Freshwater Strategies in the IJsselmeergebied for the Year 2100: Scenario planning, Consequences, and Policy Making Process

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Abstract

The IJsselmeergebied currently has an important role in the compliance of the freshwater demand in the Netherlands, especially in the North Netherlands, North Holland and South Holland. It is projected that the position of the IJsselmeergebied will be more essential in the future due to the climate change issue and the increasing freshwater demand. Considering this crucial position, it is important to investigate the current planning process in the IJsselmeergebied. By doing this research, we question about the freshwater planning in the IJsselmeergebied for the year 2100 and how Rijkswaterstaat can have roles in the planning and the actualization process.

The literature study and interviews with advisors in Rijkswaterstaat reveal that there are currently four possible scenarios in the IJsselmeergebied. Unfortunately, none of these scenario are without consequences nor resilient. This study discloses that the current freshwater planning in the IJsselmeergebied is still in the first phase of the planning process; the scenario study. Therefore the planning process in the IJsselmeergebied must be accelerated and guided in a good direction. However, preparing the freshwater planning in the IJsselmeergebied is difficult not only because of the uncertainties in the climate change issue and the future freshwater demand, but it is also complex from the policy making perspectives. This study highlights how the existence of the Deltaprogramma and the shifting from technocratic water engineering to integral and participatory water management has put Rijkswaterstaat in a difficult position. Rijkswaterstaat has to reposition itself and become more involved in coalition building inside the Deltaprogramma.

After discussing about the freshwater issue and organizational structure in the IJsselmeergebied, this study tries to find a solution in guiding the freshwater planning in the IJsselmeergebied by linking the current freshwater issue with the idea of sustainable development and scenario planning. As the result, this study brings the idea to combine between the sustainable development cycle by Johnson et al., (2004) and the idea of scenario planning and use it for guiding the freshwater planning in the IJsselmeergebied. This study then tries to give recommendations on how Rijkswaterstaat can play an important role in this new sustainable development cycle. Other recommendations concerning the future freshwater planning are also being revealed in the end of this study.

Keywords: Freshwater, IJsselmeer scenario planning, sustainable development, adaptive water management,

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1 Introduction

1.1 Background

Observational records and climate projections provide abundant evidence that freshwater resources are vulnerable and have the potential to be strongly impacted by the climate change, with wide-ranging consequences for human societies and ecosystems (Bates et al., 2008). Climate changes will also affect the “wet heart” (“natte hart”) of the Netherlands: the IJsselmeergebied[1]. Van Drunen (2009) mentions that in this area, specifically in the IJsselmeer[2], both the winter storage and summer storage conditions are affected by climate changes in different ways:

- During winter the discharges in the Rhine will be higher as the response to increases in winter precipitations as well as less snowfall on the Alps due to a rise of temperature. This will generate higher volumes flowing through the IJssel to the IJsselmeer and increase the flooding probability in this area. This danger is amplified by the expected sea level rise, which will make gravity discharges to the Waddenzee more difficult.
- During summer, the demand for drinking water might rise a few percent due to a gradual temperature rise and more frequent heat periods. Furthermore, the agriculture sector might experience longer growing seasons and higher summer water demands due to longer soil water deficits. Even if it is doubtful whether the water demand will grow (agriculture development also depends on the market demand and land planning scenarios, while the possibilities for expansion of the agriculture sector seem limited in the Netherlands), the lower summer discharges of the Rhine, predicted by the climate scenarios made by the Deltacommissie (2008), will surely pose problems on its satisfaction.

Realizing that the climate is changing rapidly (Deltacommissie, 2008) and the water system in the Netherlands has experienced undesirable events such as two major floods in 1993 and 1995 (Brugge et al., 2005), we might suggest that the ‘Dutch water management is not sufficiently prepared to meet the challenges of climate change effects in the next century’ (CW21, 2000).

The IJsselmeergebied, as a part of the Dutch water management system, is also predicted to face difficulties in dealing with future extreme situations (Deltaprogramma IJsselmeergebied, 2012). Rijkswaterstaat, the executive arm of the Dutch Ministry of Infrastructure and the Environment, who is responsible for policy support and advice (Van den Brink, 2010) tries to find the solution for this problem.

However preparing the future long term freshwater condition is not easy for several reasons. First, The Netherlands might be one of the leading countries if it comes to freshwater management. The

[1]The IJsselmeergebied: the water-land system in the center of the Netherlands which includes not only the IJsselmeer, the Markermeer, the Randmeren, Ketelmeer and Zwartemeer, but also the coasts and the neighboring areas to those water bodies.
[2]The IJsselmeer: the IJssel lake.

literature that provides information concerning freshwater planning in other countries is very limited. The literature available mainly provides information about the short term freshwater planning that intends to solve the current freshwater problem instead of thinking for the future (see for example; Lempert and Groves, 2010; USAID, 2009), thus a different concept with the long term freshwater planning in the Netherlands. Other literatures discuss about the future long term freshwater planning, but the discussion is still limited on recognizing or estimating the future possible problems instead of already giving possible solutions for the future (see for example: Van der Molen and Hildering, 2005; UNFCCC, 2011), Learning from other countries failure and success in long term freshwater management is therefore not an option. With this situation, innovation and careful judgment have become more crucial in planning the future freshwater condition, and therefore the task of Rijkswaterstaat becomes more essential as well.

Second, the gap between the technical design and the implementation of the chosen freshwater scenario for the future should also be taken into account. This gap occurs because the nature of the water management planning process in the Netherlands has changed from technocratic to integral and participatory water management. Huitema and Meijerink (2009) wrote that the monopoly of the influential Rijkswaterstaat engineers in the planning process has broken because of these changes. In this era, even though Rijkswaterstaat, together with other water experts, has developed various analysis tools and models to support policy development in the field of water resources management, it is often difficult for policy makers to implement this technical design in practice due to economic, environmental, social and political conditions or other issues that are more crucial in the eyes of the policy maker (Hermans, 2005). This has caused water experts to reflect on their role in policy making, to see how they might decrease the gap between their analyses and the policy making process. Water experts have come to recognize the importance of addressing the needs of policy makers and politicians in their work, in one-way or another (Cosgrove and Rijsberman, 2000). The position of Rijkswaterstaat in the decision making process of the new integral and participatory water management is therefore interesting to investigate.

The third difficulty that Rijkswaterstaat has to deal with is the fact that this project is a long-term planning project. In this situation, it is hard for Rijkswaterstaat to predict what actually will happen in the year 2100. Even though Rijkswaterstaat has already developed some possible scenarios to deal with the future climate change, it still is difficult to predict which of the scenarios would be the most suitable for the future. Additionally, not only environmental conditions are unpredictable, but also economic, social and political conditions in the Netherlands are hard to predict.

Fourth, there are dilemmas within the four possible scenarios suggested by Rijkswaterstaat for the future freshwater planning in the IJsselmeergebied. The basic idea to increase the water level in the IJsselmeer already gives consequences for the infrastructure and environment around the IJsselmeergebied. In the same time, the possibility of the sea level rise also generates discussions about the future technique to stream water from the IJsselmeer into the sea. Streaming water using pumps or using gravitation will both have consequences. All the solutions proposed by Rijkswaterstaat to create more room for the water appear to be mainly focused on the engineering approach, for example using pumps as the final solution or increasing the water level in the IJsselmeer even though effecting on the whole infrastructure condition in the IJsselmeergebied. An engineering approach might indeed be a good solution to create additional room for the water. However, the long-term consequences that might occur should already be taken into consideration. This is a difficult task for Rijkswaterstaat.

Rijkswaterstaat will have to deal with the four constraints explained in this chapter during the planning and realization of the freshwater scenario in the IJsselmeergebied. Therefore this research is interested in investigating the role and position of Rijkswaterstaat during the long term freshwater planning in the IJsselmeergebied. This research aims to further give suggestions on how Rijkswaterstaat can improve its role. For this purpose, it is important to first investigate the current freshwater planning process in the IJsselmeergebied and the difficulties from technical perspectives. After all, it is also important to investigate the organizational structure inside the IJsselmeergebied and the position of Rijkswaterstaat in the policy making process.

1.2 Research Objectives

The aim of this study is to give suggestions to Rijkswaterstaat how it could deal with the freshwater planning towards the year 2100. This study tries to bridge the gap between the engineering design and the actual use of the results in practice, whereby social and political conditions are also taken into account. For this purpose, an overview of the possible spatial consequences of the freshwater scenarios for the year 2100 in the IJsselmeergebied and an overview of the possible conflicts of interest among all the actors were made. Following the objective, the research question that leads this research is: “What are the spatial impacts of freshwater planning in the IJsselmeergebied, and what are the consequences for Rijkswaterstaat?”

In order to answer this main research question several sub-research questions were drawn as follows:

1. *What are the freshwater scenarios in the IJsselmeergebied?*
   In order to answer this question, I conducted a literature review, used data from Rijkswaterstaat, and used the results of the interviews with advisors from Rijkswaterstaat to get an idea about the freshwater scenarios for the year 2100.
2. *What are the spatial consequences of these scenarios?*
   It is important to be aware of possible consequences of the freshwater scenarios in the year 2100 in a early phase so that Rijkswaterstaat and other decision makers can anticipate and minimize the consequences during the planning and the actualization of this project.
3. *What are the consequences of the freshwater planning in the IJsselmeergebied and the fundamental shift from technocratic water engineering to integral and participatory water management for the role/position of Rijkswaterstaat in the future freshwater planning?*

This question moves towards the conclusion whether Rijkswaterstaat is ready to reposition itself in the new integral and participatory water management and whether Rijkswaterstaat is ready to guide the planning and actualization of the freshwater scenarios in the IJsselmeergebied.

4. *How can Rijkswaterstaat play a role in the "Adaptive" Freshwater Planning in the IJsselmeergebied*

   Based on the consequences, answers derived from the second sub-research question, and based on the interviews, further analysis is directed to know how Rijkswaterstaat could guide the actualization of this project.

1.3 Research Framework and Methodology

1. An explorative study was undertaken due to the limitation of literature and data concerning long term freshwater planning. An explorative study in this research is useful to better comprehend and recognize the freshwater problem. Furthermore, extensive interviews with advisors in Rijkswaterstaat were undertaken to get a handle on the situation and to understand the current condition. Figure 1.2 shows the methodological steps conducted for this research. The methodology consists of the following four stepFirst, this current introductory chapter is the prelude to the research objectives and approaches found in this research paper.
2. The second step consisted of a literature review to provide a theoretical perspective and current discourse on several issues. The literature review on climate change issues, adaptive water management, sustainable development, resilience, and vulnerability was used mainly to explore the dilemmas of the freshwater scenarios in the IJsselmeergebied and to predict the spatial and social consequences of the scenarios. The literature review on the policy making process and scenario planning was essential to know the position of Rijkswaterstaat and the difficulties of the decission making process in freshwater planning in the Netherlands. The literature review on scenario planning and sustainable development was also important to support the authors argument on how Rijkswaterstaat can play a role in the "Adaptive" Freshwater Planning in the IJsselmeergebied . . Literature and data collection were gathered from books, journal articles, working papers, theses, seminar proceedings, unpublished materials, newspapers, and other sources from the internet. Additionally, the available data from Rijkswaterstaat is also used for this research.

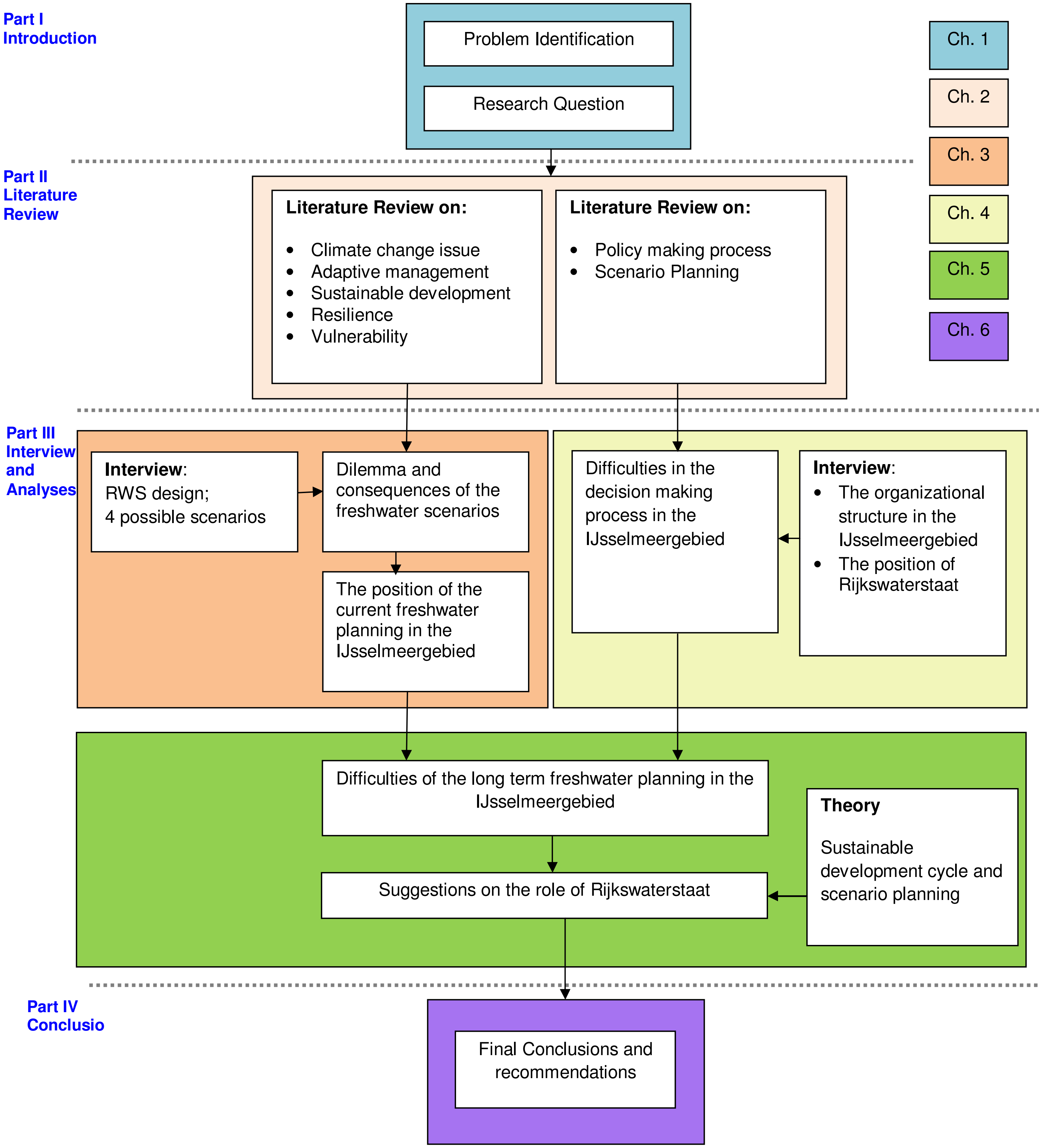

Figure 1.2 Research Framework

3. The third step of this study consist of interviews and analyses. The author tried to make a judgment based on the interviews with experts from Rijkswaterstaat (see appendix 3). Advisors from Rijswaterstaat were interviewed to gain more inside information and to obtain an impression of their viewpoints. Interviewing the advisors from Rijkswaterstaat is important since the focus of this research is to investigating the role and position of Rijkswaterstaat in the freshwater planning in the IJsselmeergebied. Interviewing the advisors from Rijkswaterstaat is also important because Rijkswaterstaat is responsible for providing the possible scenario for freshwater planning in the year 2100. Additionally, interviews are important during this study because the planning process in the IJsselmeergebied is still in an early phase and therefore some information could not be obtained from the secondary data. Primary data through in-depth interviews is important to get a more comprehensive overview of managing spatial planning and coordination issues among stakeholders in the IJsselmeergebied. The interview method could also explore more issues that the researcher might not have previously anticipated, thus it could provide a more widening and deeper discussion on the issue (Valantine, 2005). Analyses were then made by comparing and criticizing the information gathered from the interviews and from the literature reviews. In chapter three, the current possible scenarios were gathered from an extensive interview with a designer of the freshwater planning in the IJsselmeergebied who's also an advisor in Rijkswaterstaat. Then, the analysis concerning the dilemmas and consequences of these scenarios were made by comparing these scenarios with the resilience concept being discussed in the literature review. . , Another analysis is made in chapter four by comparing the interview results concerning the organizational structure inside the IJsselmeergebied and the literature review of the policy making perspective. From this analysis, chapter four reveals the difficulties of the decision making process in the IJsselmeergebied. Based on the analysis results in chapter 3 and chapter 4, chapter 5 will then discuss the difficulty in the long term planning in the IJsselmeergebied. Suggestions on the role of Rijkswaterstaat are made by analysing the sustainable development cycle theory and the scenario planning theory and by trying to use these two teories to solve the difficulties in the long term planning in the IJsselmeergebied.The last step in this study contained a reflection based on the resulting overview of the spatial consequences and actor analysis. Suggestions are made as guidance for the decision making process when the freshwater project is being implemented in the IJsselmeergebied.

2 Theoretical Context

2.1 Introduction

The foundation used in this chapter is purely explanatory to provide theoretical context to the reader. The theoretical discussion gives the background of the occurring policy and practice discourses. As the framework for further analysis, this chapter discusses the current discourse concerning the effects of climate change on freshwater management and common terms being used within this discourse (adaptive management, adaptive capacity, vulnerability, resilience, sustainable development, etc). Additionally, dealing with the effect of climate change will enforce planners to see the planning approach from a broader perspective and longer term of period. Scenario planning is a tool to understand how to see planning from this broader perspective and also think for the longer future, and therefore this chapter also discusses about theoretical perspective on scenario planning.

Furthermore, deciding about solutions for the future freshwater management in the Netherlands not only depends on the planner and engineer. Deciding such a big issue like freshwater management in the Netherlands should be done through policy making process in which undoubtedly will involve multiple actors. The different perceptions and interest of multiple actors involved will be hard to circumvent. Policy making process is thus not a simple process. Therefore, the theoretical perspective on the policy making process is also discussed further in this chapter. Overall, the theoretical context in this chapter is important to give guidelines and principles to the next chapters.

2.2 The Effect of Climate Change on Freshwater Management

Climate change presents a significant planning challenge for water management agencies in the whole world. Some climate change impacts on hydrological processes have been observed already (Rosenzweig et al., 2007). For example, Chiew (2007) observed that due to changes in temperature, evaporation and, crucially, precipitation, the effect on the distribution of river flows and groundwater recharge can already be seen nowadays. Furthermore, saline intrusion due to excessive water withdrawals from aquifers is expected to be worsening by the effect of sea-level rise, leading to reduction of freshwater availability (Kundzewicz et al., 2007). Therefore, it is important for water agencies to be aware of the effect of climate change on their hydrologic planning. Unfortunately, how climate will change and the effect of climate change in a long-term period is hard to predict (Cubasch et al., 2001).

In accordance with this situation, water agencies in the whole world have always considered hydrologic uncertainty in their planning (Lempert and Groves, 2010). Since the amount of available water in future years is never certain, water agencies build physical infrastructure (including reservoirs and groundwater wells) to accommodate this variability. However, Lempert and Groves (2010) report that this planning approach typically only considers uncertainty about year to year conditions and not uncertainty in long-term trends or other non-hydrologic factors. For example, when developing long-term plans, most water agencies develop a single estimate of how water needs or demands will evolve into the future. They then estimate (using planning or hydrologic models) how different schedules of capital improvements and program implementation would perform under the projected future water demands and historical hydrologic conditions (often called the "Period of Record").

Climate change presents new challenges to the way water managers plan for the future. Water managers can no longer assume that historical hydrologic conditions of the past will be good guides for the future due to the threat of climate change (Milly et al., 2008). Nevertheless, water managers are required to design their water system in such way that there is no failure probability in their plan even in the absence of historical hydrologic data making it rather impossible to estimate the probabilities or return periods of hydrologic events of interest. This gave rise to the concept of a new established water planning known as "**reliability**" (Brown, 2010). Here Brown (2010) defines reliability in a general way as "the probability of failure".

In the current era of constrained supply and limited untapped natural sources of water, uncertainty in the basic assumptions about future water demand, future yields of resources such as aquifers, and future regulatory environment are called into question. Water planners are increasingly turning to approaches that explicitly address these uncertainties when identifying strategies for meeting the water needs of their customers. Lempert and Groves (2010) further identified six uncertain factors that are potentially important for water manager to take into account in order to achieve their objectives:

- Future climate key factors;
- Future water demand;
- Impact of climate change on imported supplies;
- Response of groundwater basin to urbanization and changes in precipitation patterns;
- Achievement of management strategies;
- Future costs.

Based on the fact that there are uncertain factors involved in the future water management, the idea of adaptive water management has been discussed for quite some time (Pahl-Wostl, 2006). Pahl-Wostl (2006) defines **adaptive management** as a systematic process for continually improving management policies and practices by learning from the outcomes of implemented management strategies. Adaptive management aims to increase the adaptive capacity of the (water) system. In this term **adaptive capacity** can be defined as the capability of a system to adjust, via changes in its characteristics or behaviour, so as to cope better with existing and future stresses. More specifically, adaptive capacity refers to "the ability of a socio-ecological system to cope with novelty without losing options for the future" (Folke et al., 2002) and "that reflects learning, flexibility to experiment and adopt novel solutions, and development of generalized responses to broad classes of challenges" (Walker et al., 2002).

The concept of adaptive capacity is closely related yet confusing with the term of vulnerability and resilience. The exact relationship between these three terms is sometimes not so clear due to different usages of the concepts. When analyzing adaptive capacity one might get a similar picture of interconnectedness. Generally, a system (e.g. a community) that is more exposed and sensitive to hazard condition will be more vulnerable, and a system that has more adaptive capacity will tend to be less vulnerable (Smit and Wandel, 2006). Adaptation could be seen as choice processes where sets of adaptation alternatives are put into play to reduce exposure of a given system. In this sense one could think about adaptations as the actions an entity is putting into place to react to a stimulus in order to reduce its vulnerability or increase its resilience. From this explanation, it seems that vulnerability is the flip side of resilience.

To explain the differences between these two concepts, ISDR (2009) defines **vulnerability** as "the characteristics of a system that make it susceptible to the damaging effects of a hazard". Vulnerability includes not only physical features of buildings and infrastructures which make them susceptible to be damaged (that is usually the core of an engineering perspective to vulnerability analysis) but also environmental aspects as well as social, economic and institutional features affecting the capacity of a community to withstand, cope with and adapt to a hazardous event (Galderisi et al., 2010). Additionally ISDR (2009) defines the term **resilience** as "the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions". Here it can be seen that resilience and vulnerability are linked core-concepts in the climate change issue although, as mentioned above, the relationships between them are still a nebulous matter (Galderisi, 2010).

Despite of the confusion about the nature of adaptive capacity, resilience and vulnerability, the concepts can be useful to think about complex and dynamic systems. They can reveal patterns which can be used to develop hypotheses, models, and theories in order to gain a better understanding about the system under investigation (Gallopin, 2006).

In the past water management was characterized by an engineering based approach, where predictability was the norm rather than the exception. Now that practitioners and theorists become aware that the future is hard to predict, a shift in thinking is necessary, or else the future human being will be in danger. For example, Netherlands has experienced serious river floods in 1993 and 1995, causing evacuations of people and extensive material damage. The traditional engineering based approach would be raising dikes in whole water system. However, since the future climate changes are hard to predict, it would also be hard to decide about the dikes escalation. Moreover, rising the dikes will worsen the impact of possible flooding in the surrounding area in case that the dike systems fail. This condition is known as the "bathtub effect" (Roth and Warner, 2007).

River denaturalization is nowadays seen as the best way to achieve more water buffering capacity given the future climate expectations (De Boer et al., 2011). Achieving more water buffer capacity is in line with the idea of adaptive water management in which the system is designed to deal with the increasing complexities and uncertainties. This approach aims to enhance sustainability of complex socio-ecosystems with learning-by-doing through experiments (Holling & Walters 1990, Berkes et al. 2003).

Pahl-Wostl (2006) shows how the climate change issue, water management, and adaptive management relate (see Figure 2.1). Pahl-Wostl (2006) places adaptive management in an extended PSIR (Pressure-State-Impact-Response) framework, to increase the ability of the system to cope with change. Climate change in this figure is a part of pressure (P) that forces the current condition or the State condition (S) to change. Impact (I) is the effect of the pressure that depends on the vulnerability of each system. Response (R) in this diagram is part of the response strategies. The whole process has to be perceived as being iterative and proceed in cycles in contrast to the quite linear and sequential approach that is often adopted when using the PSIR scheme. In adaptive management cycles, policies and practices are adapted as circumstances to make a change and to learn. A key element of adaptive management and the transition to more adaptive management regimes is the participation of stakeholders (Pahl-Wostl, et al., 2005).

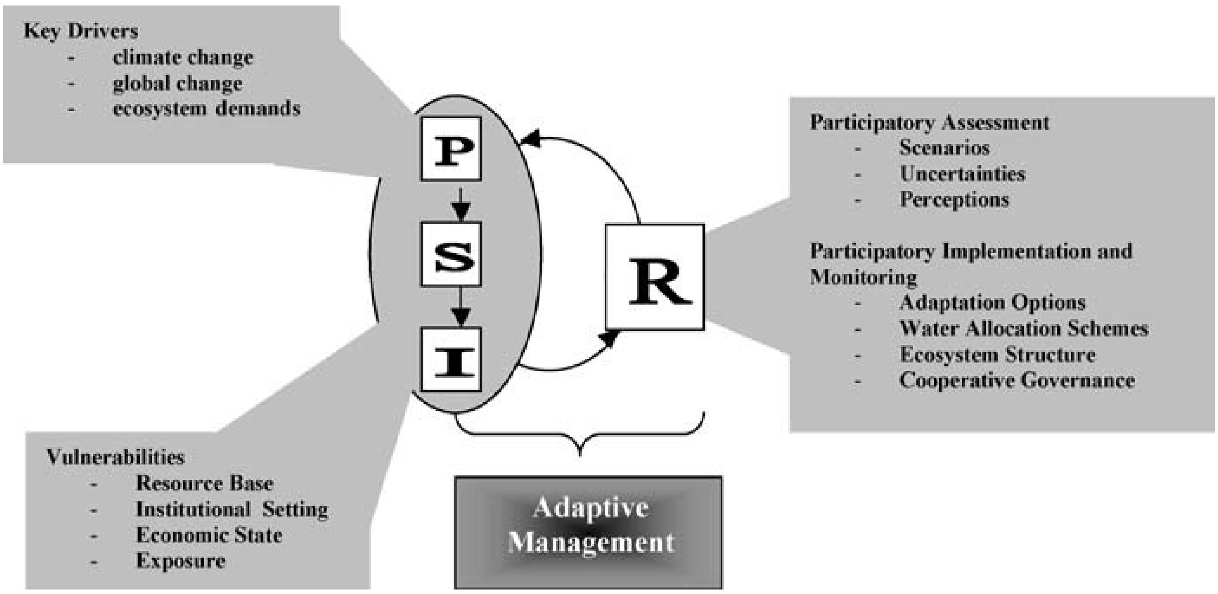

Figure 2.1 Adaptive management represented in an extended PSIR (Pressure-State-Impact-Response) framework
(source: Pahl-Wostl, 2006)

The IJsselmeergebied is currently also facing climate change issues that might have impact on the vulnerability of the whole system. Therefore, the idea of adaptive water management in Figure 2.1 is suitable to be used in preparing responses for the future freshwater planning in the IJsselmeergebied.

2.3 Sustainable Development in Freshwater Management

It is important to keep in mind that adaptive water management aims to enhance sustainability of complex socio-ecosystems (Holling & Walters 1990, Berkes et al. 2003). Therefore, in this section the concept of sustainable development will be discussed. **Sustainability**, as defined in the Brundtland Commission's report Our Common Future (WCED, 1987), focuses on meeting the needs of both current and future generations. Since the Brundtland report in 1987, sustainable development has become the focus of discussions and debates throughout the world (for example see Gleick,1998; Jordaan et al., 1993; Young, 1992; etc.). From the debates, it has been extremely difficult to define what sustainability is in terms more specific than those suggested by the Brundtland Commission. Therefore, This paper will use the concept of sustainable development that being outlined in Brundtland's report; development is sustainable if it meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987). **Sustainable development** lies in the three-fold overlap at the centre, where it integrates the three areas of concern; environmental protection, economic growth and social justice as shown in Figure 2.2 (Conelly 2007). Thus, water resource systems that are managed to satisfy the changing demands placed on them, now and on into the future, without giving environmental, economic and social degradation can be called "sustainable".

> *Sustainable water resource systems are those designed and managed to fully contribute to the objectives of society, now and in the future, while maintaining their ecological, environmental, and hydrological integrity* (ASCE, 1998; UNESCO, 1999).

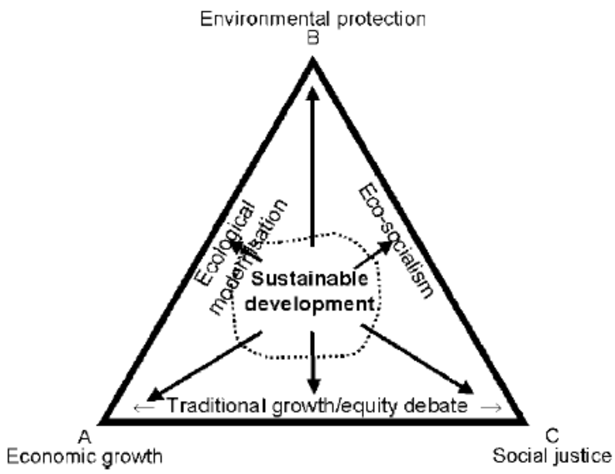

Figure 2.2 Sustainable development mapped in the field
(Source: Connelly 2007)

Sustainable development is thus hard to achieve considering that the future condition is uncertain. Given all these challenges with respect to the planning and management of sustainable water resource systems, it is appropriate to ask what can and should be done. No single profession pretends to have sufficient knowledge and experience to answer that question (Loucks, 2000). However, with inputs from a multiplicity of professionals and the interested and affected public, resource managers and decision makers can identify more clearly just what may be done to achieve higher levels of sustainability in specific situations (Loucks, 2000). Furthermore, the concept of resilience can be used as a key property in achieving sustainable development of water resource systems (e.g. Carpenter et al. 2005; Walker & Salt 2006). The chosen scenario for sustainable development of water resource systems should be resilient, consisting of the following properties (Chang & Shinozuka 2004):

- Robustness: the strength or ability of systems to withstand a given level of stress or demand without suffering unacceptable degradation or loss of function;
- Rapidity: the capacity to meet priorities and achieve goals in a timely manner.
- Redundancy: the availability of elements or systems that are substitutable and can be activated when disruptions due to disturbances occur;
- Resourcefulness: the capacity to identify problems, establish priorities and mobilise resources in the event of disruptions. It can be further conceptualised as consisting of the ability to apply material and human resources to meet established priorities;

Of these properties, robustness and rapidity can be viewed as the desired ends for a resilient system, whereas redundancy and resourcefulness are the means to support the desired ends. In addition, resilience is also conceptualised as encompassing the following interrelated dimensions (Chang & Shinozuka 2004):

- Technical: the ability of physical systems to perform to desired levels when subject to disturbances;
- Organisational: the ability of organisations or governing bodies that manage the system and have the responsibility for making decisions and taking actions that contribute to achieving the properties of resilience;
- Social: the measures designed to lessen the extent to which the systems and society suffer negative consequences due to loss of services as a result of adverse events;
- Economic: the capacity to reduce both direct and indirect economic losses resulting from adverse events.

Achieving sustainability in the IJsselmeergebied, thus, can be done by implementing adaptive water management while considering that the chosen scenario is resilient.

2.4 Theoretical Perspective on Scenario planning

The growing complexity, an increasing concern about rapid and apparently random development, the dramatic increase in interest (at all scales, from local to global) in environmental issues (Breheny, 1991), the growing strength of the environmental movement, and a reemphasis on the need for long-term thinking due to the idea of sustainable development (Friedmann, 2004; Newman and Thornley, 1996) enforce planners to see the planning approach from a broader perspective than the classical project plans, therefore strategic planning approaches emerge. Before the existing of strategic planning, planning was fuelled not only by the neoconservative[3] disregard, but also by postmodernist scepticism, both of which tend to view progress as something which, if it happens, cannot be totally planned and controlled (Healey, 1997). The focus of urban and regional planning practices at that moment was on projects (Motte, 1994). The importance of strategic planning is explained by Albrecht (2003):

> "By the end of the century, new efforts were underway in many parts of Europe to produce strategies for cities, sub regions and regions. Often these efforts involve then construction of new institutional arenas within structures of government that are themselves changing. The motivations for these efforts are varied, but the objectives have typically been to articulate a more coherent spatial logic for land use regulation, resource protection, and investments in regeneration and infrastructure. Strategic frameworks and visions for territorial development, with an emphasis on place qualities and the spatial impacts and integration of investments, complement and provide a context for specific development projects" (Albrechts et al., 2003, p. 113)

From this explanation, Friedman (2004) draws a conclusion that strategic spatial planning is conceived as long-range planning for territorial development. It calls for new institutions of governance, and, in the long tradition of spatial planning; it calls for a comprehensive, integrated approach. Faludi and Van der Valk (1994, pp 3) make a distinction between project plans and strategic plans (Table 2.1). They define project planning as the opposite of strategic planning, for example in project plans the future condition is determined on beforehand, thus the future is closed, while the future condition in strategic plans is open. Strategic plans are defined as frameworks for action. They need to be analyzed for their performance in helping with subsequent decisions. Project plans are blueprint plans and form an unambiguous guide to action. For Granados Cabezas (1995) strategic planning anticipates new tendencies, discontinuities, and surprises; it concentrates on openings and ways of taking advantage of new opportunities.

Table 2.1 Project plans and strategic plans

	Project plans	***Strategic plans***
Object	Material	Decisions
Interaction	Until adoption	Continuous
Future	Closed	Open
Time element	Limited to phasing	Central to problems
Form	Blueprint	Minutes of last meeting
Effect	Determinate	Frames of reference

Source: Faludi and Van der Valk, 1994, pp 3

In case of a medium to long-term planning under uncertain conditions, scenario planning can be used as an effective strategic planning tool (Lindgren and Bandhold, 2009). Scenario planning is somewhat

[3] Neoconservativism promotes a strong authoritarian state that actively intervenes in the lives of its citizens

similar to adaptive management (Walters, 1986), an approach to management that takes uncertainty into account. It helps us to sharpen up strategies, draw up plans for the unexpected and keep a lookout in the right direction and on the right issues. “The central idea of scenario planning is to consider a variety of possible futures that include many of the important uncertainties in the system rather than to focus on the accurate prediction of a single outcome” (Peterson et al. 2003 p. 359) Scenario planning is not only about writing the scenario, but also related to strategic planning. It is mainly a feed-forward process, while traditional planning concern mainly about feedback system (Lindgren and Bandhold, 2009). Feedback system is important to know what was happening in the past, while a feed-forward process are important to get information to choose which way to go (see Figure 2.1). The differences between traditional planning approach and scenario planning are illustrated in table 2.2

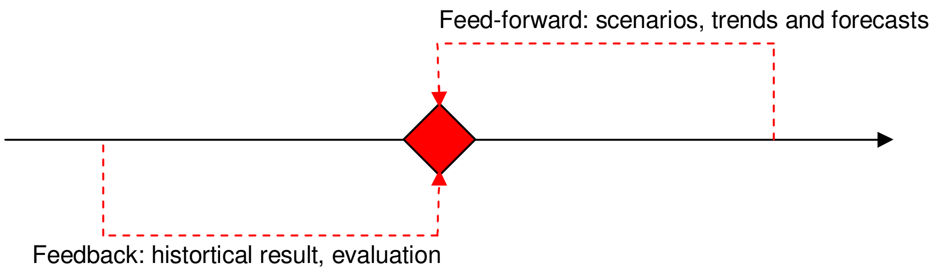

Figure 2.3 Feed-forward and Feedback system

Table 2.2 Characteristics of traditional planning compared with the Scenario planning

	Traditional Planning	Scenario planning
Perspective	Partial, 'everything else being equal'	Overall, 'Nothing else being equal'
Variables	Quantitative, objective, known	Qualitative, not necessarily quantitative, subjective, know or hidden
Relationships	Statistical, stable structures	Dynamic, emerging structures
Explanation	The past explains the present	The future is the raison d'être of the present
Picture of future	Simple and certain	Multiple and uncertain
Method	Determinist and quantitative models (economic, mathematical)	Intention analysis, qualitative and stochastic models (cross-impact and systems analysis)
Attitude to the future	Passive or adaptive (the future will be)	Active and creative (the future is created)

Source: Lindgren and Bandhold, 2009, pp 27.

Figure 2.4 illustrates four levels of proactiveness in a scenario-planning continuum. The scenario planning continuum enables organizations to be better at anticipating future needs and eventually "shaping the future", identify a range of potential futures (Lindgren and Bandhold, 2009). Identifying a range of potential futures in scenario planning is closely tied to the notion of probable and possible (Peterson et al., 2003) as it is shown in Figure 2.5.

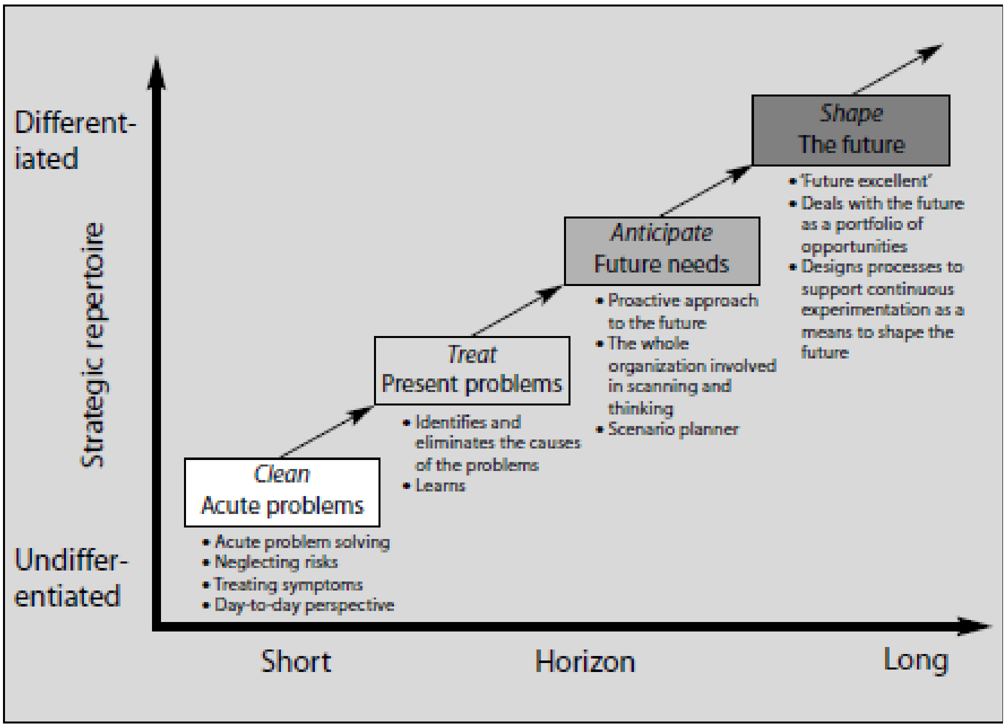

Figure 2.4 Four Levels of Proactiveness
Resource: Lindgren and Bandhold (2009) pp. 15

Peterson (2003) further explains that 'the probable' is related to prediction, forecast, and projection, while 'the possible' is related to scenarios made during the planning process in order to deal with the uncertainties. A prediction is a probabilistic statement that something will happen in the future based on what is known today (MacCracken 2001). Related to a prediction is a forecast. The public and decision-makers generally understand that a forecast is a "best" prediction made by a particular person or with a particular technique or representation of current conditions (MacCracken, 2001). In contrast to a prediction, a projection specifically allows for significant changes in the set of "boundary conditions" that might influence the prediction, creating Projections lead to "if this, then that" statements (MacCracken 2001).

However, it is difficult to create an accurate forecast. Therefore, in response to this difficulty, Herbert Kahn developed the idea of scenarios (Kahn & Wiener 1967). Unlike forecasts, scenarios stress irreducible uncertainties that are not controllable by the decision makers (Peterson, 2003). Scenarios may include realistic projections of current trends, qualitative predictions, and quantitative models, but their actual value lies in incorporating both qualitative and quantitative understandings of the system and in stimulating people to evaluate and reassess their thinking about the system (Greeuw et al. 2000). Evaluating peoples thinking means that scenarios can be revisited to adjust the range of possible futures as planning assumptions change, old possibilities weaken and new ones emerge (Marra and Thomure, 2009).

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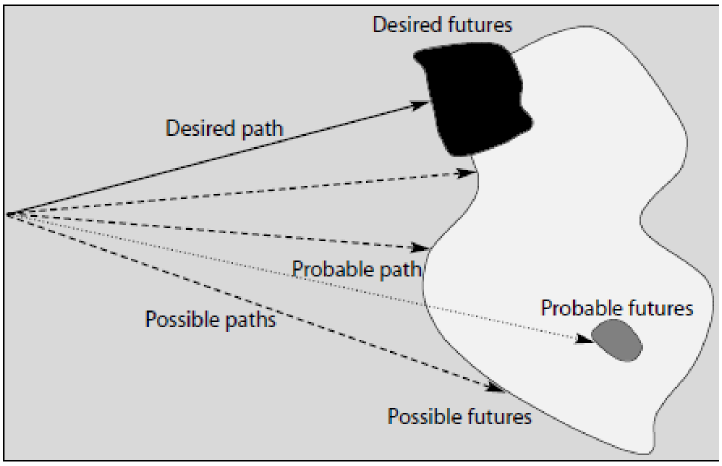

Figure 2.5 The relations between possible, probable and desired futures
(Source: Resource: Lindgren and Bandhold (2009) pp. 22)

Scenario planning that involves stakeholders can provide a forum for policy creation and evaluation. Stakeholders who become involved in the scenario-planning process are likely to find that some scenarios represent a future that they expect, whereas others are highly unwanted (Peterson, 2003). Therefore, scenario planning is also closely related to the policy making process.

2.5 Theoretical Perspective on Policy making

Deciding on solutions for sustainable forms of future freshwater management requires a policy making process. The traditional and highly stylised model of policy-making views it as a linear process in which rational decisions are taken by those with authority and responsibility for a particular policy area. This approach views policy-making as involving a number of stages that lead to a decision; First step is understands the policy issue or problem. Secondly, explore possible options for resolving the problem. Thirdly is weighing up the costs and benefits of each option. Fourth step is making a rational choice about the best option. Fifth, implement the policy. Sixth, evaluating phase which will look backwards in practice, how successful the policy was being implemented to adjust the policies or programs that have become dysfunctional, redundant and so forth (IDS, 2006). The linear process in this traditional approach is a non-iterative process, in which the planning process goes from the first step to the next steps and stops in the sixth step.

This model assumes that policy-makers approach the issues rationally, going through each logical stage of the process, and carefully considering all relevant information. If policies do not achieve what was intended to achieve, responsibility will go to political or managerial failure in implementing it – through a lack of political will, poor management or shortage of resources, for example. It is also assumed that there is a clear separation between fact (a rational policy approach based on evidence, science and objective knowledge) and value (seen as a separate issue, dealt with in the political process). Policy-making is mainly a bureaucratic or administrative exercise. While the role of experts is seen as critical to the process of making well-informed decisions, and scientific expertise has long been presumed to be independent and objective (IDS, 2006). However, research on policy processes shows that this classical theoretical perspective is hard to be implemented in the reality (IDS, 2006)

This classical planning approach shows serious weakness due to the cognitive limitations and 'bounded rationality' identified by Simon (1972). Simon views decision-making as a fully rational process of finding an optimal choice from the available information. However, decision-makers are often lack of the abilities and resources to arrive at the optimal solution. Uncertainty about future developments make difficult for decision-makers to choose the optimal solution. For example, no one can guarantee how the future will be concerning climate change. Because of this uncertainty situation, decision makers often have to apply their rationality based on assumptions about uncertainties (Gigerenzer and Selten, 2002). Using uncertain assumptions for making a decision can be dangerous if it is not guided with a planning method to deal with uncertainties in the future environment.

Another problem in policymaking processes is that most of the policymaking processses will involve multiple actors. Problems may be perceived differently by multiple actors. In addition, the information needed to choose a rational solution is spread over various locations, governed by multiple institutions at different levels and may be difficult to access (Forester, 1989). Forester (1989) also describes that the multiple actors involved in a policymaking process are impossible to be equally powerful. Yet, the power of actors is related to their positions in historical, social, political, and economic structures. As a result of this multi actor involvement, actors need to compromise during the policymaking process. Policymaking processes are also generated within actor networks in which multiple actors are interrelated in a more or less systematic way, therefore multi-actor perspectives are needed during policymaking processes (Kenis and Schneider, 1991). Investigating the multi-actor policymaking setting is useful to help water experts to connect between their analyses and the needs of the policy makers (Hermans, 2005).

2.6 . Conclusion

The climate change issue is enforcing planners to see the planning approach from a different perspective because the threat of climate changes makes historical hydrologic conditions of the past become not longer trustworthy guides for the future (Milly et al., 2008). The idea of adaptive water management emerged based on the fact that there are uncertain factors involved in the future water management due to the climate change issue (Pahl-Wostl, 2006). Adaptive water management aims to enhance sustainability in the water system, although it is not easy to clearly define what sustainability is, nor to achieve sustainability itself. The ongoing discourse concerning the idea of sustainability is not being discussed in detail in this chapter, rather, this chapter seeks for the alternative way to achieve sustainable development of water resource systems.

The concept of resilience can be used as a key property in achieving sustainable development of water resource systems (e.g. Carpenter et al. 2005; Walker & Salt 2006). The chosen scenario for sustainable development of water resource systems should be resilient. A resilient scenario based on

Chang and Shnozuka (2004) means that the chosen scenario should be able to overcome a certain level of stress without suffering from failure (robust). The chosen scenario should also be able to react in a short time period on the changing situation (rapidity). Additionally, the chosen scenario should have a backup system in case that the primary system fails (redundancy). Finally, the materials and human resources of the chosen scenario should be available (resourcefulness). In addition, resilience is also conceptualised as encircling the interrelated dimensions of technical, organizational, social and economic dimensions. Based on this interrelated dimension, a resilient water system should technically be able to overcome the pressure while in the same time having the organizational resources to manage the system and to take the responsibility for making decisions and taking actions. Additionally, the system should be able to decrease the negative consequences for the society and the economic consequences when the disturbance occurs (Chang & Shinozuka 2004). Thus, adaptive water management can be a useful tool in achieving sustainability as long as the chosen scenario is able to fulfill the eight requirements of a resilient system.

However, choosing the suitable scenario is not simple since there are a variety of possible futures. In this uncertain situation, scenario planning can be used to judge multiple possible futures in the system rather than to focus on the accurate prediction of a single outcome (Peterson et al., 2003). Additionally, scenario planning is also closely related to policy making processes. Stakeholders who are involved in the scenario-planning process are likely to choose some scenarios that represent their future expectation, while other scenarios are highly discarded (Peterson, 2003). Therefore, it is important to also investigate the needs of the policy makers and how they interact (Hermans, 2005).

Based on the theoretical context in this chapter, chapter 3 is exploring the current climate change issues in the IJsselmeergebied. It further explores about the dilemma in preparing freshwater planning in the IJsselmeergebied due to the idea of sustainable development and the requirement that the chosen scenario should be resilient. The needs of the policy makers in the IJsselmeergebied and how they interact is further discussed in chapter 4. Then, chapter 5 tries to link between the concept of sustainable development and scenario planning that are being discussed in this chapter with the freshwater issue in the IJsselmeergebied that is being discussed in chapter 3 and the organizational structure in the IJsselmeergebied that is being discussed in chapter 4.

3 Freshwater Planning in the Netherlands and in the IJsselmeergebied

3.1 Introduction

The dilemma in preparing the freshwater planning in the IJsselmeergebied will be discussed in this chapter. For this purpose, first the current freshwater problem in the Netherlands will be discussed to give a background why it is important to already start thinking about the future freshwater planning in the Netherlands and why the IJsselmeer can play an important role for the compliance of the future freshwater demand. The discussion will then move to the planning process of the freshwater scenarios which consist of three phases: the scenario study; the development of the master plan; and the formal decision making.

This chapter further discusses about the current freshwater planning in the IJsselmeergebied and tries to position the current process within these three planning phases. This information and the possible solutions for the future freshwater planning in the IJsselmeergebied were gathered from the interviews with senior advisors from Rijkswaterstaat. It will then try to judge whether the current possible solutions in the IJsselmeergebied are adaptive to the future changing situation and whether the current possible solutions are fulfilling the eight requirements of a resilient system as it was discussed in chapter 2. Finally, this chapter tries to illustrate the consequences of every possible solution for the freshwater planning in the IJsselmeergebied.

3.2 Freshwater Issue in the Netherlands

Van Oel (2002) has reported that the total water footprint of Dutch consumers is about 2300 m^3 per capita per year for the period 1996-2005. The term 'water footprint' is being used instead of the term water consumption because freshwater consumption not only consists of direct water use of a consumer or producer, but it also consists of indirect water use. Indirect water use is the cumulative water used in the production process of an agricultural or industrial product that is being consumed by the individuals of one country (Hoekstra and Hung, 2002). Agricultural goods are responsible for the largest part of the footprint (67%), industrial goods are responsible for 31% and domestic water use accounts for about 2% (Figure 3.1). The global demand for water in the agriculture sector will increase over time with increasing population, rising incomes and changes in dietary preferences. Increasing demands for water by industrial and urban users, and water for the environment will intensify competition (Fraiture and Wichelns, 2010).

Moreover, the demand for drinking water may increase a few percent due to a structural temperature rise and more frequent heat periods. Additionally, the agriculture sector might experience longer growing seasons and higher summer water demands due to longer soil water deficits (Van Drunen, 2009). Considering this condition the Netherlands should already be worried about the future freshwater availability in their area.

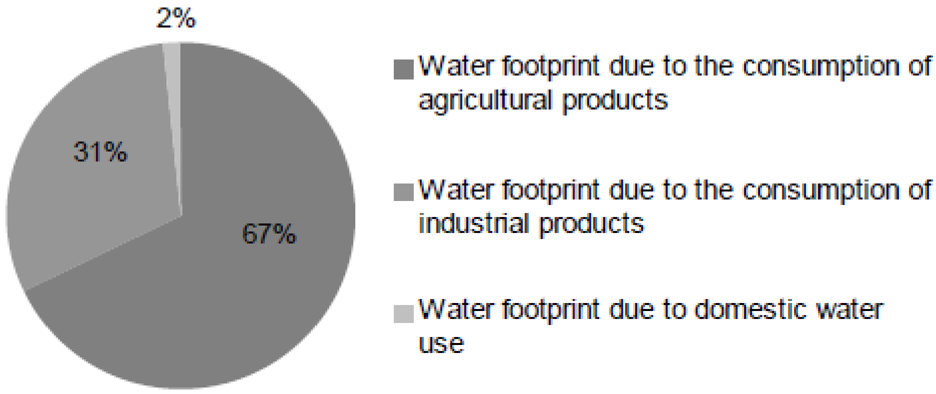

Figure 3.1 Water Footprints in the Netherlands
(Source: Van Oel et al., 2002)

Even though the PBL Netherlands Environmental Assessment Agency (2011) argues that the Netherlands has a water surplus when it is viewed from an annual perspective, it also points out that water deficits already occurred recently during the summer periods, when evapotranspiration exceeds precipitation. During the summer months, about three-quarters of the Netherlands is supplied with additional water from the national waterways, which include the rivers Rhine and Meuse and the IJsselmeer. In the summer, the river Rhine is by far the most important source of fresh water for the Netherlands. Parts of the more elevated regions with sandy soils in the east and south of the country and a few of the islands in the south-west delta rely entirely on precipitation and regional groundwater reserves for their water supply. In normal and dry summers these water resources are usually sufficient to meet the demand. However, in extremely dry summers – which occur about once every 60 to 100 years – the available water resources may be insufficient, as was the case in 1976. Climate changes are expected to increase the frequency of periods of drought during summer, which will also lead to increased risks of water deficits.

Furthermore, it has been proven that the sea level rose 10 to 25 cm over the last century and is expected to rise about 50 cm by 2100 due to climate changes (Warrick et al. 1996). Sea level rise will not only create a safety issue, but it will also create a freshwater availability issue. Seawater intrusion will occur in accordance with sea level rise, and these will be the main factors that threaten the availability of freshwater in the Netherlands. The effect of sea water intrusion can already be observed in the Netherlands, whereby based on the data reported by PBL (2011), 80% of the water from the national waterways is used mainly to maintain water levels and for flushing regional water systems to maintain water quality and control salinity levels.

Considering all of these situations, the government in the Netherlands has to start finding solutions how to manage their freshwater availability (Deltaprogramma IJsselmeergebied, 2012a). Yet should also be taken into account that finding a freshwater solution is not only related to a technical situation but it is also related to political commitment and governmental leadership for overcoming the many obstacles involved in spatial planning. The long-lasting and substantial governmental support for nature development policies are hard to implement in such a densely populated country. Therefore, the government in the Netherlands believes that it is important to start planning the freshwater scenario for the year 2100 (Deltaprogramma IJsselmeergebied, 2012a).

3.3 The Future Freshwater Planning and the Planning Issues

Planning for freshwater issues for the year 2100 is not simple due to several reasons. First, it is hard to predict the future freshwater demand. Freshwater demand not only depends on the changes in population and food consumption, but also depends on economic policy (including water pricing), technology, lifestyle, and society's views of the value of freshwater ecosystems (Kundzewicz et al., 2007). Thus, changing the freshwater management system is not the only solution for the compliance of future freshwater demand. It is possible that in the future water will be used in a more efficient way, and as a result the freshwater demand will not increase significantly. Second, preparing the future freshwater scenario is also complicated since the future climate condition is uncertain. For example Warrick et al. (1996) predict that due to climate change, the sea level will rise about 50 cm by 2100. While The Royal Netherlands Meteorological Institute (KNMI) has a different prediction concerning sea level rises.

KNMI does not mention one precise number about the prediction of sea level rises; instead KNMI worked out two scenarios for the sea level rise on the Dutch coast, the G scenario and the W scenario. These scenarios are known as the KNMI 2006-scenario's. The G scenario predicts that the temperature will rise with approximately +1℃ between 1990 and 2050 and will rise approximately +2℃ until 2100. Meanwhile, the W scenario predicts that the temperature will rise with approximately +2℃ until 2050 and +4℃ until 2100 (KNMI, 2006). Besides of these scenarios, there are also the G+ scenario and the W+ scenario. Summarized, the KNMI produced a total of four scenarios (see Figure 3.2). The letter 'G' is taken from the Dutch word 'Gematigd' (= moderate), while 'W' is taken from 'Warm', and '+' indicates that these scenarios include a strong change of circulation in the winter and the summer. These four climate scenarios result in a sea level rise of 15 to 35 cm in 2050 and 35 to 85 cm in 2100 (Deltacommissie, 2008). Neither of these cases take into account land subsidence and in all the cases the reference year is 1990 (see Figure 3.3).

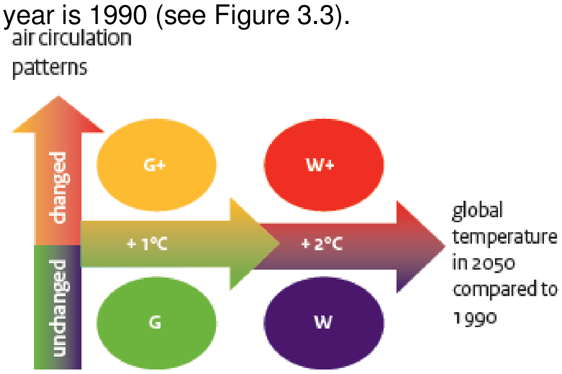

Figure 3.2 Schematic overview of the four KNMI'06 climate scenarios
(Source: Deltacommissie, 2008)

The Deltacommissie, on the other hand, has a different opinion about the sea level rise. The Deltacommissie sought to base its advice on the most recent scientific insights into a conceivable upper limit to global and regional sea level rise, changed storm conditions above the North Sea, and precipitation changes leading to altered discharge in the major rivers. The Deltacommissie has therefore commissioned additional research to provide a systematic survey of the most recent information on climate scenarios. A number of prominent national and international climate experts, including several IPCC authors, have been commissioned by the Deltacommissie to produce scenarios for 2100, supplementary to the IPCC 2007 and KNMI 2006 scenarios. Based on these scenarios, the Deltacommissie predicts that untill 2100 the sea level will rise with 55cm to 120cm (Deltacommissie, 2008).

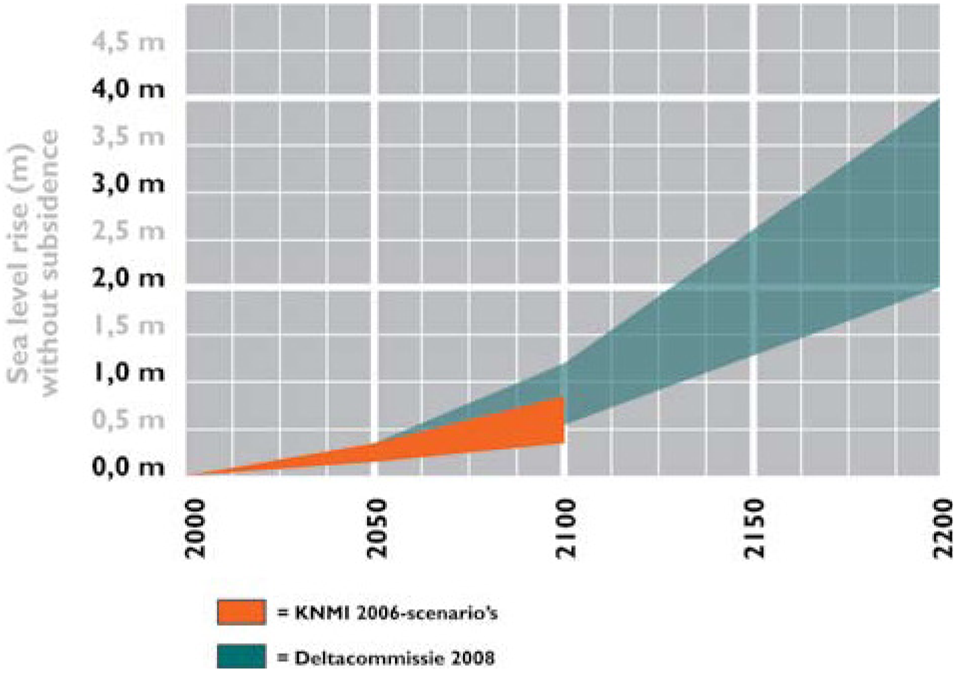

Figure 3.3 Prediction of Sea Level Rise
(Source: Deltacommissie, 2008)

The uncertainty about the sea level rise until 2100 is a hindrance for planning the future freshwater scenarios. On the one hand it is important to already make a plan to defeat seawater intrusion so that the future freshwater availability can be guaranteed. On the other hand, the future sea level rise and the future water demand are hard to predict.

Despite of the uncertainty in the future freshwater demand and sea level rise, the vulnerability of freshwater systems to climate changes is closely interconnected with water management (Kundzewicz et al., 2007). Even though it is difficult to predict the future water demand and sea level rise, it is still possible to plan the future freshwater management by anticipating future needs and eventually identifying a range of potential futures by using scenario planning theory (Lindgren and Bandhold, 2009) as it was discussed previously in chapter 2.

3.4 Freshwater Situation in the IJsselmeergebied

The IJsselmeer has an important role in the compliance of the freshwater demand in the Netherlands, especially in North Netherlands, North Holland and South Holland as shown in Figure 3.4. Figure 3.4 further shows the current freshwater distribution in the Netherlands. Based on this figure and the PBL (2011) report, 80% of the water from the national waterways is used mainly to maintain water levels and for flushing regional water systems to maintain water quality and control salinity levels. Therefore, the water from the national waterways cannot be used effectively to comply with the freshwater demand in Netherlands (PBL, 2011). With this situation it is perceptible that the accomplishment of water management in the IJsselmeer can be valuable for the compliance of the future freshwater demand.

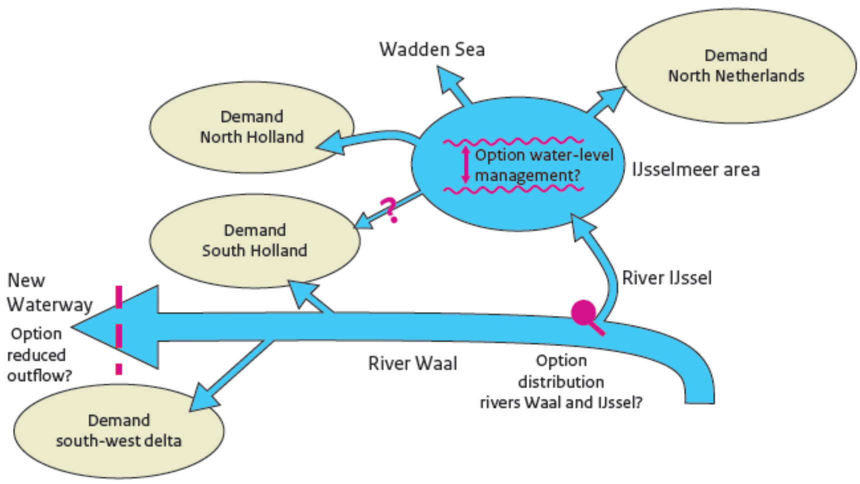

Figure 3.4 Freshwater analyses in the Netherlands
(Source: PBL, 2011)

The IJsselmeer is currently receiving water from a large area in the Netherlands and a part of Germany, as shown in Figure 3.5. Freshwater is stored in the IJsselmeer and being used by some areas in the northern part of the Netherlands as shown in Figure 3.6. Furthermore, the latest discourse inside Rijkswaterstaat is to look for the possibilities of using water from the IJsselmeer for the future freshwater supply in the western part of the Netherlands (interview with Smedes and Oosterberg, 2012) . It can be concluded from this current situation that the position of the IJsselmeer in complying the freshwater demand in the Netherlands is crucial.

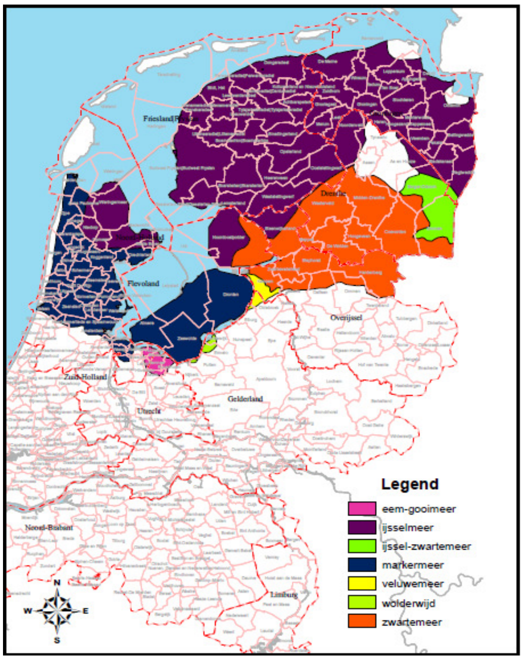

Figure 3.5 Areas that contribute to water storage in the IJsselmeer and Markermeer

Figure 3.6 Areas that use Freshwater from the IJsselmeer and Markermeer

(Source of Figure 3.5 and Figure 3.6: made by Author based on Rijkswaterstaat database)

Nevertheless, the current condition in the IJsselmeergebied in a way cannot be classified as an ideal condition since the current mean water level in the IJsselmeer is already below the mean sea level in the North Sea, known in Dutch as *Normaal Amsterdams Peil* (NAP). With this condition, streaming water from the IJsselmeer to the sea can only be done when the sea level is below the water level in the IJsselmeer. There are only nine hours per day that can be used to stream water to the sea by using gravity in the spring time (Interview Smedes, 2012). While in the summer time, there is only less than six hours that can be used to stream water to the sea. The fluctuation in the water level in the IJsselmeer is illustrated in Figure 3.7

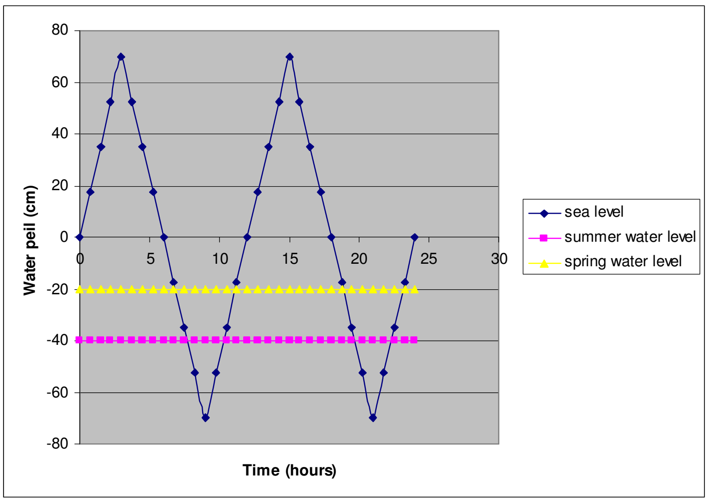

Figure 3.7 Comparison of sea level fluctuation and water level in the IJsselmeer
(Source: Made by author based on the interview with the designer of freshwater scenarios in the IJsselmeer)

From the freshwater management perspective in the IJsselmeer, there is a 20 cm water level difference between the summer and spring period that can be used for accomplishing the freshwater demand in the Netherlands. This means that in the current situation there are 400 million m^3 of freshwater available in the IJsselmeer. Meanwhile, it is predicted that in order to fulfil the freshwater demand in 2100, there must be about 40-150 cm water level difference available in the IJsselmeer (Deltaprogramma IJsselmeergebied, 2012). This prediction implies that the current condition in the IJsselmeer would not be sufficient to fulfil the future demand and for this reason the idea to increase the water level in the IJsselmeer emerged.

3.5 Freshwater Planning Issues in the IJsselmeergebied

The Deltacommissie has developed an integrated vision concerning freshwater availability for the future. One of the recommendations is about the future water management in the IJsselmeer:

> The level of the IJsselmeer will be raised by a maximum of 1,5 m. This will allow free discharge from the lake into the Wadden Sea beyond the year 2100. The level of the Markermeer will not be raised. The IJsselmeer retains its strategic function as a freshwater reservoir for the Northern Netherlands, North Holland and, in view of the progressive salt water intrusion in the Nieuwe Waterweg, for the Western Netherlands.
>
> *Until 2050:*
>
> The measures to achieve the elevated water level can be implemented gradually. The aim must be to achieve the largest possible fresh water reservoir around 2050. The measures needed to adapt the lower reaches of the river IJssel and the Zwarte Water to a 1,5 m higher water level in the IJsselmeer must be investigated.
>
> *Post 2050:*
>
> Depending on the phased approach adopted, follow-up measures may be needed to actually implement a maximum water level increase of 1,5 m (Deltacommissie 2008).

From this recommendation, it is clear that the Netherlands are already aware of the future freshwater pressure condition. Nevertheless, looking at the current condition of the IJsselmeergebied, this recommendation is definitely not a simple idea.

First, there is no guarantee that this amount of water level increase will be enough nor that it will be an efficient solution to comply with the future freshwater demand and the future sea level rise. However, giving the recommended scenario to overcome the future freshwater condition is a prudent step. Through skilfully crafted scenarios, it is possible to reduce a large amount of uncertainty to a handful of reasonable alternative directions that together contain dimensions that even though still uncertain but already relevant (Lindgren and Bandhold, 2009). The scenario planning has an important role in identifying potential risks and opportunities, and to prepare for not one but many possible futures (see

Figure 2.5). Here we should realise that the Deltacommissie is giving a recommendation of maximal 1,5 meter water level raise in the IJsselmeer in order to give space for the many possible futures. In other words, the amount of 1,5 meter is just one of the possible futures, while the real future can be different.

Second, it can be seen from figure 3.8 that increasing or lowering the water level in the IJsselmeer might give problems in the surrounding areas. Additionally, it can also be seen that even the current water level in the IJsselmeer is already threatening some of the dykes and water constructions around the IJsselmeer because the tipping point is located in between -0,40 NAP and -0,20 NAP.

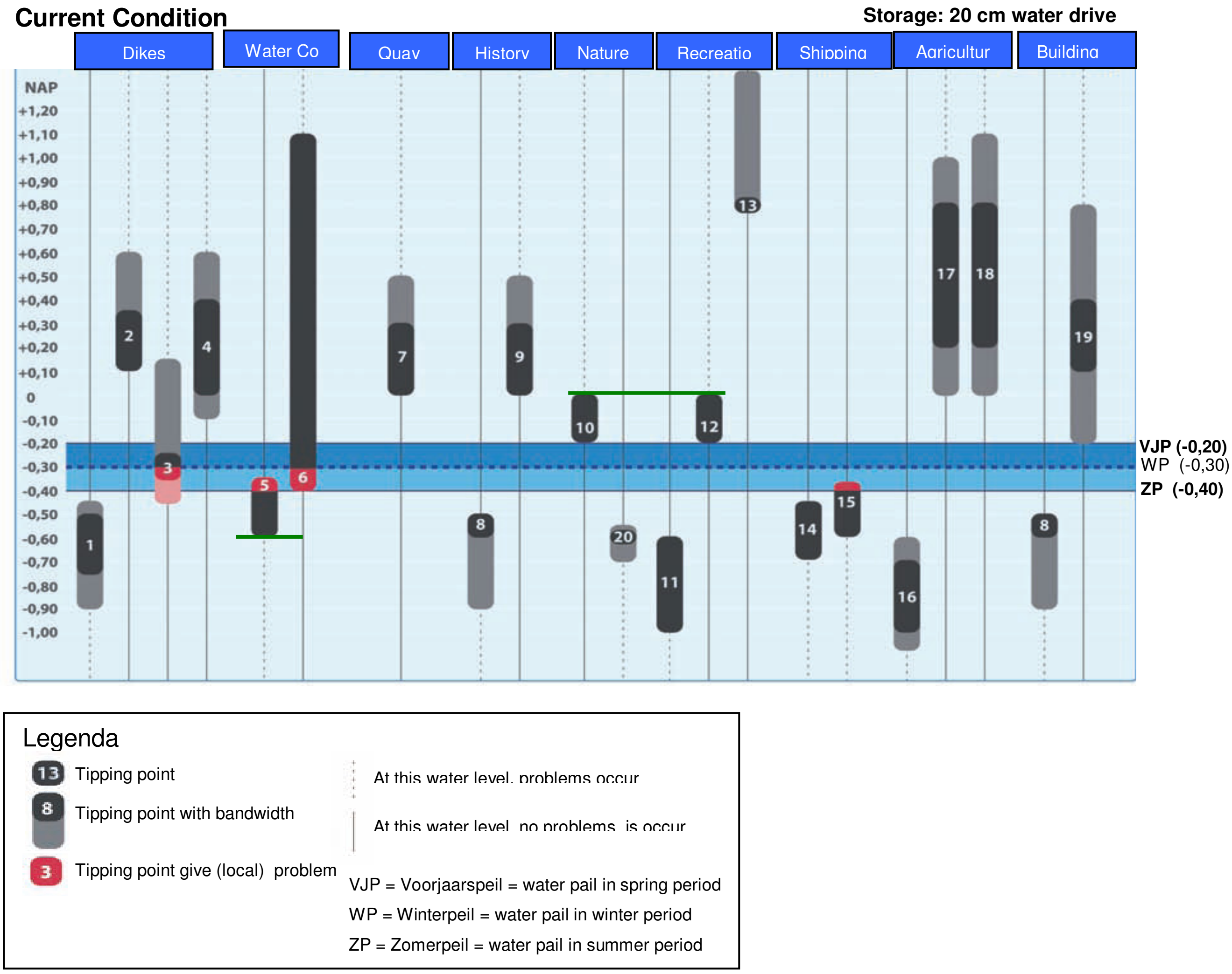

Figure 3.8 The current water level condition in the IJsselmeer
(Source: Deltaprogramma IJsselmeergebied, 2012a)

The charts in the Figure 3.8 represent several functions in IJsselmeergebied:

1. Dikes macro stability; risk of outside shear and expansion
2. Dikes stability in summer condition threatened
3. Failure risk in peak situation (winter condition)
4. Increased risk of additional piping because of inside and outside water level difference
5. Water intake points are no longer sufficient
6. The strength of the various structures (locks, intakes, pumping stations) is not sufficient in peak situations (winter)
7. Quays and jetties too low: outside the industrial area flooding more than once every 10 years

8. Risk of damage to buildings because of wooden foundation stability, continuation and latch
9. Historic waterfronts under pressure; quays and jetties flood more than once every 10 years
10. Ecology in the IJsselmeer and the IJssel-Vecht Delta threatened by water level
11. Recreational shipping experiences limitations through less depth
12. Recreational beaches overflow
13. Increase of waiting time locks
14. Cargo channel not deep enough
15. Threshold height of the locks is too high, interference with ship
16. Sagging leads to the reduction of the local water tables: risks for agriculture
17. Increase of local water level leads to increasing seepage: risks for agriculture
18. Increase of local water level leads to increased salinity: risks for agriculture
19. (Ground) flooding in urban areas (especially Zwolle and Kampen, IJssel-Vecht Delta)
20. Ecology around IJsselmeer under pressure

The tipping point shown in Figure 3.6 represents the crucial point where the system should be adjusted if the water level in the IJsselmeergebied reaches this point. Tipping point with bandwidth means that disruptions might already occur within the bandwidth level, yet, the real crucial point where we have to adjust the system is still located in the tipping point. It is difficult to maintain the water level in the IJsselmeergebied by also considering the tipping points and bandwidths because all the functions are conflicting. Based on Figure 3.8 it is not possible to maintain the water level in the IJsselmeergebied without touching the tipping point of one of the functions. Therefore, the judgment for maintaining the water level in the IJsselmeergebied is based on the point where problems really occur, instead of the tipping point.

It can be seen from Figure 3.8, for example, that in order to support the function of the dikes, the water level in the IJsselmeer should be maintained lower than -0,90 NAP or higher than + 0,15 NAP (see: red line in Figure 3.8); a water level lower than -0,90 NAP will have consequences on the dikes macro stability while a water level higher than +0,15 NAP will be dangerous for the winter condition. Furthermore, the effects of changing the water level in the IJsselmeer on other functions in the IJsselmeergebied are as follows:

- From the water constructions (Kunstwerken) perspective, the water level should not be maintained between -0,60 NAP until +1,1 NAP; a water level between -0,60 NAP and +1,1 NAP will give problems on water constructions such as pumping stations, intake areas, etc.
- The water level should be maintained lower than 0 NAP in order to ensure that the quays around the IJsselmeergebied can function properly. With a water level higher than +0,5 NAP, the quays in the IJsselmeergebied cannot fulfil their function at all and in that case new quays will have to be build.
- From a historical perspective, the water level should be maintained between -0,90 NAP until +0,5 NAP.
- Some recreational areas, such as artificial beaches, will be in nuisance if the water level is higher than 0 NAP or lower than -1 NAP. Therefore from the recreational perspective, the water level should be maintained in between -1 NAP until 0 NAP.
- The water level should not be lower than -0,6 NAP, otherwise it will give shipping problems in the IJsselmeer.

- From the agriculture perspective, the current water level condition in the IJsselmeer is still pleasing. The water level will only give a problem if it gets lower than -1,1 NAP or higher than +1 NAP.
- Changing water levels in the IJsselmeer can also generate consequences for building constructions in the IJsselmeergebied if the water level becomes lower than -0,9 NAP or higher than +0,8 NAP.

From the explanations above can be concluded that in general the water level in the IJsselmeer should be maintained between -0,6 NAP and 0 NAP (see: green line in Figure 3.8). A water level lower than -0,6 NAP or higher than 0 NAP will have consequences for other functions in the IJsselmeergebied. However Koeman et al. (2012) argue that it is possible to manage the water level in -0,40 NAP during the summer period and +0,10 NAP during the spring period. The reason for this suggestion is that a water level lower than -0,40 NAP will already threaten water safety in the IJsselmeergebied, while water safety is the most important water management issue in the Netherlands. Meanwhile, some adjustments can still be made in order to increase the water level from 0 NAP to +0,1 NAP.

Based on Figure 3.8, the recommendation of the Deltacommissie to increase the water level in the IJsselmeer by a maximum of 1,5 m, will generate a lot of consequences for other functions in the surrounding area. The consequences of changing the water level in the IJsselmeergebied might trigger the conflict of interest between stakeholders. Stakeholders involved in the decision making process will have the tendency to struggling to defend their interests (Edmunds and Wollenberg, 2001; Hermans, 2005).

Therefore, the Deltacommissie (2008) has realised that the idea to increase the water level in the IJsselmeer by a maximum of 1,5 m should be implemented gradually and is impossible to be implemented in a short time period. Nevertheless, long term periods of implementation are not identical with 'doing nothing'. The Deltacommissie should guide this implementation from the early phase by initially keeping the options in the IJsselmeer open. Keeping the options open for an increase of the water level in the Ijsselmeer will require spatial planning rules, since planning rules can be useful to accommodate future needs and to minimise future consequences (Hasnoot et al., 2012). For this reason, the Deltacommissie should give a recommendation for the establishment of planning rules, such as forbidding the development of new housing and infrastructure in the IJsselmeergebied that will have consequences on the space availability that will be needed for the future dikes' improvement in order to keep the possibility open for increasing the water level in the IJsselmeer. The Deltacommissie should be aware that the idea to increase the water level in the IJsselmeer with maximum 1,5 meter will require certain technical consequences such as improvement of the dikes around the IJsselmeer.

To keep the options open is a cautious way to take before the real infrastructure shifting has started. However, besides of the policy to keep the options open for the future freshwater planning, there should also be a balancing strategy to 'navigate' the future freshwater planning from point to point.

One of the most important things in navigating the future freshwater planning is to find out what is the preference solution for the future. Knowing the preferring solution for the long term future might be too difficult, however it is still possible to breakdown all the possible solutions and further make realistic projections of the future by using scenario planning (Peterson, 2003).

3.6 Towards Managing Freshwater Planning issues

Managing long term freshwater planning in the IJsselmeergebied is not a simple task due to the uncertainties in future condition and the difficulties in creating a system that is able to fulfil the eight requirements of a resilient system. Breaking down the multiple possible scenario and make a careful projection as suggested in the scenario planning theory is important in this uncertain condition.
The idea of scenario planning is in line with the first phase of the planning process in the “Room for the river” project (Van den Brink, 2010); scenario studies. Within the planning process of the “Room for the river” project, there are two other phases following the scenario studies: developing a master plan and the formal decision making phase. The current freshwater planning in the IJsselmeergebied is still in this first phase, therefore this sub-chapter concerns mainly on the scenario making process, while the second and the third phase are only being discussed slightly. . The “Room for the river” project might not be totally the same with the freshwater planning project in the IJsselmeergebied, however learning from this project might still be useful for estimating the possible obstacles in the planning process . :

3.6.1 First phase: Scenario study

The main point of this phase is the development of a preferred scenario (*voorkeursscenario*) for the freshwater planning in the Netherlands. It is projected that the decisions about the future delta planning, thus also the freshwater planning in the IJsselmeergebied, should be made in December 2014 (interview Van Waveren, 2012). Those decisions will mainly concern about whether it is the water management in national waterways or the water management in the IJsselmeergebied that should get the main attention for the compliance of the future freshwater demand in the Netherlands. Additionally, the rough budget prediction for the future freshwater projects should already be made in this phase (Deltaprogramma, 2011). Rijkswaterstaat as a technologically oriented government body (Van der Brugge et al., 2005) who is responsible for policy support and advice (*beleidsondersteuning en advies*, BOA) has to provide the technical possible solutions to increase the water capacity in the IJsselmeergebied while in the same time investigating the consequences and estimating the budget for every solution. The Deltaprogramma will in the end make a final advice based on the investigation and advice from Rijkswaterstaat. It can be seen here again that Rijkswaterstaat has crucial roles in the decision making process. Considering the current investigation and the deadline in December 2014, it is presumable that Rijkswaterstaat will have to speed up the process.

Rijkswaterstaat came up with four possible options in the IJsselmeergebied to deal with the future freshwater demand and the sea level rise. These four possible scenarios have not yet been published and therefore the information in this sub chapter was mainly gathered from the interview with the designer of these scenarios:

Scenario 1, do nothing, keep the present situation

The designer of this scenario explained:

> "*The 'do nothing' scenario is basically a continuation of the current situation with no additional investments in freshwater management. 'Do nothing' might still be an option because there is a possibility that in the future the sea level will not rise as is predicted now. Moreover the freshwater condition in the Netherlands is still sufficient to fulfil the current freshwater demand, and therefore there is no urgency at the moment to already take an action for the future freshwater planning and to already spend billions of euros to adjust the present situation in this era. Additionally, the 'do nothing' option is also still relevant because there is still a possibility that without significant adjustments in the IJsselmeer the freshwater condition in the year 2100 is in some way able to provide the freshwater demand by that time*" (interview with Smedes, 2012).

. Rijkswaterstaat is indeed already working on several investigations concerning the future freshwater scenario, but the real physical and infrastructural investments have not yet been initiated, therefore the Netherlands currently are still in the 'do nothing' position. Figure 3.9 shows the prediction of the future water condition in the IJsselmeergebied made by Rijkswaterstaat. Based on this figure can be seen that the Netherlands is still basically keeping its condition from the year 2000. The 'do nothing' option can be preserved until the moment when the sea level rises above the current lowest water level in the IJsselmeer. After this moment the 'do nothing' option has to be combined with placing pumps to stream water from the IJsselmeer to the sea.

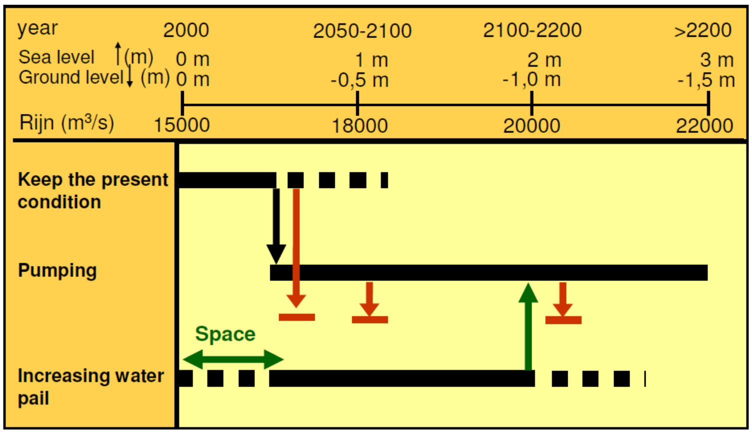

Figure 3.9 Water planning and Prediction in the IJsselmeergebied
(Source: Van Waveren, 2012)

From the freshwater perspectives, it was historically easy to presume that there would always be enough water to go around and that plentiful amounts would generally be so inexpensive that investments in freshwater demand would not be cost-effective. Conversely, Gleick (1998) find out that it is currently increasingly difficult in many developed nations to build major new water supply systems because of both environmental and economic constraints. Preparing the future freshwater supply will need a long period of environmental investigation and huge financial support. The preparations should already be started some generations before the real problems occur. The ‘do nothing’ option will, therefore, put the future generations in a vulnerable condition.

Aware of the risk that might arise because of the ‘do nothing’ option, Rijkswaterstaat tries to find solutions for how to manage and increase the water level difference in the IJsselmeer in such way that the water level difference can be used to provide the future freshwater demand. As a result, Rijkswaterstaat offers three possible options for the freshwater management in the IJsselmeer (scenario 2, 3 and 4).

Scenario 2, Increasing water level above predicted sea level in the year 2100.

The Program Director of the IJsselmeergebied explained:

> *“ The idea of this scenario is to manage the water level in the IJsselmeer in such way that the water level difference between the summer and spring period can be used to provide the future freshwater demand. In this scenario the water level in the IJsselmeer will be increased above the predicted sea level in the year 2100. With this solution, not only the freshwater problem is solved, but water can also stream naturally to the sea by using gravitation*” (interview with Klavers, 2012).

Nevertheless, the prediction made by Rijkswaterstaat that the sea level will rise 1 m until the year 2100 should be our consideration. With this prediction and based on Figure 3.8, the plan to increase the water level above the sea level will definitely bring consequences for other, surrounding functions such as dikes, water constructions (pumps, intake points, etc), quay walls, historical areas, nature, recreation areas, agriculture and building constructions.

Looking at all the consequences, the Program Director of the IJsselmeergebied believes that increasing the water level and stream the water into the sea is not a wise solution. She further explained:

> *“There is a flawed thought that gravitation will never fail and that’s why people thought that increasing the water level in the IJsselmeer will be the best solution, while it is not! Increasing the water level in the IJsselmeer will generate huge consequences for our future generation. On the one hand, it is true that by increasing the water level in the IJsselmeer, water from the IJsselmeer will easily stream into the sea. But when we see it from a broader perspective, it is much more complicated than the option to stream water using pumps. Increasing the water level in the IJsselmeer would mean that we need to build new dikes around the IJsselmeergebied. Increasing the water level would also mean that the current urban water management would collapse; we will need to place pumps all around the urban areas just to*

stream the water from the dry land into the IJsselmeer. This will also put our future generation in a vulnerable condition. Moreover, based on the KEA (Kosteneffectiviteitsanalyse) report (Deltaprogramma IJsselmeergebied, 2012b), the option to stream water using gravitation by increasing the water level in the IJsselmeer will cost us much more than the option to stream water using pumps" (interview with Klavers, 2012).

Looking at the consequences based on Figure 4.6 whereby a lot of the infrastructure and environmental conditions in the IJsselmeergebied have to change because of this scenario and looking at the recent KEA report, this second scenario will most likely be avoided. The finding of the KEA report will be further explained in scenario 3.

Scenario 3, Close the connection between the IJsselmeer and the Wadden Sea, stream the water from the IJsselmeer to the Wadden Sea using Pumps

The designer of this scenario explained:

"*In this scenario, the difference between the water level in the summer and in the spring period will be maintained to provide the future water demand. The connection between the IJsselmeer and the Wadden Sea will be closed permanently in case that the sea level rises above the future lowest water level in the IJsselmeer. Furthermore water will be streamed from the IJsselmeer to the Wadden Sea by using pumps. This will be applied if it is not possible to stream water out from the IJsselmeer using gravitation due to the sea level rise*" (interview with Smedes, 2012).

Figure 3.10 shows this second scenario. In this scenario the IJsselmeer can still be used to retain freshwater.

The drawback of this scenario is the idea of using pumps as the only way to stream water from the IJsselmeer into the Wadden Sea. The failure of the pumping system will be the failure of the whole system, while a resilient system should have a backup system (redundancy) that is substitutable and can be activated when disruptions due to disturbances occur (Chang and Shinozuka, 2004). Decision makers should be alert that this option might endanger the future generation. Meanwhile, Rijkswaterstaat can play a role in this situation by investigating the possibilities of creating a backup system for the pumping technology.

The positive point of this third scenario is that the idea to stream water using pumps will be cheaper than the idea to stream water using gravitation by increasing the water level in the IJsselmeer as reported in the latest KEA report made by the Deltaprogramma IJsselmeergebied (2012b) in the beginning of July 2012. Figure 3.11 shows the price differences between the options to stream water using pumps and using gravitation; the nominal value of streaming water using pumps for the G scenario, for example, is around 2,200 million Euros, while the price to increase the water level in the same G scenario is 5,700 million Euros. This means that the option to increase the water level in the IJsselmeergebied is more than twice as expensive as the option to use pumps. The present value of each scenario is illustrated in Figure 3.11 represented by the blue bars (in Dutch: CW, *Contante Waarde*), while the nominal value is represented by the orange bars (in Dutch: *Nominale Waarde*).

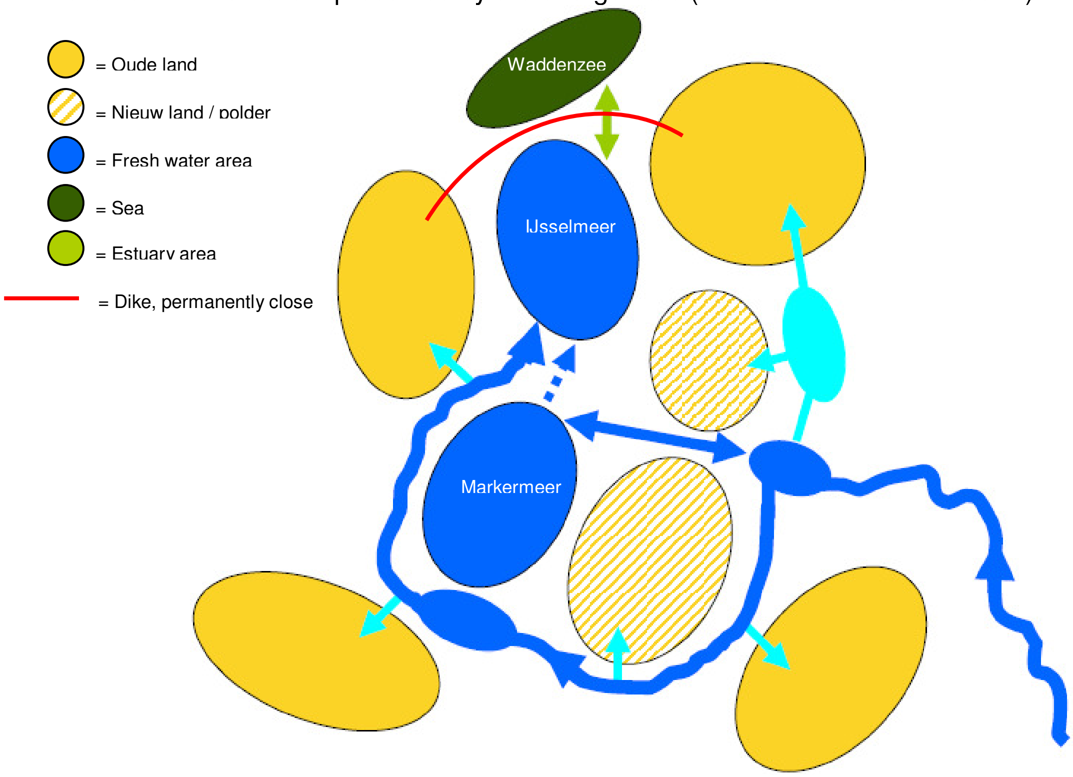

Figure 3.10 The Freshwater Scenario for the year 2100, Closing the connection between IJsselmeer and Wadden Sea, stream water using pumps
(Source: adapted from the presentation of Roeloef Smedes, 2012)

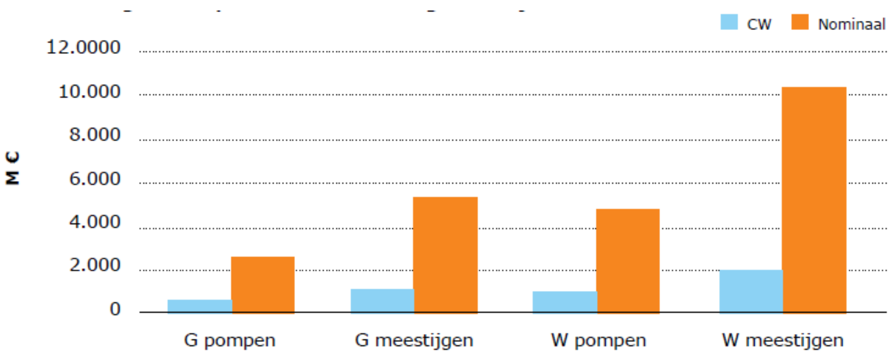

Figure 3.11 Price comparisons between streaming water using pumps and using gravitation in two climate scenarios
(Source: Deltaprogramma IJsselmeergebied. 2012b)

To sum up, the KEA report has found several interesting investigation results:

a. Using pumps will be more beneficial from the economic perspective than increasing the whole water level in the IJsselmeer. Thus, scenario 3 will be cheaper than scenario 2.
b. The W-scenario will have greater consequences than G-scenario (see the previous explanation of KNMI scenario).
c. The costs of the water buffer which arises due the idea to increase the water level in the IJsselmeer following the sea level rise (*meestijgen*) are much higher than the costs for

increasing the freshwater capacity at specific measures on a constant winter level. Thus, again, this investigation results show that scenario 3 will be cheaper than scenario 2.

d. The option to not increase the water level in the IJsselmeer does not mean that we will not have to invest for the flood defences in the next century.

Scenario 4, Change IJsselmeer into estuary area, stream the water using the combination of pumps and gravitation.

> ***The designer of this scenario explained:*** *"This scenario overcomes the possibility that the sea level will rise as is expected now while in the same time it tries to avoid the complete use of pumps. In this scenario, water will stream using gravitation during low a sea level and will stream using pumps during a high sea level" (interview with Smedes, 2012).*

The drawback of this scenario is that the function of the IJsselmeer has to change from the freshwater retaining area into an estuary area. Thus, with this scenario the Netherlands will lose its current freshwater retaining area instead of increase it. Figure 3.12 illustrates the condition of this fourth scenario.

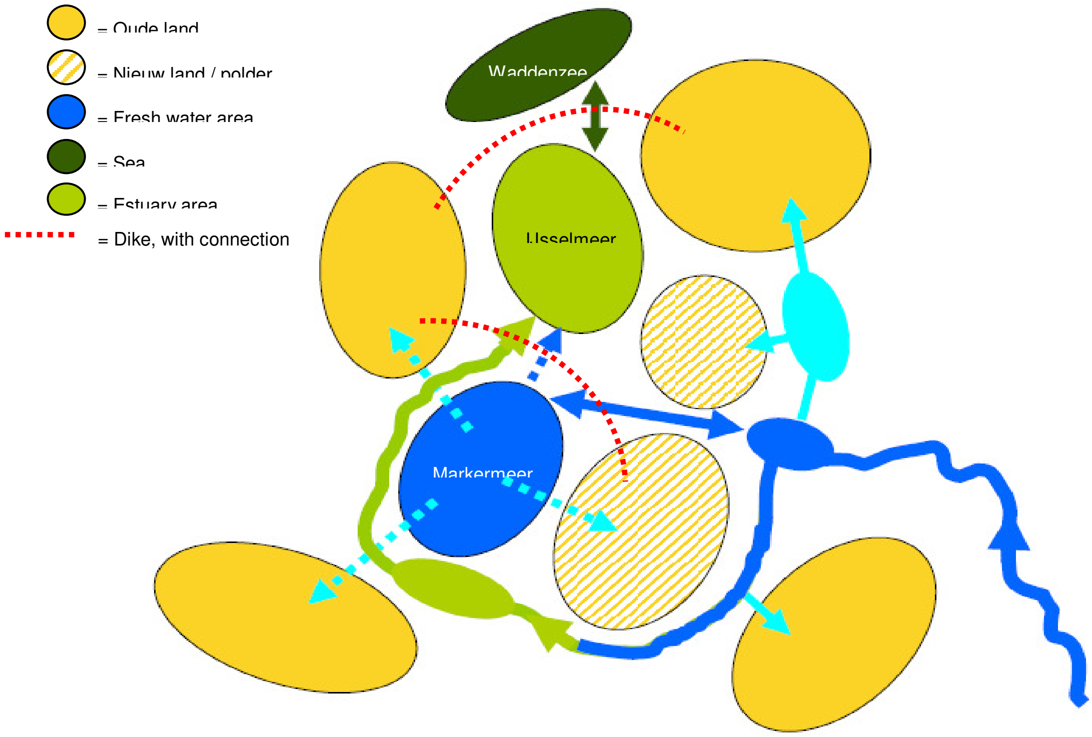

Figure 3.12 The Freshwater Scenario for the year 2100, IJsselmeer is changing into estuary area. (Source: adapted from the presentation of Roeloef Smedes, 2012)

In order to replace the function of the IJsselmeer as a freshwater retaining area, the water level in the Markermeer will be increased and it will further be used as the new freshwater retaining area. The Deltaprogramma IJsselmeergebied (2012) predicts that in the year 2100 there will be around 800 – 2,200 million m^3 of freshwater buffers needed in the IJsselmeer. Based on this prediction, it is necessary to increase the level difference between the summer and the spring period in the IJsselmeer from 20 cm difference in the current condition into 40-150 cm in 2100. This consequently means that the water level in the Markermeer should be increased around 80 - 300 cm by 2100 since the Markermeer surface area is about half of the surface area in the IJsselmeer.

On the one hand, the idea to change the IJsselmeer into an estuary area will give benefits. The ideal robust water system should also consist of estuary area (Elliot et al., 2007), Ecological resilience is generally defined as the amount of disturbance that a system can absorb without a change in its state, usually defined by its structure and composition (Carpenter et al. 2001, Walker et al. 2006). A resilient estuarine system is a system that can continue to provide the necessary services, even after times of stress. For example, suitable and resilient ecological conditions will allow fish stocks to recover after extensive fishing during the previous season. The IJsselmeer currently has no space for estuary area. Thus, changing the IJsselmeer into an estuary area theoretically will create a new resilient and 'robust water system'. Moreover, the idea to change the IJsselmeer into an estuary area has several ecological potencies since estuaries are typically composed of a mosaic of between four and nine major habitat types (subtidal, intertidal mudflats, intertidal sandflats, marshes, shingles, rocky shores, lagoons, sand-dunes and grazing marshes/ coastal grassland) (Davidson et al., 1991). Furthermore, estuaries support many important ecosystem functions: biogeochemical cycling and movement of nutrients, purification of water, mitigation of floods, maintenance of biodiversity, biological production (nursery grounds for several commercial fish and crustacean species) etc. (Meire et al., 1998). An estimation of the economic value of these ecosystem functions (goods and services) indicated that estuaries are among the most valuable ecosystems in the world (Costanza et al., 1997). Estuaries are one of the most valuable ecosystem types supporting human society, with much of this value due to assimilation of nutrients (Constanza et al., 1997).

However, the ability of estuaries to process nutrients is not infinite and excessive nutrient inputs can lead to eutrophication, defined as excess inputs of organic matter particularly from increased primary production (Nixon 1995). Eutrophication is arguably the biggest pollution problem facing estuaries globally. Moreover, we have to learn from the previous prestigious water defence project in the Dutch province of Zeeland, part of the Delta works ('Deltawerken') construction, that was huge and unique in many aspects, driven by culmination of the technocratic and scientific regime (Van der Brugge et al., 2005). The construction of this project also had profound consequences for ecosystems nearby. Aquatic ecosystems suddenly changed from saltwater systems into freshwater systems, which had dramatic consequences for its biodiversity (Van der Brugge et al., 2005). Rijkswaterstaat, as a technologically oriented government body associated with the construction of this project, suffered a bad reputation and had to face numerous protests against the environmental and landscape degrading constructions. At that time there was a growing awareness of environmental problems, both at local and global level. The idea to change the IJsselmeer from a freshwater retaining area into an estuary area might generate similar problems. Therefore, decision makers should consider these possible consequences before they decide to change the IJsselmeer into an estuary area. For that reason, a careful investigation from the ecological perspective should be made on beforehand.

Furthermore, the IJssel River will be extended in this fourth scenario in order to give more room for water in estuary areas. The scenario for extending the IJssel River is by changing the direction of the river flows. In the future water will not flow directly from Kampen to the Ketelmeer and later on to the IJsselmeer, instead it will flow around through the Veluwemeer, the Wolderwijd, the Eemmeer, the Gooimeer, the IJmeer and the Markermeer before it reaches the IJsselmeer. Figure 3.13 shows the direction scenario for the year 2100, whereby red arrows show the future scenario and purple arrows show current water flow direction.The designer of this scenario explained:

> *"The idea to extend the IJssel River will also solve the current wind problem in the IJsselmeer. In the current situation water from the Ketelmeer cannot flow to the IJsselmeer when there is a strong wind from the Wadden Sea. This situation is often threatening some areas in the old land from flooding. The idea to flow the water through the Verlengde IJssel River and Krabbegat Enkhuizen instead of flow it directly to the IJsselmeer can solve the current wind problem in the Ketelmeer. The wind force in Krabbegat Enkhuizen is relatively low, and therefore it is more save for water to flow to the IJsselmeer through Krabbegat Enkhuizen than through the Ketelmeer"* (interview with Smedes, 2012).

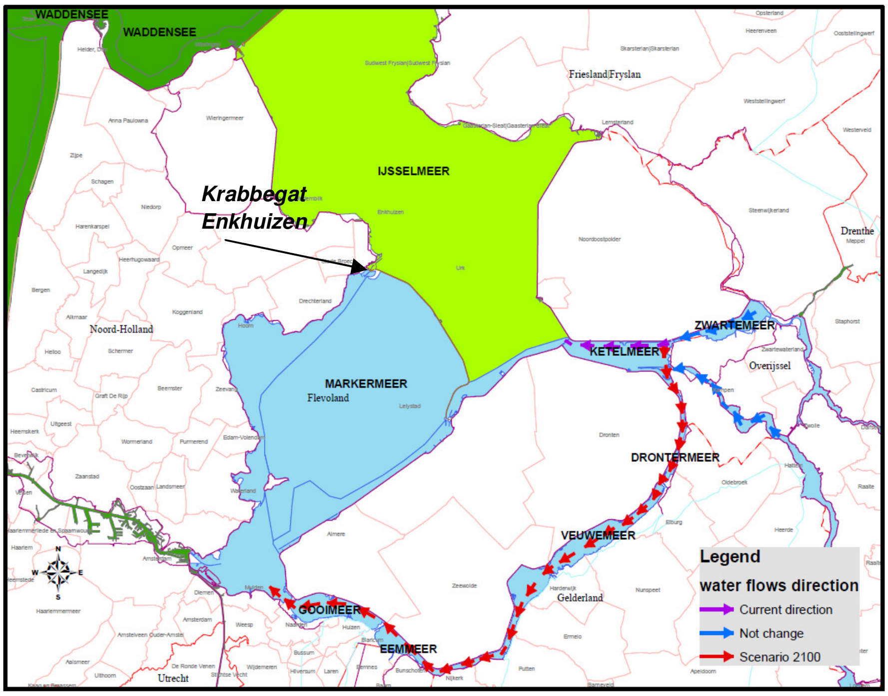

Figure 3.13 Water Flows Scenario direction for the year 2100
(Source: made by author based on the interview with Roeloef Smedes)

Considering this explanation, the idea to extend the IJssel River can also be implemented in other scenarios since it is also beneficial from safety perspectives.

3.6.2 Outlook: from scenario's to masterplanning and decision-making

Knowing all the possibilities and consequences is in sequence with the idea of scenario planning as it was discussed in chapter 2. Using scenario planning will ease the decision making process because it will provide the decision makers with a more clear 'premonition' of the future condition. Additionally, breaking down all the possibilities and its consequences might also trigger new innovations by combining the positive sides of some scenarios and avoiding the negative consequences. Meanwhile, the resilience aspect should also be taken into account while preparing for the scenarios. Table 3.1 shows the resilience aspect that needs to be considered for choosing the preferred scenario. After all, the author tries to make a judgment on the availability of the eight resilience aspects in the four Rijkswaterstaat scenarios and concludes that none of these scenarios are fulfilling the resilience requirement.

The third scenario, for example, might seem as the best solution compared to the three other solutions since the third scenario is cheaper and will generate less ecological consequences than the fourth scenario. However, the idea of using pumps as the only way to stream water from the IJsselmeer into the Wadden Sea is not resilient since it has no backup system that can be activated when disruptions occur, and thus is not redundant (Chang and Shinozuka, 2004). If the third scenario will be implemented in the future, then there should be a backup system created for this scenario. A backup system can be a creation of the second pumping system or evacuation scheme in case that the pumping system in the IJsselmeer fails.

From the robustness aspect, none of the scenarios can already give the guarantee to overcome the possible pressure in the future. The fourth scenario, for example, even though it is the only scenario that provides a backup system by combining between gravitation and pumping technology, still not gives any guarantee that this system will able to stream water from the IJsselmeer to the Wadden sea in case of the extreme condition where the sea level increases above the prediction and the runoff from the catchment area of the IJsselmeer is also higher than the expectation. Therefore the author states in Table 3.1 that the robustness aspect of scenario 4 is still hard to predict.

The discourse about which of the scenarios will be suitable to solve the freshwater problem in the year 2100 is still continuing. The ongoing discourse is still in the phase of considering all the possibilities and assessing which of these possibilities fit for the future, by taking into account the resilience aspects, technical, environmental, social, political, and economic conditions.

Table 3.1 The availability of resilience aspects in the four scenarios

Resilience aspect		Scenario 1	Scenario 2	Scenario 3	Scenario 4
Robustness	Is the scenario able to overcome certain levels of stress without suffering from failure?	No	Not clear	Not clear	Not clear
Rapidity	Is the scenario able to react in a quick period when the disturbance occurs?	No	Yes	No	Not clear
Redundancy	Does the scenario have a backup system?	No	No	No	Yes
Resourcefulness	Are the materials and human resources available to support this scenario?	yes	Not clear	Not clear	Not clear
Technical	Is the scenario technically able to overcome the pressure?	No	Not clear	Not clear	Not clear
Organisational	Are there organizational resources available to manage the system and to take the responsibility for making decisions and taking actions?	yes	Yes	Yes	Yes
Social	Is the scenario able to decrease the negative consequences for the society when the disturbance occurs?	No	No	No	No
Economic	Is the scenario able to decrease economic consequences when the disturbance occurs?	No	No	No	No

Van den Brink (2010) wrote that the second phase of the planning process in the IJssel Delta South project is the development of a master plan. Building a master plan might be to concrete to be discussed in this early phase of a long-term planning process like in the IJsselmeergebied. Nevertheless, we can learn how it was important to make a 'declaration of intent' (*intentieovereenkomst*) during the development of a master plan in the IJssel Delta South project. Therefore, this thesis would also recommend the Deltaprogramma to make a 'declaration of intent' for the freshwater planning process in the IJsselmeergebied. By making the declaration of intent, all the parties involved, including Rijkswaterstaat, would commit themselves to the integrated planning process and cooperate with each other. Building commitment between all the parties involved is not a simple task since these parties might still have different perceptions about the future condition. They might also have their own needs.

The discussion about the development of the master plan might indeed still come too early at this moment. However, we can already consider about the aspects that we need to take into account when choosing the preferred scenario. A key property to consider in achieving sustainable water resource systems, is resilience (e.g. Carpenter et al., 2005; Walker and Salt, 2006), thus the master plan should fulfil the requirement of robustness, redundancy, resourcefulness, and rapidity. Additionally, the master plan should also be conceptualised as encompassing the interrelated technical, organisational, social, and economic dimensions as it was described in chapter 2. After fulfilling all the requirements of a resilient system, the development of an integrated vision or master plan for the IJsselmeergebied can be started.

The third phase in the planning process after signing the declaration of intent is mainly dedicated to the preparation of the substitution decision, such as running through and completing formal-decision making procedures, and raising the budget for the implementation of the master plan (Van den brink, 2010). Again, it might still be too early to discuss this third phase at this moment, considering that the freshwater planning in the IJsselmeergebied is projected for the year 2100. However, it is still important to know the whole planning process that might be faced in this project by learning from other planning processes such as the IJssel Delta South project as it was described by Van den Brink (2010).

Van den Brink (2010) wrote that the third phase in the IJssel Delta South Project was started with the drawing up of a Strategic Environmental Assessment (SEA). The SEA can be defined as a systematic decision making process to regard and designate complex environmental, social and economic effects and influences of proposed plans, policies or programs at the earliest possible stage of planning and implementation, on their systematic application at highest levels of decision making and law-making institutions (Dalal-Clayton & Sadler, 2005; Partidario & Clark, 2000).

The preferred alternative forms the basis of the next step, the Environmental Impact Assessment (EIA). EIA is a public process by which the likely effect of a project on the environment is identified, assessed and then taken into account by the consenting authority in the decision making process (Sheate et. al, 2005). Thus can be concluded that, while EIA is mainly describing the effect of the proposed or already existing projects, SEA is assessing the alternatives which might be available in earlier stages of implementation.

Nevertheless, the planning process is not only about realising ambitions, but also about costs and the division of costs between the parties involved. Therefore, the hardest part before the formal decision can be made is to get the required funds for the construction of the project. The project can only be realised if the cabinet approves the project planning by considering the result of SEA and EIA and if the necessary funds can be collected.

Funding is one of the common problems in planning for a long term project. A senior advisor in Rijkswaterstaat *Departement Waterkwantiteit*, explains:

> *"The economic condition is the most important factor that can stop freshwater projects in the Netherlands. It is dangerous if people keep on thinking that the freshwater problem is not the*

most urgent problem, and therefore the funding goes to other more urgent problems. This project is a long term project, and thus can't we wait until we really have a problem" (Interview with van Luijn, 2012).

The tension between 'short-term expenditures' and 'long-term benefits': investments in the security of the freshwater supply result in benefits in the future while the direct benefit is hard to identify. Unfortunately the investigation and investment should be set off years before they are actually needed. As a result, the budgeting for freshwater projects has to compete with other expenditures on matters that command immediate attention. It is noted in this regard that funding should be seen as the government's primary responsibility for the security of the freshwater supply.

Considering the fact that freshwater planning is classified as a long term benefit and not commands an immediate structural change, it is logical that the government puts the water safety issue as their main attention in the current water issue. Freshwater projects have to compete not only with other urgent expenditures outside the water sector (such as health issues, credit issues, employment issues, etc) but also with other issues inside the water sector such as the water safety issue. On the one hand, it is true that freshwater projects do not command immediate changes, but on the other hand it is important to keep in mind that investing in the freshwater issue should start before it is too late.

3.7 Conclusion

There is a growing awareness in the Netherlands that the country should start being active and proactive towards the future freshwater condition. The IJsselmeergebied could be planned in such a way that the freshwater retaining area can be increased for the compliance of the future freshwater demand, can cope with the extreme winter and summer conditions and in the same time is prepared for some scenarios of sea level rise in the year 2100. However, the current freshwater planning is still in a early phase and is difficult to manage.

There are no preferred scenarios yet in the IJsselmeergebied. What is available now is the recommendation of the Deltacommissie (2008) to raise the water level in the IJsselmeer by a maximum of 1,5 m in 2050. However, the idea to raise the water level in the IJsselmeergebied will generate a lot of consequences for other functions in the surrounding area, and therefore the Deltacommissie should be careful with the implementation of this idea.

Acting in response to the idea of the Deltacommissie (2008), Rijkswaterstaat prepared four possible scenarios for the IJsselmeergebied. Even though none of these scenarios are without consequences nor able to fulfil the eight resilience aspect as it was previously described in this chapter, it is a good step that Rijkswaterstaat already tries to figure out the possible solutions in the IJsselmeergebied. Knowing all the possibilities and consequences is in sequence with the idea of scenario planning as it was discussed in chapter 2. Therefore it is important for the decision makers to open their eyes not only for the four proposed scenarios, but also for other new solutions. New innovations and ideas concerning freshwater planning can be obtained either by searching for a completely new idea or by mixing the positive elements of the previous scenarios whenever it is possible.

From the previous discussion, it is clear that the current freshwater planning in the IJsselmeergebied is still in the first phase of the planning process; the scenario study. Thus, it is not yet relevant to already discuss about the second and the third planning phase; the development of the master plan and the formal decision making process. However, by knowing the whole planning process, we can see that choosing the suitable scenario for the freshwater planning in the IJsselmeergebied is in the end not only based on how resilient and how adaptive the scenarios are, but it also depends on the economic condition, and the needs of the actors involved in the planning process. Therefore, chapter 4 further discusses about the organizational structure and the decision making process in the IJsselmeergebied.

Additionally, by looking at the fact that the current freshwater planning in the IJsselmeergebied is still in the first phase and still a lot of investigations have to be done before the suitable solution can be selected, the idea to keep the option open for the new innovations might be in a way tricky since the Netherlands has to also speed up the planning process. Therefore, chapter 5 will try to give suggestions on how to balancing between keeping the options open and speeding up with the planning process by using the scenario planning theory and the sustainable development cycle process.

4 Organizational Structure in the Freshwater Management in the Netherlands and in the IJsselmeergebied

4.1 Introduction

Climate change, ecological and safety issues as they were discussed in chapter 3 are not the only difficulties in long term planning in the IJsselmeergebied. Deciding about the suitable solution for the freshwater availability in the IJsselmeergebied is also closely related with policy making processes as it was discussed previously in chapter 2. It is currently no longer sufficient for water experts to only use simulation and optimisation techniques to develop mathematical computer models to identify efficient solutions to water resources management problems as it was in the past decades (Hermans, 2005). This idea is in line with the idea in chapter 2 presented by Friedman (2004) that the strategic spatial planning calls for new institutions of governance, and, in the long tradition of spatial planning; it calls for a comprehensive, integrated approach. The previous technocratic water engineering is already shifted to the integral and participatory water management, whereby more actors involve in the planning process (Van der Brugge et al., 2005). With the involvement of multiple actors in planning and decision making processes, it is essential to realise that Rijkswaterstaat does not stand alone during these processes. Additionally, the ideas of adaptive water management and scenario planning given in this research will require the involvement of stakeholders to provide a forum for policy creation and evaluation (Peterson, 2003). Therefore, it is important to know in this chapter who is involved in the planning and decision making process inside the IJsselmeergebied.

This chapter firstly pays special attention to the organizational structure in the IJsselmeergebied. Afterwards, the current policy development for freshwater management in the Netherlands and particularly in the IJsselmeergebied will be discussed in this chapter. Subsequently, the discussion about the funding system of the freshwater projects in the IJsselmeergebied is also being provided in this chapter since funding is one of the common problems in planning for a long term project as it was already previously being discussed in a glance in chapter 3.

In the end, the whole discussion in this chapter is important to know about the position of all the actors and especially the position of Rijkswaterstaat in the decision making process. Additionally, this chapter tries to recognize the difficulties of decision making processes in the IJsselmeergebied, then it tries to derive how Rijkswaterstaat can play an important role in guiding the freshwater planning in the IJsselmeergebied.

4.2 Water management in the Netherlands and in the IJsselmeergebied

Policy development for water management in the Netherlands is organized at three levels as shown in Figure 4.1. At the national level the Ministry of Infrastructure and the Environment (Rijkswaterstaat as its performing organization) drafts the Integrated National Water Management Policy Plan. This plan is guiding and binding for the Integrated Provincial Water Management and Spatial Policy Plans that are translated by the regional water authorities into Regional Integrated Water Management plans (Timmermans, 2008). The Ministry of Infrastructure and Environment is also responsible for controlling the coastal zone and the major rivers (such as the Rhine and Meusse).

At the provincial level, Provinces have the responsibility for groundwater. At the regional level, the water responsibilities are separated into municipalities and water boards, whereby the municipalities are responsible for sanitary sewage while water boards are responsible for the regional water system, water in polders (land enclosed by dikes, and often reclaimed from lakes, rivers, or the sea) and the surrounding outlet and drainage waters (Woltjer and Al, 2009). In general, water boards are responsible for three tasks: flood defence, water quantity management, and water quality management. Flood defence involves ensuring that dikes, dams, and dunes stay in a good condition. Water quantity management implies maintaining certain water levels in streams and canals, and using pumping stations to discharge surface water surpluses. Water quality management involves monitoring industrial and urban wastewater and guaranteeing that water quality in ditches and canals is good enough for uses like recreation and agriculture (Woltjer and Al, 2009).

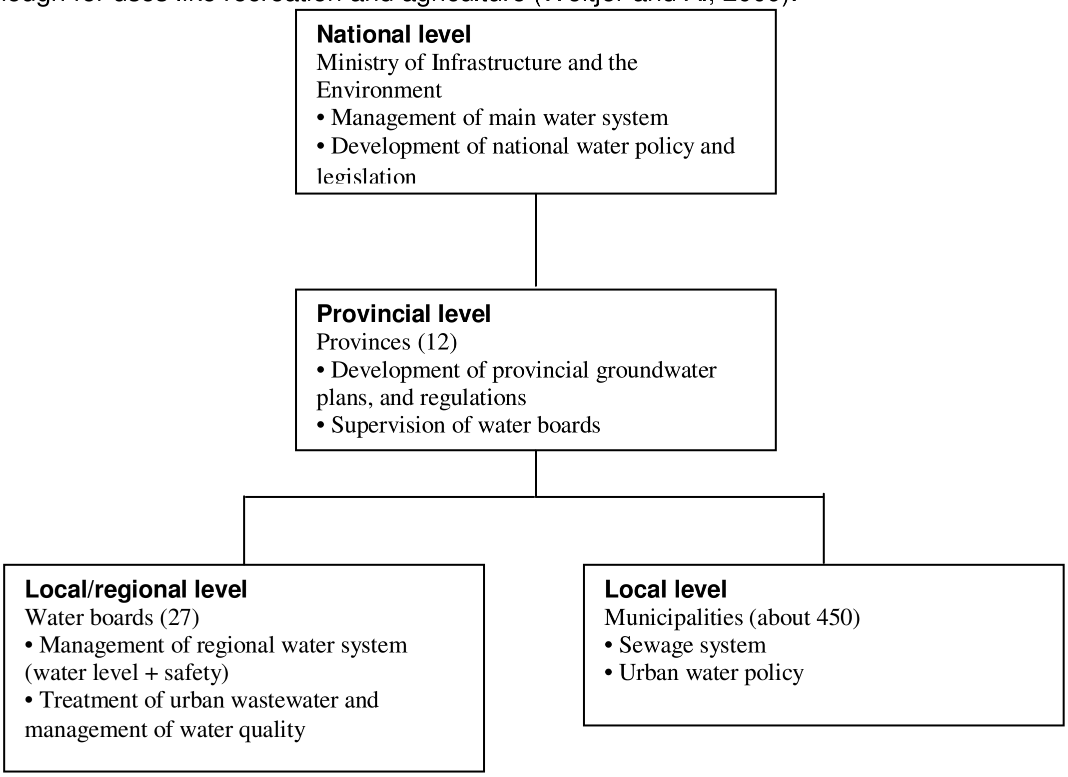

Figure 4.1 Responsibilities in the current Dutch water management
(Source: Woltjer, J and Al, Niels, 2009)

The role and function of each organization on the national level as mentioned in Figure 4.1, is the same with the role of each organization on a regional level in the IJsselmeergebied. The roles of the four main organizations are as follows:

1. Ministry of Infrastructure and the Environment (Rijkswaterstaat)

Rijkswaterstaat is the executive arm of the Dutch Ministry of Infrastructure and the Environment, the former Ministry of Transport, Public Works and Water Management. Rijkswaterstaat remained under the wings of the ministry, but was positioned at a greater distance from the policy-making department (Van den Brink, 2010). In general, Van den Brink (2010) points out that Rijkswaterstaat has two roles; the first role is a reviewing role (toetsende rol), assessing and supervising the plans that were drawn up by a region. The second role is a proactive 'collaborative thinking' role (meedenkende rol), which aims at developing an integrated spatial plan with the local and regional parties involved.

A new business model was introduced with the repositioning of Rijkswaterstaat as a policy-implementing agency (Rijkswaterstaat, 2004: pp 25-26). On the basis of the three central tasks and activities of the new Rijkswaterstaat, three central steering relationships between the ministry and Rijkswaterstaat were distinguished as illustrated in Figure 4.2

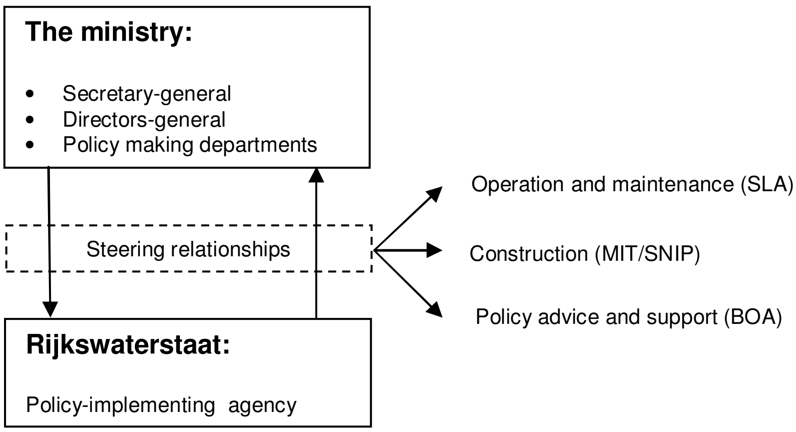

Figure 4.2 The new business model of Rijkswaterstaat
(Source: Van den Brink, 2010)

The first and primary steering relationship concerned the day-to-day operation and maintenance (beheer en onderhoud) of the infrastructure network for which Rijkswaterstaat was responsible. It was decided that from January 2006 about 50% of Rijkswaterstaat's budget would be depoliticised, which means that this budget would be made independent of the unknown and uncertain annual political allocation of means (Van den Brink, 2010: pp 114-115)

The second steering relationship in the new business model concerned the construction of infrastructure projects (aanlegprojecten). These projects were part of and financed by the Multiannual Programme for Infrastructure and Transport (Meerjarenprogramma Infrastructuur en Transport, MIT) and accounted for about 45% of Rijkswaterstaat's budget. The construction tasks included explorative studies (verkenningen), planning studies (planstudies) and the actual implementation of projects (realisatie) (Van den Brink, 2010: pp 114-115).

The third steering relationship, also between the director-general of Rijkswaterstaat and the directors-general of the policy making departments, was concerned with policy support and advice (beleidsondersteuning en advies, BOA). This steering relationship represented only about 5% of the Rijkswaterstaat budget. Rijkswaterstaat employees were asked to help the policy department to formulate new policies by carrying out policy studies or by establishing expert groups. This steering relationship was referred to as 'capacity steering' (capaciteitssturing) (Van den Brink, 2010: pp 114-115).

In the IJsselmeergebied, Rijkswaterstaat has its role as the water management board. Therefore, Rijkswaterstaat is responsible to deliver the basic information about water management. Rijkswaterstaat proactively retrieves and brings information, especially concerning freshwater ecology, safety and spatial quality.

From this explanation, it is clear that Rijkswaterstaat has an important role not only in the IJsselmeergebied, but also throughout the Netherlands. It is interesting to investigate the position of Rijkswaterstaat further in relation to water management in the Netherlands, because on the one hand Rijkswaterstaat has the genuine knowledge and experiences concerning maintenance, construction, and the policy situation in the water sectors. However, on the other hand there has been a fundamental shift over the past 30 years from technocratic water engineering to integral and participatory water management (Van der Brugge et al., 2005). The changing nature and scope of the water problems and the accumulating water-related damage and costs force water managers to manage the water in a more innovative and sustainable manner, pushing the government to deliberately install an interdisciplinary advisory commission, and thereby breaking the monopoly of the influential Rijkswaterstaat engineers (Huitema and Meijerink, 2009). The fundamental shift from technocratic water engineering to integral and participatory water management triggered Rijkswaterstaat to reposition itself[4].

The fundamental shift from technocratic water engineering to integral and participatory water management has put Rijkswaterstaat in a difficult situation. On the one hand Rijkswaterstaat has to maintain its knowledge and expertise since this can definitely play an important role in guiding the decision making process and the implementation of the project planning in the Netherlands and thus also in the IJsselmeergebied. With this expertise Rijkswaterstaat can, for example, play a role in making engineering (technical) scenarios for freshwater management in the Netherlands. On the other hand, Rijkswaterstaat is also severely criticised because of its lack of effectiveness, efficiency and its technocratic way of working (Van den Brink, 2010). In the new integral and participatory water

[4]This repositioning is unfortunately not as easy as it sounds. As an example, in the actor analyses report of IJsselmeergebied, DHV (2009) has reported that there are 205 organizations involved inside the IJsselmeergebied. Ironically, they forget to mention Rijkswaterstaat as one of those organizations. This might have happened because DHV is still seeing Rijkswaterstaat through a technocratic approach; DHV perceives Rijkswaterstaat as the organization that leads the whole project process instead of to perceive Rijkswaterstaat as part of the integral and participatory water management.

management, Rijkswaterstaat should be more aware that they are 'just a part' of the whole project, and that therefore the involvement of citizens and other stakeholders is also important.

2. Waterboards (Waterschappen)

There are seven water boards within the IJsselmeergebied who manage the regional water systems and are responsible for the treatment of urban wastewater and the management of the water quality in their areas. Furthermore, the water boards are also responsible for safety issues and the maintenance of the dykes inside their areas. All the water boards inside the IJsselmeergebied are also actively involved in the planning processes and provide the basic water management system information for their area.

3. Provinces

There are six provinces inside the IJsselmeergebied. These provinces are responsible for supervising the water boards and for the development of the provincial groundwater plans and regulation as mentioned in the national water management tasks. Provinces in the IJsselmeergebied are also actively involved in directing the project process and providing the basic spatial information within their area. Additionally, are also responsible for communicating the water program inside IJsselmeergebied to their citizens

4. Municipalities (Gemeenten)

There are 42 municipalities in the IJsselmeergebied. Beside of their role in managing the sewage system and making urban water policy on a local level, all the municipalities inside IJsselmeergebied are also responsible for communicating the water program inside IJsselmeergebied to their citizens, and in the other way around, communicating what citizens expect from the government.

However, the actor participation inside the IJsselmeergebied is to some extent different from the actor participation on a national level. Apart from the four previously mentioned organizations, also two other (co-operations of) organizations are involved. The first is the Deltaprogramma IJsselmeergebied (DPIJ). Deltaprogramma IJsselmeergebied is one of the six regional Deltaprogrammas that is responsible for water safety issues, freshwater issues and urban development and restructuring issues inside the IJsselmeer region (Deltaprogramma, 2012). The second is a group of social organizations (maatschappelijke organisaties) inside the IJsselmeergebied. These organisations are invited to the planning process (Rijkswaterstaat, 2011) and were selected as the representative of about 200 organizations inside the IJsselmeergebied (DHV, 2009) and land owners that might be affected by the water projects inside the IJsselmeergebied. In this way, all these organisations together can give their opinion concerning the water projects in their area.

Rijkswaterstaat (2011) is optimistic that the coalition positions within all the actors involved will be as shown in Figure 4.3. In this coalition process the DPIJ, together with the provinces, municipalities, water boards and Rijkswaterstaat will form an alliance, while other organisations involved will act as a coalition partner. However, this coalition position seems too good to be true since the water problems are always connected to important functions of the area. This means that stakeholders with conflicting interests, what in its way necessitated a problem-structuring approach, can change their opinion due to the conflict of interest among all the actors. Van den Brink (2010), for example, wrote on her book about the positioning difficulty in the IJssel delta south project. Within this project Rijkswaterstaat had a watchful awaiting role, because the National Spatial Planning Key decision says this river will be dredged over a length of 22 Kilometres and the budget is all available; so this project should be done easily. But things become different in reality because the Ministry of Housing, Spatial Planning and the Environment and the Ministry of Agriculture, Nature and Food Quality become involved and spatial quality and other interests become important as well. In the end Rijkswaterstaat has to invest a lot of time and energy in guiding this project. This example shows that conflicts of interest are not unlikely to occur, even if it is between government agencies.

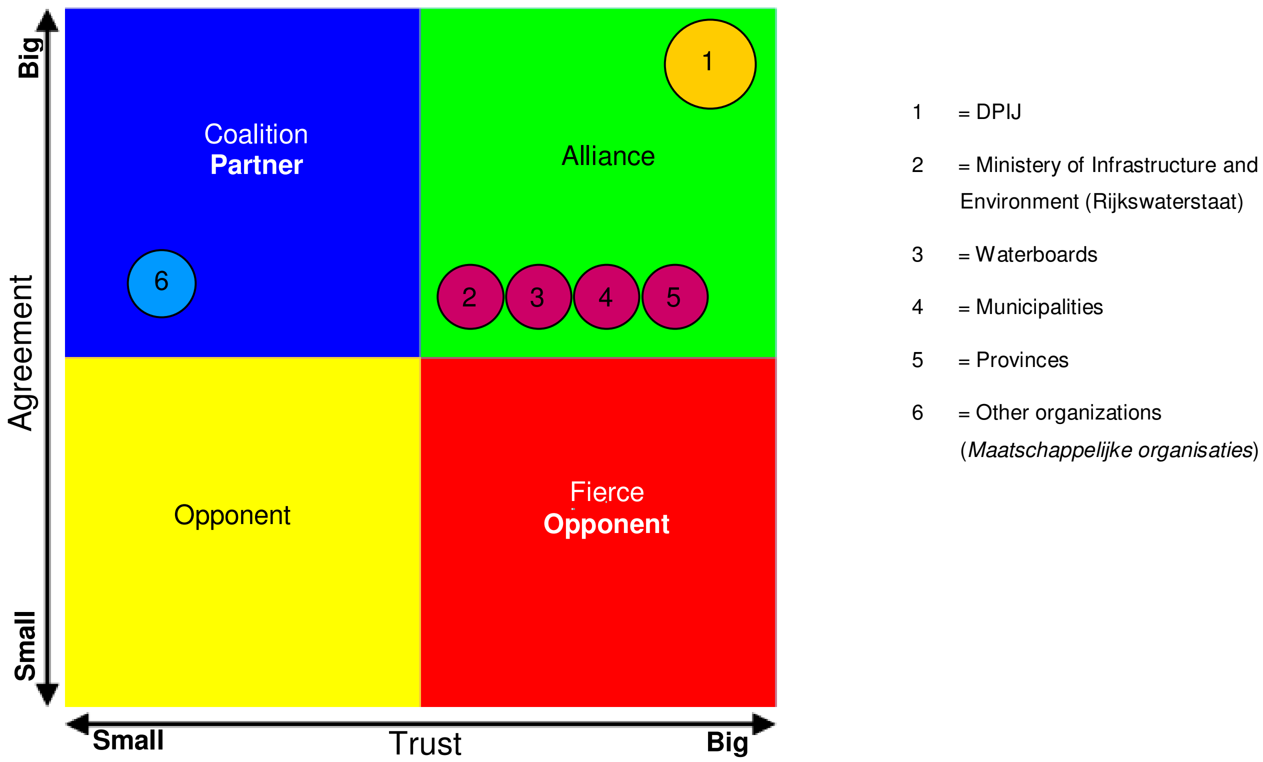

Figure 4.3 Coalition Position
Resource: Rijkswaterstaat (2011)

4.3 *Political-administrative, Legislative and Financial Structure inside Deltaprogramma IJsselmeergebied*

Realising that conflicts of interest might occur even between government agencies, and consequently that the coalition position in Figure 4.3 might be hard to achieve, a special political-administrative, legislative and financial structure was being arranged for complex situations like freshwater planning in the IJsselmeergebied. This special political-administrative, legislative and financial structure is to some extent complicated because it consists of multilevel governance (national, regional and local level) but they also have equal positions inside the Deltaprogramma as illustrated in Figure 4.4.

The story of this special arrangement started in 2007 when the cabinet set up a committee chaired by former minister Cees Veerman. This Deltacommissie was asked to make recommendations regarding the water safety and the freshwater supply issues by looking at climate changes and social developments in the next century. Realising that actualising the concept of sustainable development will require multidisciplinary involvement, the Deltacommissie drafted the Deltaprogramma which consists of actors with different backgrounds from some related organizations to implement its recommendations concerning freshwater strategies in the Netherlands (Deltacommissie, 2008). The Deltacommissie has also made eleven other recommendations from which one consists of the political-administrative, legislative and financial organization structure as shown in Figure 4.4

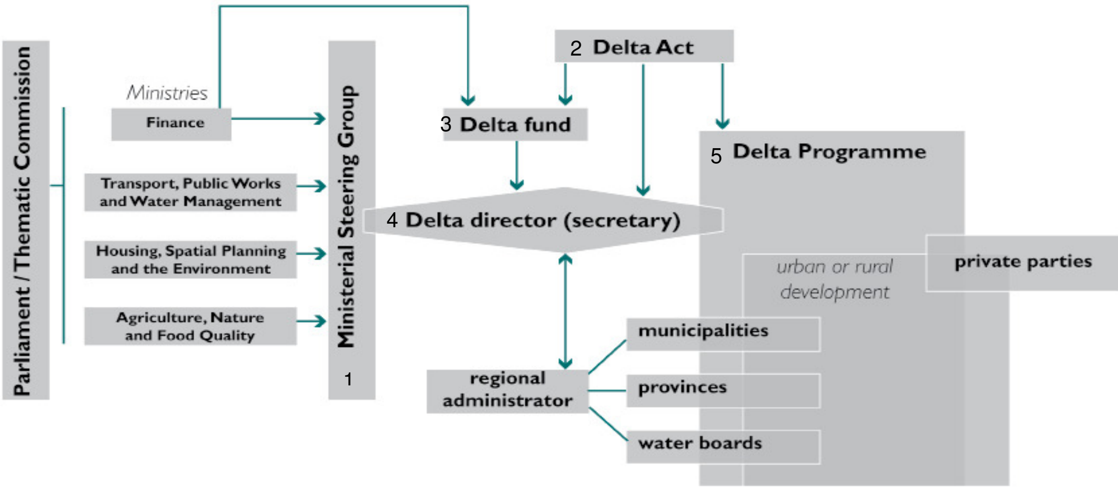

Figure 4.4 Administrative/ political/legislative structure Deltaprogramma
(Source: Deltaprogramma, 2008)

It is important to discuss about the administrative, political and legislative structure of the Deltaprogramma because it also signifies the policy making process inside IJsselmeergebied. From Figure 4.4 can be seen that the policy making process inside the IJsselmeergebied consists of multiple actors as it was discussed in chapter 2. The administrative, political and legislative structure of the Deltaprogramma involves a ministerial steering group, the Delta act, the Delta fund, the Delta Director, and the Deltaprogramma itself. The explanation of each position is as follows:

1. Ministerial steering group

The ministerial steering group includes the representatives of the Ministry of Transport, Public Works and Water Management (*Ministerie van Verkeer en Waterstaat*; *V&W*), the Ministry of Housing, Spatial Planning and the Environment (*Ministeries van Volkshuisvesting, Ruimtelijke Ordening en Milieu; VROM*), the Ministry of Agriculture, Nature and Food Quality (*Ministerie van Landbouw, Natuur en Voedselkwaliteit*) and the Ministry of Finance (*Ministerie van Financiën*; *Fin*). On October 2010, when Rutte was elected to become the prime minister, the Ministry of Transport, Public Works and Water Management merged with the Ministry of Housing, Spatial Planning and the Environment into the new Ministry of Infrastructure and the Environment (*Ministerie van Infrastructuur en Milieu, I&M)*, while the Ministry of Agriculture, Nature and Food Quality merged with the Ministry of Economic Affairs into the new Ministry of Economic Affairs, Agriculture and Innovation (*Ministerie van Economische zaken, Landbouw en Innovatie, ELI*).

2. Delta Act (Deltawet)

The realization of the Deltaprogramma should be secured by law. For this reason the Deltacommissie advised in 2008 that a Delta Act should be introduced. The Delta Act was in the end adopted by the House of Representatives on 28th June 2011. The Delta Act constitutes the legal basis for the Delta Fund which can be used to finance the safeguarding of the freshwater supply and protection against high water in the future. The Act also provides for the role of the Delta Commissioner who is tasked with ensuring that a Deltaprogramma is drawn up every year and the progress is reported.

A Delta Act makes it quite explicit that adequate procedural, substantive and financial guarantees must be available, far into the future, going beyond ‘normal’ legislation (Deltaprogramma, 2008):

- Procedural: the tasks and authority of the Delta Director (who is secretary to the Ministerial Steering Committee), as well as regulations needed for strategic land acquisition, damages, and loss of financial advantage – including private parties – would be set down in the Delta Act
- Substantive: it is the Delta Act that stipulates that a Deltaprogramma will be drafted. This comprises a list of delta works that must be undertaken (with an outline, general description of the works and an outline of their cost, plus financing);
- Financial: the institution of the Delta Fund, as well as the cash flowing into and out of it. This shall explicitly mention the measures’ objectives, as well as the conditions to be fulfilled by the measures financed. The Delta Act sets down that up until 2020 the funds from the Infrastructure Fund that have already been reserved for this purpose will be transferred to the Delta Fund.

3. Delta Fund (Deltafonds)

Funding is an important issue for the nation's water safety and the fresh water supply. The financing of water safety and fresh water projects must be independent of short term political priorities and economic fluctuations. The Committee advises, therefore, to establish a Delta Fund. The Delta Fund aims to finance and funding for the tasks in the field of flood protection and fresh water (Deltawet, 2011; article 7.22a)

The Minister of Finance is responsible for financing and managing the Delta Fund (Deltawet, 2011; article 7.22b), but the fund would be kept separate from the national budget and other funds, such as the Infrastructure Fund and the Economic Structure Improvement Fund (FES).

This will guarantee the budget availability for water related purposes. Not only for the fresh water supply, but also for other important issues such as flood protection and flood risk management. The expenditures will later on follow the pace of the work on the physical infrastructure. In this way, competition with other short-term agendas can be avoided.

Final responsibility for the Fund's expenditure lies in the Ministry of Transport, Public Works and Water Management (Deltacommissie, 2008). One requirement for the pursuit of a Deltaprogramma is that the decisions on how to allocate the funds must be taken nationally: drawn up by the Delta Director and settled in the Ministerial Steering Committee. The Delta Director then makes budgets available to the parties responsible for implementing the (regional) measures, such as the water boards, the Directorate- General for Water Management and Public Works, etc. If a measure is incorporated into the Deltaprogramma, it will be funded from the Delta Fund, even if it serves wider interests than flood protection and/or securing the fresh water supply.

The water projects will require big amounts of financial support. At this moment about 1 billion euro per year is allocated through the Delta Fund for water safety and freshwater projects in the Netherlands. The budgeting system inside the Delta Fund can be planned for the future 10 until 15 years because the government realises that most of the water projects, including the freshwater projects, will need a longer period to implement (Deltacommissie, 2008). However, the Deltacommissie (2008) predicts that the implementation of the entire package of measures proposed by the Deltacommissie will cost more than 1 billion Euros per annum.
The budget estimation is projecting for flood protection projects and the fresh water supply projects but does not include the annual sums for maintenance and management. This estimation implies that freshwater projects will have to compete with flood protection projects, since the budget assured in Delta Funds is only 1 billion per annum. Clearly, funding is indeed an important issue. However, many politicians, lobbyists, civil servants and scientists believe that social cost benefit analyses leave too little room for human creativity and daring (Savelberg et al., 2008). It would be worrisome if decision makers would decide 'on the right course' solely based on cost benefit analyses results.

Table 4.1 Budget Estimation

Indicated extra cost per annum [billion €]	Period		Average
	2010 – 2050	2050 – 2100	2010 – 2100
Deltaprogramma	1,2 to 1,6	0,9 to 1,5	1,0 to 1,5
Deltaprogramma with extra with space for other functions on the coast	1,3 to 1,9	1,2 to 1,8	1,2 to 1,8

(Source: Deltacommissie, 2008)

For example, the later budget estimation made by the Deltacommissie (2012) predicted that between 2021 and 2028 there is only 0,3 billion euro available for the new water projects that have not yet been proposed in 2012 (see Figure 4.5).

This amount of budget is relatively small compared to the entire package of measures proposed by the Deltacommissie which already cost more than 1 billion Euros per annum. This amount of budget might not be enough for financing the new solutions and innovations in freshwater projects. Therefore a new solution to gain financial support is needed. The possibility to involve private parties, industrial or NGOs for generating financial support should be investigated. Even though officially funding for the security of the fresh water supply should be seen as the government's responsibility, it is reasonable in this condition to involve private parties. Freshwater supply projects have a huge potential in generating financial support from private parties since they deliver extra added value for the community and the economy. However, financial support from the private sector should not, by any reason, give them full power in controlling the freshwater price and distribution in the Netherlands. Water is essential for human life, and therefore a 'water monopoly' should be avoided (FAO, 1993).

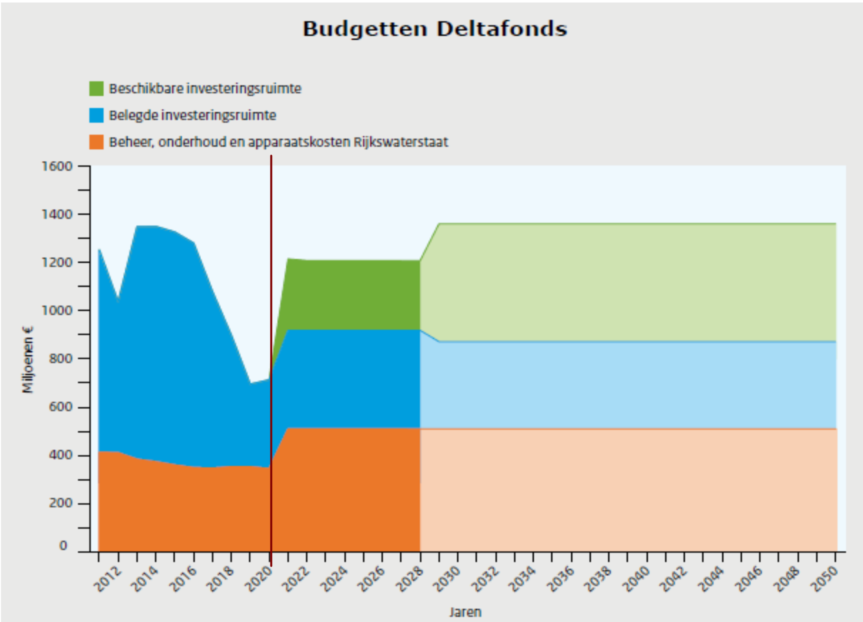

Figure 4.5 Budget Prediction of Delta Fund
(Source: Deltaprogramma, 2012)

4. *Delta Director (Delta Commissioner)*

The Delta Director or in Dutch also known as the Delta Commissioner is the one who directs the Deltaprogramma. The current and the first Delta Commissioner is Mr. Wim Kuijken. He was elected in 2010 and has been appointed for a term of seven years. Every year he has to make a proposal for the Deltaprogramma and ensure that progress is being made. Also the Deltaprogramma will be presented every year on *Prinsjesdag* (the state opening of parliament). The Delta Commissioner serves as a liaison between the ministries, the state and the regions, authorities and civil society organizations. He monitors the cohesion between the various components of the Deltaprogramma. He should ensure that decisions are made at the right time so that the Netherlands will remain protected from high water and will have sufficient freshwater in dry spells in the long term. The Delta Commissioner acts as a government commissioner, under the direct responsibility of the coordinating cabinet minister, the Minister of Infrastructure and the Environment. The Delta Commissioner provides advice to all cabinet members involved and may participate in the advisory council of the Council of Ministers[5].

5. *Deltaprogramma and Deltaprogramma IJsselmeergebied (DPIJ)*

As it is already explained before, the Deltaprogramma is a nationwide programme. The existence of the Deltaprogramma is one of the results of the fundamental shift from technocratic water engineering to integral and participatory water management. The national government, provinces, municipalities and regional water boards work together with input from social organizations and the business community. The objective is to protect the Netherlands from flooding and to ensure adequate supplies of freshwater for generations (Deltaprogramma, 2008). The Deltaprogramma has nine sub-programmes, consisting of three generics programs and six regional programs as shown in Figure 4.6.

Three generic programs of the Deltaprogramma:

- Deltaprogramma waterveiligheid (water safety)
- Deltaprogramma zoetwater (freshwater)
- Deltaprogramma Nieuwbouw en Herstructurering (New urban development and restructuring)

↓

Six regional Deltaprogrammas:

- Deltaprogramma Rijnmond Drechtsteden (Rhine Estuary-Drechtsteden)
- Deltaprogramma Zuidwestelijke delta (Southwest Delta)
- **Deltaprogramma IJsselmeergebied** (IJsselmeer Region)
- Deltaprogramma Rivieren (Rivers)
- Deltaprogramma Kust (Coast)
- Deltaprogramma Waddengebied (Wadden region)

Figure 4.6 Structure of Deltaprogramma

[5] See: http://www.deltacommissaris.nl/english/topics/delta_commissioner/
.

The three generic programs concern about one of the three delta issues on a national scale. These three delta issues consist of water safety, freshwater, and the new urban development and restructuring issue. At the same time, the six regional Deltaprogrammas are responsible for all these three issues on the local scale inside their areas. The location of these six regional Deltaprogrammas is shown in Figure 4.7.

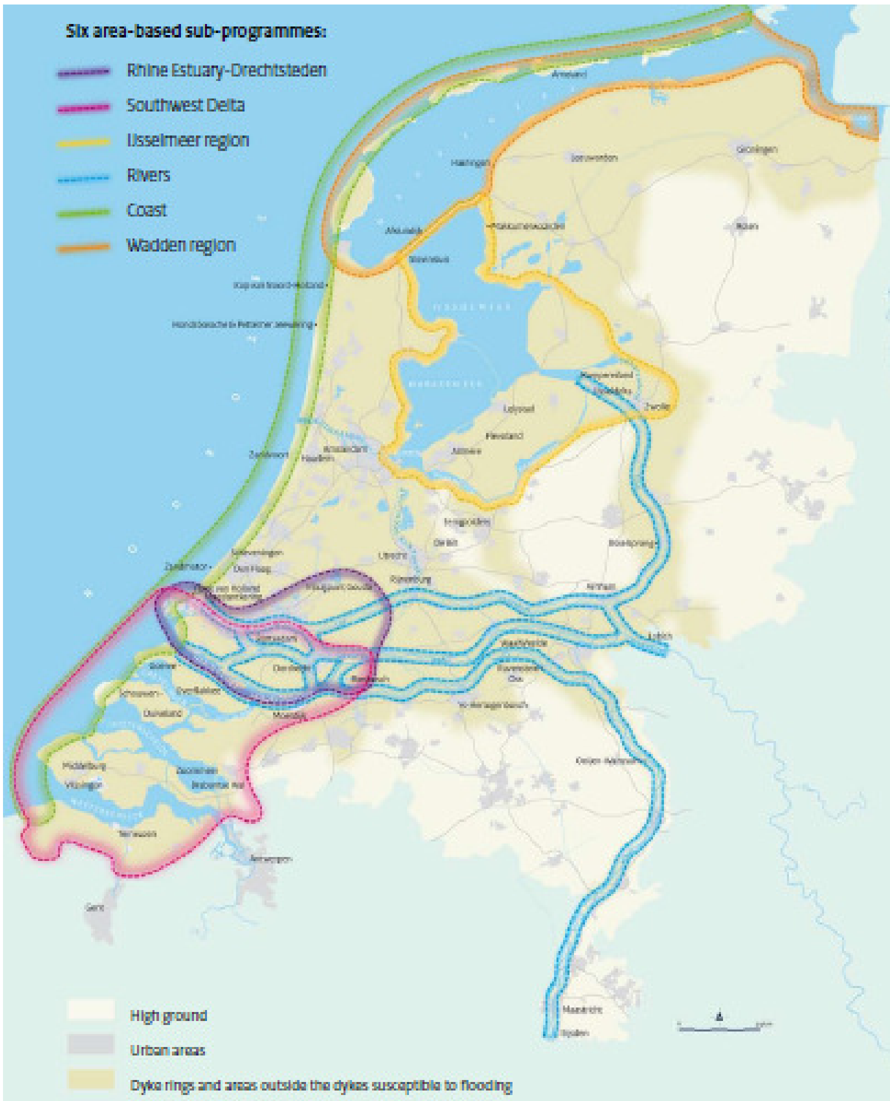

Figure 4.7 Deltaprogramma Area
(Source: Deltaprogramma, 2012)

Deltaprogramma IJsselmeergebied is one of the six regional Deltaprogrammas that is responsible for the three issues inside the IJsselmeer region. The Deltaprogramma IJsselmeergebied, together with five other regional Deltaprogrammas is receiving information from the three generic programs of the Deltaprogramma concerning water safety, freshwater and the new urban development and restructuring issue. DPIJ has a role as initiator of the project inside its area; giving its influence to other decision makers. Besides of this role, DPIJ also fulfils its role as a consultant and as an organiser for a good functioning network during the project.

It is important to re-emphasize that the decisions concerning the freshwater issue have to be made by the Deltaprogramma. It is assumed that all the actors involved inside the Deltaprogramma (provinces, municipalities, water boards, Rijkswaterstaat, and other organizations) have already given their agreement once the Deltaprogramma IJsselmeergebied formulates a new policy. With this assumption, Municipalities and Provinces have a strong role in communicating the water program inside the Deltaprogramma to their citizens, and in the other way around, look after citizens' expectations from the government by communicating this to the Deltaprogramma.

4.4 Delta Decisions

At this moment the Deltaprogramma is preparing the decisions for the future of the delta. The decisions about safety and freshwater supply issues in this century will then be submitted in 2014 to the cabinet by the delta commissioner, to have them anchored in the National Water Plan in 2015. There are 5 'proposed' decisions for the National Water Plan in 2015 (Rijkswaterstaat, 2012; Deltaprogramma Waddengebied 2011):

1. Updating the safety standards for primary defenses
2. The freshwater strategy for an adequate water supply in the Netherlands should be considered for the long term scale
3. Long term water levels in the IJsselmeer in the Netherlands focused on water supply and safety problems in the area
4. Protection of the Rhine - Meuse delta
5. A national policy framework for the (re) development of built-up areas.

The second and the third decision are important to discuss in this paper since it concerns about the freshwater strategy and the water level in the IJsselmeer. The Deltaprogramma is still questioning about to what extent the freshwater strategy should be planned, should it be planned for the self-sufficiency of each region? The Deltaprogramma also questions about the use of freshwater in maintaining the water quality and controlling salinity levels because of the effect of sea water intrusion. Furthermore the Deltaprogramma is questioning the possibility to get water from other countries and how it effects on the water price (Rijkswaterstaat, 2012).

The management of the water level in the IJsselmeer is related to the freshwater strategy. The accomplishment of water management in the IJsselmeer can be useful to solve the problems in the Netherlands, and thus also to answer the previous questions.

4.5 National Water Plan (NWP)

The National Water Plan (NWP) outlines the policy and corresponding implementation measures for the full scope of water management and contains an initial collaboration of the Deltaprogramma in the nine sub-programs, which are largely in-line with the themes indicated by the Deltacommissie (National Water Plan, 2009). Thus, in essence, the final decisions concerning water management in the Netherlands is made by State Secretary (*Staatssecretaris*) of the Ministry of Infrastructure and the Environment and being outlined in the NWP. However, since most of the time the NWP completely consist of recommendations made by the Deltacommissie (interview with Van Waveren, 2012), we can conclude that in the practice the Deltacommissie is powerful in the decision-making process concerning the NWP of 2009.

The policy making process in the IJsselmeergebied for NWP2 (2015) is as shown in Figure 4.8

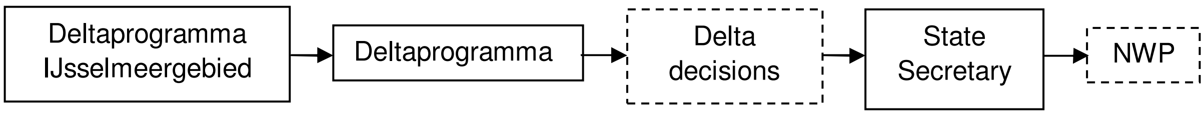

Figure 4.8 The Decision Making Flows

Figure 4.8 illustrates that the decisions made by the State Secretary is actually coming from the recommendations of the Deltaprogramma. This shows that the discussions concerning the future water planning in the Netherlands take place inside the Deltaprogramma.

4.6 The Role of Rijkswaterstaat in Freshwater Planning in the IJsselmeergebied

From the previous explanation about the current Dutch water management system, from the political-administrative, legislative and financial structure of the Deltaprogramma and from the decision making process, it is clear that Rijkswaterstaat is not the decision making agency. The decisions concerning freshwater issues have to be made firstly by the Deltaprogramma, these decisions will then be advised to the State Secretary and later on they will be outlined in the NWP.

However, it is important to highlight here that Rijkswaterstaat also has its representation in the Deltaprogramma. The project leader of the *Droogtestudie Nederland* of RIZA (National Institute for Freshwater Management and Waste Water) and also senior advisors in Rijkswaterstaat said that there are about 50 people from Rijkswaterstaat currently present in the Deltaprogramma (Interview with Van Waveren, 2012). The position of Rijkswaterstaat inside the Deltaprogramma is important because Rijkswaterstaat has the knowledge concerning maintenance, construction and the policy situation in the water sectors. Thus, even though Rijkswaterstaat is not officially a policy maker, in the practice Rijkswaterstaat has a big role in deciding the future freshwater condition in the Netherlands.

Nevertheless, the existence of the Deltaprogramma in a way has put Rijkswaterstaat in a difficult position. As explained before, the existence of the Deltaprogramma is the manifestation of the fundamental shift from technocratic water engineering to integral and participatory water management. The shift to participatory water management is important because it has positive impacts such as fostering deliberation, encouraging social learning, and encouraging new alternatives (Priscoli, 1999) as it was discussed in chapter 2. However, the current integral and participatory water management has fractured the monopoly of the influential Rijkswaterstaat engineers. Especially concerning those engineers who engage in the decision making process inside the Deltaprogramma and who might have their own ideas, the coalition process plays an important role in this project. Meanwhile, Rijkswaterstaat should also be aware of its position as the organization that has the knowledge and experience concerning maintenance, construction, and the policy situation. With this expertise and experience, it is logical that people will expect more from Rijkswaterstaat.

With its expertise and experience, Rijkswaterstaat is likely able to carry its three tasks, especially the tasks in policy support and advice (beleidsondersteuning en advies, BOA). What might be a challenge for Rijkswaterstaat is to recognize whether the advised scenarios are resilient and adaptive. Finding a resilient and adaptive solution for freshwater planning in the IJsselmeergebied is not simple, it needs new ideas other than the four scenarios being explored in chapter 3. It is again a challenge for Rijkswaterstaat to see the shift from technocratic water engineering to integral and participatory water management as an opportunity to gain new ideas (Priscoli, 1999) from other actors outside Rijkswaterstaat instead of seeing this as an obstacle in their work. Citizens might have good ideas since they live close to the central problem. Moreover, involving citizens and other parties from an early phase will be beneficial for gaining support in the further phases. By considering the ideas from other parties, the advice of Rijkswaterstaat will be more valuable for the decision making process inside Deltacommissie.

4.7 Conclusion

The political-administrative, legislative and financial structure of the Deltaprogramma is to some extent complicated because it assembles the vertical dimensions of multilevel governance (national, regional and local level) to cooperate in a more horizontal way. Nevertheless, this structure is important to bridge the gap between the previous technocratic water engineering and the current integral and participatory water management. The engineering approach will remain important, nonetheless, the coalition between actors in the decision making process has become essential in this integral and participatory water management era. It is assumed that the Deltaprogramma's decision is in the same time the decision of all the actors involved in the Deltaprogramma; provinces, municipalities, water boards, Rijkswaterstaat, and other organizations. The Deltaprogramma in this essence can bridge the conflict of interest between the actors involved in the IJsselmeergebied.

Apart from this, the early involvement of other actors in the decision making process is also important to gain support and commitment for the further phases. For example: it is important to gain support from municipalities and provinces during the construction phase of freshwater projects. Actors such as municipalities and provinces can be valuable for several reasons like to communicate about the ongoing water program inside the Deltaprogramma to their citizens and, in the other way around, to gain 'local knowledge' by communicating what citizens and other organizations have experienced and what they expect from the government. Here it can be seen that support and commitment from all the actors involved, and thus coalition, plays an important role in the new integral and participatory water management.

Meanwhile, funding will be a problem in the long-term freshwater planning. The funding issue might be a constraint in freshwater planning in the IJsselmeergebied, however, it would be dangerous if decision makers would decide about the preferred solution solely based on cost benefit analyses results. Lack of government funding should not be the main burden in choosing the preferred solution (UNESCAP, 2011), rather, government should start thinking how to gain financial support from the private sector while in the same time finding a solution to avoid a 'water monopoly' by the same private sector. Gaining financial support from the private sector will, again, require a coalition building. Building coalition in this planning process is therefore crucial for 'key players' involved, thus including Rijkswaterstaat.

The position of Rijkswaterstaat in the freshwater planning will remain important considering its expertise and experience. However, the shift from technocratic water engineering to integral and participatory water management does not make the responsibility of Rijkswaterstaat less difficult. Instead it produces extra works for Rijkswaterstaat. The fundamental shift from technocratic water engineering to integral and participatory water management has pushed Rijkswaterstaat to not only take the responsibility of giving policy and engineering advice for the decision makers, but it also pushed Rijkswaterstaat to consider about the opinion of other actors and citizens and hence pushed Rijkswaterstaat to involve in the coalition building. Therefore, it is important for Rijkswaterstaat to involve citizens and other parties from an early phase. The coalition building should be seen as a valuable step instead of seeing this coalition building as an obstacle that might postpone the planning process.

The explanation in this chapter shows how the ideas of adaptive water management and scenario planning that were being introduced in chapter 2 have made the policy making process in the IJsselmeergebied become more complex because it requires participation of actors from different backgrounds. By linking the organizational structure inside the IJsselmeergebied that was being discussed in chapter 4, the freshwater issue in the IJsselmeergebied that was being discussed in chapter 3, and the idea of sustainable development and scenario planning that was being introduced in chapter 2, suggestions on how to achieve sustainable freshwater development in the IJsselmeergebied are being made in the next chapter.

5 Towards "Adaptive" Freshwater Planning in the IJsselmeergebied

5.1 *Introduction*

This chapter tries to give suggestions and recommendations for how to guide the freshwater planning process in the IJsselmeergebied. First, this chapter explores some difficulties that might occur in the long term planning and implementation of the freshwater scenarios in the IJsselmeergebied. Then, the idea of the sustainable development cycle (Johnson et al., 2004) is being introduced as one of the possible theories that can be used in guiding the freshwater planning in the IJsselmeergebied. Afterwards, this chapter tries to connect this sustainable development cycle with the role of Rijkswaterstaat in the freshwater planning process in the IJsselmeergebied. This chapter further suggests the importance of adding scenario planning to the sustainable development cycle.

Nevertheless, adding scenario planning to the sustainable development cycle can not happen without any drawback. Some aspects such as the iteration process in scenario planning might delay the planning process and expand the budget needed. Meanwhile it was already discussed in chapter 4 that the budget issue might probably be a constraint in freshwater planning in the IJsselmeergebied. Therefore this chapter further discusses about several steps that can be adopted to diminish the drawback of combining scenario planning and the sustainable development cycle.. Furthermore, this chapter tries to remind Rijkswaterstaat and other stakeholders that there might be some difficulties in the long-term planning process in the IJsselmeergebied. Both of the sustainable development cycle and the scenario planning theory might not have enough effect to fully reduce these difficulties. Finally, the conclusion will be provided as the final remark of this chapter.

5.2 *Difficulties in the Long Term Planning and Decision Making Process*

Deciding and guiding the long term planning in the IJsselmeergebied is not only difficult because of its technical dilemmas as they were described in chapter 3, but it is also difficult from the planning process and the decision making perspectives. De Boer et al., (2011) have recognized several difficulties in the Dutch freshwater management; the same difficulties might occur in the planning and implementation of the freshwater scenario in the IJsselmeergebied:

1. **Processes: interacting process phases and manageable scales of operation**

   In the classical project-planning and implementation perspective there is a sequence of phases through which each project goes: planning, design, realisation and maintenance. However, in a complex and dynamic context, such as in a big planning project like freshwater planning in the IJsselmeergebied that need years to be implemented, all such phases no longer offer clarity and organisation (De Boer et al., 2011). The fact that the freshwater planning in the IJsselmeergebied for the year 2100 will take more than 80 years to be implemented implies that the whole organisation and actors involved in this project will face transition phases before it is being executed. The transitions from one phase to another will be difficult to control. There is always a chance that the next generation will fail in fulfilling their task and this chance increases under stressful conditions. Even though it is determined that freshwater planning should get our attention from now on, there is no guarantee that the future generation will have the same opinion. The future generation might have the idea that the current economic crisis, for example, should get our main attention, and therefore, they neglect the freshwater planning process in their era (De Boer et al., 2011). This will delay the realisation of freshwater planning in the IJsselmeergebied, if not being completely canceled.

2. Actor openness: craftsmanship and team spirit for effective organisations

The technical dilemmas explained in chapter 3 show that water management is actually not a predefined list of 'do's and don'ts'. It is in fact a matter of careful judgment in informed dilemmas as it is outlined by De Boer et al., (2011). Therefore, support for the continuous learning processes of the staff is important. This involves stimulating the exchange of views and practical experiences among colleagues, both within the organisation inside deltaprogramma IJsselmeergebied and with those in other organisations. It basically serves to stimulate all staff members to become 'reflexive practitioners' (Schön, 1983). Mutual learning through sharing of each other's experiences creates sharper insights and a team spirit, with a jointly-held collection of possible actions and outcomes.

3. Dynamic strategies: a balancing act between fixing options and keeping them open

The previous chapter already discussed about how to balance between fixing options and keeping them open, yet it is still difficult to implement this in practice. De Boer et al., (2011) wrote that many implementation processes in the previous freshwater planning are bound to fail, get stuck at some stage or only proceed after substantial alterations to the initial plans that have been made. Culturally, it requires accepting the predictability that unforeseen complications or complexity will arise. Dealing with uncertainties requires a continuous balancing act between stability and adaptive behaviour. The freshwater planning in the IJsselmeergebied will also face similar difficulties since the future condition is not assured. On the one hand it is important to already have a concrete plan what to do for the future, on the other hand it is important to keep the options open, adjusting to the future situation. For that reason the Deltacommissie (2008) has decided that the water level in the IJsselmeer will be increased by a maximum of 1,5 m after 2050. Nevertheless, the Deltacommissie also shows the awareness for the uncertainties through this policy; it mentions the maximum level for increasing the water level in 2050 and not the precise level. Furthermore, the Deltacommissie also mentions that the measures to achieve the elevated water level can be implemented gradually. It can be observed here that the Deltacommissie is actually aware of the gap between possible futures and the desired futures as it is explained in the scenario planning (Lindgren and Bandhold, 2009).

4. Interactions: dealing with motivations, cognitions and resources

The idea of sustainable development requires an open, participative and communicative approach because the concept of sustainable development will require multidiscipline involvement (Bell, 2005). It is inclusive towards the social environment of other actors and it supports learning from each other. Bressers (2004) argue that it is important to have a good understanding about the characteristics of the other actors and to monitor when and where productive settings of positive motivations, adequate cognitions and sufficient resources of actors can arise.

All the actors involved in the IJsselmeergebied should be aware that the same difficulties might also occur in the freshwater planning in the IJsselmeergebied. The sustainable development cycle in combination with scenario planning might be useful to guide the planning process especially from the managerial perspectives, even though might not completely solve the four problems explored in this sub chapter.

5.3 The concept of Sustainable Development Cycle for Freshwater Strategies in the IJsselmeergebied

Long term planning processes such as climate change adaptation for the future sustainable development require long term planning strategies and policy decisions. Johnson et al (2004) argue that planning for sustainable development is in a way different from the classical project plan as it was discussed in chapter 2. While the classical project plan goes from the first step to the next steps and stops in the last step, a sustainability action strategy is posited relating to infrastructure capacity-building and sustainable innovations that consists of a five-stage cyclical process: assessment, planning, implementation, evaluation, and reassessment and modification, if necessary (see Figure 5.1). This cycle is build based on the assumption that sustainability is an ongoing cyclical changing process rather than a one-time sequential stage process.

The sustainability cycle process can be used for guiding the freshwater planning in the IJsselmeergebied because the future freshwater planning in the IJsselmeergebied is also a long term planning process for sustainable development. The further discussion tries to relate the concept of the sustainable cycle by Johnson et al (2004) and the guiding process for freshwater planning in the IJsselmeergebied, as well as a way for Rijkswaterstaat to play a role in this process.

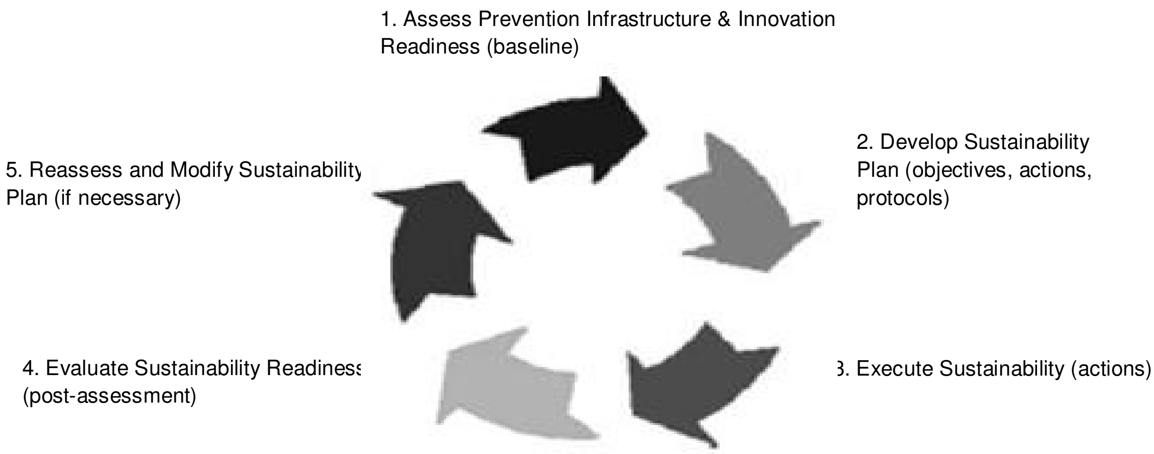

Figure 5.1 The sustainability action steps.
(Source: Johnson et al., 2004)

Step 1; Assessing Phase.

Step 1 consist of assessing the sufficiency of the infrastructure capacity to support the establishment of a new innovation and assessing the attributes of innovation. There are two purposes for conducting this assessment:

1. To determine which sustainability factors, if any, need attention in the planning and implementation steps

The concept of sustainable development is clearly not represented by a single point at the centre of the field. A singular, 'true' 'sustainable development', is indefinable, since it would be impossible to demonstrate that economic, social and environmental goals were all given equal weight (Connelly, 2007). Therefore, Johnson et al. (2004) recommend that it is important to determine which sustainability factors need more attention in the planning and implementation steps. In the case of freshwater planning in the IJsselmeergebied, for example, is difficult to plan an adaptive freshwater system without giving any consequences to one of the social (safety), environmental, and economic issues, as it was discussed previously in chapter 3.

The emphasis here is not to disregard the importance of the environmental and economical issues, but to set the right priority. The environmental and economical issues should be taken into account as much as possible, however Rijkswaterstaat has to realise that the freshwater planning in the IJsselmeergebied will generate environmental issues and, consequently, will most likely create complaints from environmental organisations. Rijkswaterstaat has to prepare to counter the criticism by giving strong arguments that this is the dilemma that we have to work out together. Rijkswaterstaat also has to reveal all the environmental and economic measurements that have already been done so far. Involving the environmental organizations from the early planning process can also be a solution. In this way, the environmental organizations are being embraced to solve the environmental problem. This, however, might be difficult if we have to oppose the ecocentric philosophies such as Arne Næss's 'Deep Ecology' (Næss, 1997) that prioritize the health of the ecosystem over concern for human welfare, let alone human justice. This idea, even though explicitly opposed to the concept of sustainable development, undeniably exists in this world.

2. To provide baseline data for evaluating the impact of the sustainability actions.

Rijkswaterstaat, is since 1798the organization responsible for maintenance, construction, and policy advise. Thus, Rijkswaterstaat has been experienced in these three sectors for more than two centuries. Rijkswaterstaat might still play role in these three sectors for the coming centuries. With this experience, Rijkswaterstaat can provide data from the previous era and collect data from this moment onwards and use these data evaluating the impact of the freshwater scenario in the IJsselmeergebied. Rijkswaterstaat can also make further investigations concerning spatial, environmental and economical consequences of each scenario and make expert judgments based on its data and expertise. Rijkswaterstaat can additionally make investigations to generate new innovation for resilient solutions in the IJsselmeergebied. Rijkswaterstaat can enquire support from other parties during these investigations. Moreover, it is possible to build a coalition or joint research with other countries that have already found or are currently looking for the solution for the future freshwater planning.

Step 2; develop sustainability plan.

Step 2 consists of developing a sustainability plan. Planning for sustainable development requires a comprehensive and gradual approach, generally divided into three periods of planning: a short-term plan (0–5 years), a medium-term (5–20 years) and a long-term plan (more than 20 years) (Bentivegna et al., 2010). Creating a long-term plan is the most difficult part, especially since the future climate change and freshwater demand is hard to predict. However, Huitema and Meijerink (2010) argue that even though policy changes in freshwater management can perhaps not be managed in the sense of being pre-planned and centrally controlled, at least it can be prepared for and “navigated” from point to point. The idea of Huitema and Meijerink is in line with idea of scenario planning to anticipate future needs and eventually identifies a range of potential futures. Long term planning in the scenario planning theory is needed to provide a relevant contextual framing for the short-term decisions (Lindgren and Bandhold, 2009).

For example, when the Deltaprogramma (2008) recommended to increase the water level in the IJsselmeer with a maximum of 1,5 m after 2050, then this long term idea, even though not a detailed planning, should be followed by the adoption of new regulations to keep this plan possible in the future. The short-term planning in this case would be to set up a deadline for the ratification of the new regulation regarding new buildings and infrastructure in the IJsselmeergebied, so to avoid conflicts of space needed for the new dike constructions that will be necessary when increasing the water level in the IJsselmeer.

Moreover, long term planning requires building support. Public support is important not only in the planning phase but also during the implementation and the moments afterwards. As it is already explained before, water management is not about the ‘do’s and don’ts’. It is actually a matter of careful judgment in informed dilemmas (De Boer et al., 2011). Therefore, support for the continuous learning processes and implementation is important. It might be difficult and it takes a lot of time to gain support from the citizens especially because the final plan for changing the infrastructure has not yet been decided about. However, the short-term planning concerning public support building can start on a smaller scale. First it is important to set a 'declaration of intent' (intentieovereenkomst) in which all the parties involved inside the Deltaprogramma, thus including Rijkswaterstaat, would commit themselves to the integrated planning process and cooperate with each other. Second, the government should gain support from other parties outside the Deltaprogramma, who might become important in the future. Some parties might not share the same policy beliefs or value preferences; nevertheless they might share an interest in realizing a particular sort of policy change. We can call this type of coalition a strategic alliance (Meijerink, 2005). Partzch (2009) in her account of the development of the EU Water Framework Directive, for example, describes how the water industry and environmental NGOs joined forces because they shared an interest in water pricing, although for entirely different reasons. Whereas the drinking companies hoped to take financial benefit from the freshwater projects, the environmentalists wanted to improve the surface water quality and to restore the water ecosystem. The Netherlands can learn from this experience, and use the water price issues for building support and coalition.

From the above it can be concluded that it is important in this second step to already define the long term plan, even though it is not yet possible to be managed completely. Furthermore, it is important in this second phase to identify achievable short term steps that are easier to manage. Additionally, there should be a timeline to guide the planning process.

Step 3, Step 4 and Step 5;

Implementation, evaluation, reassessment and modification.

Step 3 consists of executing the sustainability plan determined in step 2. The result of this implementation should be evaluated in step 4. In step 5 sustainability interventions are reassessed based on the evaluation to determine whether plans and interventions need to be modified.

It is important to stress that additional innovations in this sustainability cycle are adopted and subsequently considered for becoming a feasible element of a prevention system. This means that first, even though currently there are at least four freshwater scenarios available in the IJsselmeergebied, other possible (new) scenarios should still be welcomed, and therefore these five-step processes could be repeated. Second, a sustainable development plan requires a comprehensive and gradual approach, consisting of short-term, medium-term and long-term plans, that need to be implemented, evaluated and modified over the course of time.

The Five-stage cyclical process suggested by Johnson et al., (2004) is indeed useful for guiding sustainable development. However, it might not be enough for guiding the freshwater planning in the IJsselmeergebied. Johnson et al. (2004) describe a process of considering futures based on choices between short-term plans and long-term plans (see also: Loucks, 1994). He does talk of multiple future uncertainties and their connections to the present decision making. This allows us to relate scenario planning to the sustainable development cycle.

5.4 The concept of Scenario planning for Freshwater Strategies in the IJsselmeergebied

A sustainability action strategy is posited relating to infrastructure capacity-building and sustainable innovations (Johnson et al., 2004). However, the concept of sustainable innovation is vague since we cannot predict the future technological condition with any certainty (Scott, 2012). Adding scenario planning to the sustainable development cycle could be valuable because the central idea of scenario planning is to consider a variety of possible futures that include many of the important uncertainties in the system (Peterson et al. 2003 p. 359).

Scenario planning revolves around creating multiple scenarios, each based on a unique combination of the critical uncertainties. (Marra and Thomure, 2009). This makes scenario planning different from the one dimensional planning. The one-dimensional planning approach (see Figure 5.2, top side) is appropriate when the scope is well-defined and the range of future uncertainties is limited. The scenario planning approach (see Figure 5.2, bottom side) allows progress along a path of elements common to many possible futures, providing greater flexibility for responding to changing possibilities (Marra and Thomure, 2009). By identifying and sequencing all the projects and initiatives that would be needed to realize each future scenario, an implementation pathway can be developed. The overall purpose of this approach is to identify the common elements that will strategically place a system in a highly flexible, adaptable position when change and its surprises inevitably occur (Schwartz, 2003).

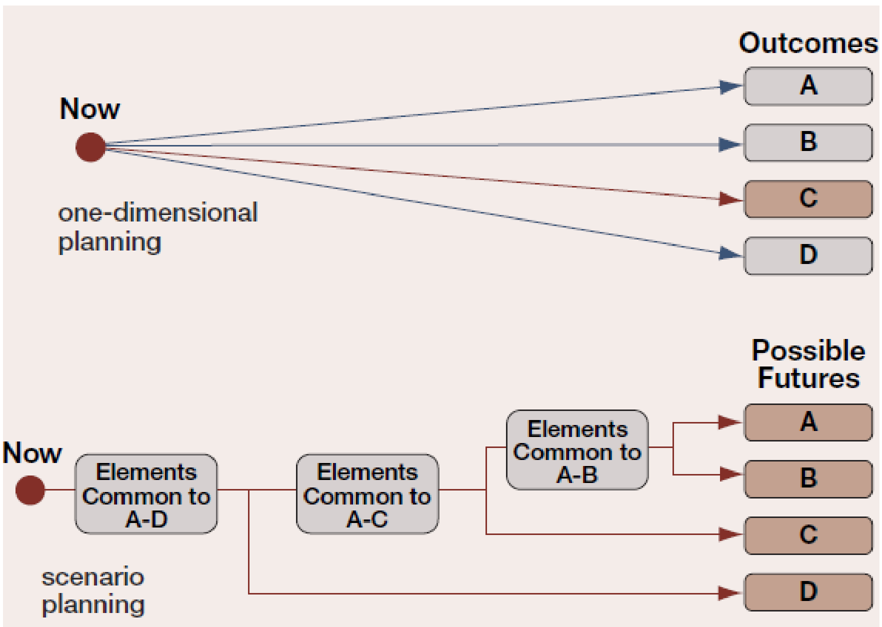

Figure 5.2 The One-dimensional Planning and Scenario planning Concept (Source:Marra and Thomure, 2009).

If the situation changes and enforces the strategy to change, then a strategic retreat to an earlier junction on the common path is more reasonable than a drastic retreat to the starting point. The Scenario planning process can be revisited over time to adjust the range of possible futures as planning assumptions change, old possibilities fade and new ones emerge. This ensures that strategic flexibility and adaptability are maintained (Marra and Thomure, 2009). The evolving, iterative process of scenario planning described in this paper reflects the need of new information, both on changing current conditions but also on improving our understanding on the future trends. As a result, the process must be seen as continuous, necessitating reconsideration of uncertainties.

Meanwhile, the concept of the sustainable development cycle could be seen as still rather linear and moving forward from one phase to the next phase without giving possibilities to retreat to an earlier phase. Scenario planning suggests to include an iterative process in the sustainable development cycle. Figure 5.3 illustrates the suggested sustainable development cycle.

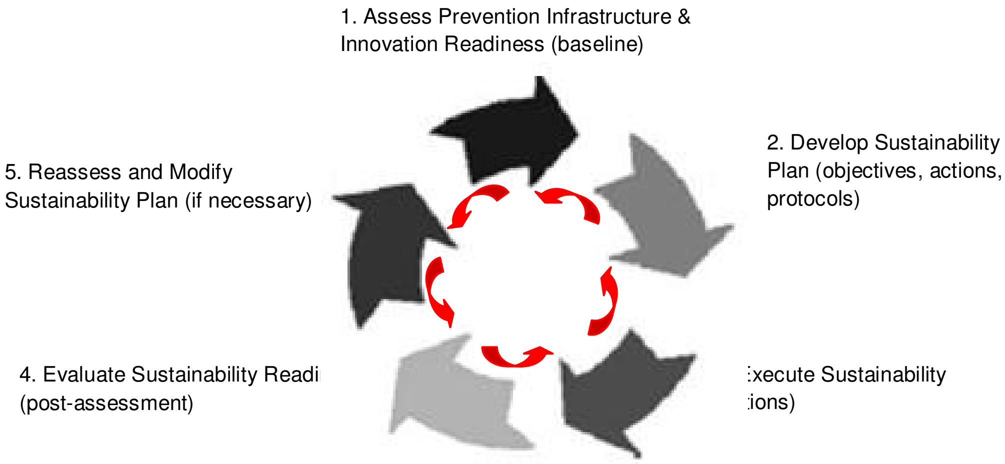

Figure 5.3. The suggested sustainable development cycle

The suggested sustainable development cycle can be used in the freshwater planning in the IJsselmeergebied. For example, in order to assess which of the scenarios will be the most suitable for the future freshwater planning in the IJsselmeergebied, the assessing phase should consist of investigations concerning four (or more) possible scenarios. Thus, this first (assessing) phase already forms a cycle. After the first phase is completed, it can move on to the next phase; developing a sustainability plan based on the preferred scenario in the first phase. By using the new suggested sustainable development cycle, when it appears that the preferred scenario in the first phase is no longer suitable for the current situation because the current situation has already changed from the predicted situation, it is possible to iterate the process.

Controversially, the planning process should not keep on iterating indefinitely due to the policy making procedures and budget constraints (see: chapter 4: Delta Decisions, NWP, Delta Fund). Scott (2012) as well as Marra and Thomure (2009) suggest several aspects to take into account :

1. Initiating Scenario planning

The first step is to identify one or more essential issues in order to prepare for a significant decision (Marra and Thomure, 2009). Identifying the central issue can be accomplished through a brainstorming session involving a diverse group of staff members with active involvement. Scott (2012) suggested ongoing and alternating meetings between a “small group” of active participants, comprising University researchers, project managers, planners, engineers and hydrologists, economists, and a “large group” of participants who attended only a subset of meetings but provided oversight and ratified (or modified) key decisions made by the small group. Alternating meetings between this “small” and “large” group can help the process of scenario planning in achieving a strategic position that is flexible enough to adapt to a credible range of possible uncertain futures.

Establishing a meeting between experts as it is suggest by Scott (2012) can also be adopted in the planning process of the IJsselmeergebied. Rijkswaterstaat can have a role in steering the meeting since Rijkswaterstaat not only has the engineering expertise but it also has a close affiliation with the policy sector. Thus, Rijkswaterstaat can be a mediator between the policy sector and the engineering sector (researchers, engineers, hydrologist, etc). To become a mediator is however no easy. Rijkswaterstaat could guide meetings to fabricate an “optimal” solution for the future freshwater planning in the IJsselmeergebied. Creating optimal solutions appears to be difficult, however. The result of initiating scenario planning in Arizona as reported by Scott (2012), for example, was in the end focused on cost-reduction objectives instead of attempting to identify one or a limited set of scenarios as “optimal” outcomes.

2. Ranking Driving Forces

The next step of the scenario planning process involves ranking the driving forces distinguished in the initiation phase, in terms of their importance and uncertainty (Scott, 2012). Both the large and small groups participate in collectively plotting the relevant forces on axes of uncertainty and importance, which in the end suggest the priority-setting for the planning process.

The planning group subsequently develops a sufficiently complete description of each unique future. This step requires creativity and imagination. The participants should identify the potential issues that must be managed considering the uncertainties involved. Each scenario about the future essentially becomes a different story. To develop a more flexible, multidimensional view of the future, it should be considered that each scenario is likely to occur in a greater or lesser extent (Marra and Thomure, 2009).

3. Pathways and Common Elements

The future scenarios collectively create a range of future possibilities (compare figure 2.5 and figure 5.2). The group plots an independent pathway, a sequence of projects and programs, to realize each unique future based upon its specific characteristics and issues. Despite differences among the developed pathways, similarities and overlaps will occur; this cohesion indicates which projects and programs would be most possible over time (Marra and Thomure, 2009).

The three steps suggested by Scott (2012) as well as by Marra and Thomure (2009) are conceivably useful to minimize the iterating process in scenario planning. However, it should be taken into account that even though these three steps emphasise the importance of forming groups of expert members in the scenario planning process, accommodating the public opinion as described in chapter 3 and 4 is still important. Moreover, planning for the long term future requires flexibility to adapt to changing future conditions. Therefore, it might still be difficult to completely avoid the iterating process.

5.5 Conclusion

Long term planning for sustainable freshwater development in the IJsselmeergebied is different from the general planning process. It needs an ongoing cyclical change process instead of a one-time sequential stage process (Johnson et al., 2004). The five-stage cyclical process suggested by Johnson et al., (2004) can be useful for guiding the planning process in the IJsselmeergebied. Based on this cycle, Rijkswaterstaat can have an important role in the assessing phase by building strong arguments why the freshwater planning is important and should get the priority even though it might have economical and environmental consequences. Furthermore, Rijkswaterstaat can have a role in providing the baseline data for evaluating the impact of the freshwater scenario in the IJsselmeergebied. Rijkswaterstaat, with support from other parties, can also continue the investigations concerning spatial, environmental and economical consequences of each scenario. In the phase of developing sustainability plans, Rijkswaterstaat can play a role in identifying the achievable steps, steps in the short term plan that are easier to manage. Also they can set the timeline to guide the planning process. Rijkswaterstaat can particularly play a role in the implementation, evaluation and modification phase.

The concept of the sustainable development cycle supplemented with scenario planning, have been discussed as useful to guide the planning process especially from the managerial perspective, to be able to adapt to changing future conditions and enhance the resilience of the IJsselmeergebied.An iterative planning approach could be useful since what is considered the 'best scenario' might over time not prove to be the real 'best solution' because the future condition might appear to be different from the prediction, and therefore, an iterative planning process is sometimes needed. On the one hand, however, the iterating process should be limited because the freshwater planning in the IJsselmeergebied has a limited budget and decision-making is subject to time constraints as was discussed in chapter 4. Taking into account that this planning process might face some iterations that can delay the planning progress, it would be judicious for Rijkswaterstaat and other stakeholders to start the freshwater planning process in the IJsselmeergebied as soon as possible.

6 Conclusion and Recommendation

6.1 Conclusion

The analysis of this study shows how the uncertainty of the future climate change makes freshwater planning in the IJsselmeergebied for the year 2100 difficult. The analysis further leads to four main conclusions in order to answer the four sub research questions stated in Chapter 1. The first conclusion is about the position of the current freshwater planning process in the IJsselmeergebied and the dilemmas in the planning process. With these dilemmas, it appears that planning a resilient system is not easy, while resilience is a key property in achieving sustainable development. The second conclusion concerning the consequences of the freshwater planning in the IJsselmeergebied and the fundamental shift from technocratic water engineering to integral and participatory water management for the role/position of Rijkswaterstaat in the future planning is subsequently made based on the first conclusion. Afterwards, by looking at the sustainable development cycle and the scenario planning theory, practical recommendations on how *Rijkswaterstaat can a play* role in the "Adaptive" Freshwater Planning in the IJsselmeergebied is provided in this chapter. Finally this chapter will conclude with recommendations to Rijkswaterstaat for guiding the planning and actualization of the freshwater scenarios in the IJsselmeergebied.

6.1.1 The scenarios of freshwater planning in the IJsselmeergebied and the dilemmas

The Netherlands is one of the leading countries to be aware of the importance of being active and proactive towards the future long term freshwater condition. However, the current freshwater planning is still in the scenario study phase, the first phase of the planning process. Currently Rijkswaterstaat already has been preparing four possible scenarios for the IJsselmeergebied (based on interview with Smedes and Van Waveren, 2012). The first scenario is the 'do nothing' scenario, which basically means a continuation of the current situation with no additional investments in freshwater management. The 'do nothing' option can be vulnerable for the future generation and therefore it should be avoided if the Netherlands want to create a sustainable freshwater system. The second scenario is managing the water level in the IJsselmeer in such a way that the water level difference between the summer and spring period can be used to provide the future freshwater demand. The water level will be increased, adjusted to the future sea level rise. In this scenario water from the IJsselmeer will still be streamed to the Wadden Sea by using gravitation. The third scenario is maintaining the water level in the summer and in the spring period in order to provide the future freshwater demand. In this third scenario the water from the IJsselmeer will be streamed using a pumping system because it is predicted that the sea level will rise above the water level in the IJsselmeer. For this reason the connection between the IJsselmeer and the Wadden Sea will be closed permanently. The fourth scenario tries to overcome the possibility that the sea level will rise as is expected now, while in the same time it tries to avoid the complete use of pumps. Water will stream using gravitation during a low sea level and will stream using pumps during a high sea level. The function of the IJsselmeer has to change from the freshwater retaining area into an estuary area in order to implement this fourth scenario.

Unfortunately, none of the four scenarios are without consequences nor able to fulfil the eight resilience aspects (robustness, rapidity, redundancy, resourcefulness, technical, organisational, social and economic aspect) as it was discussed in chapter 3. The idea to increase the water level in the IJsselmeergebied will threaten the infrastructure and the environment in the surrounding area. The option to use pumps in the future to stream water from the IJsselmeer into the Wadden Sea seems to be the most reassonable solution from the economic perspective. However economic reasons should not be the main reasons or the main burden in choosing the preferred solution (UNESCAP, 2011). From a sustainability perspective, human welfare should get priority as well. The idea to use pumps to stream water from the IJsselmeer can be the future solution as long as it has a backup system that is substitutable and can be activated when disruptions occur (Chang and Shinozuka, 2004). Furthermore, the idea to change the IJsselmeer into an estuary area should be considered carefully since it will have a lot of ecological effects (see: Nixon 1995; Van der Brugge et al., 2005) Moreover, the idea to change the IJsselmeer into an estuary area will make the Nethelands loosing its current freshwater retaining area, instead of getting more retaining capacity for the compliance of the future freswhater demand. The desk research shows that it will be hard to evade from the infrastructure and environmental consequences.

Even though in chapter 3 the author argues that the four scenarios made by Rijkswaterstaat are not yet fulfilling the requirements of a resilient system, it is a positive step that Rijkswaterstaat already tries to figure out the possible solutions in the IJsselmeergebied. The scenario planning theory in chapter 2 suggests that knowing and breaking down all the possibilities and consequences is important for the decision making process for a long term project such as freshwater planning in the IJsselmeergebied. Therefore it is important for the decision makers to open their eyes not only for the four proposed scenarios, but also to mainly looking for other new solutions that can be more adaptive and resilient. New innovations and ideas concerning freshwater planning can be obtained either by searching for a completely new idea or by mixing the positive element of the previous scenario whenever it is possible.

Meanwhile, it is important to involve more actors in the planning process (Van der Brugge et al., 2005) since the current planning process has already shifted from technocratic water engineering to integral and participatory water management. Choosing one of the scenarios without involving other actors is no longer acceptable. The idea of scenario planning is to explore all the possibilities and not to directly decide the ‘best scenario’.

6.1.2 The consequences of the freshwater planning in the IJsselmeergebied and the fundamental shift from technocratic water engineering to integral and participatory water management for the role/position of Rijkswaterstaat in the future freshwater planning

The freshwater planning in the IJsselmeergebied shows how the fundamental shift from technocratic water engineering to integral and participatory water management has put Rijkswaterstaat in a difficult position. On the one hand, Rijkswaterstaat should be aware of their position as the organization that has the knowledge and experience concerning maintenance, construction, and the policy situation. With this experience and expertise, it is logical that people would expect more from Rijkswaterstaat than what people expect from other organizations. A challenge for Rijkswaterstaat is to recognize whether the advised scenarios are resilient and adaptive, and perhaps generate alternative ideas next to the four scenarios being explored in chapter 3.

On the other hand, the current integral and participatory water management has fractured the monopoly of the influential Rijkswaterstaat engineers. Those who engage in the decision making process inside the Deltaprogramma might have their own ideas, thereby the coalition process plays an important role in this project. It is again a challenge for Rijkswaterstaat to see the shift from technocratic water engineering to integral and participatory water management as an opportunity to gain new ideas (Priscoli, 1999) from other actors outside Rijkswaterstaat instead of seeing them as an obstacle in their work. Citizens might have good ideas since they live close to the central problem. Moreover, involving citizens and other parties from an early phase will be beneficial for gaining support in the further phases. By considering the ideas from other parties, the advice of Rijkswaterstaat will be more valuable for the decision making process inside the Deltacommissie.

6.1.3 Recommendation on how Rijkswaterstaat can play role in the “Adaptive” Freshwater Planning in the IJsselmeergebied

The shifting to integral and participatory water management does not signify that Rijkswaterstaat will have a smaller role in the adaptive freshwater planning in the IJsselmeergebied. Instead, planning for the adaptive management and for the long term future requires flexibility to adapt to the changing future conditions, and is therefore more complicated. The author suggest to use the sustainable development cycle by Johnson et al. (2004) to guide the planning process especially from the managerial perspectives.

Based on this sustainable development cycle, Rijkswaterstaat can have an important role in the assessing phase by providing the baseline data for evaluating the impact of the freshwater scenario in the IJsselmeergebied. In the developing of the sustainability plans, Rijkswaterstaat can play a role in identifying the achievable steps, steps in the short term plan that are easier to manage. Also they can set the timeline to guide the planning process. Rijkswaterstaat can particularly play a role in the implementation, evaluation and modification phase.

Additionally, it was discussed previously in chapter 5 that supplementing the scenario planning concept to the sustainable development cycle would be useful to guide the planning process from the managerial perspective, especially in adapting to changing future conditions and enhancing the resilience aspects of the IJsselmeergebied. What was considered as the 'best scenario' might in the end not be sufficient for the future condition because the future condition appears to be different from the prediction, and therefore, an iterative planning process is sometimes required. However, due to budget limitation and time constraints in the decision making process as was discussed in chapter 4 the iterating process during the freshwater planning in the IJsselmeergebied should be limited. Rijkswaterstaat and other stakeholders should be aware of this situation and start the freshwater planning process in the IJsselmeergebied as soon as possible, taking into account that this planning process might face some iterations that can delay the planning progress.

Minimizing the iteration process can be done by identifying the central issues through a brainstorming session that involves a diverse group of experts as suggested by Scott (2012). Rijkswaterstaat can initiate this brainstorming session. The next step to minimize the iteration process is by ranking the driving forces distinguished in the initiation phase, in terms of their importance and uncertainty (Scott, 2012). The third step is indicating which projects and programs would be most possible over time based on the importance and uncertainty founded in the second step (Marra and Thomure, 2009).

6.2 Recommendations

The research discovers several recommendations that might be useful for the future freshwater planning, investigation and implementation in the IJsselmeergebied:

- Creating a robust, rapid, redundant and resourceful system is not easy. However it is still possible to intervene and increase these four aspects. First, Chang and Shinozuka (2004) wrote that the chosen scenario should be able to overcome a certain level of stress without suffering from failure (robust). This means that the water manager (in this case Rijkswaterstaat) should be aware of the worst possible condition and should try to develop a defence system in case that this failure occurs. Second, the chosen scenario should have a backup system in case that the primary system fails (redundancy). Therefore, it is important to, for example, create a backup pumping system for each proposed scenario. Third, it is important to consider that the proposed scenario should be able to react in a short time period on the changing situation (rapidity), meaning that water manager should be very careful with the idea of diminishing the system's ability to react naturally on disturbance. For example, the idea to permanently close the connection between the IJsselmeer and the Wadden sea might be dangerous in the future because than the system has no ability to quickly react when the pumping system fails. Finally, the materials and human resources of the chosen scenario should be available (resourcefulness).

- Pahl-Wostl (2006) defines adaptive management as a systematic process for continually improving management policies and practices by learning from the outcomes of implemented management strategies. Pahl-Wostl, et al., (2005) further explained that a key element of adaptive management is the participation of stakeholders. To make the system in the IJsselmeergebied more adaptive will also require stakeholder participation and learning processes. For this reasoon, the same brainstorming session that involves a diverse group of experts and stakeholders as suggested by Scott (2012) can also be used to increase the adaptive capacity in the IJsselmeergebied. It is important to hold the brainstorming session periodically since this session is also useful to monitor the outcomes of the implemented management strategies.
- Sustainable development lies in the three-fold overlap at the centre, where it integrates the three areas of concern; environmental protection, economic growth and social justice (Conelly 2007). Interrelating these three dimensions into singular, 'true' 'sustainable development' is unattainable, since it would be impossible to demonstrate that economic, social and environmental goals have an equal weight (Connelly, 2007). The decision makers in the IJsselmeergebied might reap several criticisms no matter which of these three dimensions will get the most attention. It would be wise to already involving other related actors (citizens, NGOs etc.,) to discuss about the dilemmas facing the planning process from the early phase. Rijkswaterstaat also has to reveal all the environmental, economic, and social measurements that have already been done so far. Involving other related actors might surprisingly give a better solution for the future freshwater planning in the IJsselmeergebied. Involving the environmental organizations who concern about the future ecological condition in the IJsselmeergebied and who most likely will disagree with the changing environmental condition in the IJsselmeergebied from the early planning process, for example, might have a new idea to solve the environmental problem.

6.3 Point to be Remarked for the Future Freshwater Planning in the Netherlands

- It was discussed in chapter 2 that making a 'declaration of intent' *(intentieovereenkomst*) during the development of a master plan in the IJssel delta south project appeared to be important (Van den Brink, 2010). We can see a declaration of intent as the first manifestation of public support building. Public support is not only important in the planning phase but also during the implementation and the moments afterwards. Therefore, this thesis would also recommend the Deltaprogramma to make a 'declaration of intent' for the freshwater planning process in the IJsselmeergebied. In chapter 3, it was described in a glance that the Netherlands has two possible water management options to deal with the freshwater demand in 2100; the first is by managing the water level in the IJsselmeer, and the second is by arranging the distribution of the national waterways. This paper is not discussing the distribution of the national waterways but gives the impression that the water level ordinance for the IJsselmeer is being set independently.

However, the long-term decisions might also depend on the possibilities in the Rhine estuary for taking a more effective approach to preventing salinisation of the New Waterway and the possibilities for the Rhine system to alter the distribution of river water during dry periods. It is important to investigate all the possibilities concerning the freshwater issues in the Netherlands, and this is actually not only limited to the solution from the water management in the IJsselmeergebied.

- In chapter 2, it is mentioned that the uncertain factors in freshwater management are not only the climate change and water supply, but also the water demand and three other factors. By far, the government's main attention seems to be more focused on the climate change and the water supply issue. The government should actually also pay more attention to exploring options on the demand side. Rather than projecting the current demand trends forward and then trying to find the water to meet these future desires, analysts should start to deconstruct the demand in order to better identify actual needs and the most efficient way of meeting those needs.

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APPENDIX 1: Questioner Fieldwork

University of Groningen

Freshwater Strategies in the IJsselmeer for the year 2100: the Scenario planning, Consequences, Policy Making Process.

Researcher : Aulia Tirtamarina

Interviewee : Rijkswaterstaat

A. Coordination and Stakeholders

1. Do you think that the freshwater planning project will gain more supporters than opponents?
2. How can we gain more supporters for this project?
3. How should we guide the actualization of this project, considering the spatial consequences and conflicts of interest that might occur?
4. Do you think there will be a big political debate concerning this project? If yes, based on your experience, how long these debates take?
5. What will be our main consideration during the realization of this project? (e.g. environmental issues, financial issues)
6. Considering that this project is a long-term planning, and thus complex, do you think that the next runners are eager to accept the 'baton'?

B. The role of Rijkswaterstaat

1. What is the role of Rijkswaterstaat in freshwater planning in the Netherlands?
2. How does Rijkswaterstaat want to position itself?
3. Do you think that Rijkswaterstaat is capable to guide the actualization of this project? What other organizations might also be good or maybe even better to fulfil this task?
4. Which department of Rijkswaterstaat should actually be the initiator, or act as internal contractor (opdrachtnemer), and develop the plan for freshwater project?
5. What do you think about the Deltafonds? How optimistic are you that it can help the actualization of freshwater projects in the Netherlands for the year 2100?
6. When does RWS expect to finish the "scenario study" phase? And when does RWS expect to finish the "development of master plan" phase?
7. How many possible scenarios are currently available for freshwater planning in the IJsselmeer?

C. Technical

1. What assumptions are being used in the planning of freshwater scenarios for the year 2100? (e.g. Precipitation, tidal waves, sea level, etc)
2. With the prediction that the sea level will rise 1 m in the year 2100, how can we prevent the Ijsselmeer from sea water intrusion?
3. How high the water level in the IJsselmeer will increase based on this scenario?
4. Why should we flow water from Kampen to the Verlengde IJssel River?
5. Do you already have a (rough) budget estimation for this scenario?

University of Groningen

Freshwater Strategies in the IJsselmeer for the year 2100: the Scenario planning, Consequences, Policy Making Process.

Researcher : Aulia Tirtamarina

Interviewee : Director of Deltaprogramma IJsselmeergebied

(Mrs. Hetty Klavers)

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1. How does the fundamental shift from the technocratic water engineering to integral and participatory water management effect on the Dutch planning system? Rijkswaterstaat previously had the "full" power to decide water management in Netherland but nowadays it hasn't anymore, even though on the one hand Rijkswaterstaat has the complete knowledge concerning maintenance, construction, and policy situations in the water sectors. What are the positive and negative effects of this situation?
2. How strong is the position of Rijkswaterstaat inside the Deltaprogramma?
3. Could you please tell me about the 'Deltabeslissingen' deadline in May 2014?
4. What should Rijkswaterstaat do before May 2014?
5. What is the next agenda for the freshwater planning in the Netherlands?
6. What do you think about the current discourse regarding the option to stream water from the IJsselmeer into the Wadden Sea using pumps? On the one hand, it will be cheaper to use pumps (based on the KEA report) than to use gravitation. But on the other hand, the idea to use pumps to stream water to the sea will be vulnerable for the future generation.
7. How far is the current discussion and investigation about these 2 options (pump vs gravitation)
8. What is the trend now? Which option (between pump and gravitation) gains more support inside the Deltaprogramma? And in the parliament?
9. How important is the signing of the 'Declaration of intent' in the freshwater planning project? What were the experiences from the previous project (for example from 'room for the river' project?) What are the difficulties of having all the parties involved, including Rijkswaterstaat, committing themselves to the integrated planning process and cooperate with each other?
10. How important it is to 'keep the option open'?
11. Apart from 'keeping the option open', a concrete step in the freshwater planning is also important. What can we already do with this?
12. What can Rijkswaterstaat do in order to guide the freshwater planning process in the Netherlands?
13. Are there any other countries who already build the future freshwater planning?

APPENDIX 3: Overview of The Interviewees

1.	Name Occupation Date of Interview	Hetty Klavers Director of Deltaprogramma IJsselmeergebied 13 July 2012
2.	Name Occupation Date of Interview	Harold Van Waveren Project manager in Rijkswaterstaat 19 June 2012
3.	Name Occupation Date of Interview	Francien Van Luijn Senior advisor in Rijkswaterstaat 15 June 2012
4.	Name Occupation Date of Interview	Roelof Smedes Senior advisor in Rijkswaterstaat, designer freshwater scenario in the IJsselmeer 4 June 2012
5.	Name Occupation Date of Interview	Tom van der Wekken Programmamanager KRW (Kaderrichtlijn Water) 4 June 2012
6.	Name Occupation Date of Interview	Willem Oosterberg Senior advisor in Rijkswaterstaat