TOWARDS INTERACTIVE FLOOD GOVERNANCE: CHANGING APPROACHES IN DUTCH FLOOD POLICY PAPER

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1. INTRODUCTION

The damage that floods cause to societies is enormous and is likely to increase (Jongman et al., 2012). Governments everywhere are in search of strategies to avoid flood risks, not in the last place in the low lands of the Netherlands (Bouwer et al., 2010). During last decades of raising awareness about climate change, thinking about handling flood risks changed here considerably. This type of change will be further elaborated in this article. It is not a new change; already in ancient China, Taoists and Confucians were diametrically opposed in their conceptions of dealing with the Yellow River (Dubbelman, 1999). To prevent floods, the followers of Confucius constructed the river between high dikes. The Taoists however believed in broadening the flood plain. After working some time on Taoist basis, the Confucian‘s conception became stronger and the river was constricted again. For twenty centuries engineers of both schools disputed on the correctness of their approach towards the Yellow River, without any of them winning the argument. In essence, this is exactly the transition in thinking that emerged during the turn of the centuries in the Netherlands. The fight against the water by strengthening the dikes will reach its limits if climate change will occur as forecasted. The call for ‘living with water’ is swelling. Key is that the water should not be considered as a threat, but in the first place as a chance, or in terms of its value, as ‘the blue gold’, (Rhatenau Institute, 2000).

This change of thinking has important consequences for the approach of floods and flood risks in water management. According to this new trend, floods are part of the natural dynamics of water systems and in that, represent an important ecological value. This value expresses itself in higher biodiversity, in a larger sedimentation rate for the compensation of the subsidence of land and in the enrichment of soils with fertile deposition. Another important advantage of regular modest flooding is the reduction in victims and damage in case a severe flood really happens.

In the following, the shift in thinking about dealing with respectively water policy and flood management is analyzed, based on regime change, transition management, paradigm shift theory, and evolutionary thinking on changes in system equilibrium (Broekhans et al., 2010). How did the policy makers come to these new insights and how is this implemented in concrete flood policy? Main policy documents of the Dutch government are investigated and interviews have been conducted with civil servants working on flood policy-making and implementation. What features does the new thinking have and which changes in flood

management can we expect to happen? Let us first consider the changing perspectives in water management.

2. HISTORICAL DEVELOPMENT OF THE WATER MANAGEMENT CONCEPT

The history of Dutch water management shows a long paradigmatic development (Van Ast, 1999; Van der Brugge, 2009). In line with social trends, the field of interest of the water manager has broadened considerably in time, since more and more functions were added to the policy scope of the water manager. Already before our era, flood management lead in the coastal zone of the Netherlands to the construction of mounds and later dikes for the protection of property and good. Mounds to live on were constructed for security and also the first dikes were constructed to prevent incidental floods.

During medieval times it became clear that the methods used for protection against undesired water on land, could also be deployed to withdraw land from water. It resulted in ever larger land reclamation projects, both from the lakes in the peat area, and from the sea in coastal areas. Water quantity management emerged, first by improving the natural drainage and later by active pumping with windmills.

With the industrial revolution, the focus on security against floods became a sectoral policy. For each of the various usages of water systems, a distinct water sector policy was designed. When in the mid eighties the consciousness arose that sector optimization created major drawbacks, the concept of integrated water management was born (V&W, 1985; Saeijs, 1991; Saeijs, 1995). The integration refers not only to surface water and groundwater or to water quality and water quantity. It also refers to the various uses and to the policy focused upon them. Integrated water resources management is based on a water systems approach, transcending environmental compartments. This focuses on the preservation of all features of the water system, on the long term and on a river basin level. First there was the protection of humans against the water, now explicitly attention is paid to the protection of the water against humankind.

In this phase of integrated water (resources) management a number of other significant changes in thinking emerged. Perhaps the most important insight of the water system perspective is that ecology is the basis of all handling of water. It means the ecosystem approach (Allen et al., 1992) is embedded in water management. Similar views are expressed in other terms, such as dynamic and adaptive water management (Geldof, 1995; Pahl-Wostl et al., 2007), total water management (Van Rooy et al., 1997) and interactive water management (Van Ast, 2000). On the one hand, interactivity here concerns interactive policy-making (Edelenbos, 2005); Pröpper & Steenbeek, 1999): the interaction with the actors in the social system. On the other hand it concerns the water system, in

which the water manager deals with the physical, biological and chemical factors interactively. Moreover, both the systems interact with each other as well (Van Ast, 2000).

The interaction paradigm can be characterized by the way the management of the water system occurs. The interactive water manager 'pushes and pulls' the water systems in a desired direction, with maximum use of knowledge based on monitoring of system indicators. He is aware of the fact that knowledge can never be complete. The reaction of the water system on adjustment and control, teaches him how to adjust follow-up procedures. Through 'learning by doing' and 'trial and error' he changes iteratively the conditions under which water systems develop, or, he adapts to the changes in the natural system.

In the nineties of last century, water management also became increasingly focused on sustainable development. Sustainable management of water systems means that the current social and economic needs are met without sacrificing the ability of future generations to meet their needs (WCED, 1987).

Particularly important for water management is the water system approach, because it entails all relevant developments throughout the whole of the water system. In the Dutch Water Law of 29 January 2009, it is incorporated in the Basin Plans for the four main (international) river basins, as four appendices to the National Water Plan (Dutch Government, 2009). Decisions about aspects should therefore always be weighed from a catchment perspective. This is also referred to as the 'river basin concept' and in operational terms as 'integrated catchment management' (Teclaff, 1996; Wolsink et al., 2006).

Because interactive water management, amongst others, means that more and more decisions occur in consultation with citizens and social actors, water managers more than before also focus on social processes. Control of human behavior takes place in networks of social actors and public policies are designed together with stakeholders. This means demand management in contrast with optimizing the supply.

Thus, administrators can no longer determine what is good for the citizens without consultation, but at the same time, the hierarchical position of a powerful body for the implementation of jointly agreed objectives cannot be missed for valued 'commons'. This tension between desired bottom up participation and necessary top down power is the core dilemma in current water management. It affects the role of government as - in the first place – a facilitator, but with special powers to enforce corrective action if necessary. The problems regarding water systems and the dangers of floods are too serious to be exposed to a wide range of social forces, not seldom focused on short-term and self-serving. Interactive flood management should find balance between these two poles, especially in times of expected climate change.

The real occurrences of disasters have large impact on flood management. It appears that disasters are often decisive for whether or not measures will be effectuated. This inefficient habit to only take measures after the event is already there, may be counterbalanced by the constant processing of information based on efficient monitoring. The classic approach, responsive to outputs, is by definition running behind the facts. On the other hand, a water manager operating on the basis of the interpretation of signals will be more able to intervene pro-actively. It is no coincidence that Geographic Information Systems (GIS) are booming. With GIS, the abundance of data can be transformed into clearly and understandably visualized information. Data processing of the physical water systems were strongly developed in recent decades, but the social systems are still weakly developed in GIS instruments used by water managers. Still water managers need information about the social system too. Adequate data presentation of the full Social Ecological System delivers the essential control variables for modern water management. Specifically spatial interventions can have large impact on water systems and, from an opposite perspective, water systems can highly determine human activities. Therefore it is necessary that water managers are able to understand the developments in both interrelated fields. Besides, they should be able to 'translate' the essential conditions and constraints resulting from the operation of water systems to the local level.

In table 1, the most important changes in thinking are summarized.

Table 1. Changes in water management

FROM	***TO***
Water systems follow social processes	Social processes follow water systems
Water follows spatial development	Spatial development follows water
Sectoral water management	Integrated water system management
'fighting against water'	'living with water'
Water as an 'enemy'	Water as a 'friend'
Effective and efficient	Sustainable: long term responsibility
Technocratic: build and maintain; force the water system	Ecosystem based: support resilience and self-regulation; adapt to the water system.
National	International en regional
'command and control' water policy	participative water management
Supply Management	Demand Management

The following further elaborates on the question what the various components in the development of thinking about water management specifically mean for flood policy.

3. WATER MANAGEMENT IN THE 21ST CENTURY

The 'Taoist' report of the Committee Water Management in the 21st century is considered to be one of the most influential regarding flood policy in The Netherlands. The ideas of the committee, also known by the name of its chairman 'Van Tielrooij' (Commissie

Waterbeheer 21ste eeuw, 2000), are mainly a response to the near-floods of the River Rhine in 1993 and 1995. In the last mentioned year, vast parts of the area surrounding the river were evacuated because of flood danger. The main remedy for the future, according to the committee, is spreading the water over a larger surface, so horizontal instead of vertical storage of flood water.

Another important recommendation that has been introduced by the Committee concerns the *water check* for all plans regarding spatial planning. The aim is to be sure that the impacts on the water system are not negative. Otherwise compensation for any space loss of the water system should be necessary. There should not be any case of problem passing to other areas.

The support of this vision on water management in the 21st century is broad (WNF, 1993; WNF 1997; WNF, 2000; World Water Forum, 2000; Rhatenau Instituut, 2000; Committee Water IPO, 2000; VROM-Raad, 2005). After the official Water Agreement for the 21st century was signed by the Dutch national government, the collaborating provinces, the organization of municipalities and the Union of the Water Boards in 2001, the principles can be found throughout Dutch policy. They also fit perfectly in the historical development of water management, with the emphasis shifting from *'fighting the water'* to *'accommodating the water'*, or adapting to the natural water system.

Other important advisory boards on the water management in the Netherlands were the Delta Committees. The first Delta Committee (1953) proposed the closure of the Zeeland estuaries, after a major flood disaster in 1953 in which a large part of these areas were flooded, with a death toll of nearly 2000. The ambitious and costly plan can be regarded as the source for the position of the government as solely responsible for flood prevention. The strategy is based on reducing flood risk through innovative engineering. Following the ideas of renowned scientists such as Tinbergen and Van Danzig (Delta Committee, 1959), it lead to the acceptance of the so-called 'risk approach'. This means that not only the chance that a flood will happen is decisive, but also the potential damage that could be the result. Protection level of a densely populated and highly industrialized area is decided to be higher than that of a sparsely populated agricultural area. The newly constructed delta dams do not all have the same excess risks, but are differentiated according to the number of potential victims.

In 2007, the changed circumstances regarding the climate led to a second Delta Committee (Delta Committee 2, 2008). This committee is instructed to take up the question how the Netherlands can be arranged in a way that the country is on the (very) long-term safe against flooding, whilst still remaining an attractive place to live. As pillars of the new policy, the Committee recommends *'sustainability'* and *'security'*. The strategy is *adaptive*: developing along with climate change and other ecological processes (Deltacommissie 2, 2008) and based on resilience (Remmelzwaai and Vroon, 2000). The *risk approach*, in which the risk is defined as probability multiplied by consequence remains, but is renewed.

Besides explicit attention to the risk of victims, the basic principle of the first Delta Committee is broadened in definition of security. It includes not only economic loss but also includes for example the damage to landscape, nature, and historical and cultural values, social disruption and reputational damage. This new risk approach leads to standards based on the probability of deadly victims, the chance of large numbers of victims at once and also on non-financial losses.

The forward-looking risk approach leads, according to the Ministry of Water Management, to a multi-layer security policy. This means an anticipation strategy (instead of responding), based on three main layers in which the policy is reflected. The first layer concerns the traditional focus on the prevention of flood risks. The renewal can be found in the two other layers. First the incorporation of flood risk in spatial planning: the second layer. Flood risk should be explicitly included in future deliberations about area development. Second, the preparation for possible disasters: the third layer. If under extremely unfortunate circumstances a real crisis happens, adequate preparation can significantly limit the number of casualties and the total damage. This last factor has been inserted in the official Government Position regarding Disaster Management of Floods, as has been documented in the vision on water safety in the 21st century (Zanting and Noordam, 2008). The three layers approach is directly linked to the safety chain known from overall security policy. Each of the five links (pro-action, prevention, preparation, response, aftercare) constitutes a portion of the spectrum of potential safety measures.

In summary, the new policy approach is founded on three main pillars:

a. anticipation;

Policy-decisions will be based on expectations of the spatial, demographic, 'social-economic developments and of the climate changes in the coming decades'. Spoken is of 50 years of forward thinking and in some cases even 100 years.

b. risk approach:

Policy decisions are based on limitation of the risk of flooding and in addition on limiting the impact of floods. This applies both on economic damage and on casualties.

c. three layers – concept

Decisions to avoid flooding have to be taken on three levels: (1) prevention measures, (2) spatial development, (3) disaster management.

The three layers approach revitalizes the 'renewed risk approach' of the first Delta Committee. Its introduction is explicitly linked with advices of the (second) Delta Committee and the European Directive on Flood Risks (EU, 2007). The approach broadens the range of measures and strategies and should result in a more robust and more sustainable water security policy. The inclusion of flood effects in addition to solely flood chances could logically lead to the choice of standards that are also based on risks. However, this choice is not made because it could lead to undesirable outcomes if the potential consequences in terms of damage are so insignificant that the strength of the dam becomes of minor importance. Regarding flood prevention, a change has been realized

from a focus on the chance of overtopping a dike towards the risk of flooding (change and damage). In the latter approach, not only the risk of water flowing over the dam, but also the risk of a collapse of the dam is included. This difference in terms of failure mechanisms of dikes makes the standards more in line with what the perception people generally have.

The three layer approach meets the requirements of the Directive on Flood Risk of the European Union (EU, 2007). This regulation has the same meaning for flood management as the Water Framework Directive (EU, 2000) has for water management in general. The Flood Risk Directive introduces the following concrete requirements:
1. Risk assessment of flood risk areas (before 2011).
2. Flood hazard maps, which indicate the likelihood of flooding and flood risk maps that show effects of the floods in terms of depth, potential damage and numbers of affected (by December 22, 2012).
3. Flood risk management plans, in which all goals and measures for the reduction of flood risks are fully incorporated (by December 22, 2015).

The general principles on which the directive is built are all well recognized in Dutch policy, like:

- The Catchment Approach: the flood risks are considered in the perspective of the entire basin;
- Risk management: goals and actions are determined based on flood chance combined with the effects of flooding;
- Integrated approach based on the security chain: measures must be related to risk reduction, reducing the probability and its consequences, crisis management and aftercare;
- Sustainability: risk assessment and preparation of risk management plans must take into account long term sustainable development as has been regulated in other EU - directives and the impact of climate change;
- Solidarity: States may not take measures that increase the flood risks in other countries. This non-passing principle is essential for the Netherlands, due to the geographic location at the end of four basins.

An important implication mentioned here is the emphasis on ‘maintaining water awareness’ in case no flood disasters have occurred for a long time. Instruments selected are education, participation (‘involvement new style’) and cooperation. Climate change issues are of main importance in this context.

Together the publications of the mentioned Dutch committees, combined with the EU directive, shows a clear picture of the implications of the new thinking on water management for flood policy. Before discussing the implications for flood policy, in the following section first the views of the actors in the water policy sector are explored.

4. DIFFERENT PERSPECTIVES ON FLOOD MANAGEMENT

The policy statements show the transition in thinking, in accordance with the transition to adaptive and interactive water management (Van der Brugge, 2009; Van Ast, 1999). But how do the civil servants that have to apply these new concepts perceive the changes? By interviewing various local and regional agents that have to deal with flood management in practice (Broekhans et al., 2010), it was possible to generally conclude that the mentioned changes are well known. The shift in concept is said to also have implications for the object of water policy. In general, it is realized that the demand for the many water use functions cannot grow indefinitely. The increase of human use of these functions goes over its limits. The demand for all kind of resources supplied by the water system will have to be limited, according to the respondents. Regarding water systems, not all human desire can be realized.

This means that the emphasis in water management will have to be changed from 'supply management' to 'demand management'. Application of demand management to flood management means that interventions should also consider the demand from society for activities with a high flood risk, like building in flood prone areas. This is in line with the Scientific Council for Government Policy (Van Leeuwe, 2007) that criticizes what it calls the disturbed relationship between risk and behavior and points this as the main cause of insecurity. Security is not achieved only by reducing the risks but also by aligning the behavior of people. Since government is considered to be taking the responsibility for security - and no flood occurred for decades - the impression originated that the government has been able to exclude natural disasters. The WRR advocates consciousness of the real risk to human behavior. The government has accepted this recommendation and started a campaign to get the perception of citizens more in accordance with reality.

Awareness raising, ‘water consciousness’, is also mentioned by several interviewed actors as an important instrument to realize necessary measures such as space for water. ‘It takes years to accept the new reality and to act accordingly. The Ministry (V&W, 2008) formulates it as follows: ‘If this is taken into account in decision making, ‘Living with Water’ becomes less a risk and more an opportunity’. The starting point is that through education, communication and participation water conscious behavior can be promoted.

The following principles are considered to be the most important:
1. Flood prevention (main pillar)
2. Minimizing the impact of floods (improving disaster management and embedding water security in spatial planning)
3. Increasing flood consciousness (seen as a recurring theme that provides the motivation for the first two points).

Furthermore, the assumption that a climate proof Netherlands requires resilience and adaptability, is approved widely. 'The guiding principles are risk approach and restoration of natural processes', states the yearly Voortgangsnotitie water (V&W, 2008), the document in which progression of water policy is communicated by the Minister to the Parliament.

As water shapes society, it plays an important organizing role in the spatial, physical and biological development of the landscape. Most flood policy-makers are aware that by following the natural boundaries, social processes can be continued more efficiently in the long term. The approach that is based on an 'enemy image' of water, leads to increasingly complex and costly maintenance works. Ultimately, the fortifications are limited and unsustainable. In the Netherlands, building ever higher dikes against rising water levels combined with a declining soil is not a sustainable development. Even for Dutch hydraulic engineers, this technocratic approach cannot be continued forever.

5. CONCLUSION: TOWARDS INTERACTIVE FLOOD MANAGEMENT

The changes in thinking about flood risks and water management in general, are closely related. In table 2, some of the key aspects are typified, based on the mentioned documents and interviews with civil servants that apply the flood management in practice.

Table 2. Changes in Flood policy

FROM	***TO***
Management of the water quantity (the 'supply')	Management of use of the water system ('the demand')
Holding the water: raising dikes	Accommodate the water: space for water
Exclusive focus on prevention of flood risk	Additional focus on limiting the impact of flooding
'Whatever the cost might be'	Cost-benefit analysis
Damage in terms of victims and financial damage	Damage also in non-financial value
Government as a guarantee against unsafety	Citizens own responsibility
Dikes: overtopping probability	Dikes: flood probability (including dike failure)
Focus on flood prevention	Focus on flood risk (probability multiplied with impact)

Despite the change described above, in large parts of the Netherlands, building dikes is as logical as building houses. It seems much less logical to imagine what impact the dikes will have for the water system when pressed in a straitjacket. The lack of sustainability in this practice requires an alternative. It appears to be available in the form of a water policy focusing on demand, rather than a policy focusing on expanding the features of the water system. But for influencing demand, involvement of social actors is needed. This means

that participation of the inhabitants in the water system is requested, irrespective the international character of, for example, a river basin (Dieperink, 2000). Together the basin residents have to find ways to balance their activities with their water system. This may include the long-term balancing of the (social) costs and benefits of projects and programs. It can be expected that people come easier to taking their own responsibilities in preventing flood damage.

Furthermore, the various uses have to adapt to the capabilities of water systems. No longer is the water perceived as a technical matter which can be manipulated indefinitely, but as a substantial part of an integral dynamic system that can incrementally be adjusted to the main affairs. In summary, the new views on water and flood management can be captured in three main principles:
1. adaptive management: "moving with the water', 'resilience as a strategy' and 'water as an organizing principle';
2. water awareness: responsibility for citizens in reducing flood impacts;
3. the catchment as the policy entity: space for water.

The principles can be translated into concrete policies in conjunction with the core elements for the direction of the flood policies, such as:

- Sustainable development and transboundary water management;
- Anticipative instead of reactive policy;
- Flood risk management (prevention and reduction of effects)
- Enhancing flood awareness programs
- Multi-layer security (prevention, damage restriction, disaster management)
- Application of the safety chain (pro-action, prevention, preparation, response, aftercare)

Together they give a picture of a society that is aware of its dependence on complex natural systems. A society that increasingly respects phenomena in the natural system like higher water levels due to climate change. Flood risk is an example tailored on to the Dutch context. It is wise to make citizens aware of flood hazards and offer them a perspective for action in case it really goes wrong. In this context, exercises in which citizens and government together search for possibilities for flood damage prevention are useful. Active citizens shaping policy interactively with the government are a desirable development in the direction of a conscious and sustainable society. This fits very well in the historical development towards interactive, adaptive water management and sustainable flood management. When a citizen has to think, together with the government about the water in his area, he is forced to obtain the knowledge that can lead to flood awareness. Then, the next step can be made: acceptance of responsibility for his threatened home and property.

However, interviewees raised the question how far the extensive preparation programs for a possible disaster could reach. Can it be expected from a Dutch citizen to make time

consuming analyses of potential action in case of a flooding once every 10,000 years? Is it appropriate to obtain survival kits for a chance of flooding that is so small that in ordinary life it may be regarded as non realistic? In terms of cost-benefit analysis this is irrational behavior (Jongejan, 2008). Above, it is the question whether it is possible for people that deal with so many other issues in our modern society: do they really have enough time to make this extra effort?

These are questions that come to the surface in a society evolving towards ever more complexity. Questions also, that cannot be answered in a context of only flood management or even water policy.

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SUMMARY

In the course of history, flooding brought misery to humanity. Since ancient times, people pondered about strategies to avoid flood risks. During last decades of raising awareness

about climate change, thinking about dealing with flood risks changed considerably, not in the last place in the low lands of the Netherlands. The conceptual turnover, or transition, suits in a broader development towards integrated and interactive water management. Here 'fighting against' turned to 'living with' water. The way the new perspectives on flood management in the Netherlands developed, is the central theme of this paper. The analysis is based on theoretical insights from paradigm shift, transition management, and evolutionary thinking on changes in system equilibrium. The final objective is to understand which changes the new approach of flood governance brings, and how the turnover appears in the application of flood policy. The different policy visions and documents show incremental change, but in-depth interviews with decision-makers and professional water managers confirm that it is time for a transition towards sustainable, or interactive, flood governance. Knowledge of the contents of these new concepts is relevant for planners that have to deal with the new challenges brought by climate change.