



Case-study: Adaptation in water resources

IJsselmeer region (WP 5)

(Deltares, The Netherlands)

Subgroup: water resources
Case-study: IJsselmeer region
(Deltares, The Netherlands)

Title: Governance of climate adaptation
in the IJsselmeer-region in The Netherlands

Date: 30 January 2015

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Project:

FP7 / Project BASE [2012-2016]

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Purpose of this document:

"The Case Studies Living Document (CSLD) will be the document that each case study leader will use to share the information that (i) characterize and give context to its case study, (ii) the goals within BASE, (iii) the methods used and mainly (iv) a synthesis of the results that that case study is providing to BASE project. This will allow the CS leader to understand how its own case is going (having a good overview), but also (v) will allow the sub-group to which the case study belong to know what is happening and what can be done (mainly on synergies and so on) as well as to (vi) WP4 & 5 coordinators to use that information to report (including each WP task leaders). These living documents will also (vii) allow WP6 & 7 partner to know the information."

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1. General Case Study Description

A. Location

GPS: 52°47'N 5°19'E/52.196°N 24.925°E

Area: n/a

B. Case Study Summary

Despite the vast body of literature on climate change, the need for climate adaptation and adaptive governance, less attention has been given to the actual governance arrangements that are needed to be able to implement climate adaptation strategies. We consider climate adaptation strategies as a specific category of policy implementation, since a) climate change impacts will occur on the long term, nonetheless in the near future decision have to be made on how to act, b) there is irreducible uncertainty on how and how fast the climate will change, c) therefore, the strategy needs to be adaptive and responsive to the actual change by keeping other adaptation options open, and d) climate change is often not perceived as a driver for profound infrastructural investments on the short term, therefore climate adaptation objectives will be achieved only if combined with other policy objectives.

These four features of climate adaptation policy imply that additional institutional mechanisms should be built into the regular governance arrangements in order to ensure a proper dealing with these features. For instance, what kind of institutional mechanisms support dealing with future uncertainty, support adaptive policy making through monitoring, support co-creation, and support flexibility? These questions will be addressed in the IJsselmeer-case Study. Therefore, our research question is: what kind of governance arrangements are able to deal with these specific characteristics of climate adaptation policy and what kind of institutional mechanisms should be built into the governance arrangement of the IJsselmeer adaptation strategy?

The case study of lake IJsselmeer in The Netherlands focuses on two aspects: the development of the adaptation strategy developed within the Delta Programme and secondly on the implementation of the strategy. The analysis will focus on the envisioned governance arrangements, consisting of the set of stakeholders, actions, means, and instruments to guide and facilitate the adaptation strategy. We will devote special attention to the tensions and barriers for implementation and how they deal with keeping options open for the future.

The results of the study can help to implement the adaptation strategies in the Dutch Delta Programme and contributes to the application and development of Adaptive Delta Management, the guiding concept in the Dutch Delta Programme. Furthermore, it will contribute to the further scientific development of the Adaptation Tipping Points Approach (ATP's) ([Kwadijk, et al. 2010](#)), the adaptation pathways approach ([Haasnoot et al 2011, 2012](#)) and the institutional and socio-cultural analysis of adaptation pathways ([Van der Brugge et al. 2013](#)).

C. Context

(Máx 500 words) *If relevant to the understanding of the Case Study, please provide any contextual information of the region, history, etc of the case study*

a) Historical context

The IJsselmeer region, including the lake IJssel, is situated in the north of The Netherlands. Formerly part of the North (Wadden) sea, the IJsselmeer was created in 1932 by a construction called the Afsluitdijk, a large dam cutting off the inland sea called the Zuiderzee from the Wadden Sea. The Afsluitdijk was constructed as a safety measure while it simultaneously created a fresh water reservoir. The lake is approximately 1100 km² and on average 5-6 m deep, with a maximum depth of 9,5 m. The IJsselmeer as a fresh water reservoir, has an important role in the fresh water supply for agriculture and other sectors in the surrounding areas (a.o. the Provinces of Friesland and

Groningen in the North). According to the current policy the water level is set at -20cm NAP (NAP is the Dutch reference water level) during summer when demand is high and -40cm NAP during winter when demand is low. During dry spells in summertime, water from the lake is used to flush the regional water systems in the Western part of the provinces of Holland, and the systems in the Northern provinces to prevent salt intrusion from the North sea and Wadden Sea, respectively.

In the context of climate change and sea level rise, it has been proposed to allow on the short term for more flexibility in the water level of the lake, and to raise the water level on the long term. Though this creates a larger strategic fresh water reservoir, it requires adjustments of the physical infrastructure, including the shores, sluices and harbours. It also impacts the regional (ground)water systems along the lake.

b) Urban planning context

The IJsselmeer region has a number of larger and smaller cities, including those along the shores of the IJsselmeer, which are directly influenced by water resources management. These include Amsterdam, Almere, Lelystad, Hoorn, Enkhuizen, Kampen and Zwolle. The region Amsterdam-Almere-Zwolle is growing in terms of population and economic activity, while in the other areas population and economic characteristics are relatively stable. The regions to the North are decreasing in population numbers and economic activity. The IJsselmeer is a freshwater reservoir and supplies fresh water to the surrounding agricultural lands.

c) Institutional context

The institutional system regarding water resources management involves different governmental authorities, depending on the type of water system. Rijkswaterstaat, which is part of the Ministry of Infrastructure and Environment, is the main authority with regard to the head water system (rivers and IJsselmeer). With regard to regional water systems different waterboards are the primary authorities. With regard to the urban water system, the municipality was the prime water management authority, but in growing number of cases this responsibility is transferred to waterboards. The waterboards are subject to elections and are functional democratic organs.

D. Brief General Information on Climate CHANGE and related issues

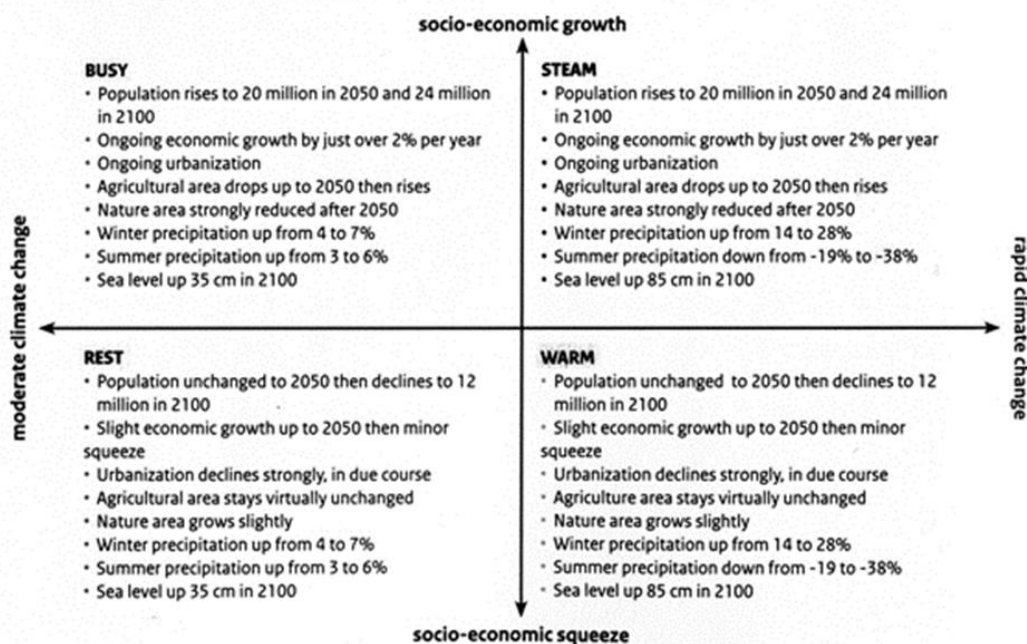
d) General Climatic and topographic information

The Netherlands have a temperate, marine west-coast climate. In general, the most important effects of climate change are expected to be sea level rise and higher river discharges during winter, leading to reduced water safety; lower river discharges during summer leading to increased drought spells; and higher recurrence of extreme weather events affecting the water system increasing the probability of pluvial flooding.

e) Scenarios used

The Delta Programme in The Netherlands is the national policy program on climate adaptation. It consists of nine subprograms and the IJsselmeer is one of them. As part of the Delta Programme, all the sub-programs base their problem assessments on the so-called delta-scenario's to ensure consistency among the subprograms. The delta-scenarios are combinations of climate change and socio-economic developments. The climate scenarios are based on the IPCC –scenario's and translated to the Dutch situation by the KNMI (Royal Netherlands Meteorological Institute). The socio-economic scenarios are based on Living Environment scenarios of the Dutch institute PBL, which were based on the European Four Futures of Europe scenario study. The four delta-scenario's called STEAM, BUSY, WARM and REST vary from moderate to rapid climate change and from socio-economic growth to decline. Each of these four scenario's create quite different challenges with regard to water management.

Brief description of the Delta scenarios



f) Relation of delta scenarios and European and IPCC scenarios

The delta-scenarios used for the assessment for the Rotterdam case study are comparable with the RCP 4.5 and RCP 8.5 pathways adopted by the IPCC for its fifth Assessment Report (2011). RCP stands for representative concentrations pathways representing greenhouse gas concentration trajectories. Although the average sea level

rise projections are lower for the IPCC scenarios, both the temperature change and CO₂ concentrations are comparable.

Up to this point it is not clear how the Socio-economic pathways compare to the socio-economic dimension of the delta-scenarios.

g) Main identified impacts in literature

The most relevant climate change impacts related to the IJsselmeer Region is sea level rise, which could hamper the drainage of water into the Wadden Sea and would require additional pumping capacity. A second concern, reaching beyond the IJsselmeer-region to the whole Western part and Northern part of the Netherlands, is the expected effects of more long-lasting dry spells during summer. The water from the Lake IJsselmeer is now sometimes used to supply additional freshwater in case of drought. In the future this will be needed more often.

Hence there are two strategic climate change related challenges with regard to lake IJsselmeer.

- a) Should the water level of the lake be raised in sync with sea level rise to ensure drainage into the Wadden Sea, or should pumping capacity increase.
- b) Should the water level be more flexible during summer to ensure availability of freshwater for agriculture, nature etc. during dry spells.

The regional effects of raising the water level and increasing flexibility are numerous: dikes, sluices, wharfs, shores should all be adjusted, seasonal freshwater demand from agriculture and nature are not synchronized, surface water levels which are all in open connection with the lake, and the groundwater levels in the area are all influenced by the water level in the Lake.

E. Existing Information on Case Study's adaptation history

(Máx 2000 words) *Please insert a Short resume of the Case study existing information related to Climate Change Adaptation (major goals, plans, measures and timelines already defined or implemented), important Milestones in its "Adaptation Journey" as well as relevant state-of the art regarding the implementation of Adaptation Strategies and Specific Measure*

The two main objectives of the Delta Programme are guaranteeing flood protection and freshwater supply taking into account the uncertainties with regard to climate change and socio-economic developments. Like all subprograms, the IJsselmeer region subprogram has been working to develop a strategy to deal with the two challenges described above. Participating in the program were representatives from municipalities, water boards, provinces and national government. The program has carried out a problem analysis based on the delta-scenarios in 2011. In 2012, they developed possible strategies and in 2013 they made more detailed studies of the preferred strategies, leading to a draft policy decision consisting of five pillars:

Pillar 1: Draining and pumping

The current draft policy decision declares that up until the year 2050, water from the IJsselmeer will be discharged into the Wadden Sea using a combination of draining and pumping. To enable this, additional pumping capacity will be built. This strategy is much cheaper than allowing the water level to rise gradually along with the sea level. The underlying argument for this strategy is that a significant rise in the water level is not realistic before 2050. For the period after 2050, the possibility of allowing the water level to rise structurally will be kept open. The Delta Programme will be studying this further in the year ahead.

Pillar 2: A flexible water level in the lake

With regard to the flexibility of the water level, the draft policy decision declares to allow more flexibility. In this way, the water management authorities can respond more sufficiently to expected weather conditions and freshwater demands as the current, fixed target levels are becoming increasingly difficult to enforce anyway. However, a more flexible water level management does require adjustments to the assets of the areas along the banks and the spatial design and planning. With a buffer of 20 cm, the IJsselmeer is able to offer sufficient supply of freshwater up until 2050. A prerequisite is that the different water management authorities (in charge of the main water system, the regional water systems) and users reach agreement on a common approach for achieving more efficient use of freshwater. After 2050, it may be needed to allow the river IJssel to discharge more water into the IJsselmeer when the water level is low during summer. This may serve also as an alternative for raising the water level of the lake.

Pillar 3: Flexible water levels in the surrounding water systems

Water management of the regional water systems should be less dependent on the water level in the IJsselmeer. If this were the case, these systems too could have more flexibility in their water levels. The water boards see opportunities in the near future, for instance through the optimization of flushing their water systems.

Pillar 4: Reduction of freshwater usage

Users of freshwater, for instance farmers, are now making endless use of available freshwater supply. In the future they will be stimulated to be more aware of their usage, to reduce their usage and create water retention buffers on their own lands and be more self-supporting.

Pillar 5: Investing in flood protection

The dykes along the lake keep the people safe. Investments need to be done to guarantee the same level of protection.

This climate adaptation strategy of the IJsselmeer-region consisting of these five pillars is expected to be cost-effective, robust and flexible.

F. Connection with other research projects:

(Please list and shortly describe previous or ongoing research projects directly related with the Case Study) Please write the name and summary of the project, relevant partner institutions, year of beginning and end of project)

This case study research project is a natural follow up to the work done by [Kwadijk et al. \(2010\)](#), [Haasnoot et al. \(2013\)](#) and [Van der Brugge et al. \(2014\)](#). Usually, decision-support studies on the impact of climate change take climate change scenarios as a starting point, calculate impacts and develop potential solutions. In a recent study, [Kwadijk et al. \(2010\)](#) took another starting point. They asked for how long the current water management strategies would continue to be effective under different climate change scenarios. [Kwadijk et al. \(2010\)](#) used the term Adaption Tipping Points (ATP's) to indicate those critical values (thresholds) beyond which the current water management policies fail to meet the objectives. Although this approach informs policy makers with regard to when it is necessary to take action, it does not tell them which adaption measures are most successful.

Therefore, [Haasnoot et al. \(2013\)](#) argue to explore a range of possible adaptation pathways, each consisting of a unique sequence of ATP's and adaptation measures. Based on the analysis of adaptation pathways, robust and flexible pathways can identified. [Haasnoot et al. \(2013\)](#) propose an adaptive policy cycle called Dynamic Adaptation Policy Pathways (DAPP) linking to the development of adaptation pathways to adaptive policy making.

[Van der Brugge et al. \(2014\)](#) aimed to contribute to this approach by introducing the institutional and socio-cultural dimensions. They present an analytical framework to evaluate the flexibility and governance. The framework addresses the governance of adaptation pathways, more specifically, the governance question of how to keep options open.

Another research project related to this work in BASE is conducted at the Wageningen UR as part of a PhD thesis. The aim of the research is to look for the wider application of the pathways, and other adaptive planning systems, in spatial planning and governance studies. The focal point is whether such adaptive and flexible planning schemes are effective to address the underlying uncertainty. In its broader context, Adaptive Delta Management as policy concept for Dutch water management strategizing is investigated. ADM is used for making strategies for amongst others the IJsselmeer area and forms the policy background for this CSLD. Also the conceptualizations of uncertainty by policy-makers and the usage of these conceptualizations to legitimize strategies and measures by means of pathways, ADM and other adaptive/flexible planning arrangements are studied.

G. Case ID, Typologies and Dimensions

Having in mind the following BASE Objectives; Categories of Case Studies, please fill in the following table.

BASE OBJECTIVES

1. Compile and analyze data and information on adaptation measures, their effectiveness. (...)
2. Improve current, develop new and integrate methods and tools to assess climate impacts, vulnerability, risks and adaptation policies (...).
3. Identify conflicts and synergies of adaptation policies at different levels of policy making with other policies (including climate mitigation) within and between sectors. (...)
4. Assess the effectiveness and full costs and benefits of adaptation strategies to be undertaken at local, regional, and national scales using innovative approaches (mainly by integrating bottom-up knowledge/assessment and top-down dynamics/processes) with particular attention on sectors of high social and economic importance.
5. Bridge the gap between specific assessments of adaptation measures and top-down implementation of comprehensive and integrated strategies.
6. Use and develop novel participatory and deliberative tools to enhance the effective use of local contextualized knowledge in adaptation strategies to assess perceptions of adaptation pathways and their co-design by citizens and stakeholders.

7. Disseminate findings by sharing the results of the project with policy-makers, practitioners and other stakeholders. (...)

CASE STUDIES CATEGORIES

- A. Public administration (municipality, regional, national, European)
- B. Research and education Centres (universities, research centres, projects and groups, schools)
- C. Public companies
- D. Companies (farms, SMEs, big businesses)
- E. Social enterprises (cooperatives, non-profit companies, woofing farms, etc.)
- F. Consortiums (partnerships, campaigns),
- G. NGOs (environmental NGO, local development NGO, charities, etc.)
- H. Transition Initiative
- I. Eco village
- J. Informal groups, Movements

Case ID			Typologies and characterization				
Country & Name of CS	BASE Objectives to be answered by the CS	Category of case study	Territorial zones	Scale	Process Direction	Temporal Definition	Timescale ¹
	<input type="checkbox"/> Objective 1 <input checked="" type="checkbox"/> Objective 2 <input checked="" type="checkbox"/> Objective 3 <input type="checkbox"/> Objective 4 <input type="checkbox"/> Objective 5 <input type="checkbox"/> Objective 6 <input type="checkbox"/> Objective 7	Example: <input checked="" type="checkbox"/> Companies (Farms)	<input checked="" type="checkbox"/> Rural <input checked="" type="checkbox"/> Urban <input type="checkbox"/> Coastal <input checked="" type="checkbox"/> River Basin	<input checked="" type="checkbox"/> Local <input checked="" type="checkbox"/> Regional <input checked="" type="checkbox"/> National <input type="checkbox"/> Transnational <input type="checkbox"/> European /Global	<input checked="" type="checkbox"/> Bottom-Up <input type="checkbox"/> Top-Down	<input type="checkbox"/> Retrospective <input checked="" type="checkbox"/> Prospective	2015 - 2050

H. Impacts, Sectors and Implementation

Please tick the relevant boxes for impacts and implementation and insert the number 1 for primary sector and the number 2 for secondary sector.

Impacts		Sectors		Implementation	
Primary CC Impacts (Climate-Adapt)	Primary CC Impacts (BASE)	Primary and Secondary Sector (Climate Adapt)	Primary and secondary Sector (BASE)	Implemented ²	Phase of Implementation ²

¹ Please insert year of start and year of end of case study.

² When the case study consists of a public administration with a top down approach, implementation can be an approved legislation or regulation. When the case study is about practical adaptation measures like a sand dune, for example, implementation should be considered finished when the dune is built in situ.

<input type="checkbox"/> Extreme Temperatures <input type="checkbox"/> Water Scarcity <input checked="" type="checkbox"/> Flooding <input checked="" type="checkbox"/> Sea level Rise <input checked="" type="checkbox"/> Droughts <input type="checkbox"/> Storms <input type="checkbox"/> Ice and Snow	<input type="checkbox"/> Extreme temperatures <input checked="" type="checkbox"/> Water scarcity <input checked="" type="checkbox"/> Flooding <input type="checkbox"/> Coastal Erosion <input checked="" type="checkbox"/> Droughts <input type="checkbox"/> Soil Erosion <input type="checkbox"/> Vector Borne Diseases <input type="checkbox"/> Damages from extreme weather related events (storms, ice and snow)	<input checked="" type="checkbox"/> Agriculture and forest <input type="checkbox"/> Biodiversity <input type="checkbox"/> Coastal Areas <input type="checkbox"/> Disaster risk reduction <input type="checkbox"/> Financial <input type="checkbox"/> Health <input type="checkbox"/> Infrastructure <input type="checkbox"/> Marine and Fisheries <input checked="" type="checkbox"/> Water Management <input type="checkbox"/> Urban	<input checked="" type="checkbox"/> Agriculture <input type="checkbox"/> Biodiversity & Ecosystems <input checked="" type="checkbox"/> Coastal and Marine systems <input type="checkbox"/> Energy <input type="checkbox"/> Health and Social Policies <input type="checkbox"/> Transport <input type="checkbox"/> Production Systems and Physical Infrastructures <input checked="" type="checkbox"/> Water resources <input type="checkbox"/> Tourism	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> On-going <input type="checkbox"/> No	<input type="checkbox"/> Assessment <input checked="" type="checkbox"/> Planning <input type="checkbox"/> Implementation <input type="checkbox"/> Monitoring <input type="checkbox"/> Evaluation
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I. Importance and Relevance of Adaptation

Please tick the relevant box for the case study.

- ☒ Case developed and implemented as a climate change adaptation measure
- ☐ Case developed and implemented and partially funded as a climate change adaptation measure
- ☐ Case mainly developed and implemented because of other policy objectives, but with significant consideration on climate change adaptation aspects

2. Case study research Methodology

a) Research Goals

(Máx 500 words) Please insert which are the General Goals for the case study as well as how will the case study contribute for BASE projects and BASE key research questions.

This research aims to contribute to our understanding of governance arrangements with regard to climate change. We consider climate adaptation strategies as a specific category of policy implementation, since

- climate change impacts will occur on the long term, nonetheless in the near future decision have to be made on how to act,
- there is irreducible uncertainty on how and how fast the climate will change,
- therefore, the strategy needs to be adaptive and responsive to the actual change by keeping other adaptation options open, and
- climate change is often not perceived as a driver for profound infrastructural investments on the short term, therefore climate adaptation objectives will be achieved only if combined with other policy objectives.

These four features of climate adaptation policy imply that additional institutional mechanisms should be built into the regular governance arrangements in order to ensure a proper dealing with these features. For instance, what

kind of institutional mechanisms support dealing with future uncertainty, support adaptive policy making through monitoring, support co-creation and support flexibility? These questions will be addressed in the IJsselmeer-case Study. Therefore, our research question is: what kind of governance arrangements are able to deal with these specific characteristics of climate adaptation policy and what kind of institutional mechanisms should be built into the governance arrangement of the IJsselmeer adaptation strategy?

The results of the study can help to implement the adaptation strategies in the Dutch Delta Programme and contributes to the application and development of Adaptive (delta) management, the guiding concept in the Dutch Delta Programme. Furthermore, it will contribute to the further scientific development of the Adaptation Tipping Points Approach (ATP's) ([Kwadijk et al. 2010](#)), the adaptation pathways approach ([Haasnoot et al. 2011, 2012](#)) and the institutional and socio-cultural analysis of adaptation pathways ([Van der Brugge et al. 2013](#)).

b) Stakeholders involved

(Máx 2000 words) Please insert any information about the stakeholders involved in the adaptation process with which you will relate to, namely their nature, involvement in the process, etc. If possible highlight the decision-making process as well as the leadership process for Climate Adaptation Strategies. Do Mention if there exists any kind of public engagement and participation within the Adaptation process.

In this case study, we will be working together with the relevant stakeholders. These are:

- Rijkswaterstaat: the water management authority of the main water system (part of the Ministry of Infrastructure and Environment.)
- The waterboards: the regional water system authorities involved
- Relevant provincial authorities
- Relevant municipalities

c) Methodology

(Máx 2000 words) Please insert what will be your research approach regarding this case study, how did you define it (did it include participatory sessions or not) and how you will implement it during the BASE Project period.

In order to identify the governance mechanisms that are needed, our research approach will consist of the following steps.

1. The first step is a literature study to identify the critical factors of adaptive governance arrangements. We define governance arrangements as the set of stakeholders, actions, means and instruments to guide and facilitate the adaptation strategy. We will look into relevant literature on (adaptive) governance, climate adaptation and the adaptation pathways approach in order to understand which characterizes and mechanisms are crucial.
2. The second step is to review grey literature (policy documents/minutes etc.) with regard to the IJsselmeer adaptation strategy.
3. The third step is to carry out interviews and focus groups with insiders and experts on how the strategy has been developed and how implementation is arranged institutionally, especially focusing on dealing with uncertainties.

4. Based in the documents and interviews, we will analyze what kinds of governance arrangements are needed. Here we make use of the method developed by [Van der Brugge et al. \(2015\)](#) to help us deepen our insight in the actual governance challenge by identifying which institutional and socio-cultural structures should be changed.
5. The fifth step is to organize workshops and discuss the findings with the stakeholders.

- Note: Partners/Case Studies using PRIMATE tool will be using CBA (to prioritize) and/or MCA (with stochastic PROMETHE II) and the Monte Carlo Uncertainty Analysis, so please check these boxes.

METHODS to be used in Case Studies ³	YES // NO
A) Methods for prioritizing adaptation options	
Cost-Benefit Analysis (CBA)	
Cost-Effectiveness Analysis (CEA)	
Multi-criteria Analysis (MCA)	
Analytic Hierarchy Process (AHP)	
B) Quantification of impacts and relationships between factors affecting adaptation	
Causal Diagrams	
Influence Diagrams	
Process-based Modelling	
Welfare variation analysis under restrictions	
C) Uncertainty and sensitivity analysis	
Probabilistic multi model Ensemble	
Monte Carlo simulations (PRIMATE uses this method)	
Real option analysis	
Climate risk management process	
D) Participatory Methods	
Scenario Workshop	
Participatory Cost Benefit Analysis (PCBA)	
Participatory add-ons to CBA	
Participatory add-ons to Multi Criteria Decision Analysis	
Participatory add-ons to Adaptation Pathways	
Other (add extra lines if necessary): 5-10 in-depth semi-structured interviews + 3 focus groups about uncertainty in strategy development and implementation	

(Máx 500 words) Please highlight if you have any special need or focus regarding any of these methods and their use on your case study.

³ For descriptions and references of the Methods please refer to Milestone 8. For data requests from specific Work Packages please refer to Deliverable 4.1

d) Case study Timeline

(Please insert an image/graph of the Timeline of your Research Approach, highlighting important milestones and deliverables.)

	March /April	May June July	August/ September	October
Research step	1	2	3	4

e) Collaboration with other Partners and Case studies

Collaboration with BASE case studies (see list in EMDESK):

Case: ____ Rotterdam ____; Person: ____ M. Zandvoort / F. Schasfoort ____

Case: ____; Person: ____

Case: ____; Person: ____

Case: ____; Person: ____

Case: ____; Person: ____

Case: ____; Person: ____

Collaboration within BASE partners/researchers (EX: for a specific competence):

Name: ____; Partner: ____

Name: ____; Partner: ____

Name: ____; Partner: ____

Name: ____; Partner: ____

Name: ____; Partner: ____

Name: ____; Partner: ____

Name: _____; Partner: _____

f) Research Outputs

a. Scientific Publications

- Interim reports
- final case study report (for D5.5, Month 30)
- Scientific papers: 2

Interim report: *Governance of climate adaptation in the IJsselmeer-region in The Netherlands*

Month/Year: 6/2014

Finale case study report: *Governance of climate adaptation in the IJsselmeer-region in The Netherlands*

Month/Year: 01/2015

Scientific paper: Van der Brugge, R., Roosjen, R (2015). An institutional and socio-cultural perspective on the adaptation pathways approach. *Int. Journal of Water & Climate* (Accepted).

Month/Year: 01/2015

Scientific paper: *Governance arrangements and climate adaptation*

Month/Year: 12/2015

(add more papers in case you need)

b. Other Publications

- Books/Books Chapters: 0

Provisional Title: _____
_____; Month/Year: ____/____

c. Other

- Scientific conferences: 1
- Title: *A typology of governance arrangements for the challenges of climate adaptation policies*
- Conference: Deltas in times of climate change. 9/2014

3. Participation in Climate Change Adaptation

a) Process overview

In (Please describe the use of Participatory Methodologies within your case study, namely its integration in the overall Research

The participatory activities carried out in this case study encompassed 15 semi-structured in-depth interviews with people directly involved in the development of the adaptation strategy and three focus groups on dealing with uncertainty in strategy development and implementation.

Interviews

A first round of ten semi-structured interviews was carried out focusing the large rivers (Rhine and Meuse). These interviews were held with several directors of the sub programmes of the Delta Programme, staff members of the Delta Commissioner and spokesmen for the 'Adaptive Delta Management' strategic planning approach. These interviews centred around the general questions on how to deal with uncertainty.

A second round of five semi-structured interviews was held focusing more specifically on the development of the adaptation strategy in the IJsselmeer region and the requirements with regard to implementation of the strategy taking into account future uncertainties. These results are analysed with regard to possible barriers, tensions and solutions

[To some extent, the interviews have also been used to reconstruct the process of how the adaptation strategy came into being. This process was part of the Delta Programme (a four year long policy program with regard to climate

adaptation) in which all the relevant stakeholders (Ministry of Infrastructure and Environment, Rijkswaterstaat, water boards, Provinces, Municipalities and NGO's) participated.]

Focus groups

Based on this first round of interviews, two focus groups were held with the people responsible for the overall strategy of the subprogramme and the staff members of the Delta Commissioner.

The first focus group was based on the interviews and analysis of the general national programmes. Emphasis was on the use of Adaptive Delta Management as strategy-making approach under uncertainty. This was discussed related to strategy-making, strategic planning and the functioning of the general programme. The main aim was to reflect on the followed procedures and main questions for strategy-makers within the IJsselmeer programme to provide input for a literature study and to generate data about what exactly happens when policy-makers with a strategic, long term policy goals encounter uncertainty.

The second focus group was based on the interviews and a literature study into strategic planning, climate change adaptation and uncertainty. This was compared with the strategies developed in IJsselmeer programme up until 2013. Three main questions stood central in the second focus group discussion:

- Does the case match with the literature about strategic planning, adaptation and uncertainty and which lessons for the case result out of the comparison?
- Are all aspects described in the literature, or are there missing aspects from the perspective of regional strategy making for climate change adaptation related to water management and spatial planning?
- Does ADM as intermediary between daily praxis and scientific literature match with both, and how can ADM as planning approach be adapted and improved to enhance strategy making under uncertainty?

These aspects were reported upon and discussed, which was valued positively by all participants, and fed into the further strategy-making process of both regional programmes.

The third focus group will be organized beginning of 2015 to reflect on the governance arrangements that are foreseen to implement the strategy. Focus will be on the adaptive capacity and future robustness and whether the proposed governance arrangements have incorporated the suitable mechanism to deal with the uncertainty and how to improve that.

b) Participation in the Process Phases

(Please uncover the role of all participants in the process of implementing adaptation measures. The adaptation implementation has been divided into four phases for purposes of ease: 1) Initiative/decision to act, 2) Development of potential adaptation options, 3) Decision-making, and 4) Implementation. The process phases are to be filled out with information corresponding to each participant. I.e. if experts were not consulted in the 'decision-making' phase, then describe why they were not included. It is also important that a wide array of participants is described, including those that were excluded from parts of the process.)

Make a bullet point for each of the five participant categories below (and distinguish between for example different stakeholder or expert groups) and be as descriptive as possible how, why/why not where they involved.

[Note: The description applies to the Delta Programme as a whole. This was a huge national policy programme on long term climate adaptation. In the program, all the relevant actors were represented over the nine sub-programmes, such as Ministry of Infrastructure and Environment, Rijkswaterstaat, water boards, provinces, municipalities and NGO's and worked together towards the adaptation strategy. It can be seen as a large participatory process in itself. Subsequently, our own participatory activities contributed only marginally.]

Process phases:

1. *Initiative/decision to act*

The Delta program was originally initiated as a result of the delta committee, who in 2008 argued that a new Delta Plan was needed in order to meet the challenges of climate change. That committee involved people (predominantly experts, but some with a political background) with a wide variety of disciplinary background. For making their report ([Delta Committee \(2008\) Working together with water](#)) they used a large participatory process involving stakeholders, interested citizens, experts and officials in collecting different perspectives and visions on the development of the Netherlands regarding water in a broad sense. Their advice resulted in the parliamentary acceptance of their recommendations to install the delta programme, with as judicial backbone the Delta Act and a fund to provide for financial resources. The Delta programme was created to further advance on the visionary view of the Delta Committee, by executing research and doing strategic planning across the multiple institutions involved in Dutch water management and spatial planning (including the national, regional and local authorities). (See also: [Boezeman et al. 2013](#); [Kabat et al. 2009](#); [Verduijn et al. 2012](#)). The interdisciplinary advice was reflected in the way the Delta Program was launched, namely as a joined effort by the relevant national, local and regional authorities (e.g. a national program).

The Delta Programme consisted of nine sub-programmes, three with a national scope (safety, freshwater supply, and housing) and six with a regional oriented scope, among others the IJsselmeer region. Each sub-programme was responsible for its own organisation and process architecture, although some general guidelines were provided by the staff of the Delta Commissioner, an official appointed with the task of coordination and reporting to Parliament.

The initial recommendations of the Delta Committee with regard to the IJsselmeer region triggered heavy resistance in the regional and local arena. Therefore, the first emphasis of the IJsselmeer subprogram was to secure the participation of stakeholders and officials among the different governmental bodies along the IJsselmeer, setting the scene for the participatory process in the IJsselmeer region.

2. *Development of potential adaptation options*

The Delta Programme consisted of four phases. The results of each phase were reported to parliament, together with the planning and budget (in September of each year). The first phase (2011-2012) of the Delta programme was devoted to the problem analysis based on long term delta scenarios. The second phase (2012) encompassed the development of possible strategies. During the third phase (2013) the most promising strategies were selected and in the fourth phase elaborated further and tuned into one main strategy per sub-programme. These were combined in to five so called Delta-decisions and offered to the Dutch parliament in September 2014 (in the report called Delta Programme 2015).

The Delta Programme was set up as a national programme, so by definition, all relevant local and regional governments were actively involved, e.g. the Ministry of Infrastructure and Environment (formerly known as the Ministry of Public Works and Water management), the water boards, the provinces and relevant municipalities. This process was called the 'regional process'.

Knowledge institutes such as Deltares, PBL (the Dutch planning institute) and KNMI (the Dutch meteorological institute) played an important role throughout the different phases wherein the development of the delta scenarios (in co-production with user groups) and impact assessments were important aspects. These institutes also played an important role in the identification of solutions and the assessment of proposed strategies and measures, and subsequent refinement by assessing the (im)possibilities and cost-effectiveness of possible strategies. This was done in commission of the various subprograms.

In the IJsselmeer sub-programme, local politicians and officials were involved in a regional collaboration body (called in Dutch: Regionaal Overlegorgaan IJsselmeergebied) and in a smaller Steering group (in Dutch: Bestuurlijk Kernteam IJsselmeergebied). Throughout the process these platforms existed, though its members increased and decreased over time.

Ten important NGO's in the region were clustered into one representative Stakeholder action group representing all their individual stakes concerning fresh water supply, fishery, nature, harbours, and agriculture. This group has been actively involved in the development of the strategy. The main proposal of the strategy – creating more flexibility in the Lake's water level – was a long lasting wish in this group.

Aside these platforms, there have been a number of so-called Area Sessions. In these sessions, citizens were asked to discuss the results and strategies and reflect on the process ahead.

3. Decision-making

The results, the adaptation strategies and the regional process in the Delta Programme were all done as policy preparations for the five Delta decisions that were offered to Dutch Parliament in 2014. Parliament agreed and the five Delta decisions were laid down in an official management contract between the Ministry of Infrastructure and Environment, The Interprovincial platform, the Union of water boards and the United Municipalities. These five delta decisions are, however, general guidelines. Local and regional measures and implications are the responsibility of the local and regional democratic and legitimate authorities.

Within the Dutch law, citizens are given the opportunity to reaction on local and regional development plans, mostly only by a written reply. There is a more elaborate democratic mechanism in place if the strategy implies infrastructural projects, namely also hearings. Residents or companies also have the right go to legal court to influence or stop a decision. This latter applies to local or regional authorities that are opposing national decisions. However, this has not occurred yet, most likely because of the involvement of stakeholders from early on.

4. Implementation

After January 2015, various regional and local governments have started to begin with the implementation of the five Delta decisions.

With regard to the IJsselmeer region, most of parties are intent on keeping the different discussion and participation platforms alive. They understand they need keep communicating on a regularly basis in order to implement the strategies successfully. The steering board of local politicians will actively participate and discuss all matters relating to the implementation of the strategy and concrete measures. Next to the steering board, a wider ‘community of practice’ will be invited for a coming-together twice a year to discuss implementation matters. Also experts will remain to be involved on the same basis as they did in the earlier phases: by means of commissioning for specific projects on regional or local scale.

Three Delta decisions on water safety, fresh water supply and spatial adaptation are part of the national implementation scheme, which means that experiences in other parts of the Netherlands need to be shared and may influence the IJsselmeer situation later on.

c) Participation Experience

(Please report with regards to your case study and the implementation of Participatory Methodologies using a traditional SWOT analysis – Strengths; Weaknesses; Opportunities and Threats)

By now, two focus groups have been held. The third workshop on implementation has not yet been organized (planned for March). Hence, the SWOT only applies to the first two focus groups.

Strengths <ul style="list-style-type: none"> • Provides for interactive discussion • Gives thick descriptions of the content • Elaboration of a lot of topics due to extended time • Collection of different visions, contrasting these, and elaboration of different arguments in play 	Weaknesses <ul style="list-style-type: none"> • Content-matter/the conversation can shift away to what is important in the eyes • Dominant participants can overwhelm less dominant participants • Less accepted or controversial visions tend to receive less attention
Opportunities <ul style="list-style-type: none"> • Draw on inferences, use the participants as researchers/questioners to provide in-depth accounts • Contribute to the actual strategy-making process (co-benefits) • Possibility to reflect on the discussion from an outsider perspective • Possible to clarify misconceptions during the focus group 	Threats <ul style="list-style-type: none"> • Misconceptions of the content-matter due to different frames and worldviews • Validity of gained data due to the influence of the researcher’s perspective (researcher bias)

d) Learning through Participation

In order to capture how participation could improve the climate change adaptation process, please report with regards to your case study:

a) Your view whether and how participation influenced the strategies and measures decided in your case?

At the level of the Delta Programme as a whole, participation was key. From the onset on, the Delta Programme was designed as a joined programme of the relevant authorities: Ministry Infrastructure and Environment, Ministry of Public Works and water management, the water boards, provincial authorities and municipalities. In addition knowledge institutes and universities were involved as well as private companies, predominantly consultants. All these organisations have more or less co-created the adaptation strategies. Important was the Delta Commissioner and his coordinating staff who supervised and supported the process and also securing deadlines, which resulted in a clear organisational structure and tempo.

At the level of the sub-programme IJsselmeer-region, participation was also very important. All the relevant provinces, water boards and a selection of municipalities were involved. Ten prominent stakeholders in the IJsselmeer region have been actively involved in the development of the adopted strategy. Citizens were involved in so-called Area-sessions, in which they were asked to discuss and reflect on the results. Also experts were involved and played an important role.

At the level of our own activities, the influence was only marginal. Up to now, only two focus groups have been held (the third is upcoming). Hence, our influence has been very small. We did however contributed to the awareness of uncertainty and adaptive delta management as an approach to deal with that.

b) How you think the participatory process in your case could be/have been improved?

If we had been involved from the start to end, we could have designed a series of focus groups covering relevant topics concerning strategy development and implementation under uncertainty.

c) Any novel (use of) participatory methods observed in the case studies

No.

4. Climate Change Adaptation Measures and Strategies

h) a) Adaptation Measures under analysis in your case study

(Please identify your Adaptation Measures considered in this case-study and provide a short description of each)

Adaptation Measure(s):

- 1) Creating more flexibility in the water levels of the lake and surrounding water systems

Short description for each Adaptation Measure (Máx 50 words):

With regard to the flexibility of the water level, the draft policy decision declares to allow more flexibility. In this way, the water management authorities can respond more sufficiently to expected weather conditions and freshwater demands as the current, fixed target levels are becoming increasingly difficult to enforce anyway. With a buffer of 20 cm, the IJsselmeer lake is able to offer sufficient supply of freshwater up until 2050. A prerequisite is that the different water management authorities (in charge of the main water system, the regional water systems) and users reach agreement on a common approach for achieving more efficient use of freshwater. After 2050, it may be needed to allow the river IJssel to discharge more water into the IJsselmeer when the water level is low during summer. This may serve also as an alternative for raising the water level of the lake.

The first step towards a new regime of water level management has been suggested. At the end of the winter the target level will be increased and slowly subsided during early spring, which is beneficial for nature in the riparian zone, but only if flood conditions allow for it. If there is a drought spell, the higher target level could hold longer. At the end of the summer, the target level on the IJsselmeer will be a little lower than in the current regime to support nature in the riparian zone and foraging birds. During winter the water level in the lake may be optimized with regard to levels at the Wadden Sea and nearby regional water systems in relation to free drainage versus pumping.

In the graph, the blue line shows the current regime and the green line the target level in the new regime. In practice, however, water levels may deviate sharply from the target level due to wind or heavy storms. Hence, this new regime should support to consciously deviate from the target level when circumstances require it. This is indicated by arrows in the graph. For example, if high river discharge or storms are predicted, the level at the end of winter will not be increased (arrow A). With predicted drought, the water level will be held high as long as possible (arrow B). In dry spells it is allowed to drop the water level to -30 cm NAP to supply fresh water to the surrounding lands (arrow C).



i)

j) b) Adaptation Measures selection and data availability prior to BASE

(Please describe how and why where these specific measures selected for further research and analysis under BASE and what is the baseline data already available for each specific adaptation measure. Máx 500 words)

This case study is chosen because it offers to the opportunity to investigate how the adaptation strategies are implemented while explicitly keeping options open to adapt the strategy in time.

k) c) Full description of Adaptation Measures

(Please provide a full description on each of the Adaptation Measures regarding this 21 leading questions under. If more than one Adaptation Measure please copy paste the structure provided.)

Process

- I. Would, or at which part would, institutions and private stakeholders implement the measure autonomously to adapt to climate change (Adaptive capacity)?

No, there are a lot of stakeholders concerned with in this measure. Therefore it cannot be done autonomously.

- II. Does the measure initiate further activities for adaptation to climate change? (Y/N) Yes
 - a. If Yes, please name which. The new target level regime requires many local measures and institutional adjustments. We are in the process of identifying these.
- III. Does adaptation aim for flexibility and reflexivity (i.e. the ability to change as CC and other factors develop)? (Y/N) Yes
- IV. Is the measure effective under different climate scenarios and different socio-economic scenarios? (Y/N) Yes

V. Is the adaptation measure iterative? (Y/N) Yes

VI. Does the measure contribute to overall sustainable development, alleviate already existing problems and bring benefits for other social, environmental or economic objectives than adaptation (no regret measures)? (Y/N) Yes

a. Please describe briefly how

It contributes to sustainability since the new target level regime is beneficial for nature in the riparian zone and foraging birds. In addition it can solve water shortages during summer. Overall, the idea is to introduce more flexibility in order to better respond to the actual circumstances. It is not yet clear how this affects economic objectives.

VII. Can adjustments be made later if conditions change again or if changes are different from those expected today? (Y/N) Yes

Outcome

Relevance and effectiveness of adaptation measures

VIII. How important is the climate change threat addressed by the measure? What economic values, ecosystem functions and socio-cultural values are at stake, and to what extent are they affected by climate change impacts? Is there an indication of overriding public interest, e.g. critical infrastructures, public health?

Quite important. The strategy aims to deal with reduction of water safety and water shortages for agriculture and other sectors (drinking water, energy).

IX. What portion of the targeted potential damages can be avoided by implementing the measure? (0-100%)
Not clear yet

Efficiency

- X. How high are the benefits of the measure relative to the costs? Are the costs justified by the benefits
(Please refer to results of economic evaluation in chapter 5)

Not clear yet

- XI. What are the costs of the administrative implementation of the measure? Are there potential funding under the umbrella of other European policies(e.g. CAP/Cohesion policy ?

Not clear yet

- XII. Does the measure give an incentive for innovation to different actors (e.g. SMEs) / can it deliver a competitive advantage for the local economy? (Y/N) yes
- XIII. Does the measure have effects on employment? (Y/N) no
- XIV. How long is the time-lag between implementation of the adaptation measure and the effect of the measure? Instantaneously
- XV. What is the timeframe during which the measure will have an effect? The measure is about creating more flexibility, so one can apply it whenever it is necessary.
- XVI. Does the measure create synergies with mitigation (i.e. reduce GHG emissions or enhance GHG sequestration)? (Y/N) No
- XVII. Does the measure alleviate or exacerbate other environmental pressures? (Explain briefly)

It is not clear yet whether it supports the nature objectives or compromises them, because it is not clear yet if the water levels under the new regime are supporting natural cycle and development.

Equity

- XVIII. What are the impacts on different social or economic groups, are there expected impacts on

Increased risk of flooding and (temporal) water shortages for large parts of The Netherlands.

particularly vulnerable groups? (distributional impact)

XIX. Does the measure enhance well-being and quality of life (e.g. in the urban environment)? (Y/N)

5. Impacts, Costs and Benefits of Adaptation measures

(This section of the CSLD follows the Economic Assessment Steps put forward by UFZ and thoroughly described in D4.1, chapter 4. Please check D4.1 for any doubts or questions. In case of duplication of information with previous sections of the CSLD feel free to copy paste.) For more detailed guidance (incl. two examples) please see the above mentioned chapter 4 of D4.1. Please do not hesitate to contact volker.meyer@ufz.de, oliver.gebhardt@ufz.de or Filipe Alves if you have questions about how to fill out this section.

I) Step 1 – Preliminary Risk Assessment and identification of adaptation tipping points (max 1500 words)

(some of these questions might be already answered in section 1 – if so, just copy&paste)

What is the climate change related problem/risk you would like to reduce by adaptation?

- Which problems already exist, what is/are the current risk/s?
- Which assets and sectors are at risk under current climate variability?
- Which adaptation or protection measures are already in place? (refer to typology of measures in D6.1, table 2)
- How do these risks presumably change due to climate and socio-economic change?
- What are the main drivers, impacts and affected sectors (refer to BASE impact and sector categories, see also Table 1 of D6.1)
- Which climate and socio-economic scenarios are used?

Which adaptation tipping points can be identified?

- Can adaptation tipping points, critical levels for adaptation, be defined for this current strategy? (=when objectives are not met anymore due to changes)
Refer to otherwise expand on Table 3 of D6.1
- When (roughly) will these critical levels be reached due to climate change or socio-economic change
- Give appropriate period (2015-2030, 2030-2050, after 2050) for each considered combination of climate and socio-economic scenario.

m) Step 2 – Identification of Adaptation Measure and Adaptation Pathways (max 1500 words)

(some of these questions might be already answered in section 4 – if so, just copy&paste)

What are the alternative adaptation measures?

- What are the primary and secondary objectives of adaptation?
- What are potential measures to meet these objectives?
- (refer to typology of measures in D6.1, table 2)
- What is your baseline option (the “business-as-usual”-option)?
 - What is the ambition level of this baseline strategy?: Maintaining current risk levels or current protection levels (implying with CC risks may increase)?
 - Is current backlog of investments for adaptation measures included or excluded?
 - Does it include only planned adaptation or also autonomous, non-planned adaptation?
- Are there complementary measures? Is it appropriate to bundle these measures?

What are alternative adaptation pathways?

- What is the “sell-by”-date of the measures or bundles of measures? I.e. when will they – under conditions of climate change – not any longer be able to meet the defined objectives?
- What would be alternative measures or bundles of measures at these “tipping points”?

o) Step 3 - Evaluation Criteria and Method (max 2000 words)

p) Step 3a Selection of evaluation criteria

Which evaluation criteria should be used?

- What are the relevant positive and negative properties of the measures (costs and benefits) to be considered in the evaluation process (economic, ecological and social effects)?
- (see D4.1, chapter 4 for examples)
- What is the appropriate unit to measure each of these criteria? Is the performance of the adaptation options measured in qualitative, monetary or other quantitative terms?

q)

r) Step 3b Selection of evaluation method(s)

What is the appropriate evaluation method?

- Is it possible to express all relevant cost and benefit criteria in monetary terms?
(→ cost-benefit analysis)
- Is it possible to express the positive effect (objective) by a single non-monetary indicator?
(→ cost-effectiveness analysis)
- Are there several relevant criteria which cannot or cannot easily be expressed in monetary terms?
(→ multi-criteria analysis, PCBA)

s)

t)

u) Step 3c Weighting of evaluation criteria (applicable only to multi-criteria analysis)

What are the preferences of stakeholders regarding the different evaluation criteria?

- Are there different stakeholder groups with varying preferences regarding the evaluation criteria?
- Which weight do stakeholders and/or decision makers attach to a substantial change in the performance of the adaptation options regarding each evaluation criterion?
(see D4.1, chapter 4.10.2 for guidance for the Swing-Weight method)

v) Step 4 - Data collection (max 2000 words)

What are the costs and what are the benefits of the alternative adaptation options?

- What potential data sources are available, including damage & impact assessment methods or existing CBA studies on adaptation measures?
- If no relevant data sources are available and modelling cannot be undertaken: Which experts can estimate proxies for assessing the performance of measures regarding the respective criterion?
- How do the adaptation options perform with regard to each of the cost and benefit criteria selected in step 3a?

What is the evaluation time frame?

- What is the lifespan of the measure with the longest lifetime?

Which discount rate should be applied?

- Which discount rate is recommended by national guidelines for climate change adaptation measures (or public investments)?
- Is it a linear discount rate or any other type (i.e. declining, hyperbolic, etc.)
- (In addition, for testing the sensitivity of the results with regard to the discount rate(s) used, also apply a low and high discount rate (1% and 5%).)

How to deal with data uncertainty?

- Can uncertainties related to the performance of the measures regarding certain evaluation criteria be described by a range (min-max), a triangular distribution (min, most likely, max) or any other kind of probability distribution?

w) Step 5 – Evaluation and Priorization (max 1500 words)

What is the ranking order of alternative adaptation options (measures, bundles of measures or pathways)?

- For cost-benefit analysis:
What is the net-present value (discounted benefits – discounted costs) of the alternative options?
What is the benefit-cost ratio?
- For cost effectiveness analysis:
Which alternative achieves a defined objective at lowest costs?
What is the cost-effectiveness ratio?
- For multi-criteria analysis:
Which adaptation option performs best?
(e.g. for PROMETHEE approach: which option has the highest net flow?)
- What are the uncertainties associated with the performance of the different options?
- Is there and, if so, to what extent uncertainty in the ranking of options?
- Is it possible to determine which option most likely performs best or is it necessary to gather further information to reduce uncertainty (go back to step 4)?

6. Implementation Analysis – Understanding, Leadership and Governance of the implementation of adaptation measures

(Please describe the process of implementation of adaptation measures in real world contexts, namely key barriers and opportunities, governance dynamics and the concrete use of scientific knowledge and economic analysis in political decision-making. Please address Policy Questions from WP2&7 on the CSLD_Support doc)

How have climate change adaptation measures and strategies been advanced in the case study? Describe the process! (Minimum 500 words)

The Delta Programme consisted of four phases. The results of each phase were reported to parliament, together with the planning and budget (in September of each year). The first phase (2011-2012) of the Delta programme was devoted to the problem analysis based on long term delta scenarios. The second phase (2012) encompassed the development of possible strategies. During the third phase (2013) the most promising strategies were selected and in the fourth phase elaborated further and tuned into one main strategy per sub-programme. These were combined in to five so called Delta-decisions and offered to the Dutch parliament in September 2014 (in the report called Delta Programme 2015).

What drives the implementation process and who enables implementation of adaptation measures and strategies/policies? Please explicitly refer to the factors mentioned in the checklist! (500 – 1000 words)

The Delta Program ended with a management contract between the most important public governments, proclaiming to execute the strategies that were developed within the Delta Program. This management contract is now driving the local authorities implement the strategy. However, there are many questions regarding how a flexible water level should be given shape on the operational level. This is now being studied and much depends on the results. Eventually, this should lead to a set of agreements between the local authorities what to do in a number of specified situations (for example, if a high water is expected, then drop water level, or, then communicate about target level with local water managers).

What obstacles were encountered to implement adaptation measures and strategies? Please explicitly refer to the factors mentioned in the checklist! (500 – 1000 words)

Important in the process have been the different stakes of the various authorities. Initially, before the Delta Program started, the idea was raised by its precursor to raise the water level with 1,5 meter in order to have a large freshwater reservoir, amongst other for drinking water and agricultural purposes. Of course, the Provinces and the Municipalities disagreed, for reasons of safety, costs and the regional identity. As a result, a number of studies were carried out to value the pro's and cons of this. Eventually, it turned out that raising the level was not needed. Instead, a more flexible water level was proposed to be able to create a fresh water buffer for periods of drought. Implementation of this strategy is now being studied.

If any obstacles were overcome, how was this achieved? (Minimum 500 words)

What are the future prospects of the climate change adaptation activities in the case study? (200 – 500 words)

The table shows how each pillar of the adaptation strategy is being implemented in existing policy instruments. Currently, all organisations are formulating activities and to starting to execute projects. As mentioned, there are still many questions about the actual execution of the strategy.

Adaptation strategy	Actors	Policy
Pillar 1 Drainage and pumping	-Rijkswaterstaat -Waterboards, -Ministry of Infrastructure and Environment	-Revision National water plan -Handbook Sea and Lakes
Keeping option open to raise level in 2050 with 20-30cm	-Rijkswaterstaat -Waterboards, -Ministry of Infrastructure and Environment -Municipalities -Provinces	-Revision National water plan -Handbook Sea and Lakes -Bestemmingsplan: Spatial reservation for long term
Pillar 2. Flexible water level (+/- 10 cm)	-Rijkswaterstaat -Waterboards, Ministry of Infrastructure and Environment -Municipalities -Provinces -ROIJ (Combined NGO's)	-Revision National water plan -Peilbesluit IJsselmeer: flexible water level regime -Water-akkoord: management contract between the water management authorities -Research project Operational flexible water level management. -Bestuurlijk Platform IJsselmeer: Members of the Executive Council of the various organisations come together 2x per year to discuss progress (follow-up of the bestuurlijk kerngroep IJsselmeer)
Keeping option open to increase flexibility (+/- 20-30 cm)	-Rijkswaterstaat -Waterboards Ministry of Infrastructure and Environment -Municipalities -Provinces -ROIJ (Combined NGO's)	-Communication between partners and keeping option vital.
3. Flexible water management in surrounding water systems	-Rijkswaterstaat -Waterboards -Municipalities (Amsterdam)	-Water-akkoord: management contract between the water management authorities -Research project Operational water management
Reduction of usage	Vitens	-Agreement that Vitens makes an action plan
5. Investing in water safety		-HWBP – National program on dike reinforcements -Follow-up project on pilot in Marken (Multi-layered water safety) -Pilot project in Westpoort, Amsterdam (raising awareness)

What is the key message from this case study (and which could work in other cases as well)? (200 – 500 words)

The key result of this case study is that flexibility is allowed with regard to the water level in the lake, enabling the water authorities to anticipate high river discharges and droughts by reducing respectively increasing the water level. In the future this flexibility may even be extended, although there is still a lot of study required and clear rules. Key message is that since the program had a participatory design from the onset, most parties were engaged and contributed to the development of the adaptation strategy and therefore felt ownership. The Delta Program also provided the platform for inter-organisational communication. People from the various organisations have come to know each other and gained understanding of the perspective and stakes of the others.

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