshwater supply: Second in resources. Explicitly aims to minimise passing problems to the future or surroundings
- New construction & restructuring plans: Third in resources. Explicitly aims to develop an appraisal framework and stimulate decision making that prevents passing on costs, risks and impacts of climate change
- Rijnmond: recognises that solutions for the region may lie outside the region. Although the instruction encourages exploring regional interdependencies, resource allocation is not explicitly dealt with
- Southwest Delta: explicitly oriented towards regional development processes
- Rivers: encourages linking regional objectives to national goals

2.6 Knowledge

Various subprograms highlight the importance of innovation. The main mechanism proposed for stimulating innovation is joint-fact-finding. Joint-fact-finding was proposed by the quartermaster team. Apart from recognising the principle in the instructions, no concrete steps have been taken to realise or finance it. Typically subprograms suggest expanding on joint-fact-finding in the implementation plan. So far, responsible agents have not supported or initiated new venues for more participatory knowledge co-creation or transdisciplinary background research. The ministries involved continue to rely on the research institutions traditionally associated with each ministry³.

Most instructions order that the implementation plans should include a knowledge agenda. Some subprograms have commissioned policy explorations ahead of the planning of the subprogram. Notably, the Freshwater subprogram has commissioned a substantial policy exploration, carried out mostly by the new national water institute Deltares.

A number of subprograms propose to set-up new pilots or to learn from ongoing experiments. The Southwest Delta for example recognises that experiments with new water infrastructure, energy production, fresh water supply, brackish agriculture and nature development have yielded good results and approaches that prepare for future development. The safety subprogram proposes six pilots to study how integrated decision-making about different safety measures can be realised. No budget has been assigned to these pilots yet.

³ For readers familiar with Dutch organisations: the Ministry of VenW relies on the institute Deltares for knowledge support, LNV on the institute Alterra, and VROM on the planning bureau PBL. For example, the instruction of the subprogram New Construction, which is coordinated by VROM, is the only instruction recognising PBL studies.

3 Observations, discussion and conclusions

The Delta Program is an ambitious and forward-looking program. It is quite unique in exploring long-term strategic alternatives and making long-term financial reservations. So far program design has focussed on problem definition and architecture amongst agents at different government levels. Presently, the responsibility lies exclusively with national government agents. The Delta program and Delta committee are interesting policy pathway, that are implemented along side the official policy stream of the National Water Plan and the 'Room for the River' water policy. All new governance bodies created for the implementation are temporarily, yet its members are agent from existing government bodies. Future earth system governance research could look at the role of ad hoc commissions and advisors (in water management). Internationally, cases have emerge where -if something has to be decided/changed- a person or commission is appointed to prepare the ground, sometimes with the mandate to decide, bypassing existing governance structures. In the Netherlands this has become quite common. Questions include: who appoints these agents? Who are they? What are implications for legitimacy, accountability, etc? Is it the government equivalent of coalition building by non-state actors? How independent are these committees from the prevailing governance regime?

With respect to the governance dimension 'adaptiveness', the implementation process is structured in small steps, allowing for responding to new insights. Yet, the planning process from scooping to selection of alternatives foresees little feedback and possibilities to go back to scooping, for example, when new information becomes available. Less provisions have been made to establish the governance dimensions allocation and accountability. Recognition of legal requirements strongly related to responsible ministry. For example, only the subprograms coordinated by the Ministry of LNV explicitly deal with the European Natura 2000 policy's areas and regulation. The early design of the Delta Act facilitates progress and long-term financial security. The process to draft the act has been largely confined to political and administrative state agents at the highest level. Its formulation and lack of inclusiveness may become an obstacle for the integral implementation of the Delta Program. At the same time, responsible agents face the challenge broadening the group of agent allows for more involvement and buying in, yet might well dilutes the strategic planning foreseen by the Delta committee and the national government. The specific governance requirements of longer-term strategic planning and goal setting may deserve more attention in earth system governance. This includes the role of potential supporters and opponents of policy (change).

One of the aims of the Delta Program is innovation of water management. So far, innovation has mostly been sought in knowledge development through joint fact finding. Although the Delta Act provides in setting up experiment, this has not yet been explored by the subprograms. Advice from policy sciences and transition research includes encouraging innovation through a rich variety of experiments and transition approaches that probe and debate possible directions through collaboration between recognised actors from civil society, policy and science. The fragmented implementation of the delta program could be turned into an advantage by recognising different subprograms as a set of experiments, from which actors can learn. For example, the analysis of the instructions suggests that different ministries have different expertise in relation to the explored dimensions of the earth system governance framework and there is potential added value in cooperation. Promising options for experiments could be the integration of agro-environmental land use systems that regulate regional climate impacts on water systems with new technologies, organisational responsibilities and financial instruments. Here governance faces creating flexible financial instruments that facilitate benefit- and burden-sharing, social learning and that support potentially better-adapted new strategies rather than compensate for climate impacts on existing activities (cf. Werners *et al.*, 2010a). A challenge remains how to scale up regional experiments to what is required for long-term national safety.

With respect to knowledge development, the ministries rely strongly on their 'own' knowledge institutes and epistemic communities. Few -if any- social scientists are actively involved in the design of the governance of the Delta Program and little social sciences research is commissioned. In other policy implementation processes, open tenders for decision support research have resulted in a new

interdisciplinary epistemic community and the creation of a new body of evidence for innovative water safety alternatives (e.g. Werners *et al.*, 2010b). For the next steps in the Delta program, the earth system governance community might want to enthuse responsible agents with inspiring examples of instruments that support dimensions of the earth system governance framework (e.g. accountability). These examples could become valuable elements of next year's implementation plans that will -amongst others- aim to address the values solidarity, sustainability and flexibility.

4 Acknowledgement

This work has kindly been supported by a grant from the decision support program of the Dutch Ministry of Agriculture, Nature and Food Quality. We are grateful for the cooperation and comments of research partners and colleagues, especially Kees van Es, Annegien Helmens, Annemarie van Hoorn, Maret Oomen, Wim Schoorlemmer, Willem Teerink and Jan Willem van Wijngaarden.

5 References

- Biermann, F., M. M. Betsill, J. Gupta, N. Kanie, L. Lebel, D. Liverman, H. Schroeder and B. Siebenhüner (2009) *Earth System Governance: People, Places and the Planet. Science and Implementation Plan of the Earth System Governance Project*. ESG Report 1, IHDP: The Earth System Governance Project, Bonn, DE.
- Commissie Elverding (2008) *Sneller en Beter*. Commissie Versnelling Besluitvorming Infrastructurele Projecten, Den Haag.
- Deelstra, Y., J. Keetelaar, J. Kabout and H. v. Zwam (2009) Veerman en Elverding: vernieuwing in waterbeleid en uitvoering. *H₂O : tijdschrift voor watervoorziening en afvalwaterbehandeling* **42** (20), 22-23.
- Kabat, P., L. O. Fresco, M. J. F. Stive, C. P. Veerman, J. S. L. J. van Alphen, B. W. A. H. Parmet, W. Hazeleger and C. A. Katsman (2009) Dutch coasts in transition. *Nature Geoscience* **2** (7), 450-452.
- Kabat, P., P. Vellinga, J. Aerts, J. A. Veraart and W. van Vierssen (2005) Climate Proofing The Netherlands. *Nature* **438**, 283-284.
- Ministerie van Verkeer en Waterstaat (2008) Ontwerp Nationaal Waterplan. Kwak & van Daalen & Ronday.
- New Delta Committee (2008) *Working together with water, A living land builds for its future - Findings of the Deltacommissie 2008*. New Delta Committee, NL.
- redactie H₂O (2009) Zoetwatervoorziening Zuidwest-Nederland grote legpuzzel. *H₂O, Tijdschrift voor watervoorziening en waterbeheer* **12**, 5.
- V&W (2006) Spatial planning key decision Room for the River. Ministry of Transport, Public Works and Water Management (V&W).
- VROM (2007) Maak ruimte voor klimaat! Nationale adaptatiestrategie - de beleidsnotitie. Ministeries van VROM VenW LNV EZ, IPO, VNG and Unie van Waterschappen.
- Werners, S. E., J. D. Tàbara, H. Neufeldt, D. McEvoy, X. Dai, Z. Flachner, J. West, F. Cots, G. Trombi, N. Luger, P. Matczak and G.-J. Nabuurs (2010a) Mainstreaming Adaptation in Regional Land Use and Water Management. In *Making climate change work for us: European perspectives on adaptation and mitigation strategies* (eds Hulme, M. and H. Neufeldt). Cambridge University Press, Cambridge, UK (in press).
- Werners, S. E., J. Warner and D. Roth (2010b) Opponents and supporters of water policy change in the Netherlands and Hungary. *Water Alternatives* (submitted).
- Zuidwestelijke Delta Provincies (2006) *Kracht van de Delta, de Agenda voor een Deltaprogramma*. Provincies Zeeland, Zuid-Holland en Noord-Brabant, Middelburg, NL.