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TNO-report

Problem structuring in interactive decision-making processes; How interaction, problem perceptions and knowledge contribute to a joint formulation of a problem and solutions

In Dutch: Probleemstructurering in interactieve besluitvormingsprocessen; Hoe interactie, probleem percepties en kennis bijdragen aan een gezamenlijke formulering van een probleem en oplossingen.

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Samenvatting

Veel ruimtelijke problemen in Nederland zijn niet of matig gestructureerd. Dit betekent dat er sprake is van onenigheid en/of onzekerheid over de kennisbasis van een probleem en/of onenigheid bestaat over de normatieve maatstaven die een rol spelen. Deze probleemtypologie is gebaseerd op de gedachte dat problemen subjectief zijn. Dit wil zeggen dat verschillende mensen een verschillend beeld of perceptie kunnen hebben van hetzelfde probleem. Probleempercepties kunnen uiteenlopen over de huidige, de verwachte en de gewenste situatie, de mogelijke kansen en bedreigingen, en de oplossingsrichtingen. Ongestructureerdheid hangt samen met de complexiteit van een probleem. Een complex probleem maakt onderdeel uit van een systeem waarin allerlei verschillende elementen onderling afhankelijk zijn. Waterproblemen zijn hiervan een goed voorbeeld. Hierbij speelt een complex natuurlijk systeem waarin verschillende elementen (bijvoorbeeld oppervlakte- en grondwater, boven- en benedenstrooms water) elkaar beïnvloeden en van elkaar afhankelijk zijn. Ook is er bij waterproblemen sprake van maatschappelijke complexiteit, doordat het watersysteem wordt beheerd door verschillende bestuurslagen en gebruikers met uiteenlopende belangen invloed kunnen uitoefenen op dit beheer. De onderlinge afhankelijkheid tussen actoren wordt ook wel netwerk complexiteit genoemd. In een netwerk maatschappij, waarin zich ongestructureerde problemen voordoen, is traditionele besluitvorming, waarbij een probleem op een analytische manier wordt benaderd, vaak niet doeltreffend. Een procesgerichte benadering waarin belanghebbenden met hun verschillende belangen en percepties centraal staan is in deze gevallen geschikter.

Een voorbeeld van een procesgerichte benadering is interactieve besluitvorming. Hierbij worden belanghebbenden betrokken in het beleidsproces. Als dit proces begint met een complex, ongestructureerd probleem, zal dit probleem gestructureerd moeten worden. Probleem structurering is een proces waarin belanghebbenden met uiteenlopende probleempercepties gezamenlijk een formulering van het probleem en oplossingsrichtingen ontwikkelingen. Doelstelling van dit onderzoek is om inzicht te krijgen in dit proces van probleemstructurering. De centrale onderzoeksvraag luidt: '*Hoe ontwikkelt het proces van probleemstructurering zich voor complexe, ongestructureerde waterproblemen tijdens interactieve besluitvormingsprocessen, welke elementen beïnvloeden dit proces and hoe beïnvloeden deze elementen elkaar?'* Voor het beantwoorden van deze onderzoeksvraag is literatuur onderzocht en vergeleken met twee interactieve besluitvormingsprojecten uit de praktijk.

Literatuuronderzoek laat zien dat het structureren van een probleem een activiteit is die door belanghebbenden wordt uitgevoerd. Het is een vorm van interactie waarbij men komt tot uiteindelijke aannames over wat het probleem en de oplossing of oplossingsrichting is. Tijdens een interactief proces verandert de formulering van het probleem vaak door nieuwe informatie, externe ontwikkelingen of door interactie. Een duidelijke afbakening van het probleem bestaat vaak pas op het moment dat er een oplossing wordt gekozen. Ideaal gesproken resulteert een interactief proces in overeengekomen kennis *('negotiated knowledge')*. Dit houdt in dat procesdeelnemers het eens zijn geworden over de wetenschappelijke validiteit, de betekenis en relevantie van de kennisbasis. Voor het ontwikkelen van deze kennisbasis is het van belang dat er bruikbare kennis wordt ontwikkeld tijdens een interactief proces. Dit is kennis die aansluit bij de percepties van deelnemers, die op tijd komt en de toets van de wetenschappelijke kritiek kan doorstaan. Om tot overeenstemming te komen helpt het vaak als procesdeelnemers

kennis kunnen inbrengen. Ook dient de ontwikkeling van nieuwe kennis en een interactief proces te worden afgestemd op elkaar.

Percepties van deelnemers verschillen van elkaar omdat hun belangen en percepties van de werkelijkheid en de hieruit voortvloeiende doelstellingen van elkaar verschillen. Percepties berusten op referentiekaders die kunnen verschillen per individu, per groep of per organisatie. Er zijn verschillende theorieën ontwikkeld die inzicht geven in de verschillen tussen percepties van mensen. Er kan een onderscheid gemaakt worden tussen het type belang van iemand (maatschappelijk, gebruiker of leverancier) en datgene waardoor ze primair worden gestuurd. Inzicht in de posities van belanghebbenden kan worden gekregen door na te gaan hoe extreem of gemiddeld hun standpunt is en hoeveel interactie ze hebben. De meest bekende typologie om verschillen in probleempercepties te verklaren is de Culturele Theorie. Deze theorie onderscheidt vier culturele types op basis van het meer of minder deel uit maken van een groep en het meer of minder onderworpen zijn aan regels/beperkingen.

Percepties van mensen zijn gedeeltelijk statisch en gedeeltelijk dynamisch. Over het algemeen zullen ze geleidelijk veranderen ten gevolge van een leerproces, maar percepties kunnen door bepaalde gebeurtenissen ook heel plotseling veranderen. Zowel het leren over onderlinge afhankelijkheid (strategisch leren) als het leren over verschillende percepties (cognitief leren) kan bijdragen aan de aanpassing van probleem percepties. Het ontwikkelen van een gezamenlijke basis draagt bij aan de ontwikkeling van overeenstemming over de kennisbasis.

Naar aanleiding van de literatuurstudie zijn er drie elementen benoemd die bijdragen aan het proces van probleemstructurering. Dit zijn interactie, probleempercepties en kennis. In de case studies zijn de ontwikkeling van deze drie ‘sporen van besluitvorming’ individueel en in samenhang met elkaar onderzocht. Voor ieder spoor is de ontwikkeling in kaart gebracht, welke actoren betrokken zijn bij de ontwikkeling (het netwerk) en hoe ze hebben bijgedragen aan de uitkomsten. Ook is aangenomen dat externe ontwikkelingen invloed kunnen uitoefenen op interactie, probleempercepties en kennis.

Het eerste project wat is onderzocht betreft een brede discussie over de zoetwatervoorziening van de landbouw op Tholen en St. Philipsland. Deze eilanden liggen in de provincie Zeeland en zijn voor de zoetwatervoorziening voor de landbouw afhankelijk van het Volkerak-Zoommeer. Door de aanleg van de Deltawerken is dit meer in 1987 een zoetwaterbassin geworden. De aanleg van het meer heeft kansen gecreëerd voor onder andere de landbouw, maar ook geleidt tot een overmatige groei van blauwalgen in zomerperiodes. Dit heeft negatieve gevolgen voor de ecologie en zorgt ervoor dat de watertoevoer in de zomer regelmatig wordt gestaakt. Om de overmatige groei van blauwalgen tegen te gaan wordt er op nationaal en provinciaal niveau onderzocht of de vroegere estuariene dynamiek van het meer hersteld kan worden. Dit zou grote gevolgen hebben voor de landbouw in het gebied, aangezien het meer in dat geval niet meer kan voorzien in hun zoetwater behoefte. In deze brede discussie zijn naast een verandering van het watersysteem ook klimaatveranderingen en de ontwikkeling van de landbouw meegenomen.

Tijdens het proces waren de volgende belanghebbenden betrokken: individuele agrariers, de agribusiness (toeleveranciers en afnemers van agrarische producten), ZLTO, vijf natuurorganisaties, de gemeente Tholen, de Provincie Zeeland, Rijkswaterstaat-Zeeland en Waterschap ‘Zeeuwse Eilanden’. Interactie tussen de partijen vond plaats tijdens algemene workshops en sectorgerelateerde werksessies. Er is ook een excursie georga-

niseerd door het gebied. Voor het proces is aan alle deelnemers een notitie uitgereikt waarin onder andere bestaande kennis over het probleem, de verschillende percepties van belanghebbenden en het beleid waren gebundeld. Vooral de agrariërs waren het niet eens met alle locatiespecifieke data die gepresenteerd werd in deze Tholenbundel. Ook bleek het niet mogelijk alle kennisvragen die opkwamen tijdens het proces met de bestaande kennis te beantwoorden. Dit leidde ertoe dat agrariërs nieuwe data verzamelden, het waterschap hun meeste recente onderzoeken inbracht en kennis die aanwezig was bij natuurorganisaties eveneens werd ingebracht tijdens het proces. Tijdens het proces is er ook kennis ontwikkeld in een planstudie over het Volkerak-Zoommeer. Hieruit bleek dat de problemen met blauwalgen niet op te lossen zijn in een zoetwater variant van het meer. In hoeverre herstel van estuariene dynamiek dit wel kan, bleef onzeker. Om tot oplossingen te komen is er tijdens het proces geen nieuw onderzoek meer verricht door professionele onderzoekers. Het resultaat is vooral gebaseerd op de bestaande wetenschappelijke kennis en kennis die aanwezig was en ontwikkeld is door deelnemers.

Toen het proces startte hadden deelnemers uiteenlopende percepties over het probleem en mogelijke oplossingen. Globaal kan er een onderscheid worden gemaakt tussen belanghebbenden die op economie waren georiënteerd en veel waarde hechten aan de zoetwatervoorziening van de landbouw en belanghebbenden die meer zijn georiënteerd op ecologie en willen dat de estuariene dynamiek van het Volkerak-Zoommeer wordt hersteld. Door het uitwisselen van deze uiteenlopende percepties en te overleggen binnen de eigen sector, realiseerden een groot deel van de deelnemers dat het van belang was om ook in de toekomst te voorzien in een goede zoetwatervoorziening voor de landbouw. Het bleek mogelijk te zijn om een adequate zoetwatervoorziening te realiseren die niet afhankelijk was van het Volkerak-Zoommeer, hierdoor zouden de opbrengsten van de agrarische sector stijgen. De natuur- en agrarische sector besloten om in een convenant vast te leggen dat ze een alternatieve zoetwatervoorziening willen realiseren voor de landbouw, waarna de estuariene dynamiek in het Volkerak-Zoommeer kan worden hersteld. Hoewel ook de percepties van overheidsvertegenwoordigers veranderde, bleken zij niet in staat om hun strategie hier ook op aan te passen. Eén van de oorzaken was dat er binnen overheidsorganisaties veel verschil van mening was. Zij gaven aan dat er eerst meer onderzoek moest worden gedaan.

Het tweede project wat is onderzocht is een interactief planvormingsproces wat is geïnitieerd door Hoogheemraadschap Rijnland. In de voorgaande jaren heeft dit waterschap een achterstand opgelopen met haar baggerwerkzaamheden. Deze achterstand en klimaatveranderingen hebben tot gevolg dat er voor 2010 in het deelgebied Zuidwest Rijnland een grote hoeveelheid bagger moet worden verwijderd en afgezet. Om draagvlak te verwerven voor de baggerwerkzaamheden en voor de afzet van sediment, heeft het waterschap besloten om o.a. gemeentes, de provincie, landeigenaren, gebruikers van het watersysteem, bewonersverenigingen en natuurverenigingen uit te nodigen deel te nemen aan een interactief planproces. Het proces bestond uit een aantal algemene workshops, ieder met een plenair gedeelte en ruimte voor discussie in deelgroepen, en twee locatiespecifieke workshops. Tijdens de eerste drie algemene workshops werden deelnemers aan de hand van hun perceptie op sedimentbeheer verdeeld in drie groepen: benutters (economisch perspectief), beheersers (maatschappelijk perspectief) en beschermers (ecologisch perspectief). Het resultaat van de discussie is een kansenpallet aangevuld met voorwaarden van deelnemers. Op basis van deze uitkomsten en een aantal aanvullende criteria zal het waterschap oplossingen selecteren.

Via het waterschap, mensen van TNO en andere experts werd bestaande wetenschappelijke kennis over sedimentbeheer gedeeld met deelnemers. Kennis werd overgedragen

via nieuwsbrieven, een kennisdocument waarin vragen werden beantwoord, presentaties en door het beantwoorden van vragen tijdens de workshops. Gelijktijdig aan het proces voerde het waterschap een meetprogramma uit waarin werd bepaald hoeveel er gebaggerd moest worden en welke kwaliteit deze bagger heeft. Halverwege het proces ontwikkelden ze in overleg met de gemeentes een kansenpallet. Hierdoor werd kennis over ruimtelijke ordening geïntegreerd in het proces. De deelnemers van het proces voegden aan deze bestaande kennis hun ervaringen en locatiespecifieke kennis toe.

Uit het eerste gedeelte van het proces blijkt dat de percepties van deelnemers van verschillende subgroepen uiteenlopen. De groep beheersers bestond vooral uit overheden. Zij hebben eveneens verantwoordelijkheden om te baggeren en zijn bekend met sedimentbeheer. Zij gaven aan dat het proces niet heel erg leerzaam was voor hen. Binnen de andere groepen was men over het algemeen minder bekend met sedimentbeheer. Over het algemeen leerden deze deelnemers meer. Ook binnen groepen waren verschillen zichtbaar tussen deelnemers. Sommige beschermers wilden vooral randvoorwaarden scheppen, terwijl anderen vooral dachten in kansen. Sommige benutters hadden veel locatiespecifieke kennis, anderen droegen meer abstracte kennis bij over uitvoerbaarheid en wet- en regelgeving. Omdat de voorkeuren van deelnemers niet expliciet is gemaakt tijdens het proces en de samenstelling van de deelnemers niet constant was gedurende het proces, is het in deze case lastig om de ontwikkeling van probleempercepties in kaart te brengen.

Reflecterend op de case studies zien we dat een belangrijk verschil tussen beide cases is dat in de eerste case het probleem werd gestructureerd door de deelnemers en in de tweede case vooral door het waterschap. De deelnemers droegen wel bij aan de probleemstructurering, maar de formulering van het probleem, het aandragen van oplossingen en de keuze voor oplossingen werd gedaan door het waterschap. Dit laat zien dat het van belang is bij het analyseren van probleemstructurering na te gaan wie er eigenlijk het probleem structureert.

In beide case studies zien we dat bestaande wetenschappelijke kennis is geïntegreerd in het proces, maar dat er tijdens het proces geen nieuwe wetenschappelijke kennis is ontwikkeld op verzoek van procesdeelnemers. In de eerste case studie zien we duidelijk dat deelnemers bij hebben gedragen aan het vergaren van nieuwe data om tot een inhoudelijke uitkomst te komen. In de tweede case studie werd bestaande impliciete kennis van deelnemers expliciet gemaakt en geïntegreerd, maar geen nieuwe kennis ontwikkeld door deelnemers. We zien in beide projecten dat de mogelijkheid om bij te dragen met eigen kennis en de uitwisselingen over het probleem en mogelijke oplossingen bij droegen aan het bereiken van draagvlak en/of overeenstemming en aan de inhoudelijke ontwikkeling van het probleem en oplossingen.

In beide cases is een verschil zichtbaar tussen de percepties van de overheid en die van andere deelnemers. Overheden zijn erg gebonden aan een groep en onderworpen aan allerlei regels. In de eerste case zien we dat ze meer moeite hadden om informatie te accepteren en hun strategie aan te passen op basis van een ontwikkeling van hun perceptie. Belanghebbenden afkomstig uit dezelfde sectoren trekken vaak samen op. Zowel het delen van percepties binnen de eigen sector als met belanghebbenden van andere sectoren draagt bij aan aanpassing van hun percepties. Het is niet zo dat percepties gelijk moeten worden om het met elkaar eens te worden. Als men gemotiveerd is om samen tot een oplossing te komen, wil men zich ook committeren aan probleemformulering die men slechts gedeeltelijk deelt. Wel is het nodig dat men een gezamenlijke basis creëert. Voor de positie van belanghebbenden in een sector is het van belang hoeveel

interactie ze normaal gesproken hebben binnen de groep en hoe extreem hun perceptie is.

Op basis van de literatuur waren er drie elementen benoemd die bijdragen aan het proces van probleemstructurering, namelijk interactie, probleempercepties en kennis. Op basis van de case studies wordt geconcludeerd dat interactie zelf niet bijdraagt aan de formulering van het probleem en oplossingen. De rol van interactie is dat het bijdraagt aan het integreren van uiteenlopende percepties en verschillende typen kennis. De ontwikkeling van percepties en de ontwikkeling van een inhoudelijke kennisbasis zijn centrale elementen in het proces van probleem structurering. Bij het ontwikkelen van percepties gaat het erom dat er draagvlak wordt gecreëerd. Hierbij spelen cognitieve en sociale factoren een rol, het gaat zowel om wilsvorming als om beeldvorming. Hiernaast dient er contextspecifieke en wetenschappelijk acceptabele kennis te worden ontwikkeld. Zowel kennis van belanghebbenden, als wetenschappelijke kennis kan hier een bijdrage aan leveren. Deze elementen ontwikkelen zich niet geïsoleerd van hun omgeving, maar worden beïnvloed door ontwikkelingen in de natuurlijke en maatschappelijke omgeving. Dit kan zowel voor, tijdens als na het proces invloed hebben op probleemstructurering. Of de formulering van een probleem en oplossingen stand houden blijkt pas nadat een uiteindelijke beslissing is genomen. Tot die tijd kan het betrekken van nieuwe belanghebbenden of de ontwikkeling van nieuwe kennis zorgen voor nieuwe onenigheid over de kennisbasis.

Summary

Water management issues are often complex, unstructured problems. They are complex, because they are part of a natural and human system which consists of many diverse, interdependent elements, e.g. upstream events influence the water system downstream, different interdependent government layers manage the water system, and multiple stakeholders use the water system. Complexity within the human context is also called network complexity. Complexity often results in unstructured problems. Problems are unstructured if their knowledge base is uncertain or disagreed upon and/or actors disagree about the normative standards (values, norms and objectives). The notion that problems may be unstructured is based on the social-constructive view that problems are not objective givens, but social constructs. This implies that stakeholders may have divergent perceptions about the same problem. This divergence of perceptions is related to their divergent interests and perceptions of reality. Perceptions may vary about the present situation, the desired situation, possible chances and opportunities, yardsticks, and the directions for solutions. For complex, unstructured problems it is not possible to define one objective problem through an analytical decision-making process. A process management approach is needed in which stakeholders, perceptions, and interaction are placed at a central position.

An example of a process management approach is interactive decision-making. Interactive decision-making implies that stakeholders (e.g. citizens, organizations) are involved. Problem structuring can be regarded as an activity in interactive processes. Problem structuring is a process in which stakeholders with diverging perceptions interact with each other and jointly develop a formulation of a problem and its solutions. The objective of this research is to get insight in this process of problem structuring. The central research question is: *'How does the process of problem structuring develop for complex, unstructured water problems addressed in interactive decision-making processes, which elements affect this process and how do these elements influence each other?'* To answer this question, theory is reflected upon experiences derived from two case studies.

Theory shows that interactive decision-making processes ideally result in 'negotiated knowledge'. This is knowledge which is agreed upon by participating stakeholders and can withstand the test of scientific criticism. To create this knowledge, knowledge should be developed apart from the process, but also adapt to the process. For reaching an agreement about knowledge it helps if stakeholders develop a joint image, reflect upon similar and diverging perceptions, have the possibility to contribute to the development of knowledge and divergence of perceptions is taken into account in the development of knowledge. Stakeholder perceptions are related to their interests and perception of reality are not adjusted easily. Based on the literature review it is concluded that interaction, problem perceptions and knowledge are central elements in the process of problem structuring. In the case studies the development of these elements is analyzed, including an analysis of the actors involved, the influence of external developments and how these elements contributed to the development of substantive outcomes, i.e. a joint formulation of a problem and its solutions.

The first case study project concerns a broad discussion about the freshwater supply for agriculture on Tholen and St. Philipsland. These are islands in the Southwestern part of the Netherlands. Currently, the freshwater supply for agriculture on these islands de-

pends on the availability of freshwater in the Volkerak-Zoomlake. During summer periods this lake suffers from an abundant growth of blue-green algae. This negatively affects the ecology of the lake and makes that the inlet of freshwater is sometimes cut off. To solve the problems with blue-green algae, it is suggested that the former estuarine dynamics of the lake should be re-established. If this will be realized, agriculture will not be able anymore to extract freshwater from the lake. This is why a broad discussion was initiated about the future of agriculture on the islands. For this broad discussion stakeholders from the government, nature and agricultural sector were invited. These stakeholders interacted with each other during several plenary and sector-specific workshops. Since existing scientific knowledge was not agreed upon by all process participants and did not answer all their knowledge questions, this knowledge was complemented with context-specific knowledge from participating stakeholders. In the beginning of the process, problem perceptions of participants diverged. During the process stakeholders' perceptions adjusted and converged. Although perceptions did not become identical, among the agricultural and nature sector a common knowledge base was created. This resulted in the willingness to lay down the results of the process in a covenant. These results were that they wanted to realize an alternative freshwater supply for agriculture whereupon the estuarine dynamics in the Volkerak-Zoomlake would be re-established.

The second case study project concerns an interactive planning process addressing sediment management in Southwest Rijnland. This area is located in the Province of South-Holland in the Netherlands. This process was initiated by Water Board Rijnland, because they currently have a dredging backlog. They need to dredge and deposit a large amount of sediment from their water system in Southwest Rijnland before 2010. To create support for these activities, Water Board Rijnland decided to involve all kind of stakeholders actively in their planning process. Stakeholders involved were users of the water system, landowners, resident societies, nature conservation organizations, and municipalities. The interactive process consisted of several general workshops – with plenary and subgroup sessions – and two location-specific workshops. Existing (scientific) knowledge was presented in news letters and workshops. This knowledge was complemented with knowledge from municipalities about spatial planning and knowledge from other stakeholders about specific features and the history of the locations. Most of the participating stakeholders were not familiar with sediment management. Because of their different backgrounds they behold diverging perceptions and had different knowledge. Since the constitution of participating stakeholders was not constant and preferences of stakeholders have not been made explicit, less is known about the development of perceptions. The outcomes of the process was a map with chances for solutions complemented with reservations of stakeholders. Based on these reservations and other criteria, Water Board Rijnland will select the solutions they will execute.

In both case studies, a process of problem structuring is recognized. A difference is that in the first case study the stakeholders defined the problem and solutions, whereas in the second case study the actual process of problem structuring was left to the commissioner. Another difference is that the problem addressed in the first case study was fully unstructured and in the second case study only moderately structured. But both case studies projects started with participants with diverging perceptions. In the first case study, the outcomes of the process were explicitly agreed upon. In this case study, perceptions of reality converged (cognitive learning) and the willingness was created to reach a consensus (strategic learning). In the second case study, process participants did not explicitly agree upon the results, but there is no sign that they did not support the results. For several participants it is known that they learned from the process and sup-

port the results. When analyzing stakeholders, actor typologies can be very useful, e.g. cultural types, perspectives, positions. For example people representing the societal perspective (e.g. municipalities, Water Boards) are much more incorporated in a group and subjected to regulations than people representing a user/supplier perspective (e.g. ecological or economical interest).

In both case studies, existing (scientific) knowledge was complemented with more context-specific knowledge. Scientific knowledge existing before the process was communicated, but no new scientific knowledge was developed by professional experts to answer specific knowledge questions coming up during the process. In the first case study project new data was gathered by process participants, implicit knowledge was made explicit, and new knowledge was developed in another policy process. In the second case study project, implicit stakeholder knowledge was made explicit and new data developed by Water Board Rijnland. The involvement of stakeholder knowledge played in both cases an important role in the creation of support among stakeholders and a context-specific knowledge base.

In both case studies we recognize that the process of problem structuring cannot be isolated from its environment; external developments do affect the process before and during the interactive process. The case studies also show that problem perceptions and research already start to develop before the interactive process is actually initiated. The input of a process of problem structuring is not just a problem, but also stakeholders and knowledge. Depending on the management of the process, stakeholders may have a central or a supporting role in problem structuring.

It can be concluded that the development of perceptions and knowledge are central elements in problem structuring. To come to a joint formulation of a problem and its solutions, support should be created among stakeholders. Cognitive and social factors contribute to the development of perceptions. Diverging perceptions need to converge (cognitive learning or perception building) and stakeholders need to become aware of their mutual interdependencies so that they want to cooperate (strategic learning or action building). Besides this, a context-specific and scientifically valid content of the knowledge base needs to be created. Stakeholder knowledge and scientific knowledge may contribute to the development of knowledge. Involvement of stakeholder knowledge contributes to the development of perceptions and to the development of context-specific knowledge. The knowledge base should also build upon scientific knowledge, so that it can pass the test of scientific validity. It should be realized that a joint formulation of a problem and its solutions is always fragile. The development of new knowledge, the involvement of other stakeholders or external developments can result in disagreement.

Preface

At the moment of writing, I am about to finish six months of research. About six months ago, I hardly knew anything about problem structuring or interactive decision-making processes. This is not surprising, since these are not often mentioned topics in my study Civil Engineering and Management. This thesis concerns a topic on the interface of public management and water management. It is about how technical knowledge can support interactive decision-making processes. Unfortunately, this is often not the case.

In June 2006, I was approached by Saskia Hommes and Henriëtte Otter with the question if I would like to write a master thesis about the 'Role of stakeholder perspectives in decision-making of complex water issues'. Already from the beginning I was enthusiastic about this topic and fortunately I still am. Of course, it was fun to do case study research and to attend workshops, but I have also had the possibility to learn a lot about public management and policy processes. This learning process was not always easy, but I was lucky with five enthusiastic and involved supervisors.

First of all I want to thank all my supervisors for your reading and traveling efforts! I would like to thank my daily supervisor, Saskia. Although I was most of the time in Delft and you in Enschede, we were still able to keep in touch regularly. You were a great help by providing a listening ear, do suggestions for literature, inspiring me, but also by leaving me space to design my own research. I really appreciated this, especially since this research is also meant to support your Ph. D. program. Saskia is currently working on the development of a methodology for assessment frameworks of large-scale, infrastructural water projects. I also want to thank my other supervisor the University, Maarten. I think that many topics of my research were quite new for you too. Thank you for your critical attitude and interest.

This study has been carried out at TNO within the core area Built Environment and Geosciences in Delft. Thank you, Henriëtte, for your efforts to arrange a working place and supervision at TNO. Thanks also to Theo and Geiske for supervising me at TNO, for our two-weekly supervision meetings, our informal meetings and your support. I would also like to thank the people who reviewed my case studies for their reading efforts: Ies de Vries and Gerald Jan Ellen. Gerald Jan and other colleagues from TNO, thank you also for providing information about the case Rijnland and the interviews.

Because of my working place in Delft and sleeping place in Rotterdam, I have had a good time in the Randstad. Jurrian, thanks to you that you gave me the opportunity to stay with you in Rotterdam. I would also like to thank my colleagues of 5-West for learning to play office golf and many other things. Last, but definitely not at least I would like to thank my fiancé. Bernd, thank you for the discussions we had, your suggestions, feedback, your patience and your never-ending love. I love you too!

Joanne de Kruijf
Delft, Mei 2007

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List of abbreviations

		Dutch translation:
AB	Agricultural Business	*Agri-business*
AD	Autonomous development	*Autonome ontwikkeling*
AG	(individual) agrarians	*Agrariërs*
B+	Bodem+	*Bodem+*
BOKV	Administrative Consultation Krammer-Volkerak	*Bestuurlijk Overleg Krammer-Volkerak*
Case 1	Case study 'Tholen & St. Philipsland	*Case studie 'Tholen & St. Philipsland*
Case 2	Case study 'Southwest Rijnland'	*Case studie 'Southwest Rijnland'*
CBA	Costs-benefits analysis	*Kostenbaten analyse*
Delta Provinces	Provinces of Zeeland, North-Brabant and South-Holland	*Provincies Zeeland, Noord-Brabant en Zuid-Holland*
DG	Directorate-general	*Directoraat-Generaal*
DLG	Government Service for Land and Water Management	*Dienst Landelijk Gebied*
ED	Estuarine dynamics	*Estuariene dynamiek*
EIA	Environmental Impact Assessment	*Milieu effect rapportage*
EWFD	European Water Framework Directive	*Europese Kaderrichtlijn Water*
FW	Freshwater	*Zoet water*
GK	Municipality of Katwijk	*Gemeente Katwijk*
GL	Municipality of Leiden	*Gemeente Leiden*
GLV	Municipality of Leidschendam-Voorburg	*Gemeente Leidschendam-Voorburg*
GT	Municipality of Tholen	*Gemeente Tholen*
GV	Municipality of Voorschoten	*Gemeente Voorschoten*
GW	Municipality of Wassenaar	*Gemeente Wassenaar*
GZ	Municipality of Zoeterwoude	*Gemeente Zoeterwoude*
GZM	Municipality of Zoetermeer	*Gemeente Zoetermeer*
HPG	Federation for Privately-owned Land, department Holland	*Hollands Particulier Grondbezit*
HR	Water Board Rijnland	*Hoogheemraadschap van Rijnland*
IVN	Society for Nature- and Environment Education	*Vereniging voor natuur- en milieueducatie*
KNNV	Royal Dutch Nature History Society	*Koninklijke Nederlandse Natuurhistorische Vereniging*
KvK	Chamber for Commerce	*Kamer van Koophandel*
LmW	Living with Water	*Leven met Water*
LTO	Federation of Agricultural and Horticultural Organizations	*Land- en tuinbouw organisatie*
MD	Environmental Service West-Holland	*Milieudienst West-Holland*
MF	Environmental Federation South Holland	*Milieufederatie Zuid-Holland*
Min. EZ	Ministry of Economic Affairs	*Ministerie van Economische Zaken*
Min. LNV	Ministry of Agriculture, Nature and Food Quality	*Ministerie van Landbouw, natuur en voedselveiligheid*

		Dutch translation:
Min. V&W	Ministry of Transport, Public Works and Water Management	*Ministerie van Verkeer en Waterstaat*
Min. VROM	Ministry of Housing, Spatial Planning and the Environment	*Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer*
NM	Society for the Preservation of Nature Reserves in the Netherlands	*Natuurmonumenten*
NVT	Nature Society Tholen	*Natuurvereniging Tholen*
PDV	Platform for Sustainability Voorschoten	*Platvorm Duurzaam Voorschoten*
PZ	Province of Zeeland	*Provincie Zeeland*
PZH	Province of South-Holland	*Provincie Zuid-Holland*
RIKZ	National Institute for Coastal and Marine Management	*Rijksinstituut voor kust en zee*
RvR	Room for Rivers	*Ruimte voor de Rivier*
RWS	Public Works Department	*Rijkswaterstaat*
SB	State Forest Service	*Staatsbosbeheer*
SCD	Foundation Committee Doesburg	*Stichting Comité Doesburg*
SLD	Foundation Country Estate Duivenvoorde	*Stichting Landgoed Duivenvoorde*
TNO	Netherlands Organization for Applied Scientific Research	*Nederlandse Organisatie voor toegepast-natuurwetenschappelijk onderzoek*
UT	University of Twente	*Universiteit Twente*
VBC	Fish-Stock-Management-Committee	*Visstand Beheer Commissie*
VMW	Birds- and environmental working group	*Vogel- en Milieuwerkgroep*
VU	University in Amsterdam	*Vrije Universiteit*
VZ-lake	Volkerak Zoom lake	*Volkerak-Zoommeer (VZM)*
WB21	Water Management 21st Century	*Waterbeheer 21e eeuw*
WS	Workshop	*Workshop*
WSV	Royal Netherlands Yachting Union	*Koninklijke Watersportverbond*
WSZE	Water Board '*Zeeuwse Eilanden*'	*Waterschap Zeeuwse Eilanden*
WVL	Quarter Society 't Lien	*Wijkvereniging 't Lien (Leidschendam)*
ZD	Freshwater supply Delta Agriculture	*Zoetwatervoorziening Deltalandbouw*
ZHL	Society Landscape South-Holland	*Het Zuid-Hollands Landschap*
ZL	Society Landscape Zeeland	*Het Zeeuws Landschap*
ZLTO	LTO-South	*LTO afdeling Zuid Nederland*
ZMF	Environmental Federation Zeeland	*Zeeuwse Milieu Federatie*

1 Introduction

This chapter provides an introduction on the background and content of this thesis. Section 1.1 provides the background of the central research question. The research questions and research model are described in section 1.2. This chapter closes with an outline of the report.

1.1 Background

The context of this research is water management in the Netherlands. The Netherlands is a densely populated Delta-country from which about one-third of the land is situated below sea level. Currently, water management attracts a lot of attention, since the land of low-lying peat polders is subsiding, river discharges are expected to increase, and sea-level is expected to rise as a result of global temperature rise. But this is not the only reason why many water management issues are complex and unstructured. Water management also requires the integration of different aspects of the natural system, user interests, scientific disciplines and government levels.

Physically, a water system consists of different kinds of interrelated aspects, e.g. land and water, water quality and -quantity, surface- and groundwater, up- and downstream systems. Integration of these aspects is needed, since the different aspects of the system influence each other. E.g. upstream contamination affects the water quality downstream. The different aspects of water management also require the integration of different disciplines e.g. hydrology, geology and spatial planning. Besides that water management is embedded in a complex natural system, it is also embedded in a complex social system.

In the Netherlands, water is a public good and thus managed by multiple government levels. The European Union, national, provincial and local government levels, and Water Boards all have their own responsibilities with regard to water management. This implies that resources are fragmented and mutual interdependencies exist between different government levels. But government alone does not determine water management or societal developments in general. To realize their objectives, the government also depends on other stakeholders. This dependency is also recognized by the government and translated into the need for a more participatory approach of policy processes, see for instance the 'European Water Framework Directive' (EWFD) or the Dutch policy 'Water Management 21st Century' (WB21). Bressers *et al* [2003] explain that characteristics of present public governance are that it is multi-level, multi-actor, multi-faceted, multi-instrument and multi-resource-based. This asks for a transition from a central, steering government to more participatory policy processes taking place in a network society.

The recognition that different stakeholders involved in water management are mutually interdependent implies that solving water management problems becomes more complicated. Different stakeholders have diverging interests and perceptions about a problem. If these stakeholders are involved in a policy process they will not always agree upon the normative standards and the knowledge base to be used. In decision-making processes, stakeholders need to arrive at a joint or shared direction for solutions (which implies a choice for a problem) even when a problem is unstructured, i.e. uncertainties

in the knowledge base exist and perceptions diverge. This process is called the process of problem structuring. The aim of this thesis is to provide more insight in this process in interactive decision-making processes, so that a contribution can be made to water management in the Netherlands.

1.2 Research questions

The previous section shows that water management problems are often complex and unstructured. This thesis aims to provide new insights about how these problems are solved in an interactive decision-making process. The central research problem of this thesis is:

'How does the process of problem structuring develop for complex unstructured water problems addressed in interactive decision-making processes, which elements affect the process of problem structuring and how do these elements influence each other?'

To get insight in the process of problem structuring in interactive decision-making processes, theory about problem structuring is reflected upon experiences derived from two case studies. To support this, a conceptual model is derived from theory. This conceptual model supports the analysis of the first case study. The second case will be a subsequent case. This implies that the second case will be studied in relation to the results of the first case [Yin, 2003]. The results of the first and the second case together will form the basis for the conclusions. This is also summarized in the research model, see Figure 1.1.

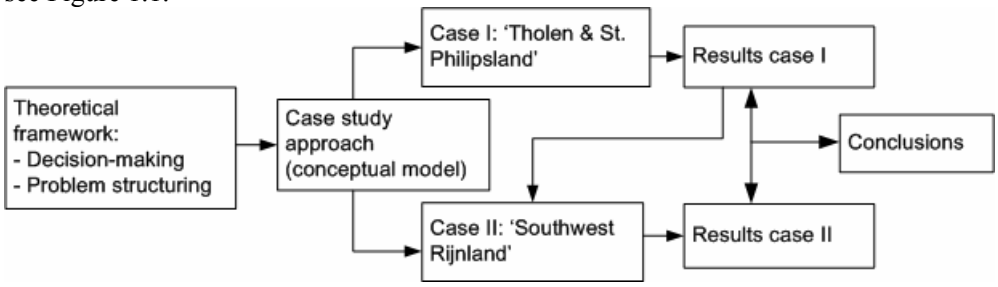

Figure 1.1 Research model

To answer the central research question, two sub questions are formulated. The first research question concerns the literature review and is formulated as follows:

1. Which theoretical framework is appropriate for analyzing the process of problem structuring for interactive decision-making processes?

Based on the results of the literature review it is possible to present a theoretical framework and to derive a conceptual model. This model describes the elements influencing the process of problem structuring. Three elements are part of this conceptual model, interaction, problem perceptions and knowledge.

The second research question is:

2. How do interaction, problem perceptions and knowledge develop and influence each other in the case studies?

In the case studies the development of each element or track is analyzed separately. They are studied in relation with the developments in the broader natural and human context. Attention is also paid to the question what contributed to a joint formulation of a problem and its solutions.

After the two sub-questions are answered, the results of the literature review and the case studies are considered. The reflection pays attention to the differences and similarities between the case studies, matches and mismatches between the results and theory, and the usefulness of the conceptual model. This reflection makes it possible to answer the central research question and to give an indication of the general applicability of the findings of this research. It is not an explicit objective of this study to do recommendations about the design of an interactive decision-making process, but in the recommendations attention is paid to this and to the possibilities for further research.

1.3 Outline

Chapter 2 explains the theoretical framework for this research. This chapter closes with a conceptual model, which forms the basis for the case study approach. Chapter 3 gives an introduction of the case studies. This chapter starts with an explanation why case study research has been carried out, how the case studies have been selected and carried out. This chapter also pays attention to the complexity of water management issues and methodological issues, such as data-collection and validity of the case studies. Chapter 4 and 5 subsequently provide a description of the elements analyzed in the case studies. These descriptions are quite extensive. If you want to go faster through it, it is recommended to read the introduction, the conclusions and the reflections of the sections in between the introduction and conclusions. Chapter 4 describes the first case study, which concerns a broad discussion about freshwater supply for agricultural in Tholen & St. Philipsland. Chapter 5 describes the second case study, which concerns sediment management or dredging activities in Southwest Rijnland. Both case studies are interactive decision-making processes considering a water management problem. Chapter 6 contains a reflection on the case studies. In this chapter the case studies are compared with each other and with the theoretical framework. This reflection results in the research findings and recommendations, which are described in chapter 7.

2 Theoretical framework

This chapter presents some theoretical insights about problem structuring in interactive decision-making processes. The first section explains what complex, unstructured policy problems are. Section 2.2 explains how decision-making processes develop for complex, unstructured policy problems. Section 2.3 explains how the process of problem structuring may develop in the context of an interactive decision-making process. This chapter concludes with a synthesis of the obtained theoretical insights about the process of problem structuring. These insights are also integrated in a conceptual model, which is a starting-point for the analysis of the case studies.

2.1 Complex, unstructured policy problems

In the former chapter it is already mentioned that water problems are often complex and unstructured. This section explains the meaning of complex, unstructured policy problems. Subsequently it is described what policy problems actually are, what problem perceptions are, what complexity implies and what distinguishes structured from unstructured problems.

2.1.1 Policy problems

One of the simplest definitions of a problem is that it is a gap between a normative yardstick and an image of an existing or expected situation [e.g. Van de Graaf & Hoppe, 1996]. The problems investigated in this report concern gaps to be bridged by government actions [Hisschemöller & Hoppe, 2001]. They are policy problems in the meaning of political problems. Bridging a gap means that a connection needs to be constructed, in other words a direction for solutions needs to be found. It is assumed in this report that the formulation of a problem goes beyond the description of a gap; it also defines a framework in which discussions about solutions take place. A problem formulation includes three elements:

1. A description of the present and future situation including a causal structure.
2. Definition of criteria, these are constraints, values to aim at and to sacrifice.
3. Definition of which direction(s) for solutions to consider and which not.

[Van de Riet, 2003. Based on Quade, 1980; Dery, 1984]

The first element of a problem formulation is an empirical element based on images about the existing or expected future situation. The knowledge available about this may be highly certain or uncertain [Van de Graaf & Hoppe, 1996]. This cognitive uncertainty may be related to a lack of knowledge about causal relations and content of the problem or to ambiguity. Ambiguity is the result of an overload of information, confusion and knowledge conflicts due to the presence of diverging frames from which problems and solutions are judged. For the latter disagreement about knowledge (and not uncertainty) is an appropriate indication [Koppenjan & Klijn, 2004].

The second element of a problem formulation is a normative element, based on values, principles, standards or ideals. Every person may have a different image of the desired situation and different yardsticks to measure this. This implies that people may disagree about the planning goal or objectives. In other words, a high or low level of consensus concerning objectives can exist [e.g. Van de Graaf & Hoppe, 1996].

2.1.2 Problem perceptions

Dunn [1994] defines a problem in terms of unrealized needs, values or opportunities for improvement. This definition corresponds with the social-constructive view on problems that they are not objective givens, but social constructs [Van de Graaf & Hoppe, 1996; Boogerd, 2005; Hisschemöller & Hoppe, 2001]. Dery [1984] explains that a formulation of a problem is not based on facts, but a highly subjective, social construction based on perceptions about the existing situations, their causes and consequences, their future developments and potential solutions. In summary, this view assumes that different actors have different interpretations of reality and that these interpretations are not direct translations of facts [Edelenbos *et al*, 2003].

Problem perceptions are the images actors have of their environment and of the problems and opportunities within it. Different actors may have different perceptions about the nature, the causes and effects of the problem and possible solutions. Also about the quality of available knowledge and research perceptions may differ [Klijn *et al*, 2000; Van Bueren *et al*, 2003]. Problem perceptions are based on people's frame of reference. Frames are the filter through which information is interpreted [Van Buuren, 2006]. A frame of reference consists of values, norms, convictions, interests and knowledge [Te Velde *et al*, 2002]. They are internalized based on a position, previous experiences and perceptions. They can be held by an individual, an organization or a group in which an actor[1] is involved [Koppenjan & Klijn, 2004].

Van de Riet [2003] explains that problem perceptions are made up of interests and perceptions of reality. Interests are determined by actors' values and their role in society. Perceptions of reality are based on their frame of reference. People with different frames of reference will select different phenomena for assessment, organize and interpret phenomena differently, and have different values. Interests and perceptions of reality determine together the objectives of actors (see also Figure 2.1). Objectives are concrete translations of parts of people's problem perceptions and result in a certain strategy. The relation between actors' perceptions, strategies, and positions is explained more extensively in subsection 2.3.2.

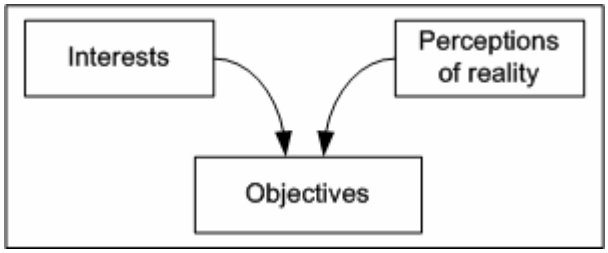

Figure 2.1 Elements of actors' problem perceptions [Van de Riet, 2003]

2.1.3 Complexity

Problems are sometimes complex, since they are part of a complex context. A complex context is a result of a complex natural (physical and ecological) system and/or a complex human system (organizational, political and economical) [Kolkman, 2005]. Complex systems can be characterized by a network structure with mutual interdependencies, many organization levels, anticipation on each other and continuing renewal proc-

[1] In this literature review the word 'actor' refers to people involved in a policy process. Sometimes the word 'stakeholder' is used, these are people directly affected by the problem or a solution. The difference between actors and stakeholders is explained in more detail in subsection 3.1.3.

esses [Geldof, 2004]. Complexity of a system depends on the number of elements involved; the diversity and interdependency among elements; and the interdependency of a system and its contextual environment. More elements imply more diversity and interdependency, which implies more complexity [Van de Riet, 2003]. Because elements in a system are interdependent, problems are also interdependent and affected by other problems and therefore dynamic [Van de Graaf & Hoppe, 1996; Dunn, 1994]. Besides on this, a solution for a certain problem might result in new problems and problem formulations [Van de Graaf & Hoppe, 1996].

Van de Riet [2003] distinguishes complexity in a single-actor context from a multi-actor context. Complexity in a single-actor context derives from system complexity and fuzzy (unstructured and multi-dimensional) objectives. Multi-actor complexity derives from divergent interests among actors and divergent perceptions of reality. This is also called network complexity. Complexity in the human system results for example from uncertainties in the global economy and from the present network society. A network society is a society in which resources are fragmented, which implies that people are interdependent of each other [Teisman, 2000].

In a network, actors with diverging problem perceptions are forced to interact with each other because of mutual interdependencies. This results in a complex process of interactions and negotiation. Because of these continuing interactions interaction patterns and institutional rules develop. The collection of stable relations among mutually dependent actors is also called a policy network. The complexity of the interaction in networks makes it often necessary that networks are managed [Van Bueren *et al*, 2003].

2.1.4 Structured versus unstructured problems

The social-constructive view on policy problems, regards policy problems as highly subjective issues. The most common classification of policy problems, taking into account this subjectivity[2], is based on two dimensions: consensus about normative standards (objectives and/or underlying values and norms) and certainty (or eventually consensus) about the knowledge base. When there is consensus about normative standards and a certain knowledge base, a problem is called structured (type 1). When objectives are at stake and uncertainty about the knowledge base exists a problem is called unstructured (type 4). There are also some problems that lack certainty about the knowledge base (type 3) or consensus on values and norms (type 2) [Van de Graaf & Hoppe, 1996; Hoppe, 2002; Boogerd, 2005; De Boer *et al*, 1999; Kolkman, 2005]. This problem typology is also schematized in Figure 2.2. This report does not focus on structured, but on complex, unstructured problems (type 2, 3, and 4).

[2] Besides this, also other classifications of problems are possible, but these classifications do not deal with the subjectivity of policy problems. Examples of other classification are the classification based on the power arena to be activated. This first classification distinguishes distributive (changes in existing resources), redistributive (new resources), regulatory (changes in regulation) and constituent (changes in institutions) policy issues. Also other classifications have been made, based on the costs and benefits or distinguishing expert (highly technical) from non-experts problems [Parsons, 1995].

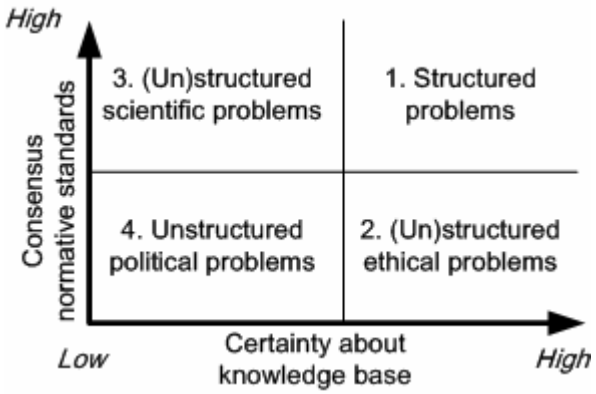

Figure 2.2 Different types of problems [After Van de Graaf & Hoppe, 1996]

Complexity refers to the context in which a problem takes place and is sometimes the reason why a problem is unstructured. However, the main difference between structured (type 1) and unstructured problems (type 2, 3, or 4) is not complexity or difficulty, but the method of solution. Structured problems (also called tamed or well-defined) can be solved with standardized techniques and procedures. Unstructured problems (also called ill-defined, wicked, messy or ill-structured) cannot be solved in this standardized way [Van de Graaf & Hoppe, 1996]. The difference between structured and unstructured problems is also explained in Table 2.1. In the table the following criteria are used: relation problem-solution, testability, treatability, explicability, level of analysis, reproducibility and responsibility. The features of unstructured problems show that problems are subjective, interrelated with other problems, the impacts of solutions are unknown and that it is not possible to separate the formulation of the problem from the solution.

Table 2.1 Differences between structured and unstructured problems [After Van de Graaf & Hoppe, 1996]

	Structured problems (type 1)	**Unstructured problems (2,3, 4)**
Relation problem-solution	Problem can be formulated apart from solution	Every problem definition corresponds implicit or explicit with the solution
Testability	Solution has been proved and tested	No evident criteria or objective yard-sticks
Effectiveness	Problem can be solved	Degree of solution and side-effects unknown
Treatability	Extended list of possible measures available	Possible measures and feasibility unknown
Explicability	Known what the situation is, should be and an explanation for the gap between current and desired situation available	No agreement concerning the present and desired situation, nor an explanation of the causes of the gap between them
Level of analysis	No differences of opinion about the level at which the problem occurs	Problem can both be the cause of and symptom of other problems, so it cannot be separated from other problems
Reproducibility	Isolation from natural environment possible, so solution is repeatable	Unique solution, learning through controllable trial-and-error not possible
Responsibility	Unsuccessful solution is taken for granted.	Policy makers are regarded as morally responsible

2.2 Decision-making processes

The central problem in this thesis focuses on complex, unstructured policy problems addressed in interactive decision-making processes. Decision-making processes aim to solve concrete problems and are often embedded in policy processes. Policy processes aim to realize political values by solving problems on the political agenda [Van de Graaf & Hoppe, 1996]. In this chapter the meaning of interactive decision-making processes is explained and why these types of processes fit to solve complex, unstructured policy problems. In the first subsection, an analytical approach is compared with the process management approach. The second subsection describes decision-making processes from a network perspective.

2.2.1 Analytical versus the process management approach

Currently a shift is visible in the design of policy processes from a purely analytical approach (the classic approach) towards a process management approach [Edelenbos *et al*, 2003]. The classic or traditional approach towards policy processes can be characterized by a central steering actor, who determines the objectives [Klijn & Teisman, 1992]. This approach assumes a single-actor policy setting [Van de Riet, 2003]. Sometimes this approach is also called the hierarchical or uni-centric approach [Teisman, 1992]. In this approach objectivity and rationality are central concepts [Edelenbos *et al*, 2003]. However, analytical rationality (reason towards a solution based on specialist knowledge) and instrumental rationality (reason towards an efficient choice of means based on a selected objective) is not a sensible approach to solve unstructured problems. For unstructured problems the choice of the objective needs to be reasoned (value rationality) and interaction and communication is needed (procedural rationality). In other words: a smart combination of thinking and fighting is needed [Grin & Hoppe, 1999]. This is why for unstructured problems a purely content-directed approach is not possible, but a process-directed approach should be adopted [De Bruijn *et al*, 2002].

The process approach recognizes the need for interaction and communication to solve policy problems. Central concepts are interaction and differences in problem perspectives [Edelenbos *et al*, 2003]. Related approaches are the pluri-centric approach, interactive decision-making and network management. The pluri-centric approach rests on the assumption of interdependent levels of governance that aim to satisfy the public interest. This approach is often regarded as the opposite of the hierarchic approach [Teisman, 1992]. Interactive decision-making implies that citizens, social organization, enterprises and other actors are involved in the policy process. Currently a lot of local governments in the Netherlands are experimenting with these types of processes [Edelenbos & Klijn, 2005]. Network management assumes that actors in a network are dependent on each other and that policy is developed through interactions among actors with different perceptions and strategies [e.g. Edelenbos & Klijn, 2005; Klijn & Teisman, 1992; Klijn & Koppenjan, 1997]. The criticism towards these process management approaches is that it neglects the development of substantive aspects of the problem and its solutions [Koppenjan & Klijn, 2004; Edelenbos *et al*, 2003]. Koppenjan & Klijn [2004] defense this by arguing that the lack of an objective problem formulation and knowledge of reality does not imply that substance does not matter in the network approach. Just as Edelenbos *et al* [2003] and De Bruijn *et al* [2002] they argue that content and process should be interwoven during the process. Edelenbos *et al* [2003] explain that an analytical process should provide the analytical input or substance and is related to ‘perception building’. Another continually interwoven process should aim at generating consensus among actors’ perceptions and is related to ‘action building’.

2.2.2 Decision-making from a network perspective

Based on the different approaches towards policy development, different models to analyze policy processes have been developed. The most widely used and dominant framework is the phase-model[3], which provides insight in the subsequent stages a central actor goes through. Edelenbos *et al* [2003] link this model with the classic analytical approach of policy processes. The shift towards a process management approach resulted in the development of empirical, descriptive models to provide some alternatives[4] for the phase-model. Here, we will discuss the rounds model developed by Teisman [1992]. The rounds model is one of the models that regard policy processes from a network perspective.

The rounds model assumes that there is no central decision-maker and no central decision. During different decision-making rounds every actor can score through the input of leading definitions of the problem or preferred solutions. Interaction between actors is placed centrally and problems and solutions are only relevant to the process if they are presented by a participant. Therefore analysis of the process should focus on the variety of actors, objectives and solutions, their dynamics and interaction between these elements. A combination of a problem formulation and solution can become consolidated once it is adapted during several rounds [Teisman, 2000].

To understand the developments in a policy process, concepts such as policy games, arenas, networks, and fora have been developed. Policy games are "series of interactions between actors that focus on influencing the problem formulations, solutions, and procedures regarding an approach to a specific policy issue". For specific policy problems parts of the policy networks will be activated, this is called 'arena'. An arena is the space of interaction with a specific purpose [Van Bueren *et al*, 2003]. An arena may consist of several fora: specific contexts for interaction in which actors interact with each other about a specific sub theme (e.g. working groups) [Van Buuren, 2006].

We will present now two models which build upon the rounds model. Both models are used as a basis for the development of the conceptual model. One first model is developed by Koppenjan & Klijn [2004]. This model places networks at a central position and suggests that there are five factors that explain the process and outcome of policy games in networks (see Figure 2.3). The network itself is affected by the management of the network and external developments. In other words, policy games do not take place in isolation. Problems are interdependent of other problems and interwoven with other problems [Dunn, 1994; De Bruijn *et al*, 2002]. Changes in the environment of a network (e.g. development of new technology, changes in the market or societal climate of political priorities) might lead to changing perceptions, changing power relations or changing institutional structures. The network itself consists of cognitive, social and institutional factors. Cognitive factors are about problem perceptions, availability of information and knowledge and about collective insights. Social factors are about diverging objectives, interests and strategies, mutual dependencies and unpredictable games. This process consists of different rounds, each round resulting in substantive outcomes and impacts on the institutional factors and the process. This is also called the reduction of cognitive, social and institutional uncertainty.

[3] Alternative names are 'stagist' model [Parsons, 1995] or policy life cycle model [Boogerd, 2005]
[4] E.g. the stream model or policy window model developed by Kingdon and the advocacy-coalition theory, advanced by Sabatier [see also Parsons, 1995; Boogerd, 2005, Teisman, 2000]

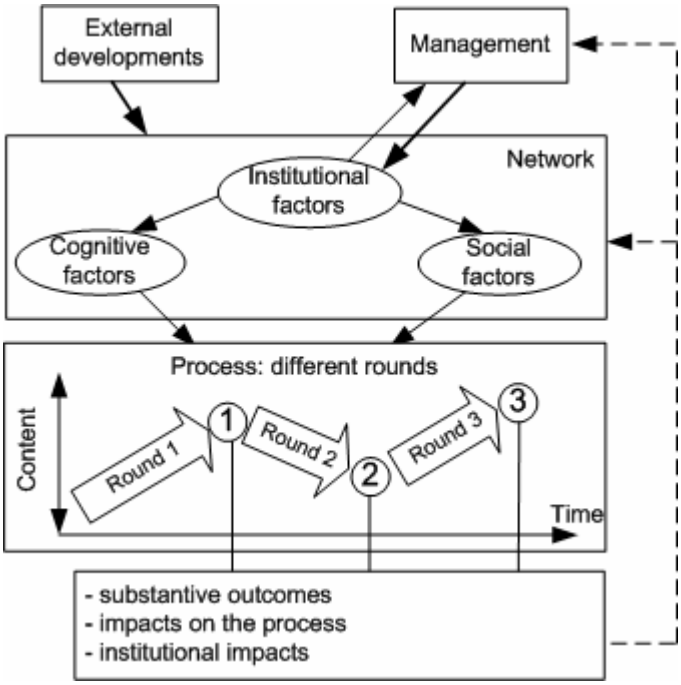

Figure 2.3 Problem solving as a policy game in a network context [Koppenjan & Klijn, 2004, p. 121]

Van Buuren [2006] also developed another model; instead of the network he places different types of knowledge at a central position. He distinguishes three types of knowledge, each contributing towards a decision-making process as a different track (a track is a sub process or one of the 'streams' or 'threads' which is part of the decision-making process). The first track concerns knowledge as facts, which is developed through research activities and recorded in documents. The second track concerns knowledge which is created through interaction and captured in problem frames or perceptions. The third track is about reaching a consensus. The competences of parties in the network are needed to bring the process to an end. These competences are created through patterns of interaction. A decision-making process is a layered and complementary process, in which these three inter-related tracks are sometimes developing independently with their own dynamics and sometimes interfere with one and another. The process and content in each track develops in its own context. Ideally, the different tracks result in: reduction of uncertainty, support and argumentation; reduction of ambiguity, convergence of opinions, and support; and joint and shared objectives of actors. This is also schematized in Figure 2.4.

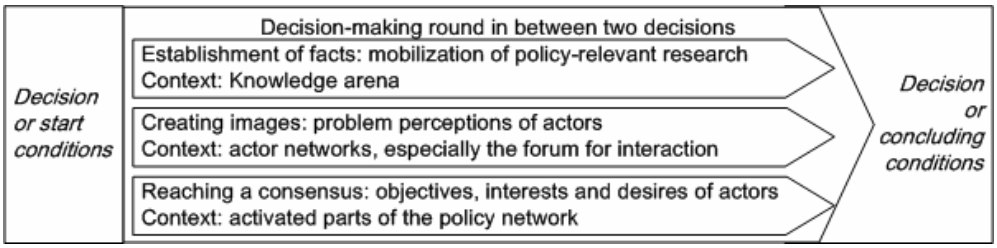

Figure 2.4 The function of knowledge in between two decision-making rounds

2.3 The process of problem structuring

Problem structuring has not been studied extensively in literature about policy processes. This is why in this section often references are made to literature about decision-making in general. The first subsection provides an introduction into 'what is problem structuring?' The last two subsections describe two aspects of these processes in more detail, namely the development of problem perceptions and the creation of 'negotiated knowledge'.

2.3.1 What is problem structuring?

Hisschemöller [1993] defines problem structuring as "a specific form of socio-politic interaction aiming at awareness of a problem by generating, using, exchanging, confronting, evaluating and integrating as much as possible (conflicting) information, which is laid down in causal, normative and final assumptions about the problem and its solution" [p. 32]. One of the basic principles of problem structuring is that people who are part of the problem are also part of the solution. Recognition of unstructured problems implies that the political construction of the problem takes different viewpoints into account. In other words, stakeholders with diverging perceptions should be able to interact with each other about the problem and it solutions. This requires also that people are willing to participate, those addressed are involved, and that decisions do not take place before problem structuring has produced new insights about the problem and its possible solutions [Hisschemöller & Hoppe, 2001].

An alternative view is to regard problem structuring as a task for the analyst. In this context problem structuring is an analytical process of defining and specifying a problem out of a meta-problem [Dunn, 1994]. The analytical approach towards decision-making is that these processes start with problem structuring; this results in a problem definition, which is a prerequisite for the generation of alternative measures [De Boer *et al*, 1999]. However, one of the characteristics of complex decision-making processes is that problem formulations are not constant. They change as a result of interaction between actors, new information or external developments. In interactive decision-making processes a flexible problem formulation is therefore required [Edelenbos & Klijn, 2005].

Another characteristic of complex problems is that it is not possible to define an unambiguous, problem and solution. As a result of negotiation a formulation of a problem and/or solutions can become authoritative or 'negotiated knowledge' [De Bruijn *et al*, 2002]. Negotiated knowledge is the ideal outcome of interactive decision-making processes. It is knowledge which is agreed upon and can withstand the test of scientific criticism. To come towards a solution, there is no need for a common or mutual problem formulation to achieve a solution. A solution needs to be found for a variety of stakeholders with different objectives who have different opinions about the issue. There is no need for consensus, but for a common ground to enable mutual adjustment of strategies and joint action [Koppenjan & Klijn, 2004]. From a social-constructive perspective it is even questionable whether it is possible to formulate a problem. It is also said that a problem finishes once resources such as time and money are finished, this implies that an outcome can only be described in subjective terms such as good or bad [Rittel & Webber, 1973. In: Courtney, 2001]. When a solution has been chosen, implicit choices have been made which problems are considered [De Bruijn *et al*, 2002].

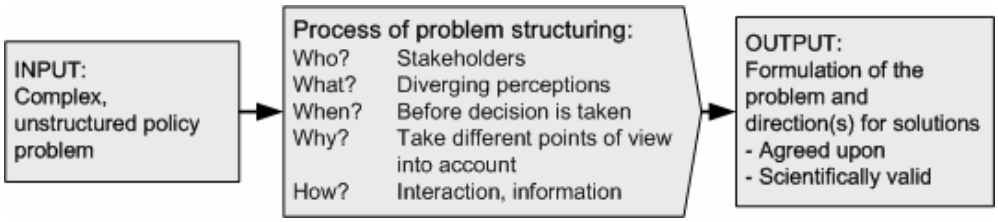

Figure 2.5 Meaning of problem structuring

To define problem structuring, the definition of Hisschemöller is chosen as a starting-point and extended with insights from the network or process management perspective. The meaning of problem structuring is also schematized in Figure 2.5. This figure explains that problem structuring starts with a complex, (partly) unstructured problem (type 2, 3, or 4 in Figure 2.2). The objective of problem structuring is not reaching a consensus among stakeholders about the knowledge base and normative yardsticks. The objective is that stakeholders reach an agreement about the formulation of the problem and its solutions (substantive outcomes). Ideally spoken, these substantive outcomes are not only agreed upon, but also scientifically valid. Stakeholders with diverging and changing perceptions are involved in problem structuring before a decision is taken. The input of problem structuring has been explained already in section 2.1. The dynamics of problem perceptions and the creation of negotiated knowledge are explained further in subsections 2.3.2 and 2.3.3.

2.3.2 Development of problem perceptions

In the first section it was explained already that different people may have different perceptions about a problem. Several typologies have been developed to explain differences between perceptions, three will be mentioned here. Van de Riet [2003] developed a typology for different performance domains of infrastructure using actors' perspectives and their primary drivers. Actors with a societal perspective are primarily driven by collective societal benefits, actors with a user perspective by individual consumer benefits, and actors with a supplier perspective by organizational benefits. To get insight in the configuration of actors De Bruijn *et al* [2002] explain that the extremeness of viewpoints and the intensiveness of interaction patterns are relevant indicators. Another classification of actors to get insight in their perceptions is the Cultural Theory developed by Douglas & Wildavsky [1982]. This theory is also used in the second case study to draw a distinction between groups of actors. The Cultural Theory states that every human being is cultural biased and that this is related to their social commitment or incorporation into a bounded group (group, horizontal axe) and to control or the prescriptions, regulations or rules individuals are subjected to in their interactions (grid, vertical axe). Based on the two dimensions it is possible to distinguish four cultural types: fatalist, hierarchist, individualist, and egalitarian [Mamadouh, 1999]. In Figure 2.6 two typologies are schematized.

Applications of the Cultural Theory are among others found in perceptions of robustness, problem orientations of actors, controversies in water issues and risk perceptions. Ecologists found that different cultural types expect different interaction between life and the world. Individualists assume that nature is robust and can take experimentation, fatalists assume that nature is unpredictable and that one cannot learn from experiences. A hierarchic point of view states that nature is tolerant and robust to a certain point and from an egalitarian position nature is fragile [Thompson, 1997]. If it is assumed that different cultural types are biased in different ways; the principles of the Cultural Theory can also be used to predict the primary orientation of actors. Hierarchists presup-

pose every problem as structured, whereas the isolates presume that every problem is unstructured. Individualists assume every problem as structured on ends or objectives, but unstructured when it is about means or values. An egalitarian assumes the opposite, namely that no consensus exists on ends or objectives. The cultural bias of people also determines the way they will act upon different problems, their second strategy. Egalitarians are fair in solving unstructured problems and biased in case of structured problems, whereas other cultural types will avoid unstructured problems [Hoppe, 2002]. Hoekstra [2000] used the principles of the Cultural Theory to explain controversies in water management issues. About the application of the Cultural Theory to distinguish risk perceptions Rippl [2002] is quite sceptical. She mentions that available methods do not measure culture, but individual risk perceptions which are processes connected to culture. Another problem is that the available methods are not able to explain risk perceptions using cultural biases.

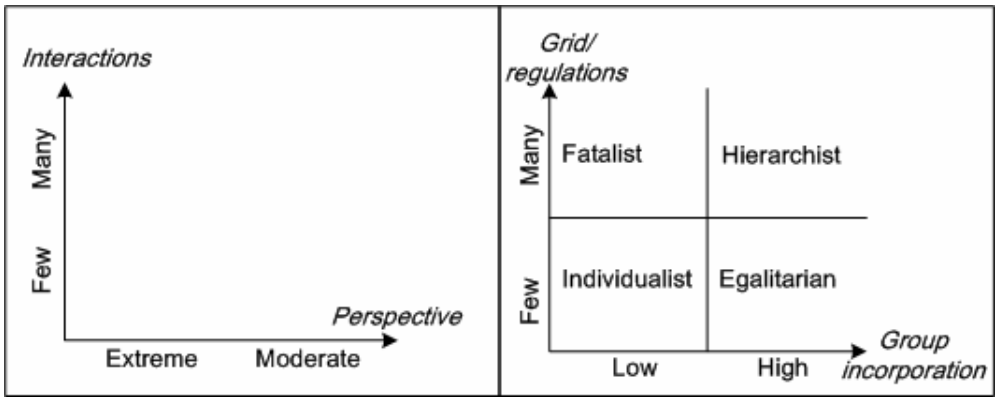

Figure 2.6 On the left: actor configuration [De Bruin et al, 2002], on the right: cultural typologies [Mamadouh, 1999]

To understand the development of perceptions (or changes in positions), Geldof [2004] uses the metaphor of a landscape. He states that an actor orientates on a problem through their own frame. This implies no actor is able to oversee the whole context of the problem (maybe because of a hill) and different stakeholders do have different perceptions (at different positions, people see different landscapes). The landscape itself is not static, but moving. This also limits the ability of stakeholders to develop rational strategies. Because of interdependencies, it is not easy for stakeholders to change position. Crises may enhance a change of position. Generally, perceptions are partly static and partly dynamic. Interaction may result in adaptation and renewal of perceptions, also called reframing. Different stakeholders go through this process in a different tempo.

Koppenjan & Klijn [2004] explain the behavior of stakeholders during interactive decision-making processes as follows. From their position stakeholders develop a strategy to influence the content of the problem formulation and solutions, the course of the interaction process and the strategies of other parties. This strategy is not fully rational, but mainly based on the realization of one's own objectives. This objective is shaped by perceptions, limited information and non-rational elements such as sympathy. Stakeholders quickly adapt their strategy, but perceptions are generally not adjusted easily. Reasons to adapt a strategy are the behavior of other stakeholders, dissatisfaction with results or changed goals or perceptions. Problem perceptions are shaped or changed gradually because of adaptation which results from experiences and as a consequence of learning. Nevertheless, perceptions might also change abruptly, under the influence of

invasive of threatening events in the environment. Two types of learning in interactive processes are cognitive and strategic learning. Cognitive learning is 'increased knowledge and insight about the nature, causes and effects of the problem, possible solutions, and their consequences' [p. 123]. Strategic learning is 'parties growing consciences of each others involvement and their mutual dependencies' [p. 125]. Cognitive and strategic learning are comparable to what Edelenbos *et al* [2003] call perception building and action building.

Koppenjan & Klijn [2004] explain that for adjustment of perceptions or reframing it is important that stakeholders become aware of differences in problem perceptions and build a joint image. Joint image building means that participants give a shared meaning to situations, events and research results, taking into account varying problem perceptions of relevant parties. Steps towards the development of a collective frame of reference are frame-reflection and cross-frame learning. This implies that stakeholders reflect on their individual frame of reference, taking into account the different problem perceptions involved in a process and become aware of divergence of perceptions. If this does not happen a dialogue of the deaf may occur. Van Eeten [1999] describes this as discussions in which stakeholders are confronted with different lines of reasoning, resting on a problem formulation and direction for solutions.

2.3.3 Creation of 'negotiated knowledge'

For unstructured problems, often knowledge about the content is uncertain. Due to Koppenjan & Klijn [2004] there are two standard responses towards this substantive uncertainty. One response is data collection, the use of experts, and research. However, facts are irrelevant if people have different opinions about the meaning of facts. This relates to the second response, deploy of counter-expertise if authoritative knowledge is lacking. In this case there is no focus on dialogue, but on winning by shopping around for experts. Turnhout [2003] calls this the paradoxical of science. Science is supposed to limit the dispute by the production of objective scientific information. However, it often enhances the debate.

Table 2.2 Types of knowledge resulting from policy processes [After Koppenjan & Klijn, 2004]

	Consensus about significance and meaning	
	Yes	No
Agreed scientific validity of problem formulation and solutions		
Yes	Negotiated knowledge	Superfluous knowledge
No	Negotiated nonsense	Ambiguity

De Bruijn *et al* [2002] explain that although formulations and solutions of a problem may not be objective, they can become authoritative since they are 'negotiated knowledge'. In case of unstructured problems, parties should strive towards this kind of knowledge which is accepted by all actors and can pass the test of scientific acceptability. Koppenjan & Klijn [2004] explain negotiated knowledge is the opposite of ambiguity, it is knowledge from which the scientific validity of the problem formulation is agreed upon and consensus exists about the significance and meaning of knowledge (see Table 2.2). This scientific validity has two components, agreement and scientific acceptability as far as possible.

Improvement of joint image building (explained in the former subsection) is one of the aspects contributing to the development of negotiated knowledge. But to further the creation of negotiated knowledge it is also important that usable or useful knowledge is developed [Koppenjan & Klijn, 2004]. Van de Riet [2003] describes that knowledge is useful if it can pass the test of scientific acceptability and is relevant to the policy debate, since it considers the wide variety of problem perceptions and comes at the right time. Taking into account a wide variety of problem perceptions, requires a broad initial scope for research taking into account multi-perspectives. Neglecting stakeholders might result in superfluous knowledge which is scientifically valid, but irrelevant for the policy process. Too much focus on stakeholder support might result in the production of negotiated nonsense. This is knowledge which is scientifically invalid. De Bruijn *et al* [2002] add that another risk of decision-making processes is that the process is not innovative since most recent insights are not used.

It is important to realize that knowledge which is relevant to a specific context is not always available, but that existing knowledge often needs to be interpreted and fitted to the local situation. Knowledge from different sources – science and practice – can be used to create valid and useful knowledge. Knowledge from science is formal, explicit scientific knowledge based on observations. Knowledge from practice is often practical knowledge of stakeholders based on experiences and knowledge about the area [Eshuis & Stuiver, 2003]. Strong aspects of practical knowledge is their precision and empirical support, weaknesses are subjectivity and their direct relation with the context [Van Buuren, 2006].

Another aspect of the creation of negotiated knowledge is that knowledge and information is exchanged between stakeholders and researchers and within these groups [Koppenjan & Klijn, 2004]. In other words, different sources of knowledge should develop individual, but should also adapt towards the process [Van Buuren, 2006]. More concrete it implies that experts should be involved in the process, so that their activities are interwoven with the process, but to prevent subjectivity, their roles should be separated from the process [De Bruijn *et al*, 2002]. Negotiated knowledge is also developed if parties do have the opportunity to contribute with their own information and values to the process [De Bruijn *et al*, 2002]. This is also called ‘joint fact-finding’. This is that ‘actors with differing viewpoints work together to develop data and information, analyze facts and forecasts, develop common assumptions and informed opinion, and finally, use the information they have developed to reach decisions together’ [Ehrman & Stinson, 1999, p. 377].

2.4 Synthesis

This chapter started with an explanation of the unstructured input and complex context of the process of problem structuring. Problems are unstructured if knowledge is uncertain and stakeholders do not agree upon objectives and knowledge. The context of a problem may be complex since many diverse elements in the natural and human context are interdependent of each other. For this type of problems, an analytical approach (with a central steering actor, determining the objectives) is not effective, but a process management approach should be adopted taking into account the existence of mutual interdependencies among stakeholders. This is exactly what is done in interactive decision-making processes.

Problem structuring is regarded as a process that starts with a complex, (partly) unstructured problem (*input*) and finishes with a joint formulation of the problem and directions for solutions (*substantive outcomes*). Ideally, the outcome of problem structuring is 'negotiated knowledge'. This is knowledge for which stakeholders agree upon the scientific validity, significance and meaning. It is also knowledge which can ideally pass the test of scientific validity. Formulations of problems are highly subjective, social constructions based on perceptions about the existing situations, their causes and consequences, their future developments and potential solutions. In the process of problem structuring stakeholders with different problem perceptions are interacting with each other and exchanging information. The creation of negotiated knowledge requires that content and process are interwoven; that problem perceptions of stakeholders will tend to converge so that they give the same meaning to research and that they are willing to reach a consensus. This brings us to the conclusion that interaction, problem perceptions and knowledge are central elements in the process of problem structuring. These conclusions are also translated into a conceptual model, which is presented in Figure 2.7.

As a starting-point for the conceptual model, insights from the network theory and the models developed by van Buuren [2006] and Koppenjan & Klijn [2004] are used (see also Figure 2.3 and Figure 2.4). Based on these models it is assumed that the process of problem structuring develops along three tracks. These tracks are interaction, problem perceptions and knowledge. From a network perspective, *interaction* can be interpreted as games between different actors. A game consists of series of interaction. During a game every actor aims to influence problem formulation, solutions and procedures. Interaction takes place in the context of a policy arena, the activated parts of the policy network. *Problem perceptions* are the images stakeholders have of their environment and of the problems and opportunities within it. People may have diverging perceptions about the same situation. Diversity in problem perceptions also stems from diverging interests among stakeholders. The interests and perceptions of reality together determine the objectives of stakeholders for the ongoing process i.e. the outcomes they want to achieve. Perceptions are developed within stakeholder networks. *Knowledge* refers to the establishment of facts through research activities or exchange of information before or during the process. Knowledge is developed in a knowledge arena, this may be scientific knowledge arenas, but also be less formal arenas.

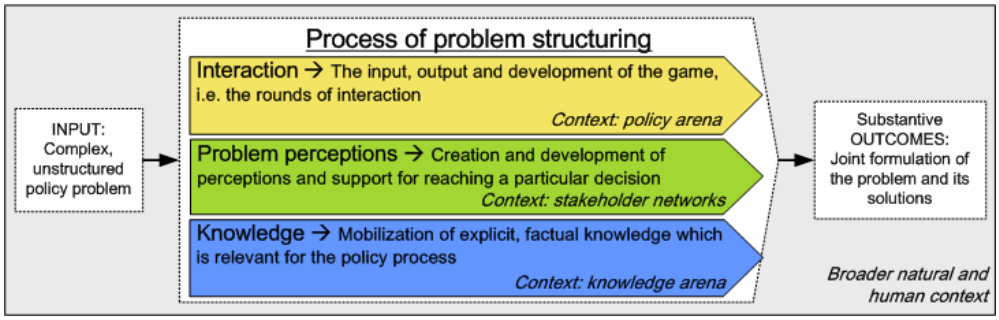

Figure 2.7 Conceptual model for problem structuring in interactive decision-making processes

3 Introduction of the case studies

To get insight in the process of problem structuring, theory about problem structuring is translated into a conceptual model. This model is tested in two case studies. The first case study 'Tholen & St. Philipsland' (Case 1) concerns a broad discussion about freshwater for agriculture on two islands located in the Province of Zeeland. The second case study 'Southwest Rijnland' (Case 2) is about the management of sediment in an area governed by Water Board Rijnland (HR) located in the Province of South-Holland. Both cases are interactive decision-making processes and were partly managed by process managers from TNO. This chapter starts with a section about the research strategy. In this section the choice for case study research, the choice for the case studies and the research methodology is explained. The second section provides an introduction in the field of water management and the cases. This chapter closes with methodological aspects of case study research, such as data-collection and the validity of the case studies.

3.1 Research strategy

The research strategy for this research is that first a conceptual model is derived from theory, which is used and tested through case study research. This section firstly explains the choice for case study research. Subsequently, the choice of the case studies is explained. The last subsection describes the research methodology and questions guiding the analysis of the case studies.

3.1.1 Choice for case study research

Case study research can be characterized by a few research units chosen selectively. Other features of case study research are that observations are open and that it generally aims to provide qualitative data and in-depth information [Yin, 2003]. This study is an explorative and explanatory study, since not much has been written about problem structuring in the context of interactive decision-making processes. Case studies do fit this type of analysis, since only a little degree of pre-structuring is needed. Another advantage of case studies is that it provides a holistic view of the research object; this also fits the objectives of an explorative and explanatory study. Besides this, case study results are often more easily accepted by 'the field' than other types of quantitative social research. A possible disadvantage of case study research is that the results may lack external validity [Verschuren & Doorewaard, 2004]. This aspect is explained further in subsection 3.3.3.

3.1.2 Selection of the case studies

The choice of the first case study was not very well considered by the researcher. Actually, the first case study was already selected, before the theoretical framework was completed. An important feature of the first case is that it is designed as an interactive decision-making process. Other features are that the natural environment of the problem addressed is complex, future developments are uncertain, and stakeholders with different perceptions are involved.

In case of an explorative study Verschuren & Doorewaard [2004] advice to search for similar cases, so that it is possible to draw some conclusions. Criteria taken into account in the selection of the second case study are the time planning of the case (preferably the project is finished already), the availability of information about the problem per-

ceptions, and that the project addresses preferably a water management problem and is designed as an interactive decision-making process. Within TNO, the project 'Dredging in Southwest Rijnland' fitted these selection criteria. The interactive process was finished already, stakeholders with diverging perceptions were involved and the project was closely monitored. The only disadvantage of the case is that the process is not designed exactly the same as the first case study project.

3.1.3 Research methodology and questions

To support the analysis of the case studies, the conceptual model was introduced in subsection 2.4 (see also Figure 2.7). The conceptual model describes the process of problem structuring along three tracks: interaction, problem perceptions, and knowledge. In the case studies, these tracks are analyzed individually, in relation with each other and in relation with the context. Questions addressed in the case studies are:

1. What are the background and the context of the interactive decision-making process?
2. How did the interaction and knowledge develop during the process and which actors were involved?
3. How did individual problem perceptions develop given stakeholders' interests and the network they are part of and/or represent?
4. How did interaction and knowledge contribute towards the development of substantive outcomes, i.e. formulation of the joint problem and its solutions?

The first question addresses the context of the process of problem structuring; these are the physical context, the background, history, objectives etcetera. This context is not described in the conceptual model, since this model only describes the different tracks of the process itself. It is nevertheless important to take these aspects into account, since external developments might influence the process.

The second question is about the development of and the actors involved in interaction and the development of knowledge. For the analysis of interaction, the analogy of the 'rounds model' or 'game analysis' is used as a starting-point. This analogy focuses on important breakthroughs and stagnations [e.g. Klijn, 2005; Klijn & Koppenjan, 2004]. According to Van Buuren [2006] in the 'establishment of facts' it is also possible to distinguish different rounds. He also explains that the development of facts covers the development of formal scientific knowledge and empirical knowledge. Actors may be sponsors, research teams, experts, stakeholders, and citizens [Webler *et al*, 1995. In: Ridder *et al*, 2005]. Several tools are available to analyze actors involved in water resources management, see e.g. Hermans [2005]. In the case studies a more intuitive approach is chosen, with a focus on the background, relations and interests of actors.

The third question concerns the analysis of problem perceptions of stakeholders participating in the interactive process, given their background and social relations. Stakeholders are 'all individuals, groups or organizations that are directly concerned by actions that others take to solve the problem/deal with the issue' [Gray, 1989. In Ridder *et al*, 2005]. The difference between a stakeholder and an actor is that a stakeholder is directly affected by the problem or solutions, actors may also be process managers or professional experts. In subsection 2.3.2 several methodologies have been presented to distinguish different types of stakeholder perceptions. These methodologies will not be used directly in the case studies. Initially, analysis of problem perceptions focuses on stakeholders' interests and their perceptions of reality. Perceptions of reality are regarded as problem formulations including formulations of the problem, expected situa-

tion, directions for solutions and so on. In the reflection attention is paid to actor typologies and their perceptions. It was not possible to analyze the development of problem perceptions in the second case in the same detail as is done in the first case, simply because not enough information was available.

The last research question is about the development of substantive outcomes. Attention is paid to the developments in the framework for discussion, the present and future situation (including expected developments), and the direction for solutions. Analysis of the definition of the problem and the development of this definition over time is also part of the analysis of problem structuring carried out by Boogerd [2005].

The case studies are subsequent studies; this implies that the second case is studied in relation to the results of the first case study. The approach of the second case does not differ from the approach of the first case, but the analysis is more focused.

3.2 Complexity of water management issues

This section explains why the water management issues addressed in the case studies are complex problems. First an introduction will be given in the policy field of water management. The second subsection describes the issues addressed in the case studies.

3.2.1 The policy field of water management

Water management in the Netherlands takes place at all levels of authority. Water management is the care of national government, provinces, municipalities and Water Boards. At national level the Ministry of Transport, Public Works and Water Management (Min. V&W) directs the policy. Within this ministry the directorate-general develops policy for national and regional water systems. For the national water system, this policy is executed by the Public Works Department (RWS). At regional and local level water management tasks are carried out by provinces, municipalities and Water Boards. Water Boards are functional decentralized administration bodies with their own governing body and financial structure. In the Netherlands, there are 37 Water Boards each responsible for tasks in the field of water control care. Officially it is the responsibility of provinces to set up, discontinue and control Water Boards. Provinces and municipalities do also have responsibilities with regard to e.g. groundwater and urban water management.

Table 3.1 Formal tasks of some governmental bodies

Body	Task
Min. V&W	Directs national policy for Transport, Public Works and Water Management
DG Water	Development of water policy of national and regional water systems within the ministry of V&W
RWS	Executive body for the ministry of V&W for the national water systems
Water Boards	Management of quality and quantity in regional water networks
Min. LNV	Directs national policy for Agriculture, Nature and Food Quality
DLG	Executive body for the ministry of LNV, mainly occupied with regional implementation
Min. VROM	Directs national policy for Housing Spatial Planning and Environment
DG Space	Development of national spatial planning policy
Provinces	Among others responsible for provincial spatial planning and groundwater
Municipalities	Among others responsible for local spatial planning

Water management is strongly interlinked with spatial planning and management of land use functions. This is why in the case studies also the Ministry of Agriculture, Nature and Food Quality (Min. LNV), the Ministry of Housing, Spatial Planning and the Environment (Min. VROM) the directorate-generals (DG) of Space and Water and the Government Service for Land and Water Management (DLG) are also mentioned. Provinces and municipalities do also have responsibilities in the field of spatial planning. The tasks of the government bodies mentioned in the case studies are also summarized in Table 3.1.

3.2.2 Issues addressed in the case studies

The issue addressed in the broad discussion 'Tholen and St. Philipsland' is the freshwater supply for agriculture. The freshwater supply in this area depends on the freshwater Volkerak-Zoomlake (VZ-lake), see Figure 3.1. The lake is supplied with river water from the Hollands Diep and used for navigation, recreation, and water supply for agriculture. The VZ-lake itself is governed by the Public Works Department and the local water system on the islands by Water Board 'Zeeuwse Eilanden' [www.volkerakzoommeer.nl, January 2006]. The distribution of water to Zeeland and to South-Holland is laid down in agreements by the Dutch government. During summer periods, the inlet of freshwater to the islands if often cut off because of the poor water quality. An important cause of this poor water quality is the nutrient supply from upstream areas and the lack of flow through.

Figure 3.1 Location of the VZ-lake. Source: www.volkerakzoommeer.nl

The topic of the interactive planning process in 'Southwest Rijnland' is sediment management. Water Board Rijnland is one of the water managers in this area, see Figure 3.2. Currently they have a backlog with their sediment management and climate change puts a higher demand on the water system. This is why they need to remove a large amount of sediment from their water system within 15 years. The cause of the backlog is related to the fact that HR is not able to deal efficiently with other stakeholders. To create support for their sediment management and to create innovative solutions they decided to start an interactive process. HR is not the only one with dredging responsibilities in this area. This is why they need to cooperate with other water managers. They also have to deal with users of the water system (fishery, water sports etc.) and landowners. Landowners do have a duty to accept sediment of a good quality on their land-

sides, but one of the problems is that sediment often has a poor quality. This is the result of diffuse pollution sources.

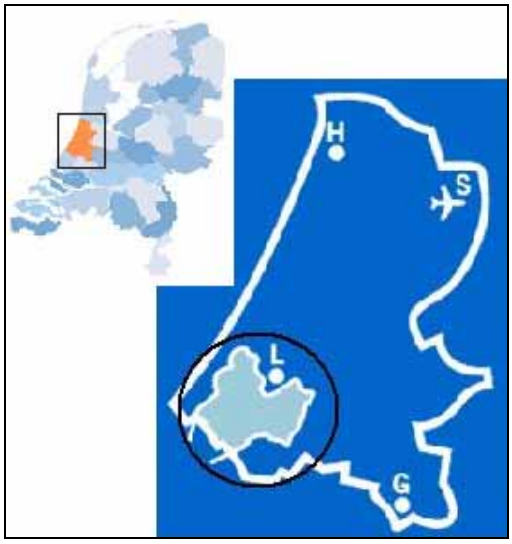

Figure 3.2 Location of Southwest Rijnland as part of Rijnland (L=Leiden, H=Haarlem, G= Gouda, S = Schiphol)

As explained in the former subsection, the development of policy and legislation and water management is carried out at multiple levels of government. The descriptions of the case studies show that water systems do have multiple users and that pollution upstream affects the water quality downstream. This is why the issues addressed in the cases are complex. Different stakeholders and government bodies have power or interests, the water system itself is complicated with upstream-downstream relations and managed at multiple levels of government.

3.3 Data-collection and validity

This section starts with a description of the data collected to analyze the case studies. The second subsection goes into the internal validity or the reliability of each of the case studies. The last subsection goes into external validity of the results of the case studies together.

3.3.1 Data collection

3.3.1.1 Case study 'Tholen & St. Philipsland'

The analysis of Case 1 started with observations done during two workshops and one excursion. During the research activities, there has been close contact with several members of the project team. They have also been an important source of information. The experiences based on observations done during the workshop have been an important source to guide the analysis of reports and documents and for the interpretation of perceptions. It provided some 'feeling' about what may have been moments of stagnations and breakthroughs in the tracks interaction and problem perceptions. Besides this, also written documentation about the interactive process was available in the form of minutes and person-specific information about their ideas, prioritization of chances and bottlenecks, and preferred solution. The minutes together with the observations provided general information about the developments in the process. It was an absolute challenge to get insight in the problem perceptions of process participants. For this the

following data sources have been used: person-specific information gathered during the workshops, articles in newspapers and magazines, e-mail conversations, the internet in general, and the interviews carried out by TNO before the process and by the *Vrije Universiteit* (VU) afterwards the process. To get insight in the stakeholders and background of the process, policy documents, news letters, the internet and the interviews have been important data sources. To get insight in the development of research and substantive outcomes at least the following sources have been used: research reports, an information note written to support the process and minutes of meetings. To verify the analysis of this case a draft version of the case study report has also been read by a member of the project team, who was not involved in the supervision of this research.

3.3.1.2 Case 'Southwest Rijnland'

Case 2 was analyzed only after the interactive process was finished. This had the disadvantage that it was not possible to attend workshops or other activities. For the analysis it was no problem, since students from the School of Public Administration of the Erasmus University in Rotterdam together with TNO wrote down observations, carried out interviews and three questionnaires. Although the purpose of their researches differ from this research, the gathered information was still useful. They investigated trust and commitment during interactive decision-making processes respectively the contribution of the interactive process to the solution of sediment management issues. Since, TNO also wanted to get more insight in the role of knowledge in interactive decision-making processes and test different perspectives on sediment management. In the questionnaires, attention is paid to aspects such as perceptions, trust, commitment, and increase in knowledge. The available observations have been extended with observations from process managers from TNO. These observations have been collected through five interviews. Besides this minutes of meetings were available, relevant research reports and policy documents, and of course articles from newspapers and magazines and information from the internet. To get insight in the history and background of the process, articles from newspapers, policy documents, research reports and the website of HR have been used. The development of knowledge and interaction, the stakeholders involved and the substantive outcomes has been analyzed using the minutes of meetings, research reports, observations from process managers and the master students, and the internet. The interviews, the questionnaires and observations have been used to get insight in interests and problem formulations. Unfortunately, these sources did not provide very much information about the development of problem formulations, this is why not much attention is paid towards this aspect in the second case study.

3.3.2 Internal validity

When collecting data for a case study it is important to use different methods and different sources. This is also called triangulation of sources and methods [e.g. Yin, 2003]. Triangulation also supports the development of a holistic view of the case. The former subsection shows that in both cases studies observations, documents, interviews, and reports have been used for the analysis. For the second case also results from questionnaires have been used, but it was not possible to triangulate these results. But generally, the analysis rests on at least two sources. Besides this, the case study reports have all been read by process managers who were directly involved in the process.

One of the most 'tricky' aspects of the case studies is the analysis of the development of problem perceptions in the first case. To describe this, different kinds of sources have been used to get insight in the perceptions of people at different moments. E.g. the description of perceptions in the beginning of the process is based on an individual inter-

view and during the process on a prioritization made during a group-session. The most common way to analyze perceptions is through questionnaires distributed during the process, eventually completed with observations or interviews. To design questionnaires, a lot of insight is needed on beforehand in the possible perceptions of people and expertise from the researcher. Interviews held during the process would have fit the objective, but in that case many interviews would have been needed. This would also affect the development of the process itself. Since, the processes have only been analyzed after the processes were finished, this was practically also not possible. A possibility of cross-checking the results achieved from other sources would have been to conduct interviews once the process was finished. This approach assumes that a study can be replicated through the use of alternative research processes and that this reproduction gives the original study credibility. In case of social phenomena this is nearly possible, since it is not possible to replicate original conditions [Strauss & Corbin, 1998, p. 266-267]. Besides this, the decision-making process is still going on, so goals people want to achieve are also playing a role. The interviews carried out by the VU, show that what people say afterwards differs from what they say during the process. It is even questionable if it is possible to reconstruct perceptions from the past, since perceptions develop gradually and influenced continually by new experiences and developments. The advantage of the used approach is that the process has not been influenced and people were not aware that the things they said would be used to analyze their perceptions. The results are completed with observations from the researchers and from several process managers. Given the circumstances it was probably the best way to get insight in this.

Besides triangulation there are also other ways to improve the reliability of the case studies. One way is to create a case study database. In this research, a case study database is made on a CD-ROM and a background report. In the database all information used is laid down as much as possible. Another way is to maintain a chain of evidence. This is that an external observer is able to follow the chain of evidence from research questions to conclusions. This aspect has also been paid attention to, also through the case study database and the use of sufficient citation. Strategies in the case studies to develop an adequate strategy are also the use of theory and a descriptive approach has been chosen [Yin, 2003].

3.3.3 External validity

External validity is about the question if the results from the case study can be used to get insight in the process of problem structuring. Gummesson [2000] explains that validity and reliability are both closely related to generalization. There are two types of generalization; the first is about how common these types of systems and interaction patterns are and the second is more an indication of mechanism one suspects also to exist in other cases. It is not possible to derive conclusions about how systems work, based on two, not even very similar, cases. But it is possible to use in-depth studies to reach the last type of generalization. This is also what type of generalization is aimed at in this research. Gummesson identifies four quality criteria for case study research:

- To what areas do the results apply?
- How closely does the case study represent the phenomena the researcher aimed to in the case study?
- Do other research findings confirm or disconfirm the findings?
- Do results bear out or disagree with extant theories or concepts?

In the conclusions in Chapter 7, these questions will be reflected upon to give an indication of the generality and validity of the case study results.

4 Case study 'Tholen & St. Philipsland'

This chapter describes and discusses the first case study. Case 1 concerns a broad discussion about freshwater supply for agriculture at Tholen & St. Philipsland. The first section gives an introduction in the background and context of the project. Section 4.2 describes the actors involved in the interactive process, the course of the interactive process and the development of knowledge. The third section describes the problem perceptions of different stakeholders and how they developed during the interactive process. Section 4.4 explains how a joint formulation of the problem and it solutions have been developed during the interactive process. The conclusions that can be drawn on problem structuring in interactive decision-making based on this case are presented in the last section. The description of the case is quite extensive. If you want to go faster through the case description, it is also possible to read section 4.1, the reflections at the end of section 4.2, 4.3 and 4.4 and the conclusions. Annex A, B and C are part of this case study and provide respectively an overview of the process participants, interview reports, and the constitution of the policy network.

4.1 Background and context

This section gives an introduction into the physical context of the problem, the history of freshwater supply on Tholen and St. Philipsland, and the context and objective of the broad discussion. The water system and islands in the South-Western Delta are also visible in Figure 4.1.

4.1.1 Physical context

In 1953, a destructive flood inundated large parts of the Dutch South-Western Delta. The impacts were devastating; about two thousand people got killed. To prevent the repeat of this kind of disaster, the Dutch Government decided to put the Delta Works in place. The realization of these works made the South-Western Delta safer, more accessible and created opportunities for drinking water supply and agriculture because several freshwater basins were also created. Unfortunately, the Delta Works also resulted in the disappearance of the characteristic freshwater-saltwater transitions and estuarine dynamics, a degradation of the water quality and ecological problems. These ecological problems are excessive algae growth in the Veerse Meer, erosion of intertidal areas in the Oosterschelde, water quality problems in the Binnenschelde and Markiezaatsmeer, deposit of contaminated silt in the Haringvliet and Hollands Diep, anoxia in lake Grevelingen and occurrence of blue-green algae (cyanobacteria or *blauwalgen*) in the VZ-lake [Delta Provinces, February 2003; Min. VROM, LNV, V&W and EZ, 2006].

On Tholen & St. Philipsland the freshwater supply for agriculture depends on the freshwater supplied by the VZ-lake. In 1987 this lake was created by the construction of the Philipsdam, Oesterdam, Markiezaatskade and Philipsdam. In the beginning, the water quality of the lake was good. But in the beginning of the nineties the water quality of the lake deteriorated because of blue-green algae. Blue-green algae are a nay form, bad-smelling scum which may produce toxins (microsystine). They may occur during warm periods in stagnant nutrient-rich surface water. For the areas surrounding the VZ-lake in October 2002 the newspapers reported the mass mortality of about 4,300 water birds as a result of contamination with toxins released from deceased blue-green algae [NRC, 9 October 2002]. To prevent contamination of regional water systems the inlet of water is

often cut off during the periods that blue-green algae occur in the VZ-lake. For example, for Tholen & St. Philipsland the inlet of freshwater from the VZ-lake was cut off in June 2003 and July 2004. Despite the hot end dry summer of 2006, the inlet of freshwater was cut off relatively late in this year, only at the 19th of July. According to agrarians, this made the year 2006 (the year of the broad discussion) a good year for the agricultural sector.

Figure 4.1 Map of the Delta

4.1.2 *History of freshwater supply on Tholen & St. Philipsland*

After the creation of the VZ-lake, the consultancy firm Heidemij developed a basic water management plan for agriculture on the islands. This plan was designed to allow water level management on the islands and has been put into practice starting from the beginning of the nineties. In 1995 these plans have also been worked out at parcel level for Tholen (Plan Dekker) and for St. Philipsland (Heidemij). Agrarians regard the investments in an adequate freshwater supply as a risk since it is uncertain if it will result in higher benefits. Only for intensive cultivation a direct link exists between freshwater and benefits. This is why some agrarians are not even willing to pay about freshwater and why the majority of the agrarians are reserved about the payment for a reliable freshwater supply system. This lack of consensus among agrarians made that the plan was rejected in a general meeting from Water Board 'Zeeuwse Eilanden' (WSZE).

In 2000, about 45 agrarians collaboratively asked WSZE again to get approval for the realization of an alternative freshwater supply. In 2001, these agrarians developed an alternative plan with ZLTO and WSZE which was supposed to be approved by WSZE in 2002. More than 75% of the agrarians owning more than 75% of the cultivated area committed themselves to this plan. In this plan the payment of water is related to the quality. Also agrarians at St. Philipsland showed their interest to realize a detailed freshwater supply planning. Unfortunately, at that time problems with blue-green algae came up. This is why WSZE only approved the realization of the plan for a test area for

a period of two years. During this test period the water is supplied for free, but there is no guarantee that freshwater is supplied all year round. In 2005, WSZE decided to continue the supply for the test area for another two years under the same conditions [Stuyt *et al*, 2006, p. 95-98, 175-178]. The test area covers about 1000 ha and is located in the Southeast corner of the island Tholen.

4.1.3 The context and objectives of the 'broad discussion'

The broad discussion developed within the framework of existing policy about the Dutch Delta. According to the Nota Ruimte [Min. VROM, LNV, V&W and EZ, 2006, chapter 4] the policy of the Dutch government is that they want agriculture and fishery to remain an important function in the Delta, but developments in this area also 'oblige the reconsideration of the agricultural use in this area' [p.30]. The Dutch Government regards the re-establishment of estuarine dynamics in the Delta as 'an important solution both for a sustainable restoration of the ecological quality, the preservation of safety against flooding, and the transportation over water' [p. 31]. The policy of the Province of Zeeland is presented in an Environmental Planning [Province of Zeeland, June 2006]. This policy document states that the provincial policy aims to preserve and to strengthen the agricultural production. They also want to promote the sustainable and safe agricultural production and to stimulate the production of freshwater demanding crops. But they are not willing to support technical measures for the construction of freshwater supply systems.

Water management policy also played in important role in the broad discussion. Contemporary, water management in the Netherlands is strongly affected by the realization of the objectives of the European Water Framework Directive, WB21, and Room for Rivers (RvR). The objective of the EWFD [European Commission, 2000] is the improvement of a sustainable use of water systems and the protection and improvement of water quality. Among others, this directive states that all surface water should have an adequate water quality, which is currently not the case for theVZ-lake. In the planning policy RvR, the VZ-lake is appointed to store river water in case of extremely high discharges. If this happens, the water will remain in the VZ-lake for about two to eight days [Website Ruimte voor de Rivier, March 2007].

The direct occasion of the broad discussion is that the Dutch Cabinet put a first step towards estuarine dynamics by deciding to open the sluices of the Haringvliet in June 2003 *(Het Kierbesluit)*. In 2004, also the connection between the Veerse Meer and the Oosterschelde was partly opened. In a letter informing the Provinces of Zeeland, South-Holland and North Brabant (Delta Provinces) officially about 'Het Kierbesluit', the State Secretaries of the Min. V&W and LNV asked the provinces to start a fundamental discussion with different stakeholders about the connection of a more natural Delta and a more natural, sustainable freshwater situation for agriculture. At that time the Delta Provinces were already working together to realize a more sustainable Delta (see also Annex C). For this specific purpose they established the working group 'Freshwater supply Delta agriculture' *(Zoetwatervoorziening Deltalandbouw,* ZD). After some research was carried out on behalf of this working group, the Delta Council decided to start an exploration how to carry out a fundamental discussion on this topic in the Delta. In 2004, this task was granted to a consortium of TNO, the National Institute for Coastal and Marine Management (*RIKZ)*, WL|Delft Hydraulics and DLG. In 2006, they were also asked to start a pilot-project for Tholen & St. Philipsland. The objectives of this pilot project and the broad discussion in general are:

'A fundamental discussion with all relevant parties about a more natural, sustainable freshwater situation in a more natural South-Western Delta' [Reijs, February 2006, p. 3], and 'to develop a shared insight and agreement about the most desirable direction for solutions or development' [Kick-off Meeting, 31 May 2006].

The late chairman[5] of the Delta Council explained that in the discussion climate change, developments in the agricultural sector and changes in the Delta water system should be taken into account. The desired water management for the VZ-lake is another issue, which is discussed in the 'Planning-study VZ-lake' (see also Annex C). The broad discussion should support the decision-making process of the VZ-lake, by providing insight in consequences and possibilities for agriculture on Tholen and St. Philipsland. The process is designed in a way that parties will together develop solutions [Kick-off meeting, 31 May 2006]. The discussion is partly funded by the program 'Living with Water' (Leven met Water, LmW). This implies that another explicit goal of the discussion is formulated as 'social learning': learning from each other and developing together feasible solutions [Ridder, Mostert and Wolters, 2005].

In November 2006, the outcomes of the discussion were presented towards the Delta Council. It was concluded that all process participants were willing to realize an adequate freshwater supply system for Tholen & St. Philipsland. This should be realized through the supply of freshwater from the Hollands Diep towards Tholen, via the service water network of West-Brabant in combination with a pipeline or chiffon underneath the Rijn-Schelde Channel. Subsequently, the VZ-lake could be coupled with the Oosterschelde, which is a first step to the re-establishment of estuarine dynamics in the VZ-lake. The results also contain an estimate of the required capacity of the freshwater supply, the costs, and a proposal for the distribution of the costs. The agricultural and nature sector expressed the wish to lay down these conclusions in a covenant with the Delta Council and all other parties involved [Reijs, November 2006]. Presently, the Delta Council and the process participants are still deliberating with each other about the execution and continuation of the results of the interactive process. Among others, a questionnaire has been distributed to get an indication how many agrarians support the results.

4.2 Interaction and knowledge

This section describes which actors were involved in the interactive process and the development of the process. The first subsection describes the different actors involved in the discussion. Subsequently, the different rounds of interaction and research activities are described. This section closes with a reflection on the development of interaction and knowledge.

4.2.1 Actor analysis

It should be realized that many of the actors involved in the interactive process also participate in one of the other numerous consultation bodies in the Delta. In 2002, Resource Analysis [October 2002] stocked at least 109 consultation bodies in the Dutch Delta. The Delta Council is just one of these bodies. The implementation of their vision 'Delta on Sight' on Tholen & St. Philipsland is strongly influenced by the 'Planning study VZ-lake'. Some of the actors involved in the broad discussion are also participat-

[5] In the summer of 2006, the chairman of the Delta Council passed away. At the end of September he was succeeded by another delegate of the Province of Zeeland.

ing directly in the Planning study VZ-lake and 'Delta on Sight'. The composition of these consultation bodies is summarized in Annex C. The composition of the broad discussion is presented in Figure 4.2. Actors involved were participating as process managers, process participants or professional experts.

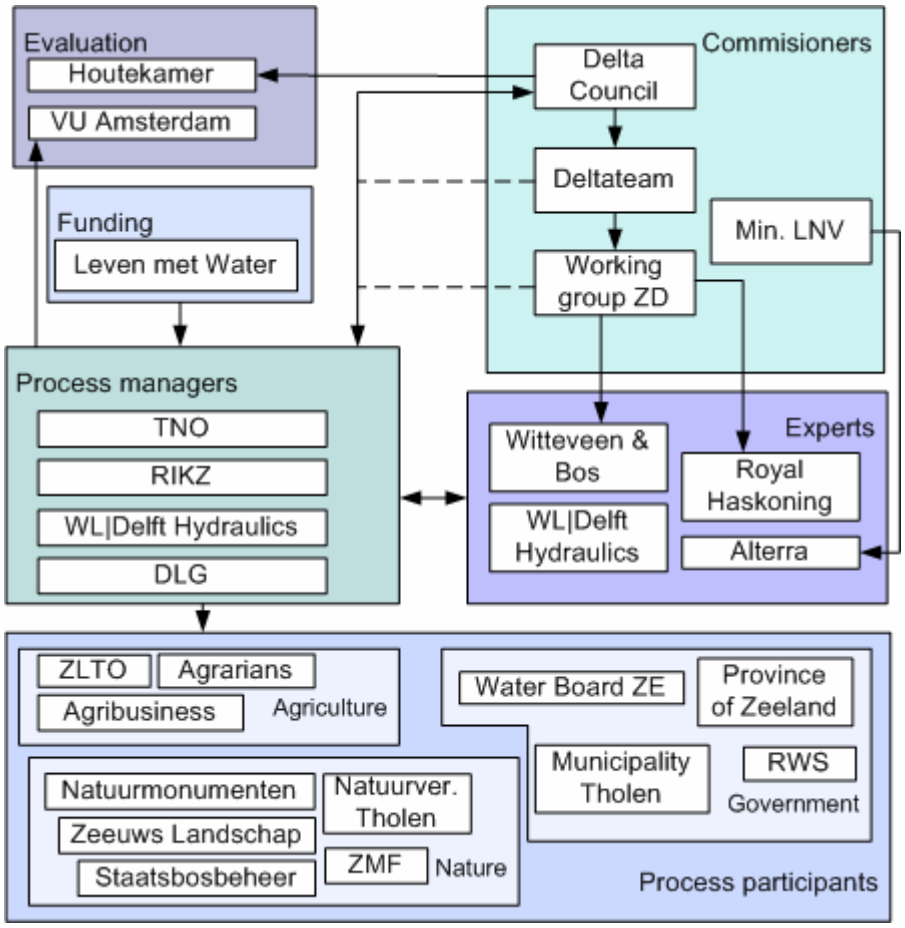

Figure 4.2 Actors involved in the interactive process

4.2.1.1 Process management

During the preparation and design of the process, process managers from TNO, WL|Delft Hydraulics and RIKZ were involved. They had also professional expertise about the content of the discussion. During this phase, the working group ZD was the formal commissioner of the project team. For the execution of the broad discussion, the Delta Council itself was the formal commissioner. After the exploration phase it was agreed upon that DLG also joined the project team. DLG is the executive body for the Min. LNV, translating policy concerning the planning of recreation, nature, water and agriculture in green areas into concrete projects. For the communication towards the Delta Council, a project manager was appointed. This person is/was also a member of the Delta team and used to be an employee of the Province of Zeeland. The objectives of the discussion, made this pilot project also fit the objectives of the program 'Leven met Water'. Project in this program are funded by the national government and partners participating in the program. The broad discussion is a pilot-project in the LmW program and therefore sponsored by the LmW program and the organizations represented in the project team.

When the discussion was finished, it was evaluated by the VU and by Houtekamer. The evaluation of the VU was carried out in the context of the LmW program. The evaluation focuses on the extent to which the process has been an open dialogue which is a requirement for social learning (an objective in the context of the LmW program). On behalf of the Delta Council, an evaluation was also carried out by Houtekamer, a self-employed person, providing coaching and counseling. Topic of this evaluation was the method of working and the results of the pilot Tholen & St. Philipsland to learn lessons for sequent discussions.

4.2.1.2 Process participants

The participation of process participants in the broad discussion is also described in Annex A. For the discussion, it was possible to divide the participants into three groups: agriculture, nature and government. The participants from the agricultural sector were selected by the water specialist from the Agriculture and Horticulture Association for South Netherlands (ZLTO). About eight individual agrarians (AG) actively participated in the discussion, two representatives from ZLTO and one representative from supplying and fetching organizations, the agribusiness (AB).

The nature sector was represented by five representatives from five nature conservation organizations. They were selected by a representative of the Zeeuwse Environmental Federation (ZMF). ZMF is a coordinating, independent nature and environmental society for the Province of Zeeland. They asked the three major terrain managers in the South-Western Delta to participate: *Staatsbosbeheer* (SB), *Natuurmonumenten* (NM), and '*Het Zeeuws Landschap*' (ZL), and the local nature society (*Natuurvereniging Tholen*, NVT).

Several governmental bodies were participating in the discussion. Water Board 'Zeeuwse Eilanden' was invited as manager of the local water system. The municipality of Tholen (GT) also participated actively in the discussion. The province of Zeeland (PZ) and RWS-Zeeland were also represented during the workshops by a one public servant. These bodies are also participating directly in the Delta Council.

4.2.1.3 Professional experts

To support the discussion with respect to the content, the Min. LNV asked the institute Alterra from Wageningen University to carry out after agriculture in the Delta in the period 2004-2005 [Stuyt *et al*, 2006]. The discussion was also supported by studies written by the consulting firms Royal Haskoning [Van den Berg *et al*, July 2004] and Witteveen + Bos [May 2005] on behalf of the working group ZD. Royal Haskoning, Wittveeen+Bos and Alterra are all established consultancy firms or research institutes. On a regular base, they conduct studies for the European and the Dutch government [Websites Royal Haskoning, Witteveen+Bos, Alterra, January 2007].

Members from the project team were not only involved in process management, but also in the composition of a note in which the studies mentioned above are summarized. This note is called the *Tholenbundel* and was composed by the project team in cooperation with Alterra. It was sent to participants as a TNO-report. TNO is a Dutch organization for applied scientific research, developing knowledge in collaboration with universities and leading technology institutes. In the composition of the note also an employee from a specialist institute for coastal zone and marine management from Rijkswaterstaat (RIKZ). This institute gathers data, investigates and to gives advice to RWS. WL|Delft Hydraulics was involved in the composition of the Tholenbundel, but also wrote a study

about the most important bottlenecks with respect to the freshwater supply and developed maps with the use and supply of freshwater [Nolte & Otter, July 2005]. WL|Delft Hydraulics is an independent research institute and specialist consultancy that provides expert advice and technical assistance in water-related issues. DLG entered the project team after the Tholenbundel was finished.

4.2.2 Course of the interactive process

Several workshops, meetings and consultations were organized to support the interaction between different parties. This subsection explains the developments during the different phases of the process starting with an exploration until the formulation of the conclusions. The interactive process is summarized in Figure 4.3.

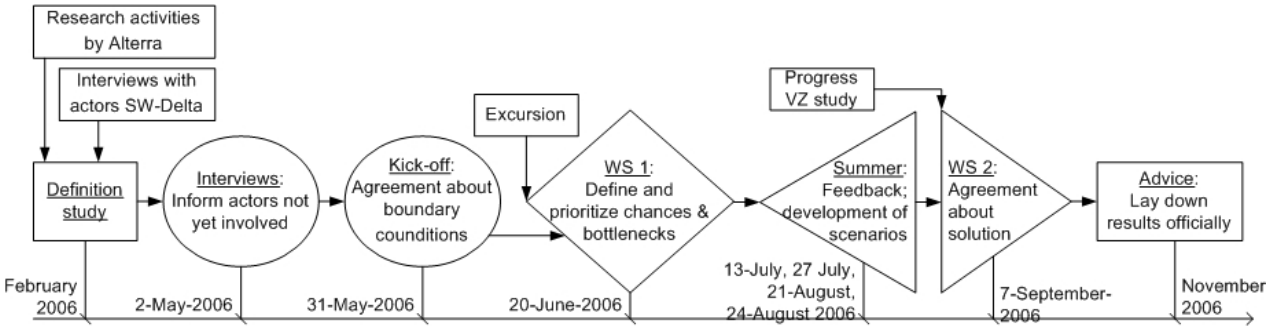

Figure 4.3 Overview of the rounds of interaction

4.2.2.1 Exploration

In November 2004, the need for a broad discussion about a sustainable freshwater supply for agriculture in the Delta was already discussed with employees from TNO and RIKZ. In the spring of 2005, an investigation of the freshwater situation in the Southwestern Delta was started by a project team consisting of TNO, RIKZ and WL|Delft Hydraulics. They integrated existing scientific knowledge and interviewed about twenty stakeholders. The results of this exploration were laid down in the Tholenbundel [Reijs, February 2006]. With the Delta Council and the working group ZD, the project team explicitly discussed the role and the ambition of the commissioner, the organization of the project team, the expected result, and the role of process participants. The process participants (including representatives from government) were obliged to commit themselves to the designed process approach (see Figure 4.4) and to the results of the process.

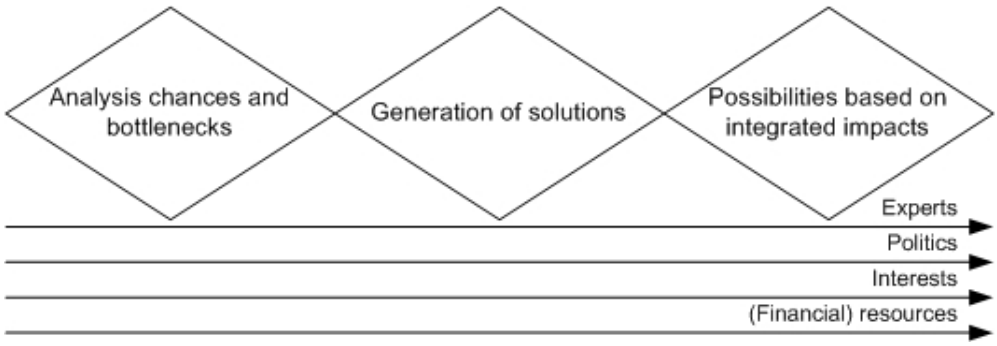

Figure 4.4 Schematization of the different phases of the process as presented during the kick-off

In the beginning of 2006, process participants were selected, provided with the Tholenbundel and consulted. Objectives were to provide all process participants with a common frame of reference, an equal basis of information and to get agreement about the framework for discussion. With different groups of participants the project team discussed the objective of the discussion, the developments to take into account, the policy context, and the process design. Agrarians expressed that they did not support all the information provided in the Tholenbundel, but they still wanted to participate in the process. The design of the process is based on several diverging and converging phases. Every phase starts with a broad scope, for which subsequently a selection, range or prioritization is made. None of the chances, bottlenecks or solutions is thrown out of the discussion; unless it is agreed upon that it is based on wrong assumptions. During the process input from experts, politics, interests of participants and (financial) resources do play a role.

4.2.2.2 Kick-off

During the kick-off meeting participants were informed again about the process design, the freshwater situation in the Delta, the policy context and the boundary conditions of the discussion. Participants also had the possibility to get acquainted with each other. During this first general meeting, some agitation came up among agrarians. They explained that they desire a freshwater VZ-lake and were not willing to participate in a discussion about a saltwater VZ-lake.

4.2.2.3 Workshop I

Preceding the first workshop (WS1), an excursion was organized by ZLTO and local agrarians through Tholen and St. Philipsland. During WS1, agricultural practices and possible chances and opportunities were discussed and prioritized in relation to three possible developments of the VZ-lake. These developments were based on three scenarios about the state of the VZ-lake by the year 2030. These scenarios and developments are:

- Autonomous development (AD), no changes in comparison with the existing situation, i.e. blue-green algae still occur in the VZ-lake in 2030
- The VZ-lake develops to a freshwater lake (FW) without nuisance from blue-green algae
- The VZ-lake develops to a lake with estuarine dynamics (ED)

The actual topic of discussion is which development is the most desired one. Which development is achievable or realistic is not a topic of discussion (this is discussed in the Planning Study VZ-lake). During WS1 every participant was able to express what they perceived as chances and bottlenecks. These chances and bottlenecks were subsequently clustered and a top-5 was selected by every participant. From the original list with chances and opportunities, some were removed because they belonged in the Planning Study VZ-lake, but none of the chances and bottlenecks related to the discussion was removed from the list.

4.2.2.4 Summer

During the summer period, participants had the possibility to consider the results from WS1 within their represented organizations. The project team also organized several working sessions with a delegation of the agricultural and nature sector and WSZE. During the working sessions the project team and participants reflected upon the results until then and possible directions for solutions were developed (see Table 4.1).

The first working session was with a delegation of the agricultural sector. In this session they started to develop directions for solutions and to estimate their possible impact on agriculture, nature and society. This les to six possible directions for solutions related to three scenarios for the future of the VZ-lake (①, ②, ③, ⑤, ⑦, ⑨ in Table 4.1). For the impacts of different directions for solutions a global estimate was made, i.e. very positive (↑↑↑), no change (↔) or little bit positive and negative (↑↓) [Working session I agrarians, 13 July 2006]. After this session, the results of WS1 and the working session with agrarians were discussed with a representative of WSZE. The results of this session were considered again with a delegation of the agricultural sector during a second working session. During this working session agrarians also estimated how freshwater supply is related to their incomes. Shortly after this working session, another session was organized with representatives from the nature sector. During this session, the nature sector decided that the realization of estuarine dynamics was much more important to them than nature on the islands. The project team also consulted the Province of Zeeland, Rijkswaterstaat, and the municipality of Tholen. The results of the summer period were delivered to all participants, together with the invitation for WS2.

Table 4.1 Matrix with different scenarios and related directions for solutions

Scenario	**I: Small investment (no extra transportation capacity)**	**II: Investments on the islands**	**III: Investments on the islands and external**
2006: Present Situation	Test area on Tholen		
2030: Autonomous development (AD)	① Test area on Tholen	② Freshwater for the total area on the islands	③ technical solutions for establishment of water quality, including extra transportation capacity
2030: Freshwater VZ-lake (FW)	④ *(Added during WS2)* Freshwater for the total area on the islands	⑤ Freshwater for the total area on the islands, including extra transportation capacity	⑥
2030: Re-establishment of estuarine dynamics (ED)	⑦ Saltwater for the total area on the islands, agriculture adjusts itself *(used to be scenario ⑧, ⑦ was do nothing)*	⑧ Bring agrarian to water, no extra transport capacity but desalinization, water basins etcetera *(added in WS2, used to be ⑦, adjustment of agriculture)*	⑨ Alternative freshwater supply system, including extra transportation capacity

4.2.2.5 Workshop II

WS2 started with an introduction of a representative of RWS-Zeeland about the developments within the Planning Study VZ-lake. He explained that the most recent insights were that a freshwater VZ-lake would not be able to solve the water quality problems in the VZ-lake. This announcement brought some agitation among participants from the agricultural sector, since they were still not willing to participate in a discussion about a

saltwater VZ-lake. After some deliberation with each other they decided that, despite these unfortunate developments, they still wanted to participate in the discussion.

At the start of WS2 the participants received information about the costs, benefits, and water demand related to the directions for solutions. During WS2 two new directions for solutions were added to the existing solutions. After the provided information was discussed, the participants were asked to vote for the direction for solutions they prefer. It was not possible to vote for solutions related to AD (①, ② or ③ in Table 4.1), since this scenario was only regarded as a transition phase. The result of the voting was that solution ⑤ and ⑨ had equal votes. It became also clear that only in case of ED (solution⑨) the nature and agricultural sector were able to reach a consensus and able to make a statement to the government. Realizing this, the agricultural sector and nature conservation organizations decided that they wanted to lay down the results of the process in a covenant.

4.2.2.6 Final conclusions

The final task of the project team was to lay down the results of the workshops in a concluding document. At the end of September 2006, the project team together with representatives from NM and ZLTO formulated some preliminary conclusions. These conclusions and a report of the process were delivered to the participants for consideration. The conclusion reads that solution ⑨ is the most desirable direction for solutions. This involves the construction of an alternative freshwater supply before ED would be realized. The agricultural and nature sector asked the Delta Council to work out this solution together in a covenant. The concluding document also describes how an alternative freshwater supply should be realized and estimates the capacity of the desired freshwater supply, the costs and the distribution of costs and the benefits for agriculture.

4.2.3 Development of knowledge

Besides interaction, the development of knowledge also played an important role during the process. The contributions made by different actors to the development of knowledge are summarized in Figure 4.5. Some knowledge was developed before the interactive process started and other knowledge was developed simultaneously with the interactive process.

4.2.3.1 Existing knowledge

Before the process started, all participants received the Tholenbundel. This note did not pretend to supply the participants with objective facts, but aimed to accelerate the discussion by providing a shared framework to all participants. The following research reports are referred to in the Tholenbundel:

- The study 'Freshwater supply Delta agriculture' (*Zoetwatervoorziening Deltalandbouw*) carried out by Royal Haskoning. The study indicates that for Tholen & St. Philipsland several technical measures can be taken to replace the existing freshwater supply of the VZ-lake [Van den Berg *et al*, 2004].
- The study 'Freshwater supply Reigerbergsepolder, a societal costs-benefits analysis' (*Zoetwatervoorziening Reigerbergsepolder: een MKBA*) carried out by Witteveen + Bos. This study shows how a costs-benefits analysis (CBA) can be carried out to select the most attractive freshwater supply in terms of costs and benefits [May, 2005].
- The study 'Transition and future Delta agriculture' (*Transitie en toekomst Deltalandbouw*) managed by Alterra. The study presents the developments to be ex-

pected, possible impacts on agriculture and market opportunities and is based on socio-economic research as well as technical models [Stuyt *et al*, 2006].

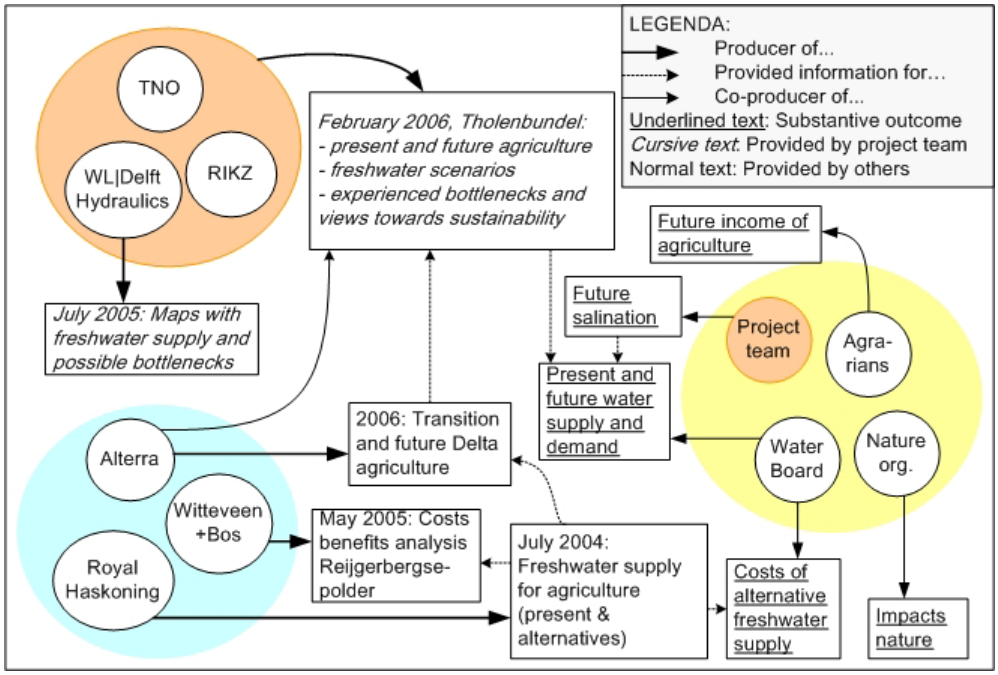

Figure 4.5 Development of the knowledge base

The scopes of all studies mentioned above were formulated in close cooperation with the working group ZD. The studies are not competitive, but build upon each others results. For instance, figures about the water demand of agriculture presented in the study by Royal Haskoning were quoted in the studies from Witteveen+Bos and Alterra (see the broken arrows in Figure 4.5. Royal Haskoning obtained this information from consultation meetings with and earlier reports of WSZE. The study carried out by Alterra has been the main source of information for the Tholenbundel. The Tholenbundel describes the objective of the discussion, the policy framework, the viewpoints of different stakeholders to the objectives of the Delta Council, the current agricultural practice and possibilities for the future, the possible scenarios for freshwater and the bottlenecks experienced by stakeholders in relation to freshwater. Besides the studies mentioned above, interviews with stakeholders carried out by TNO and policy documents from different levels of government were used. The Tholenbundel also contains maps representing the present freshwater situation. These maps were designed by WL|Delft Hydraulics and based on their study 'Freshwater situation for agriculture in the South-Western Delta' (*Zoetwatersituatie voor de landbouw in de zuidwestelijke Delta*) [Nolte & Otter, July 2005], which was carried out on behalf of RIKZ.

Besides the studies mentioned in the Tholenbundel, participants may also be familiar with other existing studies about the water system and agriculture in the South-Western Delta. Some examples of other relevant studies are:

- 'Delta 2000', an overview of the state of the Delta water system in 2000 [Project Blauwe Delta/RIKZ, October 2000].
- An exploration of directions for solutions for the VZ-lake [Project team VZ-lake, November 2003].

- A study about the prevention of blue-green algae in the VZ-lake by the University of Amsterdam, the Dutch Institute for Ecology and RIZA [Verspagen *et al*, March 2005].
- A study about the benefits of a more natural Delta carried out on behalf of the Delta Council and Province of Zeeland [Louisse Consulting, March 2005].
- Studies about the cultivation of salt-tolerant species and aqua culture, such as 'Exploration aqua culture' [Province of Zeeland, December 2003].

4.2.3.2 Knowledge developed during the interactive process

Already before the start of the general workshops, agrarians expressed that they did not support all the figures presented in the Tholenbundel. They made remarks about the possible impact of salinization, the use of freshwater for irrigation, the functioning of agriculture and the problem of blue-green algae. During WS1, questions were coming up about the required water quality and quantity for agriculture, the possible solutions for blue-green algae, the available quantity of water and impacts of salinization. Based on this WS, the project team [7 July 2006] formulated some knowledge questions. The questions were about the water demand, groundwater sources, possibilities for alternative freshwater supply, salinization, the relation between returns in the agricultural sector and an alternative, external freshwater supply and the salt-tolerance for different crops. Some of these questions were already addressed in earlier studies, but these studies were not specific enough or not agreed upon. The project team tried to address the knowledge questions via LNV to Alterra. Alterra internally spread out the questions, but this did not lead to any reaction. This is why during the summer period, the project team together with the participants together tried to answer the questions. The project team calculated the water supply and -demand based on calculations and figures of WSZE and agrarians. Based on information of WSZE, the project team also estimated the future salinization. The costs of the outcomes were based on recalculations made by WSZE of the study by Royal Haskoning. Individual agrarians estimated their future income for different directions for solutions. These estimates were based on the experiences of individual agrarians in the test area. Because of the development of a detailed freshwater planning and the test, a lot of knowledge was gathered in the area about the supply and demand of water and its benefits. Representatives from the nature sector behold a lot of knowledge about the water system in the Delta, since many of them were also involved in other consultation bodies in the Delta. They gave an indication of the impact of different scenarios on nature on Tholen and St. Philipsland. Simultaneously with the process, knowledge was also developed to support the Planning Study VZ-lake. During the last WS it was communicated that a new study showed that a freshwater VZ-lake was no realistic solution for cyanobacteria, but the impact of re-establishment of ED were also uncertain.

4.2.4 Reflection on interaction and knowledge

The actor analysis shows that participating stakeholders have diverging interests and backgrounds. This discussion cannot be separated from developments in the environment, since some participants were also involved in other consultation bodies in the Delta and familiar with other studies. The participants interacted with each other in plenary workshops and in group sessions and finally reached agreement about the most desired direction for solutions. To reach this agreement, the working sessions with people with similar interests and backgrounds have probably been at least as important as the general workshops.

To support the process, professional experts from established research institutes developed general and some context-specific knowledge. This existing scientific knowledge was communicated to participants, but especially agrarians did not agreed upon all the presented figures. Despite efforts of the project team, the established research institutes were not able to answer specific knowledge questions which came up during the process. Participants gathered new information during the process and contributed with their specific knowledge and expertise. New knowledge was also developed outside the process, in the Planning Study VZ-lake.

4.3 Problem perceptions

This section aims to provide insight in the interests and how perceptions of reality developed for the stakeholders participating in the interactive process. This was possible since participants were asked several times during the process, to express their preferences. This information was supplemented with information from e.g. newspapers, magazines and interviews. This section describes the problem perceptions subsequently for the agricultural sector, the nature sector and government bodies[6]. This section closes with a reflection on these problem perceptions.

4.3.1 Agricultural sector

From the sector agriculture three types of stakeholders were involved, namely: individual agrarians, ZLTO and agribusiness. Eight individual agrarians, one person from agribusiness and two people from ZLTO actively participated in the discussion. Although they all represent the interests of the agricultural sector, their individual interests and perceptions diverge sometimes. One important difference is that AG are more directly involved in the discussion than others, since their livelihood directly depends in the outcomes of the discussion. This is not the case for an employee or representative of the ZLTO or a person employed in the agribusiness. The number of participating stakeholders and the interest or organization they represent is also summarized in Table 4.2.

Table 4.2 Overview of stakeholders representing the agricultural sector with the type of stakeholder, number of people involved in the discussion and the constitution of the organization or interests they represent.

Stakeholder:	**No.**	**Represented organization/interests:**
Agrarians (AG)	8	Representing their own interests, taking into account interests of about 334 other enterprises, mainly cultivating vegetables.
ZLTO	2	Represents interests of agrarians in South-Netherlands: 18,500 members, 68 departments; 200 employees; governed by agrarians.
Agribusiness (AB)	1	Represents own business and business of four other agribusiness organizations.

4.3.1.1 Individual agrarians

In the introduction of this chapter attention is paid already to the history of freshwater supply on the islands. The issue is that some AG are not even willing to talk about the payment for freshwater supply, because they believe that this investment will not pay

[6] A distinction between the agricultural, nature and government sector was also made during the workshops. During the general workshops, they were not divided into these groups.

off. They are mainly located at the North side of Scherpenisse and around St. Maartensdijk. There are other AG, who actively try to realize an adequate freshwater supply. Since 2002, a test-project is going on in the Southeast corner of Tholen, for which freshwater is extracted from the Rijn-Schelde Kanaal. About 30 agrarians subscribed to participate in this project. The location of agrarians, their specialization and attitude towards freshwater supply is also schematized in Figure 4.6. This map also shows the location of some nature conservation areas, which are also mentioned in this section.

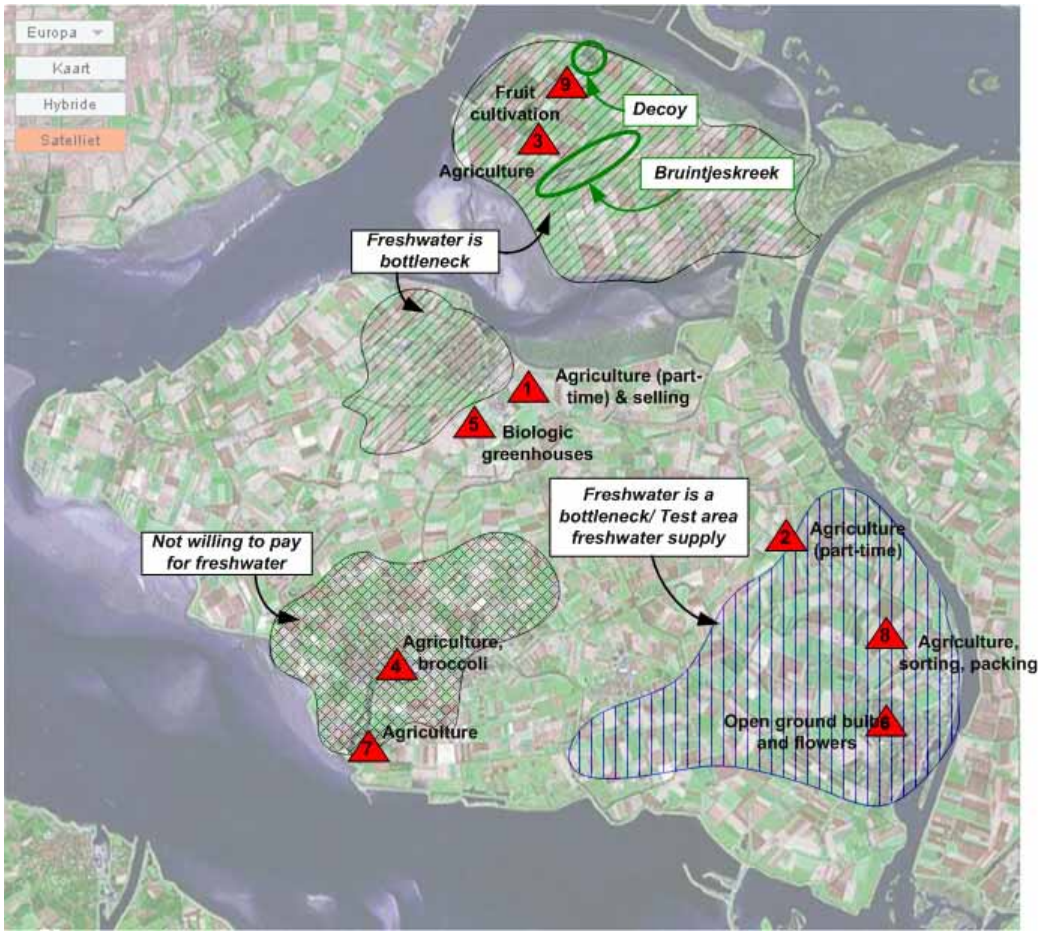

Figure 4.6 Location of agrarians and nature conservation areas. Triangles mark the location of the agrarians involved, shaded areas the managed nature areas [www.map24.nl]

At least two agrarians, who actively participated in the discussion, were benefiting from freshwater in the test area. One is AG6; he was also a member of the working group freshwater supply Tholen. Another is AG8; he used to be settled in South-Holland and moved to Tholen about 10 years ago. Since they already use freshwater for irrigation they experienced how benefits and losses are related to an adequate freshwater supply. Their main objective is to guarantee and improve the freshwater supply in the test area. This interest and objective differs from the interest of other agrarians. For instance, AG9 is much more interested to safeguard fresh groundwater resources. He uses groundwater to irrigate the fruits he cultivates. Until the end of the process, he had the opinion that salinization of groundwater resources could not be prevented in case of ED. AG5, who cultivates biologic products in greenhouses collects rainwater, does not depend on the VZ-lake for his freshwater supply. He put a note in the idea box that to him '…it does not matter how freshwater is supplied or where from, unless it is fresh'

[Idea box kick-off, 31 May 2006]. However, most of the agrarians did not think that flexible about possible solutions. AG6 said in an interview before the process that 'for agrarians estuarine dynamics is no option' and that 'the construction of basins is also a useless option' [Interview TNO, 24 May 2005]. Because of their diverging interests, the development of the perceptions has been studied separately for every AG.

Perceptions of AG most clearly adjusted about the directions for solutions. Before the process they were not even willing to talk about estuarine dynamics, later on they supported this direction for solutions under certain conditions. AG6 even voted for the scenario ED during the last WS, and AG5 and AG3 voted for scenario ED and FW VZ-lake[7]. For AG5, it is known that he is not dependent on the VZ-lake, but this is not the case for AG3. During WS1, AG3 even prioritized the statement that 'ED provides only threats'.

When focusing on AG6, some remarkable changes with respect to his perception are visible. In 2005, he said that the freshwater supply and the prevention of seepage are the most important bottlenecks for agriculture. He desired an adequate distribution and supply of freshwater all year round. He regarded the problem of blue-green algae to be solvable in the future even with a FW VZ-lake. His prioritization of chances and bottlenecks during WS1 do not show any remarkable changes in this perception. He did, just as the other agrarians, not prioritize any chances in case of ED, and put forward many bottlenecks with regard to the economic development in this scenario. However, during the last WS, he voted for estuarine dynamics. The explanation he gave for his vote was that he believes that this solution is the most robust solution on the long-term. In the beginning he rejected this option, because it was too costly. His vote implies that his perception about the solvability of the problem with blue-green algae, the costs of an alternative freshwater supply, and the possibilities in case of ED changed.

Other agrarians show similar changes in perceptions. During the process, they showed all kind of resistance against ED. During the kick-off they expressed that they did not understand the motives to want ED, why would people want salinization? During WS1 they mainly prioritized bottlenecks in case of ED. These bottlenecks were mainly related to the economic development of agriculture and the realization of an alternative freshwater supply. However, during the summer period experiences from the test area were used to get an indication of the impacts of the directions for solutions. These experiences show that an adequate freshwater supply for irrigation is very rewarding. After these figures were discussed, they were accepted by all AG. Calculations of WSZE about the costs and expected salinization showed that the costs of an alternative freshwater supply are affordable and that it is possible to fight salinization with this freshwater. So, despite their lack of trust, many other reasons for not willing ED were invalidated. Actually, the most mentioned reason for not voting for ED was that they distrusted the government. Another reason was that some were not convinced that the impacts of salinization would be manageable, which is related to their suspicion with respect to the trustworthiness of technical knowledge (especially when it is provided by people with diverging interests). So, it can be concluded that as a result of the process the perception of participating agrarians developed. In the beginning the perception was that everything should remain the same or that ED would not provide a solution. At the end, everybody wanted the freshwater test to be extended regardless of a FW of ED VZ-lake.

[7] It was not possible to vote for the scenario autonomous development (AD)

4.3.1.2 ZLTO

Every agrarian in South-Netherlands can become member of the interest group ZLTO. ZLTO integrates collective interests, develops group activities and gives individual advice. ZLTO is a department from the national association LTO-Netherlands and also has local departments. They also own land on the islands. For ZLTO it is important that sufficient surface- and groundwater of a good quality remains. From an agrarian point of view they want to work towards realistic and useful solutions for water management. The person most actively involved in the discussion was the water specialist from ZLTO. She was also actively involved in the freshwater planning for Tholen. The realization of this freshwater planning is also very important to ZLTO. A reaction of ZLTO at the end of the process was that at least the importance of freshwater became clear. The main contribution made by ZLTO to the process was their agricultural and political network and their experience in looking after the interests of agrarians. They selected representatives from AG and AB, gathered AG in between formal consultations for deliberation and compensated AG for their attendance. These contributions show that they are attached to the freshwater situation for agriculture.

Besides the water specialist from ZLTO, a member of the board of ZLTO-Tholen with the portfolio water also attended both workshops and the meetings during the summer period. Both representatives voted at the end of the process for the scenario FW. Just as the individual agrarians ZLTO-Tholen doubted the trustworthiness of the government and the impacts of brackish seepage. During the kick-off session he already mentioned the problem with brackish seepage. From the beginning his opinion was that it was possible to safeguard freshwater for irrigation with a pipeline, but at the same time he was not willing to talk only about ED. The water specialist of ZLTO explained her vote with the argument that she voted ED, because the commitment of the agricultural and nature sector is not enough, but that also the government needs to commit themselves to ED.

During the discussion, the ZLTO mentioned also economic development of agriculture as an important bottleneck in case of ED. Several representatives of ZLTO mentioned alternative possibilities to solve the problems related to blue-green algae. They made clear that they really preferred a FW VZ-lake, but it was also the water specialist of ZLTO who joined the project team to formulate the conclusions that ED was the most preferable solution.

4.3.1.3 Agribusiness

The agribusiness decided to represent themselves by a managing director of the CZAV. This is a purchase and sales organization for agriculture in Southwest Netherlands. The agribusiness is interested in the delivery guarantee of agrarians. Since agrarians know better how to reach this delivery guarantees, the agribusiness supports the view of AG. The representative of the agribusiness attended the workshops, but was not involved during the summer period and during WS2 he arrived only after the voting. When the conclusions were presented during WS2, he became angry, not willing to support the realization of ED. An AG placated him. Since he did not actively participate in the discussion, it is hard to give an indication of the adjustment of his perception.

4.3.2 Nature sector

Five nature conservation organizations actively participated in the discussion. The most leading organization was a coordinating organization, the ZMF. In the Delta Consultation, the ZMF already worked together with three terrain managers: Natuurmonumenten, ‘Het Zeeuwse Landschap’, and Staatsbosbeheer. The Delta Consultation promotes

the interests of twelve national and regional nature conservation organizations in the Delta. They operate from an integrated nature and ecology point of view and are presided by the Foundation Brabants Landschap [Resource Analysis, October 2002]. In 2004, the Delta Consultation expressed the hope that the Delta Council is able to solve the problems with blue-green algae in the VZ-lake within 5 years after their establishment [Website Delta Council, 1 December 2004]. Another participating stakeholder was the Nature Society of Tholen, but they attended the discussion only until the summer period. A substantive breakthrough for the nature sector was achieved during their meeting with the project team in the summer. In this meeting they decided, that their main objective was to realize ED. In the paragraphs below, the development of perceptions is described for each organization separately. The represented organizations and interests of the different organizations are also summarized in Table 4.3.

Table 4.3 Overview of participants representing the nature sector, with the type of stakeholder, number of people involved in the discussion and the constitution of the organization or interests they represent.

Stakeholder:	**No.**	**Represented organization/interests:**
Zeeuwse Environmental Federation (ZMF)	1	Independent coordinating society: 1,200 individual members, 24 associated regional nature societies; 8 employees; part of national organization;
Natuurmonumenten (NM)	1	Manages terrains along the VZ-lake, 1 million members, 600 employees, manages 90,000 ha nature
Staatsbosbeheer (SB)	1	Manages terrains along the VZ-lake and areas outside the dikes of Tholen. Used to be part of Min. LNV, which still provides funding; 500 employees
Het Zeeuwse Landschap (ZL)	1	Manages terrains at St. Philipsland and along the VZ-lake. Non governmental organization with about 11,000 donators and 8,000 ha terrain.
Nature Society Tholen (NVT)	1	Local nature society organizing excursions, information meetings and other activities.

4.3.2.1 Zeeuwse Environmental Federation

ZMF represent about 24 regional nature societies and work closely together with the three major terrain managers. The representative from ZMF is a policy advisor with a focus on the Delta water system in Zeeland. He is a member of the working group ZD, of the advisory council Delta on Sight, coordinator of the working group Scheldeestuary and coordinator of the Delta-consultation. Probably because of his large network, he was asked by the project team to select other stakeholders from the nature sector. He suggested that besides the NVT, also all three terrain managers should participate in the discussion.

The ZMF has no direct interest in the freshwater supply, but is mainly interested to solve the problems with blue-green algae. Besides this, they are interested in nature at the Southside of Tholen. In 1991, they presented 'Plan Tureluur' which compromises the integrated development of 44 nature areas at the Southside of Tholen. A very large-sized and ambitious plan [Website Nationaal Park Oosterschelde, May 2001].

Before the process, the representative of the ZMF was very skeptical, whether or not the freshwater demand for agriculture was justified. Nevertheless, already in 2003, he mentioned a pipeline from the Hollands Diep as a possible solution in case of ED. At that time, it was already clear to them that the problems in the VZ-lake would not be solv-

able with a FW VZ-lake. But in 2005 a colleague also argued in an interview with TNO that agriculture should adjust to the natural environment and not vice versa. This colleague also said that he does not expect a coalition between agriculture and the ZMF. At the end of the process, the representative of ZMF was also still skeptical about the calculated freshwater demand for agriculture. He said that he would have preferred a reconsideration of the calculations by objective experts. Despite this, he voted for the realization of an alternative freshwater supply and accepted that the calculations (with some reservations) would be presented in the conclusions towards the Delta Council. Apparently ZMF became aware of their mutual dependency during the process and the willingness to cooperate was created.

4.3.2.2 Natuurmonumenten

NM is a large nature conservation organization, with about 1,000,000 members and 600 employees. NM was represented by an employee who was responsible for their external policy in Zeeland. NM actively participates in the Delta Consultation and the representative from NM is a member of the advisory council for the Delta Council. From the beginning he made clear that the realization of ED was really important to them. He only participated in the discussion to create support for reaching this goal. Before the process he was very sceptical about the water demand of agrarians and from the beginning he did not regard freshwater supply for agriculture as a problem. What he learned during the process was that the supply of water, using pipelines was not too costly. He also became gentler about the importance and need for freshwater for agriculture.

4.3.2.3 Het Zeeuwse Landschap

ZL buys, maintains and protects nature and landscape in the Province of Zeeland and was represented by one of their employees. On St. Philipsland, ZL manages the decoy and the Bruintjeskreek (see Figure 4.6) and some areas outside the dikes of St. Philipsland and along the VZ-lake. ZL has an interest to solve blue-green algae as well as the preservation of freshwater nature on St. Philipsland. During the summer period ZL started to support the vision that the re-establishment of ED was much more important than nature on the islands. The representative of ZL did not attend the last WS, but informed the project team that he shared the vision of the other nature conservation organizations. To the final conclusions ZL made the reservation that the values of the Bruintjeskreek should be preserved.

4.3.2.4 Staatsbosbeheer

SB used to be part of the Min. LNV, but is currently an independent administrative body. It is the largest terrain manager in the Netherlands. They manage some salt marshes and coastal wetlands areas on Tholen and they are one of the major shore managers along the VZ-lake, but they have no direct interest in the discussion. SB was represented by a forester who is managing terrains in the South-Western Delta. During WS2, the representative from SB stated that his interest was the realization of ED, if this was not the outcome of the discussion, he would step out of the discussion and shift his focus to other areas. During the whole process he aimed at reaching a consensus and wanted to build bridges. In WS1 he explained that only in case of cooperation, the agricultural and nature sector would stand strong towards the government. During this WS he also explained that it was possible to realize an alternative freshwater supply, but that in the future not enough freshwater may be available. This was a warning to AG, but not directly in his own interest.

4.3.2.5 Nature Society Tholen

NVT was represented during the process by their chairman. They have a different scope than the other nature organizations. To them the well-being on Tholen and St. Philipsland is of much more importance. In November 2003, they already organized a debate about the freshwater problems in the Delta. In this debate people from the Province of Zeeland, Rijkswaterstaat, ZMF, WSZE and a representative from agriculture discussed economic, ecology and safety problems in the Delta [BN/De Stem, 4 November 2003]. As far as known, the NVT is not actively involved in other bodies in the Delta and their representative has only been an active member of NVT since January 2006. The prioritization made during WS1 shows that the perception of NVT diverges from the perceptions of other stakeholders within this sector. E.g. NVT mentioned flushing towards the Westerschelde as a chance, whereas SB and NM mentioned it as an ecological bottleneck. The NVT is also much more attached to the present freshwater nature. After the meeting in the summer period, the NVT decided to step out of the discussion.

4.3.3 Government sector

Several levels and types of government were represented in the discussion, each having their own interests and perceptions. Representatives from the following government bodies attended the workshops: Water Board 'Zeeuwse Eilanden', Municipality of Tholen, Province of Zeeland and RWS-Zeeland. The interests and constitution of the bodies they represent is also schematized in Table 4.4.

Table 4.4 Overview of the participating government bodies with the type of stakeholder, number of people involved in the discussion and the constitution of the organization or interests they represent.

Stakeholder:	**No.**	**Represented organization/interests:**
Water Board Zeeuwse Eilanden (WSZE)	2	Responsible for the quality and quantity of regional water systems and maintenance of roads, dikes and so on, on several islands in the Province of Zeeland (97,000 ha). About 400 people are employed at WSZE.
Municipality of Tholen (GT)	2	Responsible for local policy on Tholen and St. Philipsland. Employed in agriculture: 16%; Agricultural area: 84%
Province of Zeeland (PZ)	1	Responsible for provincial spatial policy and among others management of groundwater.
RWS-Zeeland	1	Executive body of the Min. V&W. Responsible for protection against flooding and adequate quality and quantity in national water systems. Employs about 10,000 persons, distributed over 160 locations.

4.3.3.1 Water Board 'Zeeuwse Eilanden'

Traditionally, the most important task of Water Boards is water level management and maintenance. After the introduction of the EWFD this shifted more towards water quality control. As manager of the local water system, WSZE is interested to control the water quality and the quantity with as little as possible efforts. Traditionally, agrarians have a lot of influence in the policy of Water Boards. This is why WSZE has an ambiguous interest. They want the water quality problems in the VZ-lake to be solved and want to supply AG with freshwater. They are also interested in the implementation, since they will probably be responsible for the local embedding of solutions. In the conclusions, they already committed themselves to realize the basic water system planning if necessary. Another task is that they provide licenses for the use of fresh surface wa-

ter[8]. They also have a lot of knowledge about the regional water system. Their knowledge about the use of freshwater water, costs of an alternative freshwater supply system and impacts of salinization was also used during the process.

The person who participated most actively in the discussion was an employee of the department Planning Water Management. Besides this, governors and other employees attended the general meetings from time to time. Officially WSZE did not support a freshwater or a saltwater VZ-lake, but from their reactions it appears that in case of a freshwater VZ-lake the water management would be much easier. At the same time, the occurrence of blue-green algae is a big problem to them. During the process, for at least one representative of WSZE it became clear that it was not possible to realize a sustainable and healthy water system in case of FW. Another representative was still convinced that the problems with blue-green algae are solvable in other ways and that the (other) government should not be trusted. However, he also admitted that estuarine dynamics with an alternative freshwater supply was also an option, given that the supply of freshwater was certain.

4.3.3.2 Municipality of Tholen

Agriculture is quite important for the GT. This is why already in 2003, the officials from the GT were asked to defend the stake of agriculture during consultations addressing the VZ-lake. All governing parties are mainly interested in a solution in which the VZ-lake remains a freshwater lake, in order to protect the interests of agriculture [PZC, 30 September 2003]. However, GT also wants to solve the problems with blue-green algae, since during last year summers their recreational swimming water was not fit for swimming several times.

From GT two aldermen and two staff members from the departments Water and Public Works alternately participated in the discussion. Since, the constitution of the representatives of the municipality of Tholen changed during the workshops, it is difficult to mark their changes in perception. During WS2 an alderman and a public servant were present. One voted for ED-III and the other one for FW-II. The latter reacted, just as AG, that he was only prepared to commit himself to ED, if the pipeline was actually constructed. The former reacted that for the inhabitants it does not matter what kind of water surrounds the islands. So, it is clear that within the GT no agreement exists about the most desirable direction for solutions. During WS1 and WS2 a difference in perspective is visible between officials and public servants. Officials focus on the well-being of agriculture, whereas the public servants have a wider scope.

4.3.3.3 Province of Zeeland

PZ is the initiator of the vision Delta on Sight and from that point of view interested in the re-establishment of ED. The regional policy of the PZ [June 2006] is 'the preservation and strengthening of the agricultural production function and promotion of sustainable and safely producing agriculture' [p. 116]. The realization of this policy might have been of importance, but it was not made more concrete during the process. Provinces are not only responsible for spatial planning, but also for the management of groundwater resources. During the process on behalf of the project team the representative of PZ looked up some information about the use of groundwater resources.

[8] Formally it is not allowed to extract more than 15 m^3 water per day. To use water for irrigation, agrarians need to get dispensation. During dry periods, the Water Board is able to forbid the use of surface water for irrigation [Water Board Zeeuwse Eilanden, 2007].

PZ was represented during the workshops by a public servant from the department of Space, Environment and Water. During WS1 he mentioned that the cultivation of salt-tolerant species would be a possibility for the future. This supports the vision of other employees from PZ, that agriculture should adjust itself to nature and not vice versa. However, at the end of the process, their representative also voted for ED-III including the realization of an alternative freshwater supply system. Given this, his perception was changed during the process. Reactions from other employees of PZ afterwards show that PZ was glad that a consensus was reached, but that not everybody was satisfied with the contents of this consensus.

4.3.3.4 Rijkswaterstaat-Zeeland

As manager of the VZ-lake, RWS is mainly interested to solve the problem of blue-green algae. This is also why RWS participates in the Delta Council. Their public servant, who participated in the discussion, is also a member of the Board of ZL. He did not prioritize chances and bottlenecks during WS1. During WS2, he communicated the development of knowledge in the Planning Study VZ-lake. During WS2 he voted for ED including an alternative freshwater supply system. This does not correspond with the outcome he desired and expected before the process. To the conclusions, he made the reservation that a supplementary societal CBA was needed. He was happy that agriculture and nature found each other.

4.3.4 Reflection on problem perceptions

In the beginning of the process a clear difference was recognized between agricultural sector aiming at economical developments and the nature sector aiming at ecological values. Within these groups not everybody had the same interests and objectives, but their perceptions were similar. Within the government sector perceptions varied between ecologically and economically-oriented.

At the start of the process, the agricultural sector resisted themselves against the solution ED. During the summer period, when they together calculated the possible benefits of freshwater, their perceptions slightly changed. At the end of the process most of them still preferred a FW VZ-lake, but they were less persistent in this view. It attracts attention that the person from agribusiness, who was not involved in the subgroup sessions, was also the person who showed resistance against the conclusions of WS2.

From the five stakeholders representing the nature sector, one stepped out of the process. His perception conflicted with the other stakeholders within this sector and he had less interaction. During the summer period the other stakeholders reached agreement about the importance of ED. Since most of them do not have any direct interest in nature on the islands, they are really persistent to realize ED. Their perception mainly changed about the agricultural sector in general.

The priority of government bodies is to solve the problems with blue-green algae as soon as possible. At the same time WSZE and GT want to promote the interests of agriculture, whereas RWS and PZ want agriculture to be adjusted to nature. At the end of the process these stakeholders did not agree – even within their own organizations – about the most desirable direction for solutions. Perceptions of participants from the government changed, but this does not imply that they act upon an adjustment of their perception. They did not really want to write a covenant and asked questions about the results.

4.4 Development of substantive outcomes

Problem structuring implies that despite diverging perceptions, stakeholders jointly formulate a problem and solutions. This section subsequently describes how the framework for discussion, the present situation, the future situation, and the directions for solutions developed during the process. This section closes with a reflection on the development of substantive outcomes.

4.4.1 Framework for discussion

Subsection 4.1.3 already explained the objectives of the broad discussion. Initially, the state secretary of the Min. V&W formulated the objective as 'a natural Delta in combination with a more natural and sustainable freshwater situation for agriculture'. During the process, not the criteria *natural*, but sustainability was chosen as a yardstick to evaluate solutions. The Tholenbundel mentions three aspects of sustainability: economy, society and ecology [Reijs, November 2006]. Initially sustainability had for the agricultural sector the meaning of a good socio-economic climate, whereas for the nature sector it was related to ecology and long-term robustness. The project team brought in, that the ruling definition of sustainability includes economic efficiency, ecological integrity and social equality. A boundary condition of the discussion was that three developments had to be taken into account. These were climate change, agricultural developments and the freshwater/saltwater situation in the South-Western Delta. Unlike the initial objectives, these boundary conditions did not change during the process.

4.4.2 Present situation

For the development of solutions, it was important that a better insight in the present situation was received first. Topics that have been discussed are the water system, agriculture and ecology.

4.4.2.1 Water system

An incentive of the discussion is the occurrence of blue-green algae in the VZ-lake. The Tholenbundel states that this is also a problem to agrarians, but they did not perceive this as a problem. So, whereas the government and the nature sector were really worried about the water quality of the VZ-lake, most of the agrarians did not regard this as a problem. AG in the test area, only mentioned the use of the existing capacity as a bottleneck. During the process, agrarians started to respect that blue-green algae is a societal problem to be solved. They also accepted the view of ecology-oriented stakeholders that the problem of blue-green algae was not solvable in another way than through the re-establishment of ED.

The extraction of groundwater resources did not play an important role during the discussion. This is probably because this is negligible in comparison with the water used in the test area. On the salinity standards presented in the Tholenbundel, AG reacted it did not become a topic for discussion. Another problem mentioned in the Tholenbundel is brackish seepage. This was also not topic for discussion, since AG were already used to it and able to cope with.

4.4.2.2 Agriculture

The Tholenbundel describes the present agriculture on Tholen and St. Philipsland, based on the study carried out by Alterra. Agrarians accepted this as a starting-point for the discussion, but expressed that some elements were missing, e.g. the possibilities to cultivate early crops and market circumstances agriculture has to deal with. GT and AG

clearly stated that agriculture is relevant for the economy of Tholen, but this was not directly agreed upon by everybody. Probably, the excursion contributed to the awareness among other stakeholders about the importance of agriculture for Tholen.

The present quantity of water used by agriculture has been an important question during the process, since this provides insight in the future water demand. It was a question since the nature sector was quite skeptical about the need for freshwater. A participant of the ZMF once said in an article that freshwater does not seem to be indispensable for agriculture, since 'last years agrarians hardly used the existing freshwater supply capacity' [PZC, 16 July 2002]. Existing studies based their calculations on estimates from WSZE and earlier research reports. During the process WSZE and AG gathered more recent data which did not seem to correspond with each other, but after the project team took a closer look the data was quite comparable. Based on the information of WSZE and AG, new calculations were made. Everybody involved in the data collection or calculations agreed upon the outcomes. Stakeholders who were not involved remained skeptical and said afterwards that they would have preferred verification of the calculations by objective researchers.

4.4.2.3 Ecology

Before the process, ecology on Tholen and St. Philipsland was no issue at all. For all ecology-oriented process participants, mainly the ecology in the South-Western Delta in general was an issue. During WS1 the agricultural sector started to emphasize the importance of freshwater ecology on and around the islands. This served their perspective that a FW VZ-lake should be realized. This is why during the process different opinions existed about the value of freshwater respectively saltwater nature. The final judgment about local nature was trusted to the terrain manager ZL and accepted by everybody.

4.4.3 Future situation

Maybe even more important than the present situation were the developments to be expected, since the discussion focused on the desired situation by the year 2030. Issues that have been discussed are related to the water system and agriculture.

4.4.3.1 Water system

The Tholenbundel describes that given the policy of the government, an ED VZ-lake should be expected. This vision was shared by several participants, but feared and resisted by AG. The fear of other stakeholders was the realization of half-hearted solutions. This is one of the reasons why the nature sector wanted to participate in the discussion. In the final conclusions it is stated that ED is expected to have a positive impact on ecology. An adequate freshwater supply is also expected to have a positive impact on the socio-economic situation on the islands. These were not important issues during the process and have hardly been discussed.

One of the most difficult issues during the process was the impact of a saltwater VZ-lake on the ground- and surface water system. The Tholenbundel states that the impacts of climate change are that no water will be available to flush the regional water system and that brackish seepage will increase. A calculation by WSZE indicated that to fight the impacts of salinization, 20% more water was needed in the future [Kramer, 2006]. This calculation is based on the expected pressure difference and also the only reasonable assumption. Agrarians accepted this calculation and had the opinion that with enough freshwater the impacts of salinization could be prevented, but not all agrarians were convinced that the impacts of salinization could be prevented that easy.

The Tholenbundel says that climate change hardly affects brackish seepage. It may also affect river discharges and precipitation, which will probably lead to water shortages in the summer. Brackish seepage was no topic of discussion and AG did not regard climate change as problem at all. In fact, they regarded it is a chance to receive more water, since less water would be needed to prevent salinization in the rest of Holland. In the perception of the nature sector, climate change would imply that less freshwater would be available for agriculture in the future. This vision was not shared within the nature sector, but also no issue to them. The only remark made in the conclusions related to this topic is that there should be adequate agreements about the distribution of water in the whole of the Netherlands. This reservation was sufficient for the nature sector.

4.4.3.2 Agriculture

In the Tholenbundel the future of agriculture is described based on six guiding models of prosperous future enterprises developed by Alterra. Alterra was really content with these guiding models, but agrarians reacted somewhat 'allergic' to this information. Some of their remarks were that for stock-breeding also freshwater was needed, that scaling-up would be accompanied by intensification, thus an increase in the dependency of freshwater. The Tholenbundel and agrarians both state that agriculture will become more dependent on freshwater. But in the beginning some ecology-oriented participants also suggested that the adjustment of agriculture is an option (e.g. cultivation of salt-tolerant species). However, this did not seem to be realistic anymore after the agrarians calculated the expected benefits for different scenarios. The impacts of the different scenarios on the benefits for agriculture were based on the experiences from the test area. Most process participants did not have any reservations about these figures.

In the Tholenbundel only qualitative information was provided about the expected water demand for agriculture. During the process different scenarios have been designed. The most desirable scenario was an adequate freshwater supply for whole Tholen (this implies extension of the test area). However, nobody ever calculated the water demand in that case. Initially, there were calculations available from Royal Haskoning, but they only took the present water use into account. Recalculations of WSZE also took the impacts of salinization into account and extension of the water demand towards the available capacity of the system. The project team adjusted these calculations extrapolating the water demand in the test area towards the whole area. The water demand in the test area was based on 'real-time' monitoring of agrarians in the test area in 2006. The summer of 2006 can be characterized as a dry summer in which the inlet of water from the VZ-lake was cut off because of blue-green algae relatively late during the season. The presented freshwater demand was mainly based on information provided by WSZE and AG in the test area. The nature sector was willing to accept this, if some reservations were made about the calculation of this demand in the conclusions.

4.4.4 Directions for solutions

The Delta Council decided that solutions should be developed for three water scenarios. Most formulated directions for solutions are quite similar to the present situation, namely that freshwater for agriculture remains dependent on the VZ-lake. Only in case of a saltwater VZ-lake, this is not possible anymore. In the Tholenbundel, the selected solution (an alternative freshwater supply from the Hollands Diep via West-Brabant) was mentioned already. During the process other solutions such as the construction of freshwater basins, adjustment of agriculture and desalinization installations have been mentioned too (see also Table 4.1). In the study carried out by Royal Haskoning several

other alternative freshwater supply systems were mentioned. However, WSZE regarded that the supply of water from the Hollands Diep via West-Brabant was the best solution for an adequate alternative freshwater supply. During the summer period calculations have been made by the WSZE with regard to this alternative freshwater supply. During WS2, other alternatives for freshwater supply such as water basins and desalinization installations were added, but these solutions have not been selected. Before a choice had to be made for a direction for solutions, a research developed in the context of the Planning Study VZ-lake showed that a freshwater VZ-lake probably does not provide a solution for the problems with blue-green algae. In case of re-establishment of estuarine dynamics it is uncertain. This was also communicated to process participants.

In 2004, Royal Haskoning already calculated the costs of an alternative freshwater supply from the Hollands Diep. In the summer of 2006, these costs were recalculated by WSZE. However, these calculations did not take the desired freshwater demand into account. This is why the project team made new estimations of the costs. For this, also information was achieved from Water Board 'Brabantse Delta'. The final costs were supported by WSZE and by all project participants, although more specific calculations would be needed to support the calculated costs.

Solutions do also differ about the location where investments have to be made. There were no boundary conditions defined in the beginning of the process about this aspect, but costs and benefits were important aspects to be taken into account. For the chosen solution investments have to be done at local, regional and national level. During the summer period, the agrarians already mentioned the distribution of costs as an issue. Agrarians showed to be willing to bear the costs of the extra transport capacity towards the parcels because of the expected benefits. WSZE is willing to bear the costs of extra transportation capacity on the islands. From the government it was expected that they would finance a part. They were not prepared yet to stand for their part.

4.4.5 Reflection on the substantive outcomes

Not all existing scientific knowledge, as presented in the Tholenbundel, was relevant for the process and/or agreed upon. Some problems mentioned in the Tholenbundel were not perceived as a problem and much of the provided information did not match with the knowledge questions coming up during the process. This is why during the process, also knowledge from the agrarians, the nature conservation organizations and from WSZE was integrated in the development of solutions. The analysis shows that the agricultural sector contributes knowledge about agriculture, the nature sector about the impacts on ecology, WSZE about the realization of the freshwater supply and so on. The project team made clear who provided the information and took care of the integration. The knowledge developed in the planning-study VZ-lake also influenced the substantive outcomes.

4.5 Conclusions case 'Tholen & St. Philipsland

In the case study the interaction, problem perceptions, knowledge and the development of substantive outcomes were investigated. As a starting point for this analysis, the conceptual model presented in Figure 2.7 was used. Next subsections subsequently describe the conclusions deduced from the case study with regard to the course of the process of problem structuring, the (development of) problem perceptions, and the development of substantive outcomes.

4.5.1 *Course of the process of problem structuring*

The conceptual model describes that interaction, perceptions and knowledge contribute to the process of problem structuring and that these tracks are embedded in a broader natural and human context. Figure 4.7 shows how these tracks influenced each other and were influenced by external developments.

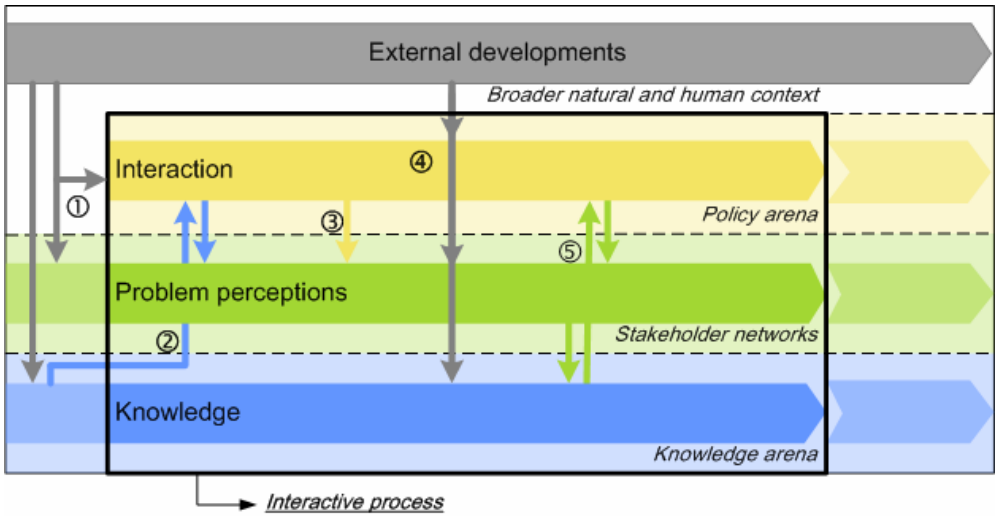

Figure 4.7 Results of the case study presented in relation to the conceptual model

The moment when stakeholders got involved is chosen as a starting-point of the interactive process. Analysis of the three tracks for 'Tholen & St. Philipsland' shows that problem perceptions and knowledge developed already before the interactive process starts. Stakeholders already read about the problem in the newspapers, read other research reports, and were participating in other consultation bodies and discussions. Policy processes at national and provincial level initiated the discussion and resulted in the development of knowledge (①).

Existing scientific knowledge was integrated in the Tholenbundel and presented to participants. They discussed this information. This interaction resulted in an adjustment of their perceptions (②). During the interactive process (meetings, excursions, workshops), the interaction between stakeholders influenced their problem perceptions (③).The interactive process was influenced by external developments. E.g. the death of the chairman of the Delta Council shocked participants, the experiences from the summer of 2006 were used to develop knowledge about the freshwater demand, knowledge developed in the Planning Study VZ-lake contributed to the knowledge base (④). Since the participants did not agree upon all existing specific knowledge, they started to gather their new data by themselves. This data was discussed with other participants and influenced the perceptions of other stakeholders (⑤).

4.5.2 *Problem perceptions*

In the case study we saw that the interests of stakeholders differed a lot; some were directly affected in their livelihood (individual agrarians), others represent interest groups or a government body. About the interest, background and perceptions of reality the following conclusions can be drawn:

1 Cognitive learning was recognized by all process participants, i.e. for everybody one or more elements of their perceptions about the present situation, expected situation and the directions for solutions were adjusted. At the end of the process, within government bodies, not all stakeholders shared similar perceptions. They

were also not involved in the development of the covenant. Among other stakeholders perceptions did also not become identical, but converged sufficiently to become willing to lay down the outcomes in a covenant.

2 The impact of cognitive learning differed among participants. Government bodies cannot easily adjust their strategy upon an adjustment of their perception, since they are bounded to their group and regulations. This is different for stakeholders with an individual interest (e.g. agrarians); they can easily adjust their strategy to an adjustment of their perception. Stakeholders from interest groups (e.g. nature sector, ZLTO) are also incorporated in a group, but more flexible to adjust their strategy.

3 Acceptance of information develops differently for different stakeholders. The agricultural sector was very critical about the provided context-specific data, but did accept the data gathered by their own sector. The nature sector and government bodies agreed upon existing scientific knowledge, but had more difficulties to agree upon the data gathered by other stakeholders. The government asked for more research. The nature sector accepted the information, since they were not affected negatively by the outcomes.

4 Social processes within stakeholders' own group also plays an important role to reshape perceptions during the process. In the nature sector, one person had less interaction and consisted in having a relatively extreme perception; he stepped out of the process. In the agricultural sector, a person from the agribusiness was not actively involved during the summer period; unlike other stakeholders from the agricultural sector he did not agree upon the conclusions during the last WS.

4.5.3 Development of substantive outcomes

The development of substantive outcomes resulted from knowledge, interaction and external developments. The roles of these aspects were:

5 The substantive outcomes are based on existing scientific research, practical and specific stakeholder knowledge, and other ongoing research. We saw that from the existing scientific knowledge the context-specific data was contested and replaced and complemented with data gathered by stakeholders during the process.

6 Interaction contributes to the acceptance and exchange of different types of knowledge. Scientific knowledge was communicated, discussed and complemented with stakeholder knowledge. The debate about different types of knowledge, but also activities such as the excursion led to adjustment of perceptions. It was also recognized that as a result of interaction, stakeholders became aware of their mutual dependency.

7 We saw that external developments related to policy processes outside the process and the natural system influenced the process. The challenge is to handle important external developments with care, as was done with the developments in the Planning Study VZ-lake.

5 Case study 'Southwest Rijnland'

Case 2 concerns an interactive decision-making process addressing the management of sediment in an area governed by Water Board Rijnland *(Hoogheemraadschap van Rijnland)* in the Province of South-Holland. This chapter describes how problem structuring developed during this interactive process and what contributed to this process of problem structuring. This chapter starts with a description of the context and background of the problem addressed. The second section describes which actors were involved in the process and how interaction and knowledge developed during the process. Subsequently, the problem perceptions of the different (groups of) process participants are described in the third section. Section 5.4 explains how substantive outcomes have been developed during the interactive process. This chapter closes with the presentation of conclusions that can be drawn upon the course of the process of problem structuring, problem perceptions, and the development of substantive outcomes. If you would like to go faster through this chapter, it is also possible to read from section 5.2, 5.3, and 5.4 only the reflections. Annex D, E, F and G respectively provide an overview of the participating stakeholders, a list of interviewed people, the contents of three questionnaires which have been filled out by process participants, and the outcome of the interactive process which is a map with chances.

5.1 Background and context

Not only the interactive process itself, but also developments in the human or natural system may affect the process of problem structuring. This section gives an introduction in the physical context of sediment management, the context and objectives of the interactive process, and the history of sediment management in the area.

5.1.1 Physical context

With the passage of time, water systems become silted as a result of sand, mud and the rests of plants. This sedimentation process causes that the depth of water systems decreases after some time. To prevent drainage and navigation problems, it is needed that dredging activities are carried out regularly. Dredging concerns the removal of a layer of sediment from the bottom of the water system and is meant to remain an adequate water depth. In the past, sediment used to be deposited on land or in deep waters. However, sediment is often contaminated as a result of polluted discharges on the surface water; therefore this is presently not allowed anymore. Since the end of the eighties, the possibilities for the deposition of sediment are based on the classification of sediment. Based on its quality, sediment is classified varying from class 0 until 4. Class 0 sediment is not dangerous at all to humans, flora and fauna, but class 4 implies that the water bottom is highly contaminated. Depending on its classification, sediment can be distributed over land or in water, stored temporarily and/or dewatered, after dewatering it can be recycled for building activities, separated and/or cleaned, or stored in a depot [Website waterbodem.nl, 4 May 2001].

As water manager, HR is responsible to dredge the polder canals and ditches in the polder areas covering the area between the cities of Gouda, The Hague and Haarlem in the west of the Netherlands (see Figure 5.1). Since, HR refrained from dredging the water networks in the polder for decades they are currently confronted with a dredging backlog. They need to remove about 7 million m^3 of sediment from the water system before

2020. These dredging objectives are related to maintain the water depth, but also for managing the water quality and the ecological system. In the area governed by Rijnland about 30% of the water bottoms are contaminated, but for the upper layer this is less. The region HR wants to start with is Southwest Rijnland (see Figure 5.1). In this area a water storage location needs to be arranged. This is why the water system needs to be at an adequate depth already before 2010.

HR is not the only government body with a dredging responsibility in this area. About 50% of the regional waterways are still owned by municipalities and other government bodies. As long as HR does not overtake their maintenance duty they are responsible for their own dredging activities. In the main waterways with a navigation function, the fare way managers are responsible for accretion of sediment. For privately owned waterways, HR is the first time responsible to bring the waters at an adequate depth, afterwards this responsibility is assigned to private owners. In a normal year, the accretion of sediment counts about 130,000 m^3 in the region Rijnland, from which about 90,000 m^3 belongs to the responsibility of Rijnland [HR, September 2004].

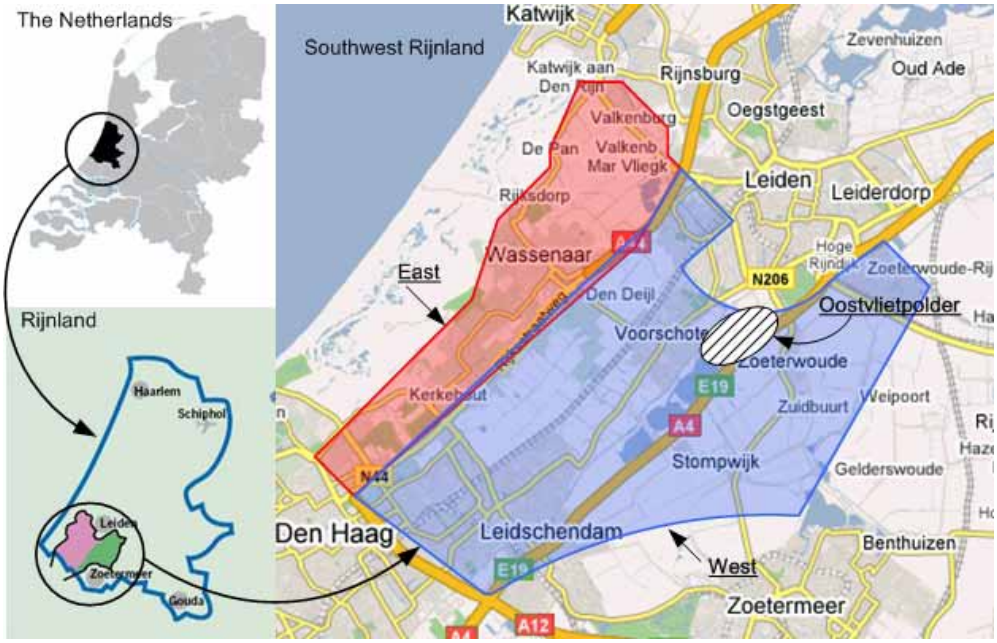

Figure 5.1 The location of Southwest Rijnland in Rijnland and in the Netherlands [www.rijnland.net; http://maps.google.nl]

5.1.2 *History of sediment management in Rijnland*

In their 'Priority note dredging activities' *(Prioriteitennota Baggerwerken)* HR evaluates their dredging activities carried out in the period 1990-1996 and present their dredging program for the period 1996-2001. Starting from 1999, the execution of this program was interrupted. Cause of this interruption was that HR encountered problems with the realization of a sediment depot in the Oostvlietpolder, located at the Southside of Leiden (see Figure 5.1). This story goes back to 1992 when the Province of South-Holland decided that a sediment depot should be constructed in the Northern part of South-Holland. The location preferred by the Province was located in the Oostvlietpolder. Although the municipality of Leiden did not prefer the placement of a sediment depot in their municipality, they admit because it offered them the opportunity to realize a business area. The inhabitants of the Oostvlietpolder were upset. They feared that the

depot will cause a nasty smell and involves a high risk for human health and vegetable gardens have to make way. In 1995, about 2,000 inhabitants resist against the spatial planning of Leiden and the Environmental Impact Assessment (EIA) was delayed. As a result of this, the municipality of Leiden decided in 1999 to remove the destination of the sedimentation depot from their spatial planning. Initially, the Province threatened that the depot would be appointed anyway, but in the Provincial States the resistance against the realization of the depot also increased [Leidsch Dagblad, 12 November 1999]. At the 19th of February 2003, a renewed spatial planning for South-Holland West was presented. In these plans the reservation for a sediment depot in Oostvlietpolder was removed. In July 2002 the Delegated States and the managers of the sediment depot the Slufter in Rotterdam agreed that HR could use the Slufter as sediment depot. This decision made that the depot in Oostvlietpolder is not necessary anymore [GS of South-Holland, February 2003].

Another issue HR had to deal with is that each time when decision-makers had to decide upon a dredging, they started to discuss the need and necessity of dredging. These issues show that HR is not able to deal efficiently with other government partners, that the need and necessity for dredging and dredging objectives are unclear. To overcome these problems, HR decided to write a new 'Dredging Note' which describes their water bottom policy and the dredging program for the next years. The note aims to provide insight in the need and necessity of dredging, in the problems related to dredging and aims to define the ambition of HR. HR also wanted to get support for their dredging activities, through the involvement of stakeholders in the planning of dredging activities [HR, September 2004; B&A Groep, August 2003].

5.1.3 Context and objectives of 'Dredging in Southwest Rijnland'

Around the time that HR intended to adapt to a more interactive planning process, TNO started a project called 'Sustainable Sediment Management'[9]. In this project TNO developed a new risk governance approach for sediment management, based on their experiences with interactive decision-making processes. When TNO was looking for a pilot-project to test their approach, HR was still struggling with the realization of their 'Dredging Note 2004'. They decided that the first dredging project of Rijnland 'Dredging in Southwest Rijnland', would be realized using the approach designed by TNO. The process has been going on from beginning of 2005 until the end of 2006. The objective as defined by TNO and HR for the process 'Southwest Rijnland' is formulated as follows:

'…to create widely supported and innovative solutions for the deposition of sediment in the area' [Project plan, 2006]

During WS1, the representative from HR explained that the final purpose of HR is to come towards a solution for sediment management, which is supported by all process participants and realized through a transparent process. The need for dredging is out of discussion; the process participants are just asked to think together with HR about possible solutions for the deposition of sediment [WS1, 28 February 2005].

[9] Dredging in Southwest Rijnland is (just as the former case study) a pilot project in the context of the LmW program. It is part of the project 'Living with Sediment', which aims to contribute to the solution of complex dredging problems. This is realized on one hand through the development of a system-oriented approach for sustainable sediment management and on the other hand through the exchange of knowledge and experiences between scientists and local people in order to find new methods of working and approaches [After: Slob, March 2005].

At the background of the interactive process, the development of a new soil policy by the Min. VROM was going on. Important aspects of their environmental policy are the protection and (where necessary) improvement of the quality of soil. The present soil policy is that the possibilities for the deposition of sediment depend on the degree of contamination. The Fourth Note Water System Management [Min. V&W, 1998] already states that during the next years it will be investigated if it is possible to replace this stringent classification of sediment with a more differentiated approach. At 31 March 2006, a design of this new policy 'Decision Bottom Quality' *(Besluit Bodemkwaliteit)* was presented. This policy document aims to provide a coherent policy, balancing between protection and human activities. This implies that not just the quality of sediment, but also the function and features of the deposition location are taken into account in sediment management. It will also provide a more comprehensible framework for sediment management, since policy and legislation with regard to sediment management is contemporary fragmented [Min. VROM, 31 March 2006]. The 'Decision Soil Quality' is expected to become operational at the beginning of July 2007.

5.2 Interaction and knowledge

The process Southwest Rijnland is an interactive process in which TNO, HR and other actors were involved. This section subsequently describes the actors involved in the process, the course of the interactive process and the development of knowledge. Finally a reflection on the tracks interaction and knowledge is given.

5.2.1 Actor analysis

Actors involved can be divided into process management, process participants and professional experts. The role of different actors is also summarized in Figure 5.2. The arrows in this figure give an indication of the relation between the actors involved. Abbreviations used in the figure are explained in the text and in Annex D.

5.2.1.1 Process management

Water Board Rijnland is the commissioner of the project 'Dredging in Southwest Rijnland'. This Water Board is one of the oldest Water Boards in the Netherlands. The mission of HR is to serve humans and the environment in cooperation with others by taking care of the water quality, the water quantity, and sustainable safety. They govern an area covering 11,000 ha which counts about 42 municipalities and has 1.3 million inhabitants. They employ about 630 people [Website HR, March 2007].

The project team was made up of seven people. Four people of the project team were selected by HR and three people from TNO were involved. The coordinator was hired by HR as a temporary worker and responsible for the coordination of information and knowledge, reports and safeguarding of the planning and financial resources. The project leader execution and the person responsible for the sediment deposition policy were both employees of HR. They were responsible for the planning and financing of the execution and the input of knowledge and information from HR. The communication was taken care of by an employee of a small independent consultancy firm, SevS. SevS gives advice for nature and environment on the interface of nature, environment and society. One of the fields in which SevS is actively involved is communication and stakeholder participation [Website SevS, February 2007]. The process management design was developed by TNO. During the process they were responsible for the input

of knowledge about the system (scientific knowledge) and about interactive decision-making processes [Project Plan, 2006]. The project was a pilot project for the LmW program. This is why LmW, TNO and HR were all contributing to the costs of the process. In the context of LmW, TNO also appointed an accompanying committee to advice them about the realization of the LmW objectives. In this accompanying committee people from Rijkswaterstaat, HR, LmW, DLG-East, the Erasmus University and Wageningen University were participating.

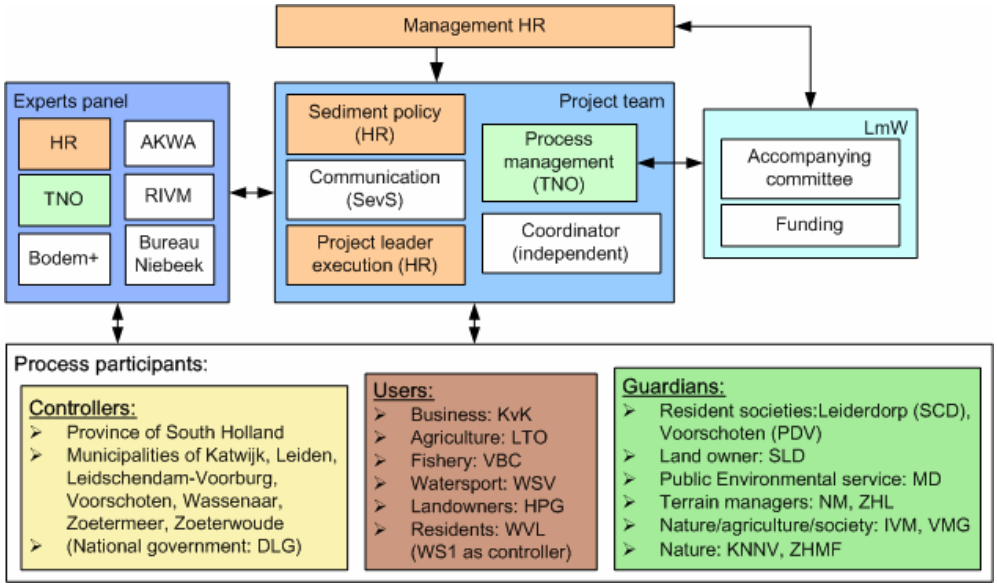

Figure 5.2 Actors involved in the process 'Southwest Rijnland'

5.2.1.2 Process participants

Stakeholders participated in the process in several ways. Some were only informed by newsletters; others attended the general or location-specific workshops. This section only describes the stakeholders who attended one of the first three general workshops. A list of these process participants is also provided in Annex D. Among the participants were representatives from municipalities, the province of South-Holland, businesses, the agricultural sector, resident societies, users of the water system, and nature conservation organizations. Based on the perspective of a stakeholder on sediment management, they were grouped as user, controller or guardian. This classification was based on the background of process participants and the results of a questionnaire[10]. The perspectives are derived from three of the four typologies distinguished in the Cultural Theory developed by Douglas & Wildavsky [1982]. The different typologies represent the following perspectives:

- Users have a short term vision about sediments. Sediment is regarded as a useful resource (e.g. for building, fertilizer elevating land), but can also be an obstacle for recreation or shipping. They have an economic perspective. This perspective is based on the risk perspective of an individualist. An individualist embraces risk and believes in technological solutions.
- Controllers behold a societal perspective and want to avoid societal risks. Dredging is necessary to prevent the risks from flooding and pollution. Information and re-

[10] During the process, several questionnaires have been held. The first questionnaire tested the perspectives of participants through statements about deposition of sediment, legislation, nature, and risks. (see also Annex F)

search are essential inputs for controllers to reduce uncertainties. This perspective is based on the typology of a hierarchist, from their points of view risks are acceptable within strict boundaries set by law.

- Guardians behold an ecological perspective and do operate with a long-term frame in mind. They regard sediment as a part of the eco-system which should be handled with care. They avoid every risk and want to protect the ecosystem. This perspective is based on the risk perspective of an egalitarian. Egalitarians believe that a slight disruption of the present situation could cause irreversible damage to nature.

[Ellen & Slob, to be published]

The 'user' or the economic perspective was represented by organizations protecting the interests of businesses, agrarians, fishers and anglers, water sportspeople, and private landowners. The 'guardian' or ecological perspective was represented by several societies, representing the interests of nature, ecology, residents, or a country estate. In this group also a semi-government organization was represented, the environmental service. One resident society was not grouped as 'guardian', but initially as 'controller' and later based on the results of the questionnaire as 'user'. The 'controller' perspective was represented by seven municipalities and the Province of South-Holland.

5.2.1.3 Professional experts

Employees of TNO and HR behold a lot of scientific and technical knowledge about sediment management. This knowledge and existing scientific knowledge was integrated in an analysis of the natural and human system. In the composition of this system analysis two people from HR, two people from 'TNO, Bottom and Groundwater' and an employee from 'TNO, Innovation and Environment' were involved.

Besides this, also a panel with experts was established. Experts who contributed to the process are employees from Bodem+, AKWA, TNO, Niebeek and RIVM. Bodem+ is an initiative from the Min. VROM and supports provinces, municipalities, and Water Boards with the execution of policy and the national government with the establishment and development of policy. They connect policy development with the execution practice [Website Bodem+, April 2007]. Every WS people from Bodem+ were present. Sometimes they fulfilled the role of observant and sometimes the role of expert in the field of policy and legislation. AKWA *(Advies- en kenniscentrum Waterbodems)* is an Aquatis Sediment Expert Centre. In this centre, specialists from various departments of the Min. V&W work together with external partners [Website AKWA, April 2007]. AKWA was asked to provide knowledge about the relation between sediment management and nature. From TNO an expert was asked to contribute with his knowledge about spatial planning. Niebeek Environmental Management is specialized in water bottoms and dredging activities. They are involved in planning and supervision of dredging, rehabilitation, and civil engineering constructions [Website Niebeek, April 2007]. They were asked to contribute with their experimental knowledge about dredging activities. 'The National Institute for Public Health and Environment (RIVM) is a recognized leading centre of expertise in the fields of health, nutrition, and environmental protection' [Website RIVM, April 2007]. They carry out research, monitoring, modeling and risk assessment activities. It can be concluded that all the experts involved are specialists and experts on an aspect of sediment management. All experts involved represented well-known, established research institutes.

5.2.2 Course of the interactive process

In Figure 5.3 the participatory process is schematized as it has been developed. The following paragraphs explain the different process activities more extensively.

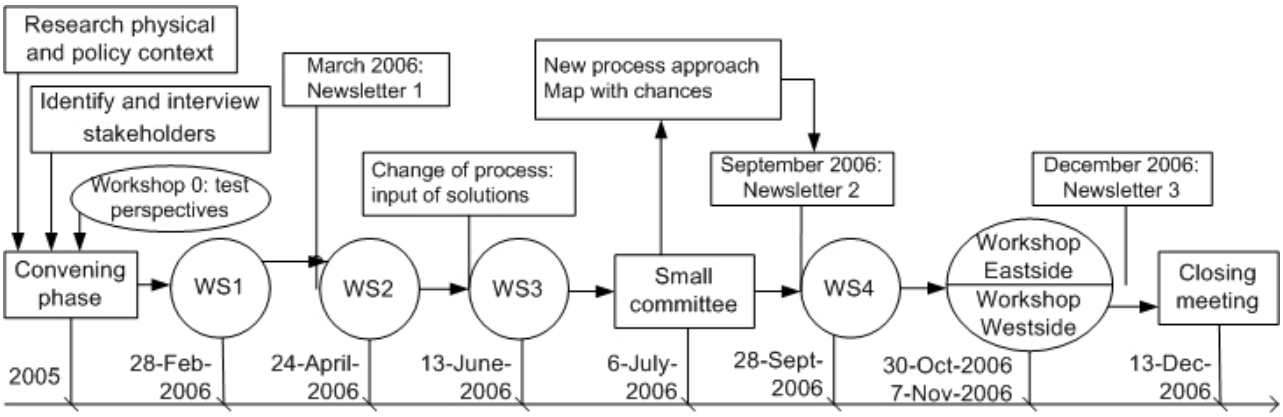

Figure 5.3 Different rounds of interaction during the interactive process

5.2.2.1 Convening phase

In 2003, TNO started to design an approach for sustainable sediment management. At that time they also decided to get in contact with HR. During 2003, they held several interviews with employees of HR, nature conservation organizations, skippers, soil processors, municipalities and the province. The results of these interviews were used to develop the three basic perspectives on sediment management: the user, guardian and controller perspective. To get insight in the problems, solutions and questions about sediment management and to test the perspectives a WS was organized. This WS was attended by two municipalities, the Royal Society for Skippers *(KSV Schuttevaer)*, a dredging firm, a marina firm, Water Boards Schieland and Rijnland and people from TNO. Based on this information TNO designed a method to realize sustainable sediment management. In 2005, the project proposal was admitted by LmW and the project started officially. The first step of the project consisted of identification and interviewing of possible stakeholders, the design of process rules, and the design of a process- and communication plan. One of the concrete outputs of this convening phase is a system analysis carried out by HR and TNO.

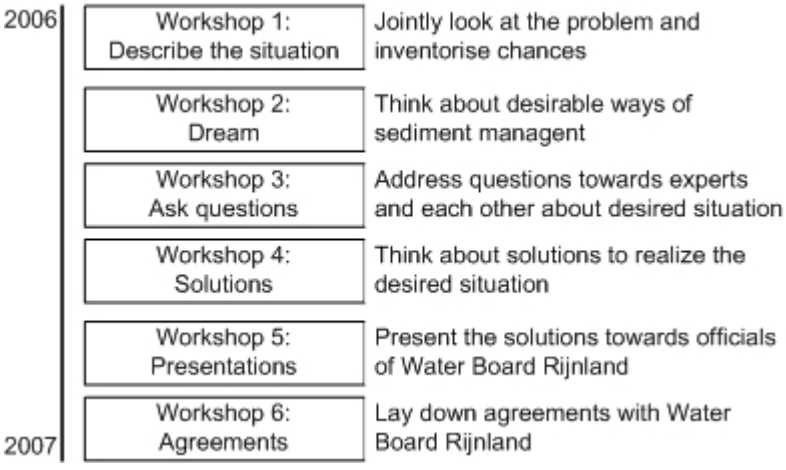

Figure 5.4 The initial process design as presented during WS1

5.2.2.2 Workshop 1

WS1 took place at the 28th of February and was attended by circa 30 people (about 35 were invited). The WS started with an introduction about the problem by HR and a presentation of the process design, see Figure 5.4. After the plenary part, discussed in subgroups the problems, causes, chances and question related to sediment management. The results of the issues discussed in the groups were shortly presented plenary by the process managers. Knowledge questions of process participants were answered directly during the workshops or answered in a knowledge document which was created after WS1. The results of the WS were presented in a newsletter, which was also sent to stakeholders who did not attend the process. In between WS1 and WS2 a project website went online were minutes of the workshops, the knowledge document, and the newsletter were presented. This website and the knowledge document were updated after every WS. During WS1, also a questionnaire was handed over to process participants.

5.2.2.3 Workshop 2

At WS2, held at 24 April, again about 30 people were present. Some people were new and some people who attended WS1 did not show up. Following WS1 the project team formulated process rules, which were discussed with the process participants. In this rules the assignment, the different steps and the objective of the process, the decision-making process, boundary conditions, and gaming rules during the process are laid down. The role of the process participants is that their input will give direction to the planning process, but the government partners will finally be responsible for the decision itself. Boundary conditions are that the costs should be as low as possible, but local solutions may cost a little bit more; solutions have to be carried out before 2010; and the legislation which will be operational in 2007. In the plenary part also the monitoring activities of HR and the results of the first questionnaire were discussed. In the subgroups participants discussed their dreams and nightmares in relation to sediment management projected on 2025 and their knowledge questions. In between the second and third workshop the process participants and the project team were interviewed by two students who did an internship at TNO. Based on WS2, TNO translated the nightmares and dreams of the process participants with the aid of a cartoonist into three desired images of the future.

5.2.2.4 Workshop 3

WS3 aimed to be a kind of ‘knowledge market’ in which process participants could address their knowledge questions to experts. However, in between the second and WS3, HR made clear to the project team that they expected some solutions to come out of the process quickly. Therefore HR suggested that to bring about the possible solutions, so that process participants could fit them with their dreams. Initially, the design was that process participants had the possibility to come up with solutions during WS4. Although TNO did not really support this adjustment, they let HR present possible solutions during WS3. Some reactions of process participants were that they regret that solutions have been chosen already, that their projections about the desired future in 2025 do not match the concrete solutions, and that the proposed solutions do not seem to match the expected ‘Decision Soil Quality’. It was decided that a delegation of the process participants would discuss the continuation of the process separately with the project team. It was planned that during this workshop, the process participants would fill out again a questionnaire about the process. Because of the discussion during this workshop, the questionnaires were sent by e-mail afterwards.

5.2.2.5 Further developments and conclusions

In the beginning of July, a delegation of five process participants and the project team together discussed the continuation of the process and decided to separate the long-term from the short-term discussion. The long-term discussion can possibly be coupled with the implementation of the EWFD. In this discussion stakeholders will also be involved, but this discussion goes beyond project level and is postponed. The remaining part of this process would be about location specific solutions, so that local stakeholders were able to contribute with their practical, location-specific knowledge. During the summer, HR and municipalities together developed a map with chances for deposition and recycling of sediment based on the local spatial planning of municipalities.

In the second Newsletter [September 2006] and during WS4 at the 28th of September the results of this consultation and the map with chances were presented. After the plenary part of WS4, process participants were asked to complement the map with chances, place remarks and to formulate the information which is needed to carry out the local discussion. For the local discussion, the area was divided into two parts: an area at the Westside and an area at the Eastside of the highway A44 (see also Figure 5.1). Residents, ground owners, and users were invited for these local workshops and asked to select the options they prefer and the conditions under which this should happen. Note that the people involved were not the same people as the ones who attended the first workshops. In contrary with the first workshops stakeholders were now invited individually and not only as representatives of interest groups. The result of the workshops is a map with twenty-five chances (see also Annex G). This map was offered officially to the responsible officials of the municipalities and Rijnland during a closing meeting. For this meeting also the process participants from the first general workshops were invited again. The final map with chances contained three kinds of reservations: yes, if the realization is discussed with stakeholders; no, unless HR can suffice strict conditions; and no, these measures will not be realized. Also new solutions were added to the solutions suggested by HR (see Table 5.1). During the closing meeting, TNO distributed a third questionnaire about knowledge gathered during the process, the opinion of process participants about the process and the results.

Table 5.1 Selected directions for solutions and reservations of process participants

Direction for solutions:	**Reaction of participating stakeholders:**
Elevation of: ➢ existing rural areas ➢ urban areas ➢ construction sites	➢ Yes, if consultation; No, unless clearness future land use; No because of nature ➢ Yes, if consultation with stakeholders ➢ Yes, if: clean sediment; clearness future
Improvement of quays	Yes, if de-watering, nature, accessibility is guaranteed
Restructuring greenhouse areas	No, unless clearness about execution
Passage depots	No, for municipalities
Space for processing	Yes, if clearness spatial planning
Cover former waste disposal site	Yes, if clearness reconstruction and costs
Rearrangement of deep wells	No, unless: class 0-2 sediment is used; combined with sand extraction
Elevation of land (several public and private locations), improvement of quays, passage depot, cover deposition sites, process to compost	

5.2.3 *Development of knowledge*

Knowledge has mainly been developed by employees from HR and TNO, but also by other members of the expert panel and process participants. The contributions of these parties are schematized in Figure 5.5. Besides this, process participants also contributed with their location specific knowledge. This section subsequently describes the knowledge which existed already before the start of the interactive process and the knowledge developed during the interactive process.

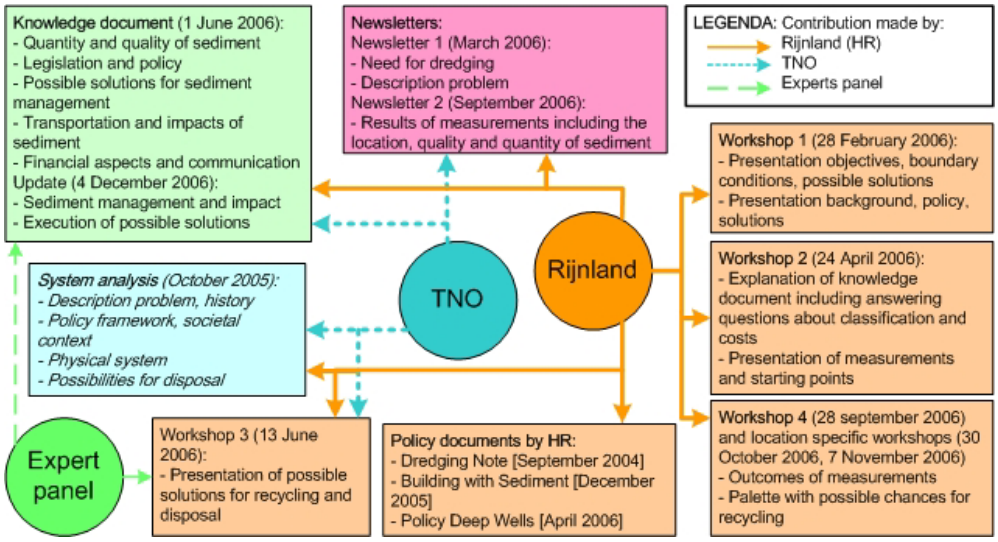

Figure 5.5 Contributions made by TNO, HR and the experts panel to the development of facts.

5.2.3.1 *Existing knowledge*

In October 2005, TNO and HR presented a '*system analysis*'. This report was meant to provide a shared problem definition and knowledge base for all stakeholders, but the report has never been sent to the process participants, since it was too extended. It describes the physical relation between sediment and the water-soil-groundwater system, the policy context, the legislation on sediment management, the stakeholders and the feasibility of possible solutions. The report refers to earlier reports made by TNO, other established engineering- and consultation firms, the government, HR, and knowledge centers and to other documents from the government [Passier *et al*, October 2005].

HR themselves also gathered knowledge about sediment management to support their policy development. The two most relevant notes are their '*Dredging Note 2004*' and their note '*Building with Sediment*'. The first note presents the policy of HR with regard to water bottoms and their ongoing multi-year sediment program, which is adjusted yearly. The note goes also into the need and necessity of dredging in order to finish the ongoing discussion about dredging; the location and costs of dredging; and the ambition level of HR. One of the important decisions of the Associated Assembly of HR presented in the note is that the polder water system should reach an adequate depth within 15 years (this is before 2020). Information sources for the note are earlier reports of HR, but also policy guidelines and reports of other Water Boards, Rijkswaterstaat, provinces and several Ministries. References are also made to research carried out by organizations such as STOWA and the University of Nijmegen [HR, September 2004]. In the subsequent note the possibilities for the processing of sediment have been explored and a selection has been made. Preferred locations for deposition of sediment are deep wells

and low-lying polders affected by salinization problems. Present and expected legislation and policy forms the basis for the selection of possibilities for sediment processing. The Dredging Note 2004 has been an important source of information for this note. Also information has been achieved from governmental projects and studies, such as AKWA, Depot+, steering group Water Bottoms (STUWABO), the Ten-year scenario water bottoms, and the project group 'soil and sediment'. [HR, December 2005].

5.2.3.2 Knowledge developed during the process

When the process started, a *measurement program* of HR was still going. The measurements involved gauging activities to get an indication of the quantity of sediment to be dredged, sampling to determine the physical and chemical quality of the sediment, and exploration of the surroundings to get an indication of the space available to carry out dredging activities. The results are laid down in maps with the dredging locations related to the quality of the sediment (varying from class 0 until 4). During WS2 (24 April 2006) preliminary results of the measurement program were presented. In the second news letter (September 2006) the measurement results for the polder water system were published. Later also the final results of the program for the total water system including the head waters was presented on the website of Rijnland. The results of the measurement program were not very surprising, since the results did not differ much from the expected results. Simultaneously with the interactive process, HR was also doing research after the possibilities to rearrange deep wells. In April 2006, the report '*Policy Deep Wells*' was published and accepted by the general assembly of HR [HR, April 2006]. Also research is going on after the deposition of sediment in low-lying polders to fight salinization. The results of these research activities were not presented during the workshops, but came forward sometimes during the workshops.

During the process, participants were informed about the problem and solutions during presentations of HR and the news letters. Questions of participants were answered in the knowledge document or directly during the workshops by HR, TNO or other professional experts. In WS3 'fact sheets' with possible solutions developed by TNO and HR were presented. The newsletters were made by HR, SevS and an expert from TNO. In the summer period, HR consulted municipalities about their spatial planning. This information was used to develop a pallet with chances for solutions. The process participants brought their area specific (practical and historical) knowledge into the discussion, but did not contribute to the answers in the knowledge document or carry out research by themselves. One process participant suggested that process participants could maybe also contribute to the knowledge document and asked questions about the scientific validity of the knowledge document

5.2.4 Reflection on interaction and knowledge

Different types of stakeholders were involved in the interactive process. During workshops they were informed about the process and were able to interact with each other in subgroups. During the first three workshops, participants were divided in groups based on their perspective, later on a spatial distinction was made between the Eastside and the Westside of the area. Especially, during these location-specific workshops, parties were able to contribute with their location-specific experiences and knowledge. This stakeholder knowledge complemented the existing scientific knowledge, the knowledge from municipalities about spatial planning and the knowledge of the commissioner about the problem. New knowledge was developed during the process by the commissioner, but this was not a result from the interactive process, but part of ongoing research.

5.3 Problem perceptions

In the first case study, the development of problem perceptions has been studied extensively. In this case HR made the final choice for solutions and process participants did not make their preferences explicit. Therefore in this section attention is mainly paid to the divergence of perceptions. For this analysis, the results of the questionnaires and interview reports and observations of two students and the experiences of process managers from TNO have been used. The first questionnaire provides insight in perceptions and the third questionnaire in the increase of knowledge. The results of the questionnaires are summarized in Annex F. In the next subsections the perceptions of users, guardians and controllers are described. Figure 5.6 gives a nice insight how perceptions may differ between these (groups of) stakeholders. In every subsection the background and interests and the problem formulations of different stakeholders are described. The attendance of different stakeholders is only known for the first three workshops.

Users: 'Sediment is part of it' **Guardians: 'Balance through customized solutions'** **Controllers: 'Think integrated, act simple'**

Figure 5.6 Examples of the dreams and nightmares, from left to right: users (deeper fare ways), guardians (afraid for stench), and controllers (clean water as a result of dredging activities).

5.3.1 Users

All people who attended the workshops from a user perspective were representatives from interest groups. The interests the stakeholders in this subgroup represent and their attendance during the first three workshops are presented in Table 5.2.

From the people represented in this group, only one person from the water sports and the VBC attended all workshops. The representation of the other stakeholders varied. From the sector fishery people representing professional fishermen, the provincial consultation for fishery, or angler societies were present. A representative of the VBC who attended all the workshops said that he desires 'a future situation in which deep wells are arranged in a way that they function better, nature-friendly maintenance, more dredging activities, and a fish-stock as it used to be about one-hundred years ago' [Interview, 24 May 2006]. The sector water sport is a strong advocate of dredging activities, because they want to maintain the water depth. In an interview a representative of the WSV argued that 'we do only have interests in the final results of dredging: "the more dredging, the better" so that we can navigate pleasant' [Interview, 24 May 2006]. The KvK aims to stimulate the regional economy. During WS3 their representative stated that too much focus on the restrictions should be prevented, since this obstructs the development of innovative solutions [WS3, 13 June 2006]. People owning land adjacent to waterways are obliged to accept sediment class 0, 1 and 2 *(ontvangstplicht)*. Only the distribution of sediment class 1 and 2 is restricted [Passier *et al*, 2005]. For

agrarians it is important that the quality of sediment is good, because of food security. Agrarians would like that they are paid for 'blue services' such as dredging activities and maintenance of ditches, so that costs and benefits are distributed equally. Private landowners are mainly interested in the value of their land and contributed during WS1 with a lot of historical knowledge. The people from resident society WVL were mainly asking questions during the process and showed a poor understanding of the problem. They know what they do not want, namely that sediment is put on the shores, because residents have to witness this every day. One of them witnessed this in a neighboring place [Interview, 26 June 2006]. Most of the people in this group did not have negative experiences with Rijnland. Only one person from the VBC mentioned that he has had negative feelings about HR, but that this changed into a positive feeling last years [Questionnaire 1, 28 February 2006].

Table 5.2 The interests of the stakeholders representing the 'users' and the number of persons who attended the first three workshops

Organization:	**Represent:**	**Interest:**	**Attendance:**		
			WS1	*WS2*	*WS3*
Fish-stock-management-committee Rijnlands Boezem (VBC)	Angler societies, professional fishermen, Water Board Rijnland, and the Province of South-Holland	Good fish stock through fish stock management plans and ecological restoration	2	1	1
Royal Society for Water Sports (WSV)	Water sportspeople (surfers, sailors, and motorboat drivers)	Keep waterways open for recreational navigation	3	1	2
Chamber of Commerce (KvK)	Business enterprises region Rijnland	Stimulation of the regional economy	1	0	1
LTO-North/agrarians	Agriculture and horticulture in the Netherlands	Distribution of the costs and benefits, food security, income	1	2	1
Federation Private Landowners (FPG)	Private landowners in Holland	Value of their land	1	1	0
Resident Society Leidschendam (WVL)	Residents from Leidschendam	No nuisance or violation of the landscape	-		2

The general perception in the user group was that policy and legislation is too abundant and too strict. Legislation should be supporting instead of paralyzing. Their dream is that dredging activities are carried out regularly, that ditches are wide, deep and do have a V-form, contaminated sediment is totally cleaned, costs and benefits of sediment management are shared and water management is arranged well. Although the interests of the process participants in this group diverge, process managers did not signalize any conflicting interests during the workshops [WS1, 28 February 2006; WS2, 24 April 2006].

The results of the first questionnaire show that everybody in this subgroup agrees that not fear should be guiding, but that risks should be accepted and the impacts on nature should not be over-estimated. Disagreement was visible about the application and necessity of rules and the role of nature. It is hard to draw a distinction between different groups of stakeholders, but the sector fishery seems to be more ecology-minded than the other people in this group (HPG, LTO, WSV, KvK) [Questionnaire 1, 28 February 2006]. The representative of WSV describes in an interview a difference in perception between landowners and the fisher-men [Interview, 24 May 2006]. An employee from

Rijnland observed conflicting perceptions between the LTO who advocates dredging activities to prevent that the agricultural business gets in danger and people who like nature and do not like dredging activities [Interview, 25 May 2006].

During WS3 people had the possibility to react upon formulated solutions. In their opinion the presented solutions were not innovative, but mainly matched the old-fashioned way of thinking in which sediment is processed based on its classification. They suggested another solution, which is more flexible legislation. It was even argued that it seems that the presented solutions are based on 'old' legislation and do not fit the expected legislation. All presented solutions do fit the existing framework; this does not enable creative thinking. Besides this the 'users' find it hard to react upon the presented solutions, since they do not have the knowledge to assess solutions [WS3, 13 June 2006].

The process participants complemented each other with their knowledge. Mainly landowners do have very location-specific knowledge and know also a lot about the history of the area. The LTO and KvK contribute less specific knowledge and are more focusing on feasibility [Interview process manager TNO, 7 May 2007]. A representative of the VBC appreciated the input of local experimental knowledge by agrarians, but water sports people, local bird-watchers and fishermen do also bring new insights and advices into the process [Interview, 24 May 2006].

The third questionnaire was filled out by two people representing water sports and one person from VBC. In their opinion the workshops and the knowledge document were most instructive; the news letter was less instructive. They had the opinion that there was enough possibility to make contributions to the results and that enough was done with these results. People from the water sports were quite positive about their increase of knowledge. In an interview a representative of the WSV said that he learned a lot during the process and heard some good ideas from other process participants [Interview, 24 May 2006]. A representative of the VBC filled out that he disagreed that his knowledge about the costs of sediment management and the role of sediment in the ecosystem increased [Questionnaire 3, 13 December 2006]. In an interview he said that the before the process he had never heard of geo-tubes. This was one of the things he learned during the process [Interview, 24 May 2006]. For the residents from WVL the dredging problem was totally new. The information provided during and before the workshops was just too much to understand and the solutions mainly called up questions. Their perceptions are mainly based on what they actually see [Interview, 26 June 2006].

5.3.2 Guardians

The guardian's perspective was represented by two resident societies, a society for a country estate, several nature conservation organizations and a semi-government organization for environmental services. Their interests are summarized in Table 5.3. All people who participated in this subgroup strived to protect nature or to sustainability in general. Some view nature from the user or experience point of view, others more from the ecological point of view. Most of the stakeholders in this subgroup were not represented during all the workshops. Only a person who was employed by HR and represented IVN (nature and environment education) and VANAde (agricultural nature society) attended all the workshops. She mainly emphasized the experience of nature. Her motive to attend the discussion was to witness the process and learn about how people experience ecology. In her opinion nature mainly wants to benefit from the process

without having to pay for the development of nature [Interview, 18 May 2006]. She represented the voice of residents, the private nature enjoyer.

The results of the first questionnaire do not show that this group is overprotective. Just as the users they also do not want to exclude all the risks. The results do also not suggest that some people are more protective than others [Questionnaire 1, 28 February 2006]. This subgroup regards water quality, drainage of water and the quality and deposition of sediment as important problems, which are mainly a result of poor communication and a lack of awareness. They regard customized solutions as the way to realize a balanced ecosystem. Nature-friendly shores, ecological maintenance, strict rules about the deposition of contaminating materials but fewer rules with regard to sediment management [WS1, 28 February 2006; WS2, 24 April 2006].

In the opinion of this subgroup the solutions handed over by HR during WS3 were formulated too vague. They want to react upon concrete solutions at concrete locations, carried out in a certain way. To them, the execution of solutions and measure-made solutions make the difference between an acceptable or unacceptable solution. This is especially important for the representative of VMG. Also a new solution was suggested within this group by NM. This was the development of wet nature areas. This could be realized in combination with the elevation of low polders. When sediment is applied in this way it can contribute to the creation of wet pioneer nature [WS3, 13 June 2006].

Table 5.3 The interests of the stakeholders representing the 'guardians'

Organization:	**Represent:**	**Interest:**	**Attendance**		
			WS1	*WS2*	*WS3*
Foundation Committee Doesburg (SCD)	Residents from Leiderdorp (26,000 inhabitants)	Surroundings of residents	1	0	1
Platform Sustainable Voorschoten (PDV)	Residents in Voorschoten (23,000 inhabitants)	More sustainable society	1	1	1
Foudation Country Estate Duivenvoorde (SLD)	Country Estate Duivenvoorde	Managing the landscape	1	0	1
Natuurmonumenten (NM)	Nature terrain	Protect and manage nature	1	0	1
South-Holland Landscape (ZHL)	Nature terrain	Protect, preserve and develop nature/landscape	1	0	0
IVN/VANAde	People who like nature and nature	Preserve (agricultural) nature, involve people	1	1	1
Birds- and environment working group (VMG)	(Agricultural) nature, a scientific approach	Ecological interest	0	1	1
Environmental Federation South-Holland (ZHMF)	Environmental and nature societies in South-Holland	Sustainable society	0	1	0
Royal Dutch Nature History Society (KNNV)	Nature in Holland	Nature	1	0	0
Environmental Service (MD)	Municipalities and own organization	Policy development, safety etcetera.	1*	1	1

* During WS1 MD attended the subgroup controllers.

An employee from HR who attended the workshops for the subgroup guardians said that he heard about many nice things. The contributions of the different parties were not

innovative, but the workshop already provided solutions he had never been thinking of. He also observed that people do not just see their own problems, but that they regard sediment management as a problem for everybody [Interview, 23 May 2006]. From this subgroup, someone from the PDV, the IVN and the VMG filled out the third questionnaire. They had a different reaction on the increase in knowledge. The only aspect they all learned something about is legislation. The representative from the PDV reacted neutrally on the increase in knowledge. The representative from IVN did not learn about the role of sediment in the ecosystem or about the classification. The knowledge of the representative of VMG only increased about the technical possibilities and legislation. He even mentioned that in his opinion the increase in knowledge was disappointing [Questionnaire 3, 13 December 2006]. This is not surprising, since he was asked to join the process because of his scientific background (he used to teach biology at the university). He was the only participant who asked questions about the scientific validity of the knowledge document and was critical about the knowledge provided by HR and TNO. The representative of IVN said in an interview that participants did not have any new input, but with their experiences and knowledge they made contributions to the concrete realization of sediment management [Interview, 18 May 2006].

5.3.3 Controllers

The perspective of controllers was represented by several municipalities and the Province of South-Holland. Southwest Rijnland covers the municipalities of Leidschendam-Voorburg, Katwijk, Voorschoten, Wassenaar and Zoeterwoude (see Figure 5.7). From these municipalities, Wassenaar, Voorschoten, and Leidschendam-Voorburg were most actively involved in the process (see Table 5.4). The representatives from the other municipalities (Katwijk, Leiden, Zoetermeer, and Zoeterwoude) only attended one of the first three workshops. For the location-specific workshops, the area has been divided by the highway A44.

Most of the people represented in this group have a function related to civil engineering or spatial planning. The position of the people in this group differed from the other groups, since their organizations also have responsibilities with regard to sediment management. This also implied that most of the people already had experiences with HR from the past. These experiences with HR were not all positive. The representative of PZH was quite negative about HR and about the process in general. He only attended the workshops, since he was interested and occupied with this topic too as an employee of PZH. In his opinion it is not very difficult to find solutions, the challenge is to create support and win-win situations [Interview, 19 June 2006]. The representative of the municipality of Wassenaar also stated that it was not difficult to formulate the final objectives of the process, namely ‘a situation of good, clean, navigable water with as less as possible maintenance’. He attended the workshops because they also have to carry out dredging activities in Wassenaar. This process allows him to learn and talk about the problem. In his opinion controllers mainly focus on costs, efficient execution of activities and the achievement of an adequate water depth. [Interview, 6 June 2006].

The problems mentioned in this subgroup in relation to sediment management are mainly related to communication, unclearness of responsibilities, restrictions as a result of legislation, and of space for deposition [WS1, 28 February 2006]. The results of the first questionnaire show that the perceptions in this subgroup mainly differ about deposition in closed depots and the acceptability of risks [Questionnaire 1, 28 February 2006]. The general perception is that it is important that the public is involved in water management issues, that problems are approach in an integrated way, that a focus not

just on the costs but also on the benefits, and that uncomplicated solutions should be preferred. An integrated approach implies that dredging activities are coupled with water quality, ecology and so on and that the water system and area is approached as a whole and not as parts [WS2, 24 April 2006].

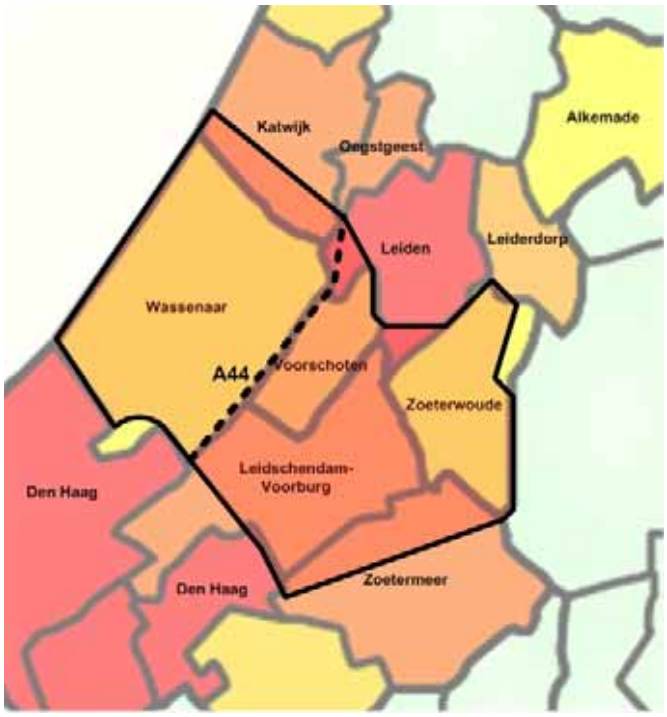

Figure 5.7 Location of municipalities in Southwest Rijnland. The background is a picture of the population density [Statline, 2006].

Table 5.4 Representation of the controllers during the workshops

Organization:	Attendance:		
	WS1	WS2	WS3
Province ZH	1	1	0
Wassenaar	2	2	3
Voorschoten	1	0	1
Leidschendam-Voorburg	1	0	1
Zoeterwoude	1	0	0
Leiden	1	0	0
Zoetermeer	0	0	1
Katwijk	1	0	0

In between WS2 and WS3, HR developed together with the municipalities a pallet with chances. These chances are based on the spatial planning policies of the municipalities. The people involved in this, were not the same as the ones who attended the process. This is why during WS3, representatives still discussed the solutions and added some new ones. New solutions they suggest are the creation of bricks of clay out of sediment, eco-sediment (sediment which is processed in a sustainable way), and mixing of sediment of different classes [WS3, 13 June 2006].

All representatives from the government who filled out the third questionnaire indicated that there knowledge about sediment and sediment management hardly increased. To them, the knowledge document, the newsletter and the workshops were not very instructive. During the interview the representatives of PZH and GW both said that they did not encounter new or unknown elements related to sediment management during the workshop [Interviews, 6 June 2006; 19 June 2006].

5.3.4 Reflection on problem perceptions

In every subgroup, another dominant perception can be recognized. Users had the opinion that legislation was paralyzing and dredging is really needed. Guardians were more skeptical about the need for dredging and emphasized the possible impacts on the natural system, awareness and communication. Controllers are clearly more familiar with

sediment, it is needed but the execution is confronted with transportation, responsibility and spatial problems.

When comparing the perceptions of process participants a clear difference is visible between people representing government bodies and other stakeholders. Government bodies have their own responsibilities with regard to sediment. They are already familiar with the problem and would like that the public gets more involved and that the problem is approached in an integrated way. The process was not really instructive to them, probably since they are already familiar with sediment management and policy development in general.

Other participants (users and guardians) had less experience with policy development and sediment management. The process mainly raises questions e.g. why dredging activities have not been carried out before, but are needed now. For laymen, for instance from WVL, the cause of the dredging backlog is not clear at all and the information overwhelming. Some differences between these process participants are that for some people the process was much more instructive than for others. Some contributed location-specific knowledge; others contributed less specific knowledge to the process. In the guardians group some participants were mainly reserved (e.g. VMG) others really pro-active (NM). Within the user group a more ecology-oriented versus more economy-oriented approach was visible. Generally users were more economy-oriented and pro-active. Guardians were more ecology-minded and some guardians were more pro-active than others. The results show that perceptions cannot be investigated apart from the background and experiences of stakeholders.

5.4 Development of substantive outcomes

The outcome of problem structuring is defined as a joint formulation of the problem and its solutions. Elements contributing to the development of these substantive outcomes are the formulation of the framework for discussion including the objectives and conditions, the present situation, the future situation, and the direction for solutions.

5.4.1 Framework for discussion

Objectives and conditions under which a solution is created together determine the framework in which the discussion takes place. This subsection describes the development of objectives and boundary conditions.

5.4.1.1 Objectives

From the project planning it appears that the objective of the project is that the outcomes of the process are: widely supported, innovative, and provide a solution for the deposition of sediment in the area. HR emphasizes in WS1 the importance of: a solution for sediment management, support, a transparent process, and local solutions for deposition (see also 5.1.2). That HR wants to realize supported and innovative solutions is also described in the process rules, handed over to all participants. The outcomes of the process will support and be directive for the decision-making process of Rijnland.

After WS3, the objective of the discussion was adjusted by a delegation of the project participants and managers. The new objective is the formulation of short-term solutions for processing sediment in the area through a location-specific open planning process. The results of this process will support the administrative decision-making process of

Rijnland. In the third newsletter HR state that based on feasibility, size, costs and realization period a top-five of chances will be worked out. They regard the pallet with chances not as concrete activities, but as serious ideas for solutions. The change of objectives is the result of the desire of a governor from HR to accelerate the process, but also of the input of process participants. A delegation of process participants expressed during the 'small committee meeting' their wish to separate the creation of short-term solutions from long-term solutions.

5.4.1.2 Conditions

HR formulated several boundary conditions, which were communicated during WS1 and in the process rules. These boundary conditions were: that societal costs should be minimized, but local solutions can cost about 10% more; solutions should be realized before 2010; and should fit the (new) legislation to be applied 2007. During WS1, the deposition of sediment in the area was emphasized. During WS1 and WS2 these conditions did not play an important role. From the reactions of process participants during WS3 it appeared that for users it is important that the problem is not averted and solutions are feasible. The reservations made by the controllers are related to feasibility, sustainable use of resources, robustness and transportation. Guardians mainly made reservations with regard to impacts, risks and the user function of the area sediment is applied.

In the third newsletter HR states that they received a good view, under which conditions participants would support the dredging activities. These are adjustment of activities with direct stakeholders, compensation for disturbance of business, the function of the area in relation to the quality of sediment, limitation of disturbance in urban areas, guarantees, monitoring and control, a constant focal point, and take into account specific local circumstances. The conditions formulated by the process participants are directly based on their area specific experiences and knowledge. Based on their organization goals, HR states that criteria for the assessment of solutions are feasibility, size, costs, and realization period. However, they also express that they want to take involve the inhabitants, users and owners to come to customized solutions. This shows that some of the conditions expressed by process participants will be taken into account in the realization of dredging activities.

5.4.2 Present situation

According to Rijnland it is clear that a large amount of sediment needs to be removed from the water system. The framework for discussion is where to deposit it. From this point of view, the objective of the discussion is to discuss solutions and not to discuss the problem itself. This was not even known, since the ongoing measurements activities resulted in several adjustments of figures about the size of the sediment management problem. The development of the problem and the size of the problem are subsequently described in this subsection.

5.4.2.1 The problem of sediment management

The slogan of HR is 'Dry feet, clean water!' In the first newsletter [March 2006] and during WS1 [WS1, 26 February 2006] they explain that dredging is needed to keep the water clean and to allow the drainage of water. Their slogan is. The current project concerns not just regular maintenance, but is also needed because climate change will put a higher demand on the storage and drainage of water. The process participants complemented other aspects of the problem. The guardians mainly regarded sediment management as a problem in the natural system caused by a lack of awareness and commu-

nication. The controllers mainly regarded the execution of dredging activities as a problem (transportation, responsibilities) which is a result of the image, lack of space and unclear responsibilities. Users regarded sediment as a broad problem related to the natural and socio-economic system. According to them financial means, planning, image and population density are causes of the dredging problem. A remark of the users and the guardians was 'How and why did this backlog occur?' [WS1, 28 February 2006]. In the Knowledge Document [June 2006] HR explains that this has several reasons: they did not give dredging activities priority, a discussion was going on about the deposition of sediment, and the prescribed water depths changed. People from HR and TNO regard the recognition of the need for sediment management among process participants as one of the main developments during the process.

5.4.2.2 Size of the problem

Every workshop and newsletter the quantity and quality of sediment was presented again by HR. At the end of the process just for 50% of the initial amount of sediment a location for deposition was needed (see Textbox 1). The development of the quantity and quality of sediment was not a result of the process, but the results of the measurement program. A location for deposition needs to be found only for class 0-3 sediment. Class 4 sediment is transported directly to a depot.

The changing size of problem attracted also the attention of process participants to the figures. When an employee from HR stated in a presentation during the 2nd workshop that 500,000 m^3 is the same as 1,000,000 m^3 of sediment, the participants reacted immediately. However, the quantity of sediment kept an abstract statement. From interviews and questions in the knowledge document it appears that the relation between the amount of sediment and the solutions is not very clear to everybody. Since process participants are not able to verify the results or to carry out their own measurements, they just have to depend on the results presented by Rijnland. Maybe even more important to the process participants is the quality of sediment. Many questions of process participants were about the quality in relation to risks and possible impacts.

Textbox 1 – Development of the quantity and quality of sediment in the knowledge document

> The question in the knowledge document was: 'How much sediment does Rijnland have to process during the next years and how does this proportion to the solutions?' The update of 1 June 2006 states that 'In Southwest Rijnland deposition locations are looked for, for about 600,000 m^3 of sediment'. The update of 4 December 2006 states that 'In Southwest Rijnland deposition locations are looked for, for about 300,000 m^3 of sediment. It is expected that in one deep well about 5 million m^3 of sediment can be deposited and that HR needs to process about 6.2 million m^3 of sediment during the next 15 years *(researcher's note: the solution deep wells is the solution HR prefers)* .

5.4.3 Future situation

For HR one of the incentives of the sediment management is the expected climate change. The dreams of HR are that sediment is applied to reduce the steepness of shores of deep wells in order to improve the quality of these ecosystems; that polders are elevated so that salinization decreases; and that sediment is used for the development of nature [WS1, 28 February 2006]. During WS2 the process participants were asked about their future nightmares and dreams. In the subgroup guardians they dreamed about cooperation for active and customized sediment management and a fair distribu-

tion of costs, to come to healthy and balanced ecosystems and a positive image of sediment. Deterioration of the ecosystem and no dredging activities are their nightmares. In the subgroup controllers they dreamed about cooperation between government bodies and involvement of the public in sediment management in which an integrated approach is aimed for in which functions are placed centrally. Nightmares to them are a technical, sectoral world in which public does not experience water and responsibilities and costs are averted. The subgroup users hoped that in the future there will be a lively and healthy ecosystem which allows security, recreation, payment for blue services and no bureaucracy. Increases of costs, bureaucracy, disappearance or deterioration of the natural system are their nightmares [WS2, 24 April 2006].

It is clear that HR expects other chances and bottlenecks for the future than the process participants. Also within the different groups differences exist between their dreams and nightmares. The dreams of HR are related to solutions, the dreams of guardians to the natural system and the perception of people, the dreams of controllers are related to the functioning of the administrative system, users dream about the socio-economic situation and the administrative system. These differences in perceptions about the future are obviously based on the background, knowledge and interests of the different participants. The divergence in perceptions was acknowledged but not discussed, since there was no need to come towards a joint perception about the future.

5.4.4 Directions for solutions

Objective of the discussion was to create solutions preferably within the area governed by HR for the deposition of sediment. These solutions can be possibilities for deposition or for recycling or processing. For process participants the discussion about directions for solutions started during WS3. But during the first two workshops, HR already expressed their preference for deep wells, elevation of polders, and nature development (see Textbox 2).

Textbox 2 – Presentation of different solutions during the workshops

Solutions suggested by Rijnland during the first three workshops:

1. Presentations HR: “Ideas in Rijnland are the rearrangement of deep wells and make bricks out of sediment.” “Solutions fitting our dreams are application in deep wells, elevation of polders, and nature development.” [WS1, 28 February 2006]
2. Presentation HR: “Rijnland continues to develop the solution ‘deep wells’.” [WS2, 24 April 2006]
3. Presentation HR: “Realistic possibilities for solutions are the rearrangement of deep wells, elevation of polders and small-scale solutions such as improvement of quays, nature development, and the preparation of construction sites.” [WS3, 13 June 2006]

The preference of HR is in line with the policy they already developed and were still developing during the process. The ‘Dredging Note’ of HR [September 2004] states that recycling is starting-point for sediment management. Besides this, they want to develop the alternatives: rearrangement of deep wells and the realization of large-scale transition depots. This is worked out further in the note ‘Building with Sediment’ [HR, December 2005]. In this note, HR mentions deep wells and salinization of polders as concrete bottlenecks in their area which can be solved through the deposition of sediment. The system analysis [Passier *et al*, October 2005] describes over ground solutions and deep

wells as the main possibilities for the processing of sediment. They state that the deposition of sediment in deep wells is currently a topic for discussion. The solution has many advantages and recently a lot of experience is gained about the design and realization of this solution. In Southwest Rijnland there are two locations fitted for the rearrangement of deep wells: the Valkenburgse Lake and Vlietlanden. Investigation of HR shows that for both lakes a lot of material would be needed, but that rearrangement is possible [HR, April 2006]. 'Deep wells' was one of the seven possible solutions (A until G in Table 5.5) presented to process participants during WS3.

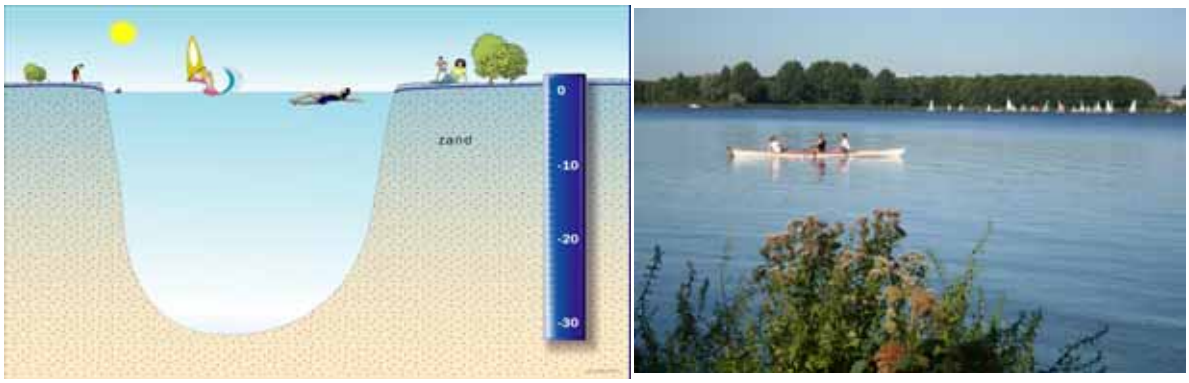

Figure 5.8 Impression of the presentation of the solution 'deep wells'. On the left a schematization used during WS3 and on the right a photo of a possible location in Vlietlanden used during WS4

Figure 5.8 gives an impression of the way the solutions have been presented. The figure on the left is a sketch of deep wells as it was presented on fact-sheets about the solutions. These fact-sheets provide for every solution, information about the boundary conditions, the environment and stakeholders, costs and the expected results in terms of quantity of processed sediment were presented. The fact-sheets were developed by HR and TNO, and aim to provide an image of possible solutions. The process participants had the possibility to react upon solutions, to add new solutions and to express whether they supported the solution or not. Generally, process participants were most positive about the possibilities to build with sediment, elevation of polders and transition depots. The other alternatives were assessed less positive. It seems that users are more positive and have less reservation than controllers and guardians. The reaction of process participants is also schematized in Table 5.5. Percentages in the green cells refer to a positive reaction, orange cells to positive reactions with a reservation and red cells to negative reactions.

Table 5.5 Judgment of the solutions by process participants in (%) [WS 3, 13 June 2006]

		Guardians			Controllers			Users			Total		
	Solutions:	Yes	Yes, if	No, unless	Yes	Yes, if	No, unless	Yes	Yes, if	No, unless	Yes	Yes, if	No, unless
A	Rearrangement of deep wells	50	50	0	60	40	0	78	0	22	**65**	**25**	**10**
B	Elevation of polders	40	60	0	75	25	0	100	0	0	**76**	**24**	**0**
C	Building with sediment	83	17	0	100	0	0	100	0	0	**94**	**6**	**0**
D	Geo-tubes	33	50	17	75	0	25	100	0	0	**72**	**17**	**11**
E	Maturing/Land farming	80	20	0	40	60	0	75	0	25	**67**	**22**	**11**
F	Trnsit depot		0	0	25	75	0	75	25	0	**71**	**29**	**0**
G	Sand seperation	40	60	0	25	75	0	50	25	25	**41**	**47**	**12**
	Development of moist nature	100	0	0									
	Thermal treatment				25	25	50						

Rearrangement of deep wells was not a solution preferred by process participants. The subgroup users regret that sediment is not used for other purposes, future generations may get in trouble and the number of landing points for yachts possibly decreases. Controllers asked questions about the long-term impacts. Guardians emphasized the risks and the unpredictability of impacts on the ecosystem. Users also suggested that legislation should be adjusted. One of their reactions on the solutions is that it seems that they are based on old legislation instead of the new 'Decision Soil Quality' which emphasizes on function instead of quality norms. In the location-specific workshops, concrete solutions were presented with photos and maps provided by Google Earth. The reservations made by stakeholders during these workshops are summarized in Table 5.1 in subsection 5.2.2. With respect to 'deep wells' stakeholders made some pragmatic reservations: if the impacts are uncertain it is better to apply only clean sediment and if it is possible to combine it with sand extraction activities it can be allowed. It is striking that all reservations made are not about the content of the solutions, but mainly about the way they will be executed. The desire expressed by agrarians for 'blue services' or the desire for nature-friendly shores expressed by guardians are not reflected in the outcomes of the process.

5.4.5 Reflection on the substantive outcomes

What we see in the development of substantive outcomes is that the problem and solutions were not formulated by process participants but by HR. Simultaneously with the interactive process, HR was measuring, developing policy, consulting municipalities, and developing solutions. This was however not influenced by the interactive process. The role of process participants was that they contributed their practical and location-specific knowledge which resulted in a list of reservations. Based on these reservations and the criteria developed by HR, solutions were developed. These were not very innovative solutions, but also not solutions corresponding exactly with the solutions desired by HR. The solutions reflect the interactive process which allowed the integration of existing scientific knowledge, existing spatial knowledge of municipalities and practical, location-specific knowledge of people living in the area.

5.5 Conclusions case 'Southwest Rijnland'

Based on the analysis of the case study it is possible to draw conclusions upon the course of the process of problem structuring, the problem perceptions of stakeholders involved, and the development of substantive outcomes.

5.5.1 Course of the process of problem structuring

Based on theory it is assumed that the process of problem structuring is mainly influenced by the development of interaction, problem perceptions, and knowledge. Developments within these tracks are influenced by the stakeholders involved and external developments. In Figure 5.9 the course of the process of problem structuring for the case 'Southwest Rijnland' is schematized.

The case study shows that external developments affected the interactive process in several ways. One example is that the analysis of the problem perceptions shows that people were affected by their experiences with HR and dredging activities they witnessed in their environment (①). Another relevant development which affected interaction and knowledge at the background of the process is the development of the 'Deci-

sion Soil Quality' (②). Also the experiences of HR with the realization of a sediment depot were important, since this resulted in the interactive process.

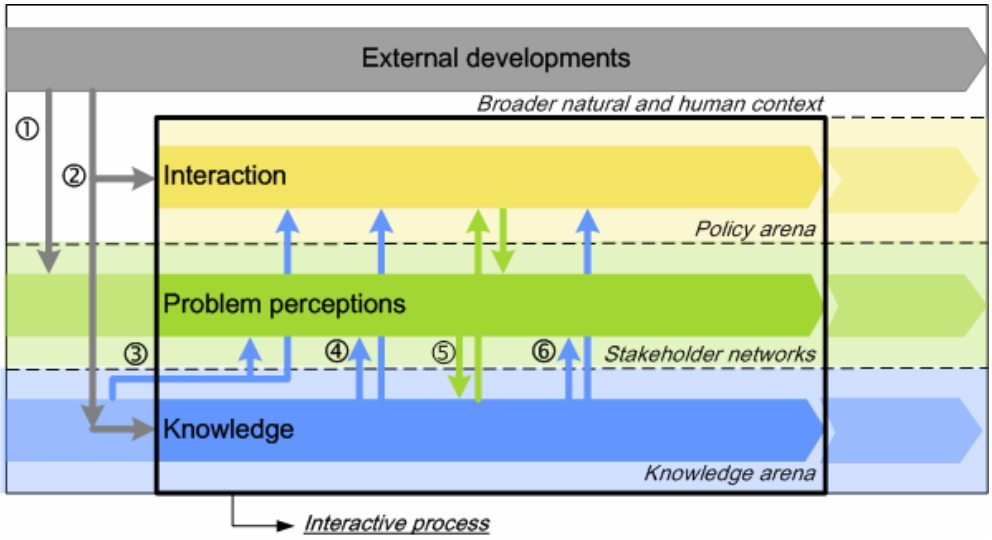

Figure 5.9 Course of the process of problem structuring for 'Rijnland'

Through the knowledge document, presentations and news letters, existing scientific knowledge was brought into the process and affected the interaction and perceptions of participants (③). Simultaneously with the interactive process, the measurement program of HR was executed. The results of these research activities were presented several times during the process (④). During the process, the process participants also contributed with their own experiences and knowledge about sediment management to the knowledge arena. This did not result in new research, but influenced the interaction and changed the perceptions of other process participants (⑤). In the summer of 2006, HR developed a map with chances together with municipalities. This resulted in the integration of existing knowledge about spatial policy and also influenced interaction and perceptions (⑥). We see in this case study that interaction did not result in the development of new knowledge, but was important for the integration of different types of existing knowledge and of ongoing research activities.

5.5.2 *Problem perceptions*

Because the composition of process participants changed during the process it is hard to analyze the development of stakeholders' perceptions. What also played a role is that in this case study, stakeholders were not explicitly asked to support the problem and solutions. Stakeholders were divided into the subgroups users, controllers, and guardians. Based on the available information it is possible to draw the following conclusions:

1 Although it has not been made explicit, it can be concluded that support for the map with chances was created during the process. Generally, no people rejected the results and all people who filled out the last questionnaire supported the results.
2 When analyzing perceptions of the problem, differences are recognized between the different groups. Controllers (e.g. municipalities, province) are familiar with the problem, to them integration and involvement of the public is important. The knowledge of users and guardians depends on their experiences. Users focus on economic development and guardians on the ecosystem. The development of perceptions has not been analyzed in this case study, but a questionnaire shows that the workshops were more instructive for users and guardians, than for controllers who were already familiar with the problem.

3 Within the subgroups, differences were also recognized. People with an administrative background (e.g. employees from larger interest groups), approach the problem differently than e.g. a resident. Residents want to approach the problem more concrete and location-specific whereas others want to approach a problem within the ruling policy. It appears that approaches are highly personal.

5.5.3 Development of substantive outcomes

The objective of this process was to create support for solutions. A final choice for solutions will be made by HR, based on the results of the process. The following conclusions can be drawn about the development of these outcomes:

4 The substantive outcomes are the result of the integration of existing scientific research with context-specific stakeholder knowledge. New knowledge was developed by the commissioner, but was not the result of interaction. Spatial knowledge was provided by municipalities and specific or historical knowledge by process participants. Professional experts contributed with existing scientific knowledge, but did not develop new scientific knowledge to support the interactive process.

5 Interaction was important to connect different types of existing knowledge. This contributed to the support among stakeholders and to the creation of a context-specific knowledge base. The intervention of the commissioner played an important role in the development of the interactive process. Because of this intervention, the objectives of the discussion were adjusted from the creation of innovative solutions to short-term solutions.

6 External developments did not affect the outcomes of the interactive process directly. But on the background, the newspapers, other dredging activities, and the development of new legislation played a role.

6 Reflection on the case study results

This chapter reflects on the similarities and differences between the case study results of Case 1 and Case 2 and the matches and mismatches between these results and the theoretical concepts described in Chapter 2. The first section describes the theory and the case study results for the process of problem structuring in general. The reflection has been worked out further for two theoretical concepts, problem perceptions and the creation of 'negotiated knowledge'. Section 6.2 compares theory and the case study results with respect to problem perceptions. Section 6.3 compares the theory about the creation of negotiated knowledge with the development of substantive outcomes in the case studies.

6.1 Process of problem structuring

This section starts with a short summary of the theoretical concepts described in Chapter 2 and the conceptual model. Subsequently, the process of problem structuring is described for both case studies. This section closes with a synthesis of theory and experiences derived from the case studies.

6.1.1 Theory

The process of problem structuring starts with an unstructured or moderately structured problem, for which the knowledge base is uncertain and/or not agreed upon and/or no consensus exists about the normative standards (values, norms and objectives). During a process of problem structuring stakeholders interact with each other about the problem and available information and ideally develop a joint formulation of the problem and its solutions. Problem formulations are changing, but a choice for a solution implies that a problem has been chosen. Chapter 2 presents two models for interactive decision-making processes. One model emphasizes on the development and integration of different types of knowledge (facts, perceptions, and competences) and another model on different factors of a network (social, cognitive, and institutional). It is concluded that interaction, problem perceptions, and knowledge are central elements in the process of problem structuring. Problem structuring is part of a broader natural and human context and therefore affected by external developments. The conceptual model derived from theory is schematized in Figure 6.1.

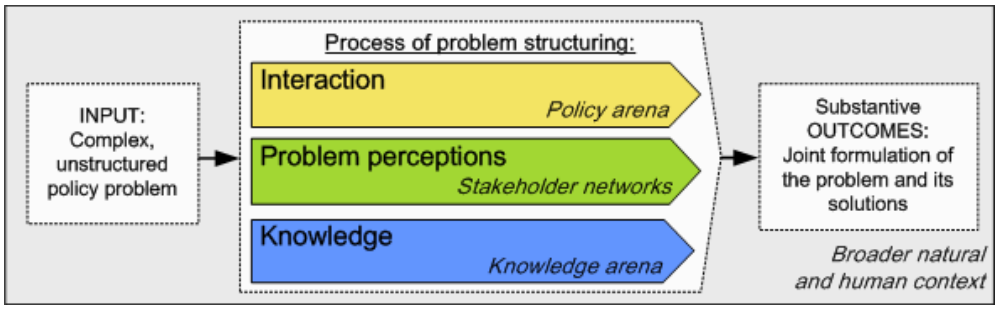

Figure 6.1 Conceptual model used to analyze the case studies

6.1.2 Case studies

Within Case 1 it is clearly recognized that the process started with an unstructured problem. Process participants disagreed about the knowledge base and upon the normative yardsticks. In Case 2, participants also behold different normative standards, but most of the participants were not familiar with the problem. This is why disagreement about the knowledge base is not recognized, i.e. the problem is a moderately structured problem (type 2). During the interactive process of Case 1, process participants together developed a formulation of the problem and its solutions. Although they did not share the same perception on every sub-topic of the problem formulation, they agreed upon the problem and its solutions. The interactive process initiated interaction between stakeholders with similar and diverging perceptions. This contributed to the development and integration of different types of knowledge, adjustment of perceptions, and created willingness to reach an agreement. In Case 2, the problem and its solutions were actually formulated by the commissioner. Simultaneously with the interactive process, a measurement program of the commissioner was going on to create more insight in the problem. The selection of solutions was not done by participants, but will also be done by the commissioner. The role of participants was that they contributed with their knowledge and expressed their preferences, which will be taken into account in the selection of solutions. In fact, the choice of solutions will be based on the perceptions of the commissioner about the perceptions of stakeholders. The problem and its solutions were not laid down in a final and agreed upon document, but there are enough reasons to assume that the suggested solutions were supported. The interactive process made people learn about the problem and able to contribute with their practical knowledge. Both case studies show that existing knowledge and perceptions, developed before the start of the interactive process, play an important role in the process of problem structuring. Developments in the natural and human context affect stakeholders and the development of knowledge. In Case 1, we also saw that ongoing developments in the natural and human system affected the interactive process directly.

6.1.3 Synthesis

Both case studies concern an interactive decision-making processes starting with a complex problem (see also subsection 3.2.2), but the process of problem structuring developed quite differently. By definition, for a complex, unstructured problem, problem structuring is a process in which stakeholders, through interaction about the problem and information, jointly develop a formulation of the problem and its solutions. This definition corresponds with the results of Case 1. Within Case 2, process participants did not formulate the problem and its solutions, but contributed to the process of problem structuring of a central steering actor (in this case HR, the commissioner). The lack of involvement in the actual process of problem structuring and the lack of knowledge about the problem among stakeholders make that the addressed problem is not unstructured, but moderately structured (type 2). This shows that knowledge and stakeholders are an input for problem structuring and contribute to the existence of a complex, unstructured problem. The role of stakeholders and of the process management is an important element to be taken into account in the analysis of problem structuring. Process management is therefore added to an adjusted version of the conceptual model, which is presented in Figure 6.2.

Furthermore, the used conceptual model assumes that interaction develops simultaneously with knowledge and problem perceptions. The case studies show that interaction *itself* is not a developing element, but interaction enables the development of perceptions and knowledge. This is why in the adjusted conceptual model interaction is not

schematized as an individual track, but as bipartite arrows. In both case studies attention has been paid to the natural and human context of the process. The case studies show that it is useful to do so, since an interactive process does not take place in a social vacuum, but is influenced by developments before, during and after the interactive process.

In the adjusted conceptual model the tracks perceptions and knowledge are schematized as central elements. With respect to perceptions, Case 1 shows that an interactive process does not result in identical problem perceptions, but in agreement about the problem and its solutions. This brings us to the conclusion that besides cognitive factors (e.g. perceptions about the present and future situation and solutions) also social factors (e.g. interests and network dependencies) play a role in problem structuring. Agreement of is the result of perception building and action building. In Case 2, it was not possible to recognize the development of perceptions clearly. But in this case, it is also recognized that participants learned about the problem and each other and supported the outcomes. The adjusted conceptual model schematizes that the development of perceptions results from cognitive and strategic learning, i.e. cognitive and social factors. Development of perceptions is needed create support for the knowledge base. This aspect is considered in more detail in section 6.2.

The case studies show that once an interactive process starts, scientific knowledge which exists already before the process is integrated with stakeholder knowledge. The adjusted conceptual model schematizes that the content of the knowledge base results from the integration of scientific knowledge and stakeholder knowledge. Both are needed to create a context-specific and scientifically valid or testable knowledge. Together the creation of support for the knowledge base and the content of the knowledge base ideally result in a joint formulation of a problem and its solutions, i.e. an agreed upon or 'negotiated' knowledge about the problem and its solutions. This aspect is considered in more detail in section 6.3.

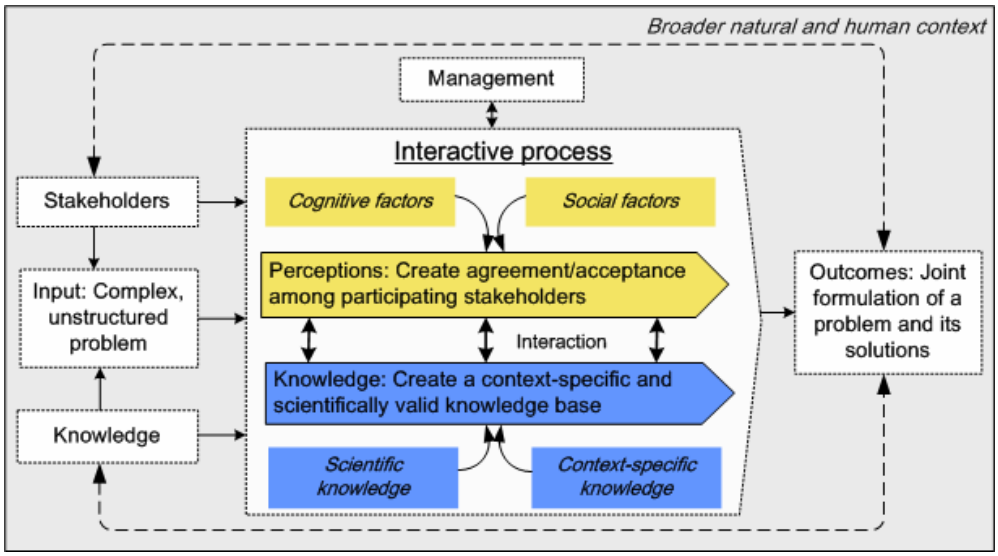

Figure 6.2 Schematization of problem structuring in interactive decision-making processes.

6.2 Problem perceptions

In the case studies, special attention has been paid to stakeholder typologies and the development of their perceptions. This section first summarizes theory about stakeholder typologies and problem perceptions which is also presented in subsection 2.3.2. Subsequently, the different types of stakeholders and their perceptions in the case studies are presented. This section also closes with a synthesis of theory and practice.

6.2.1 Theory

Divergence of perceptions among stakeholders is related to the existence of diverging interests, perceptions of reality and objectives. Interests are determined by stakeholders' values and their role in society. Several typologies are available to get insight in differences between stakeholders. To get insight in the position of stakeholders it may be useful to investigate the extremeness of their perspectives and their number of interactions. Based on the incorporation in a group and the subjection to regulations different cultural types can be distinguished. A distinction can also be drawn between stakeholders with a societal, user, or a supplier perspective, or between stakeholders who are low/high incorporated in a group, or subjected to few/many regulations. Perceptions are partly static and partly dynamic. Normally they change gradually, e.g. as a result of interaction, experiences, or learning, but they may also change quite abrupt, e.g. through external developments. The development of a joint image through reflection upon perceptions (cognitive learning) and the willingness to develop joint action (strategic learning) contribute to reach agreement.

6.2.2 Case studies

In both cases, process participants represented diverging interests. In Case 1, it was recognized that the perceptions of (almost) all process participants were adjusted during the process, but perceptions of reality did not become identical. In Case 2, the development of perceptions of reality is hard to indicate, since the constitution of stakeholders changed and preferences have not always been made explicit. In Case 1, three different sectors can be distinguished: agriculture, nature, and government. In Case 2, three basic perspectives on sediment were distinguished: controllers, users, and guardians. For both case studies, the interests can be divided into: economic interest (agriculture/users), ecological interest (nature/guardian), and societal interest (government/controller). We saw in both case studies that people representing the societal perspective or interests (e.g. municipalities, water managers) acted differently than other stakeholders. In Case 1, government bodies kept asking for more information and they were not flexible to act upon changes in their individual perceptions. In Case 2, we saw that controllers were much more acquainted with the topic, did have more experiences with the commissioner and learned less than other participants. In Case 1, a divergence of perceptions is visible between people representing an ecological interest versus people representing an economic interest. Only the livelihood of individual agrarians was affected directly by the freshwater supply. They were therefore reacting and acting differently than other people. Individual agrarians did not just accept provided data, but data provided by people from their own sector was accepted. The numbers of interactions within the groups also seem to matter in Case 1. A person from the agribusiness, who did not attend meetings in subgroups, reacted very hot-tempered during the last workshop. A person from the nature sector, who did interact less with other people within his sector, even stepped out of the discussion because his perception diverged too much. Both situations did not prevent the process from proceeding. In Case 2, the commissioner of the process was the one with the most direct interest in sediment management. The in-

terest of participants mainly depends on the choice for solutions. Within the subgroups participants were able to create coherent visions on sediment management. Besides similarities, we also recognized differences between people with a similar perception. For example some guardians were really protecting, whereas others were looking for chances, and some users were approaching the problem more abstract, others really concrete.

6.2.3 Synthesis

Based on the results of Case 1 and theory, it is concluded that both cognitive learning and strategic learning contribute to the process of problem structuring. Perceptions about the problem and its solutions converge, but will not become identical. This is why besides convergence of perceptions (cognitive learning) the willingness to support the results needs to be created (action building). To create this stakeholders have to learn about each others objectives and to become aware of mutual dependencies (strategic learning).

The case study results show that is useful to draw a distinction between the societal perspective and the supplier/user perspective. From theory it is known that people with a societal perspective (e.g. municipalities, Water Boards) are highly incorporated in a group and subjected to many regulations. Within Case 1 stakeholders with a societal perspective were less flexible to adapt their strategy and to accept information. Individually they can go through a process of reframing, but this does not imply that they are also able to commit themselves to results. Divergence of perceptions within government bodies was also visible and shows that perceptions are highly personal.

People with a supplier/user perspective, often represent the interests of a certain sector or group (e.g. residents, nature or agriculture). In both cases perceptions diverged among people with an economic interest and people with an ecologic interest. The case studies show that people with a similar interest behold partly similar perceptions, but their position and background also results in divergence of perceptions. The number of interactions of stakeholders within their own group forms an explanation for their position and the extremeness of their perception. Socially isolated stakeholders with extreme perceptions will step out of the process more easily and stakeholders may express more extreme perceptions if they have less interaction. Within a group a distinction is visible between the flexibility of individual stakeholders and people representing interest groups. The latter are less flexible because they are subjected to more regulations and incorporated in a group.

6.3 Creation of ‘negotiated knowledge’

In the case studies the development of substantive outcomes has been analyzed. In this section, these case study results are compared with the theoretical concepts related to the creation of negotiated knowledge. This section starts with an overview of the theory. Subsequently the case study results are described. In the synthesis theory and case studies are compared with each other.

6.3.1 Theory

Literature shows that interactive decision-making processes should ideally result in knowledge from which the significance and meaning and the scientific validity of the formulation of problems and solutions are agreed upon. This implies that the knowledge

contribution should be scientifically valid and relevant. Knowledge is relevant if it comes at the right time and takes the variety of problem perceptions into account. Often existing scientific knowledge has to be made more context-specific with the practical knowledge of stakeholders. Scientific validity is a question of agreement and of scientific acceptability. Other requirements for the development of negotiated knowledge are that parties contribute to the development of information, that they create a joint image, and that process and content develop partly interwoven (e.g. experts are involved) and partly individual (roles are separated). One of the risks of not involving experts is that no innovative solutions are developed.

6.3.2 Case studies

Before the start of the interactive process, in both cases an inventory was made of the existing (scientific and other) knowledge and complemented with more specific or recent insights. In Case 1, a summary of existing knowledge was distributed to process participants at the beginning of the process. The context-specific data provided in this document was not agreed upon by all process participants and was not able to answer all the knowledge questions coming up during the process. Attempts have been made to involve professional experts in the answering of knowledge questions, but questions were too specific or not specific enough. During the process, process participants (mainly agrarians) gathered more and other data material, which was integrated into the process by the process management. Also new research of WSZE, the Planning Study VZ-lake and knowledge of the nature sector was used to develop a joint problem formulation. In Case 2, the existing knowledge was communicated through presentations, news letters, a knowledge document and the attendance of professional experts to workshops. In the beginning of the interactive process, the size of the problem was still unknown, since a measurement program was still going on. The developments of this program were communicated regularly to process participants. Halfway the process, HR developed a map with chances based on their problem and the spatial knowledge of municipalities. Inhabitants were able to contribute with their location-specific experiences and knowledge to this map. The conclusions of Case 1 were not refuted by any of the participants, but some figures were accompanied by the remark that more specific research should be carried out to support the findings. The result of Case 2 is a list of solutions including all kind of reservations of process participants. In both case studies, the decision-making processes from which the interactive process was a part are still going on. Therefore it is hard to say if the outcomes of the process are also the final outcomes. Although it was initially an objective of Case 2, no technically innovative solutions were created during the interactive processes.

6.3.3 Synthesis

In both case studies, the substantive outcomes are based on existing scientific information, which has been made more context-specific with practical knowledge of stakeholders. Theory emphasizes the importance to interweave process and content. In the case studies, scientific knowledge was not developed both simultaneously *and* in interaction with the interactive process. The case studies show that mainly the integration of stakeholder knowledge is important during the interactive process. Professional experts were not able to develop new scientific knowledge to answer context-specific knowledge questions coming up during the process. This context-specific knowledge questions were answered by participants or the commissioner. Case 1 shows that the location-specific knowledge which was developed before the process was not agreed upon. Both case studies did not result in very innovative solutions. This is not really surprising, since the time needed to develop technically innovative solutions is much longer

than the length of regional interactive decision-making processes aiming to solve a certain problem as soon as possible. Still in the case studies also new insights came forward as a result of connecting existing scientific knowledge to a specific context, using practical knowledge.

In the case studies, the possibility for process participants to contribute with their own knowledge, indeed contributed to the creation of agreement or at least acceptance. It is also recognized that the development of a joint image is necessary to reach this agreement or acceptance. Theory also emphasizes the importance of the scientific validity of knowledge, i.e. the knowledge base should not be 'negotiated nonsense'. The involvement of stakeholder knowledge implies that it is more difficult to test the scientific acceptability of the substantive outcomes. In the case studies, the sequence of the process still has to prove whether the created agreement about the knowledge base is indeed long lasting. That the interactive process is part of a larger policy process also implies that the problem and solutions should fit in existing policy and take into account a wide variety of perceptions on a problem and aspects of a problem (e.g. economic, social and ecological aspects). But even when all these aspects have been taken into account, outcomes of interactive decision-making processes are still fragile. The involvement of other stakeholders, other or new knowledge, or other external developments might initiate discussions about the relevance of the outcomes, the scientific acceptability of the knowledge base or the meaning and significance of used knowledge. This is why in Figure 6.2 dashed arrows are drawn between the outcomes of the interactive process and knowledge, stakeholders and the environment.

7 Conclusions, discussion and recommendations

This chapter presents the conclusions, the discussion and the recommendations. The general conclusions that can be drawn from the reflection on the case study results are presented in the first section. Section 7.2 discusses the general applicability of these findings. This chapter closes with recommendations that can be done with respect to (the analysis of) problem structuring in interactive decision-making.

7.1 Conclusions

The central problem of this thesis is *'How does the process of problem structuring develop for complex unstructured water problems addressed in interactive decision-making processes, which elements affect this process and how do these elements influence each other?'*. This central problem has been studied in theory and two case studies. The first subsection describes the most important findings from theory, the case studies, and synthesis of both analyses.

7.1.1 Findings from theory

The first research question calls '*Which theoretical framework is appropriate for analyzing the process of problem structuring for interactive decision-making processes?'*. The main findings about problem structuring in interactive decision-making processes are that:

- Different stakeholders have different backgrounds, which results in divergence of problem perceptions among stakeholders participating in an interactive process. During an interactive process, problem formulations may change as a result of interaction, new information or external developments.
- Stakeholders involved in interactive processes are mutually dependent in obtaining a result in the process. This is why they may want to develop a joint formulation of the problem and its solutions. Ideally, these outcomes are 'negotiated knowledge', this is knowledge which is agreed upon and can pass the test of scientific acceptability.

Based on theory it was concluded that the elements interaction, problem perceptions, and knowledge are the main elements contributing the process of problem structuring. These elements are interrelated with each other and influenced by their network context and developments in the natural and human context, i.e. external developments. This is schematized in the conceptual model, see Figure 7.1. This model builds upon two existing models for interactive decision-making processes, which put different types of knowledge [Van Buuren, 2006] and the network context of stakeholders at a central position [Koppenjan & Klijn, 2004].

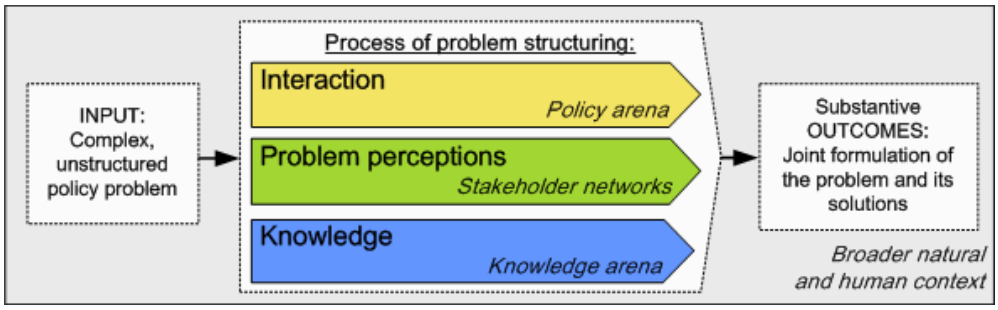

Figure 7.1 Conceptual model used to analyze the case studies

7.1.2 Case study results

The second research question is *'How do interaction, problem perceptions and knowledge develop and influence each other in the case studies?'*.

Some general remarks about the process of problem structuring in both case studies are that problem perceptions and knowledge start to develop before the interactive process actually starts. And interaction, problem perceptions, and knowledge continue to develop when the interactive process is officially finished. External developments taking place in the broader natural and human context of the process affect the process of problem structuring before, during, and/or after the interactive process officially starts and finishes.

In Case 1 the problem and solutions were formulated by participating stakeholders. In Case 2 stakeholders contributed to the formulation of the problem and its solutions. Because of this and the changing composition of process participants, it was within Case 2 more difficult to analyze the relation between development of perceptions and the outcomes of the process. Both case studies address complex problems, but only in Case 1 the problem is fully unstructured. The lack of knowledge about the problem and the lack of involvement of stakeholders in problem structuring, make that there is no disagreement about the knowledge base. So it was a moderately structured problem.

Case 1 shows how interaction between stakeholders with similar and different perceptions results in the adjustment of perceptions or cognitive learning. Process participants did not arrive at an identical perception, but still they reached an agreement. This shows that strategic learning or the creation of willingness did also play a role. Both case studies show that divergence of perceptions is related to the perspective of stakeholders and their cultural background. The knowledge base in both cases was created by making existing knowledge more context-specific. For this, existing knowledge was connected with practical knowledge from stakeholders. The possibility for stakeholders to contribute with their knowledge and interaction among stakeholders both contributed to create support for the problem and its solutions. In both case studies no scientific knowledge was developed by professional experts both during *and* in interaction with the interactive process.

7.1.3 Synthesis of theory and case studies

The last research question calls *'Which conclusions can be drawn about the development of problem structuring in interactive decision-making processes, the elements affecting problem structuring and how these elements influence each other, comparing the (results of) the case studies and theory?'*.

It can be concluded that problem structuring in interactive decision-making processes starts with a complex, moderately structured or unstructured problem. The role of process participants in problem structuring is strongly influenced by the management of the interactive process. If the problem and solutions are selected by only one or few stakeholders with similar perceptions, the problem will be less unstructured and a higher chance for consensus within this group exists.

Problem structuring is not an isolated process, but part of a broader human and natural context in which knowledge, perceptions and networks already exist. Initiation of an interactive process results in the connection of stakeholders with different networks and diverging perceptions and different types of knowledge. Ideally, this integration of stakeholders and knowledge in problem structuring results in agreement about a joint formulation of a problem and solutions, for which the knowledge base can also pass the test of scientific acceptability. Based on the case studies, it is concluded that the outcomes of an interactive process result from two developments: *perceptions* and *knowledge*. These developments should be studied in relation to the broader context and relevant networks. These conclusions are also translated in an adjusted conceptual model, which is presented in Figure 7.2.

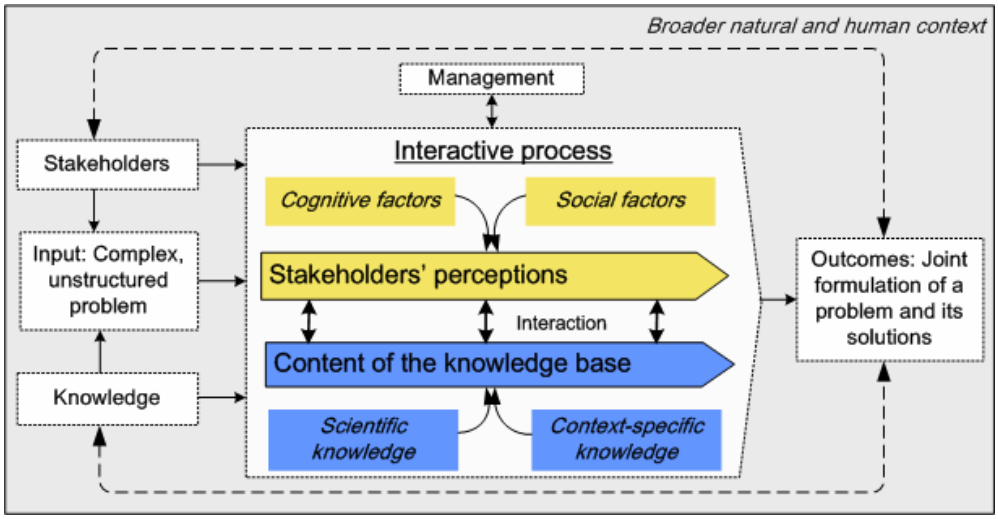

Figure 7.2 Final conceptual model based on theory and the case study results

Perceptions are related to the interests, perceptions of reality and objectives of stakeholders. During an interactive process, perceptions need to be adjusted so that support (agreement and/or acceptance) is created for the knowledge base among process participants. This support results from adjustment of perceptions and the creation of willingness. Koppenjan & Klijn [2004] call this *cognitive and strategic learning*, Edelenbos *et al* [2003] call it *perception building and action building*. This support is created differently for different stakeholder types. Differences are visible between people representing a societal perspective (e.g. municipalities, Water Boards) and people representing a user/supplier perspective (e.g. agriculture, ecology) [Van de Riet, 2003]. Besides this, the Cultural Theory [Douglas & Wildavsky, 1982] and actor configurations [De Bruijn *et* al, 2002] explains differences respectively between and within groups.

Another aspect of problem structuring in interactive processes is the creation of the substance of the outcomes or the content of the knowledge base. The development of perceptions ideally creates agreement about the knowledge base, but ideally knowledge

should also be context-specific and scientifically valid or testable. Existing scientific knowledge is often not specific enough to create a context-specific knowledge base; this is why the integration of practical stakeholder knowledge is needed [Eshuis & Stuiver, 2005]. Before the process, scientists may contribute to the gathering and development of knowledge, so that an initial base for discussion exists. Because it takes too much time, it is found to be difficult to develop scientific knowledge during the interactive process. In this phase, the development of knowledge is mainly related to making implicit stakeholder knowledge explicit and/or gathering new data.

Outcomes of an interactive process are fragile. The involvement of new stakeholders or the development of new knowledge may lead to new insights. To improve the robustness of knowledge, attention should not only be paid to the creation of support and knowledge, but also to other aspects such as the involvement of a broad variety of stakeholders, agreement about the distribution of costs and benefits and the connection with existing policy.

7.2 Discussion

Case study research allows the investigator to get a holistic and meaningful characteristic of real-life events [Yin, 2003]. It should be realized that the objective of this case study research is not to build a general theory. In fact, the merit of case study research is that it has the ability to speak specifically for certain situations [Strauss & Corbin, 1998]. A yardstick for the quality of quantitative work is that it is reproducible. For case study research, this implies that given the same theoretical perspective, following the same rules, assuming the same conditions other researchers should come to the same theoretical explanation about the investigated phenomenon [Strauss & Corbin, 1998]. To get an indication of the quality of case study research it is therefore important that it becomes clear to which areas the results apply, how closely the results are related to the phenomenon the researcher aimed to study, if other research disconfirms or confirms the findings, and if results bear out or disagree with extant theories or findings [Gummesson, 2000].

In the case studies problem structuring has been studied, through the analysis of interaction, knowledge, problem perceptions and the development of substantive outcomes. The implicit assumption was that the problem under concern was being structured by process participants. In Case 2, problem structuring was not done by process participants, but still the case study did provide a good insight in the process of problem structuring in interactive decision-making processes. But this case study did not provide insights in how problem perceptions of stakeholders tend to converge or how this contributes to the process of problem structuring.

Characteristics of both case studies are that they address local water management issues. These are issues with an impact on spatial functions and in solving the issues, government bodies from multi-levels are involved. The findings do not just apply to water management or spatial issues, but also to different kind of problems (e.g. social problems). Eventually, the findings also apply to problems at a larger spatial scale, if they are also addressed in a concrete decision-making process. The findings are not applicable to interactive processes in general, e.g. to interactive process initiated to create a shared vision. Only when a sense of urgency exists and concrete solutions are looked for the creation of support and integration of context-specific knowledge becomes im-

portant. The problem typology and the process design of the case study projects differed, but the findings apply for both cases. This implies that the findings are not limited to a certain problem typology (e.g. only completely unstructured problems) or to a certain problem structuring approach (e.g. only when process participants are really structuring the problem).

In literature, the process of problem structuring in interactive decision-making processes is not described in detail. This is why the literature review often refers to literature about process- and network management in general. The case study results suggest that selected literature about process- and network management apply to problem structuring in interactive decision-making processes too. A point of special attention is that literature about process- and network management suggests that stakeholders play a *central role* in interactive decision-making processes. This differs from the notion that stakeholders structure a problem, i.e. they formulate a problem and solutions. The case studies show that stakeholders can also play a central role in an interactive process by contributing to the formulation of a problem and solutions.

7.3 Recommendations

This report provides some insight in the process of problem structuring for interactive decision-making processes. Based on these findings, this section presents some recommendations for further research and the management of interactive processes.

Although the used conceptual model was found to be very useful to guide the analyses of the case studies, for further research the adjusted model presented in Figure 7.2 is recommended. This implies that the analysis of the interactive process should focus on the development of perceptions and knowledge. Before starting to analyze these developments, attention needs to be paid first to the role of process management and participating actors so that it is clear who actually structures the problem.

When analyzing perceptions, attention should be paid to strategic and cognitive learning of stakeholders in relation to their background and network. To get insight in the development of problem formulations it is recommended to analyze stakeholder perceptions simultaneously with the interactive process. Given the background of a stakeholder this analysis should focus more on the development of individual perceptions or the development of perceptions within a group. Further research could also provide additional insights in what is needed to create a robust agreement. Some suggestions are the involvement of a variety of stakeholders and the involvement of stakeholders with decision-making power. An analysis of the development of the content of the knowledge base should pay attention to the integration of different types of knowledge. Further research should also provide more insight in what else contributes to the creation of robust knowledge. Some suggestions are the distribution of costs and benefits, the use of a variety of knowledge resources and the match with existing policy. To get more insight in the robustness of knowledge, not just the interactive part but the process should be analyzed until the final decision is taken.

Based on the experiences of the case study and literature, it is also possible to do some recommendations about the design and management of interactive process. When starting an interactive process, it is important that a certain knowledge base about the problem already exists. In this phase, scientific research can play an important role. Scien-

tists can explore different aspects of the process, which can be discussed during the process. To play a role in the debate, scientific knowledge needs to be communicated to process participants, not as objective givens but as a base or starting-point for discussion to be complemented with stakeholder knowledge. In the preparation phase attention should also be paid to the involvement of all relevant stakeholders. Especially with representatives of the government agreements need to be made about their role.

The involvement of stakeholder knowledge during the process is a powerful instrument to create support among stakeholders and to develop a context-specific knowledge base. Stakeholder knowledge is always relevant for the debate and if it is discussed with different stakeholders, it also becomes less subjective. A difficult issue if that for stakeholder knowledge it is more difficult to test the scientific validity. This is why it is important that stakeholder knowledge is connected to scientific knowledge. One way is the involvement of experts in the debate. However, this approach may result in a debate about the content of knowledge instead of the underlying causes of conflict, namely the divergence of perceptions. It may be more effective if process managers take care of the connection of scientific and stakeholder knowledge and communicate this to stakeholders. The debate among stakeholders should focus on exchange of perceptions. With respect to stakeholders who are bounded within a group and subjected to many regulations (e.g. government bodies), special attention should be paid to the creation of support within the body they represent, since an adjustment of their individual perceptions is not related directly to the creation of support among these stakeholders.

When communicating knowledge to process participants, attention should be paid to transparency. It should be clear to process participants how knowledge has been developed, which other sources have been used, who developed the knowledge and so on.

Further research should provide more evidence for the recommendations presented above. Relevant topics for further research are the robustness of the created knowledge base and the success- and failure factors of interactive processes. More concrete recommendations for the development of further research are presented in Annex H.

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A. Case 1: Participation of stakeholders

Table A.1 Participation of stakeholders during workshops and meetings and in interviews.

		Attendance during the interactive process:					**Interviews:**	
Stakeholder:	**Sector:**	**Explo-ration**	**Kick-off**	**WS1**	**Sum-mer**	**WS2**	**May 2005**	**Nov 2006**
Individual agrar-ian (AG)	Agriculture	9	9	7	5 (July) 6 (Aug)		1	
Agribusiness (AB)	Agriculture	5	2	1	-	1		
ZLTO	Agriculture	yes	2	2	2 (July) 2 (Aug)	2	3	1
Staatsbosbeheer (SB)	Nature	1	1	1	-	1		
Zeeuwse Milieu Federatie (ZMF)	Nature	1	1	1	1	1		
Het Zeeuwse Landschap (ZL)	Nature	1	1	1	1	-		
Natuur-monumenten (NM)	Nature	1	1	1	1	1		1
Natuurvereniging Tholen (NVT)	Nature	1	1	1	1	-		
Municipality of Tholen (GT)	Government	2	1	2	?	2		1
Province of Zee-land (PZ)	Government	yes	1	1	1	1		
RWS-Zeeland	Government	yes	1	1	1	1		1
Water Board Zeeuwse Eilan-den (WSZE)	Government	yes	3	2	1	2		1

B. Case 1: Interview reports

Stakeholders interviewed by TNO before the process started in May 2005:

- Jan Auke van Werkum (18 May 2005, Waterschap Zeeuwse Eilanden)
- Lein Kaland, Thecla Westerhof, Jan Maljaars (20 May 2005, Provincie Zeeland)
- Gijs Zonneveld (23 May 2005, ZMF)
- Henk van Damme (23 May 2005, ZLTO)
- Ad Slabbekoorn (24 May 2005, ZLTO)
- Edward Rietkerk (24 May 2005, individual agrarian, AG6)
- Peter de Koeijer (24 May 2005, ZLTO)

Organizations interviewed by the VU[13] in November 2006:

- Waterschap Zeeuwse Eilanden
- Deltaraad
- Gemeente Tholen
- Rijkswaterstaat Zeeland
- ZLTO
- Natuurmonumenten

[13] It is not allowed to refer to these interviews directly.

C. Case 1: Policy network

C.1 Planning Study VZ-lake

The poor water quality in the VZ-lake is already a problem for years. In order to solve these problems the Administrative Council Krammer-Volkerak (BOKV) was established. In the end of 2003, an exploration was finished with an overview of possible solutions for the VZ-lake. In March 2006, the BOKV appointed two directions for solutions for the VZ-lake to be investigated thoroughly. Globally, these solutions are a freshwater and a saltwater VZ-lake. The development of this study is of great importance to the freshwater situation on Tholen and St. Philipsland. One of the aims of the broad discussion is to support this Planning Study. However, it is important to realize that the discussion is not initiated by the BOKV, but by the Delta Council. One of the differences between these bodies is that the BOKV aims to provide solutions for the middle long term (this is until 2015) and focuses on a solution for e.g. blue-green algae. The Delta Council aims to ensure the execution of the vision of the whole Delta over thirty years. BOKV is not taking the formal decision about the near future of the VZ-lake; this is the authority of the State Secretary of the Min. V&W.

Figure C.1 presents the different bodies participating in the Planning Study. The BOKV is the formal body and commissioner of other executive bodies. The BOKV keeps in contact with an advisory council, in which the different users of the VZ-lake are represented. The BOKV receives administrative support from public servants of the bodies they represent. A project management team is responsible for the execution of the activities of the BOKV. To do this, they are supported by a project team for communication and several project teams for the realization of an Environmental Impact Assessment (EIA) and costs-benefits analysis (CBA).

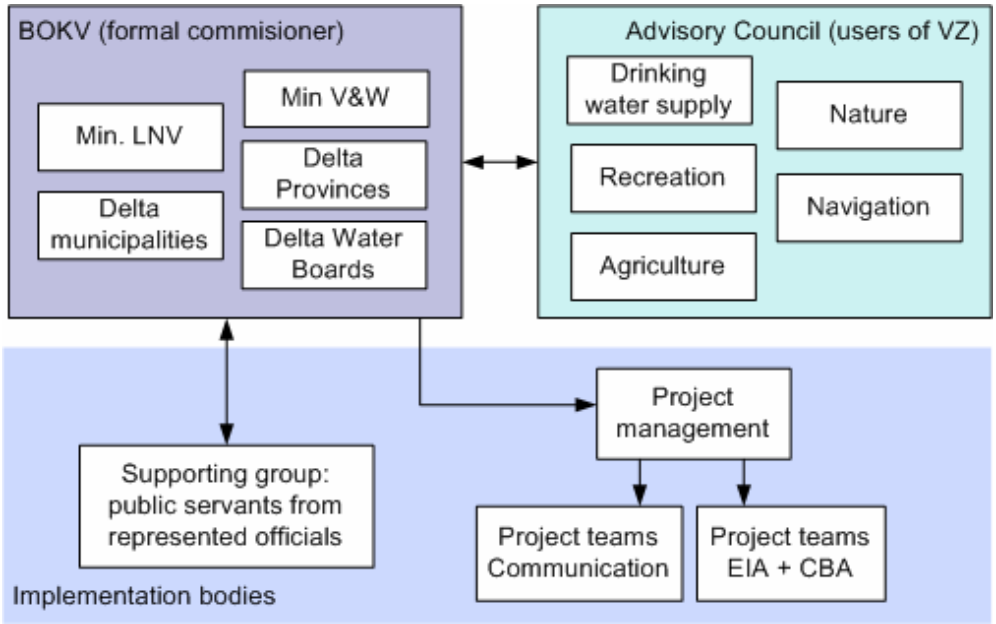

Figure C.1 Constitution of 'Planning study VZ-lake'

C.2 Delta on Sight

In February 2003, the Delta Provinces together presented the integrated vision 'Delta on Sight'. Initiator of this vision was the Provincial Administration of Zeeland. The vision states that within thirty years estuarine dynamics should be renewed in the Southwest Delta. Starting point of the vision is a sustainable Delta, this includes that attention is paid towards safety, economy, social well-being and ecology [Delta Provinces, 2003]. In November 2004, the Delta provinces together with Min. V&W and LNV subscribed this vision and the establishment of a Delta Council to implement this vision [Deltaraad, November 2004].

The bodies participating in the implementation of the vision are presented in Figure C.2. In the Delta Council are represented: the Delta Provinces with one administrative delegate each, RWS and the Min. LNV with a public servant, and the DG's Water and Space. With a mix of administrative delegates and public servants, the Delta Council has an outstanding composition. The Delta Council is mainly a coordinating and initiating body, but also develops some activities. One of these activities is the organization of a fundamental discussion of the freshwater supply for agriculture. They are advised by an advisory council representing different stakeholders. For the problems related to freshwater supply in the Delta, they established a working group Freshwater supply Delta agriculture (ZD). They are appointed to bring about concrete actions with regard to this topic, such as research activities. The Delta Council is also supported by a Deltateam. The Deltateam constitutes of public servants from different levels of government [Newsletter Deltaraad, February 2006].

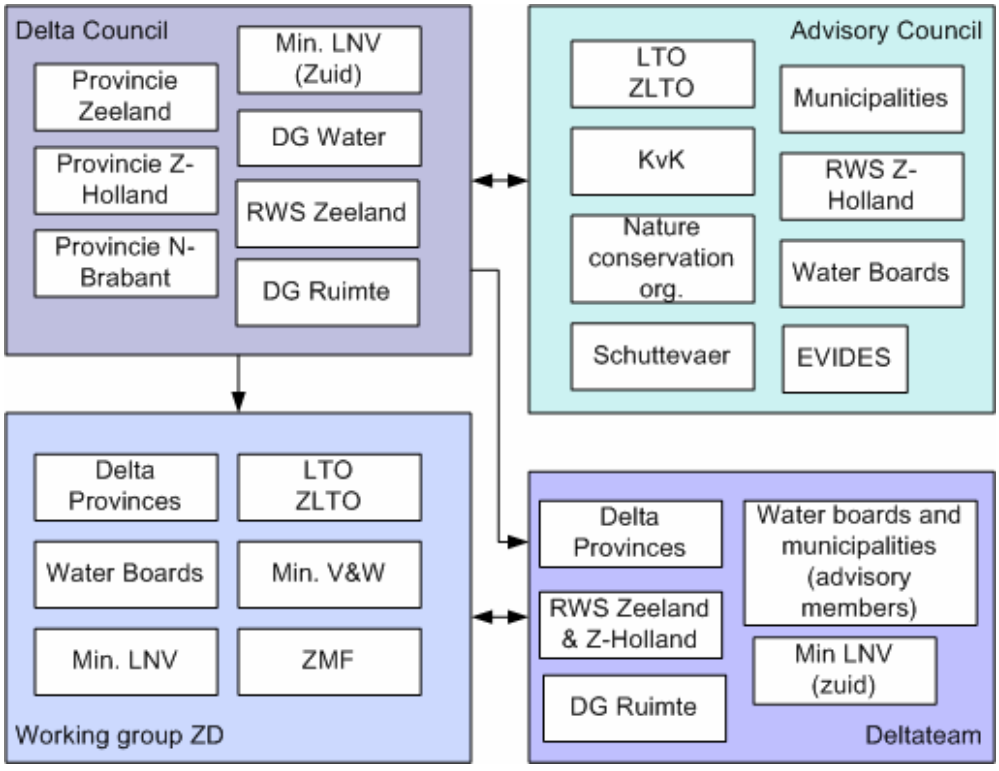

Figure C.2 Constitution of the project 'Delta on Sight' in November 2006

D. Case 2: Process participants

Table D.1 Participation of stakeholder in Southwest Rijnland during the first three workshops

Dutch name of organization	Abbre-viation	English translation of the name	WS1	WS2	WS3
Bodem+	B+	Bodem+			
Gemeente Katwijk	GK	Municipality of Katwijk	1		
Gemeente Leiden	GL	Municipality of Leiden	1		
Gemeente Leidschendam-Voorburg	GLV	Municipality of Leidschendam-Voorburg	1		1
Gemeente Voorschoten	GV	Municipality of Voorschoten	1		1
Gemeente Wassenaar	GW	Municipality of Wassenaar	2	2	3
Gemeente Zoeterwoude	GZ	Municipality of Zoeterwoude	1		
Gemeente Zoetermeer	GZM	Municipality of Zoetermeer			1
Hollands Particulier grondbe-zit	HPG	Federation for Privately-owned Land, department Holland	1	1	
Vereniging Agrarische Natuur Ade, including Vereniging voor natuur- en milieueducatie (IVN)	IVN	Society for Agricultural Nature around Ade, including Society for Nature- and Environment Education	1	1	1
Koninklijke Nederlandse Natuurhistorische Vereniging	KNNV	Royal Dutch Nature History Society	1	1	
Kamer van Koophandel	KvK	Chamber for Commerce, department Rijnland	1		1
Land- en tuinbouw organisatie Noord	LTO	Federation of Agricultural and Horticul-tural Organizations	1	1	1
Milieudienst West-Holland	MD	Environmental Service West-Holland		1	1
Natuurmonumenten	NM	Society for the Preservation of Nature Reserves in the Netherlands	1		1
Platvorm Duurzaam Voor-schoten	PDV	Platform for Sustainability Voorschoten	1	1	1
Provincie Zuid-Holland	PZH	Province of South-Holland	1	1	
Stichting Comité Doesburg (Leiderdorp)	SCD	Foundation Committee Doesburg	1		1
Stichting Landgoed Duiven-voorde (Voorschoten)	SLD	Foundation Country Estate Duiven-voorde	1		1
VisstandBeheerCommissie Rijnlands Boezem, including Combinatie van Beroepsvis-sers; Federatie Hengelsport-vereniging Zuid-west Neder-land; interProvinciaal Overleg Sportvisserij	VBC	Fish-Stock-Management-Committee. Including: Combination of Professional Fishermen; Association for Angling Societies Southwest Netherlands; inter-Provincial Consultation Sports Fishery	2	1	1
Vogel- en Milieuwerkgroep, including Agrarische Natuur-vereniging Santvoorde (Voor-schoten)	VMW	Birds- and Environmental Working Groep, including the Agricultural Nature Society Santvoorde		1	1
Koninklijke Watersportver-bond	WSV	Royal Netherlands Yachting Union	3	1	2

Dutch name of organization	**Abbre-viation**	**English translation of the name**	**WS1**	**WS2**	**WS3**
Wijkvereniging ‘t Lien (Leid-schendam)	WVL	Quarter Society ‘t Lien	2		2
Het Zuid-Hollands Landschap	ZHL	Society Landscape South-Holland	1		
Milieufederatie Zuid-Holland	MF	Environmental Federation South Hol-land		1	

E. Case 2: Interviews and observations

The following process managers from TNO have been interviewed to get insight in the role of participants, their interests, their contributions, the influence and acceptance of knowledge, influence of external developments etc.

- Rob Nieuwenhuis (14 April 2007): Fulfilled the role of professional experts, made contributions to the news letter and attended the subgroup guardians
- Adriaan Slob (2 May 2007): Fulfilled the role of process manager, attended all workshops and supervised discussions in the subgroup controllers
- Gerald Jan Ellen (19 April 2007): Supervised the discussions in the subgroup guardians
- Mario Willems (17 April 2007): Supervised the discussions in the subgroup users during Ws2 and WS3.
- Mike van Duijn (7 May 2007): Supervised the discussions in the subgroup users during WS1.

During the first three workshops observations have been made by two students. In the context of their master thesis at the Department of Public Administration of the Erasmus University in Rotterdam, they wrote the following research reports:

– Bisram, U.A. (August 2006), *Vertrouwen en commitment: onderzoek naar vertrouwen en commitment in interactieve beleidsprocessen*.
– De Graaf, T (August 2006), *Over bagger gesproken.*

They also carried out the following interviews in May and June 2006:

Guardians:

- U Dijkstra IVN, Vanade, Hoogheemraadschap Rijnland
- W ter Keurs Agrarische natuurvereniging Santvoorde
- A Blomsma Hoogheemraadschap Rijnland

Users:

- A de Wit Visserij Beheers Commissie Rijnlands Boezem
- H Hennus Koninklijk Watersport Verbond
- J Lelieveld Wijkvereninging ’t Lien, Leidschendam
- M Munnik Wijkvereninging ’t Lien, Leidschendam
- R Dreschler Hoogheemraadschap Rijnland

Controllers:

- P Verhoef Gemeente Wassenaar
- M Paalman Provincie Zuid Holland
- EJ Houwing Hoogheemraadschap Rijnland

Project team:

- E Witteman Project leader, Hoogheemraadschap Rijnland
- N van Beest Project team leader, Hoogheemraadschap Rijnland
- GJ Ellen TNO Bouw en Ondergrond

F. Case 2: Content of questionnaires

During the process, three questionnaires have been carried out. The questionnaires are presented in a background report and the results are part of the documentation of the case studies. In this annex only the contents of the questionnaires are presented globally and attention is paid to the outcomes of questionnaire 3. All questionnaires contained several statements about which participants could fill out that they totally disagree upon (1), slightly disagree upon (2), neutral (3), slightly agree upon (4), totally agree upon (5), or do not know.

F.1 Questionnaire 1

The first questionnaire was carried out at the end of WS1. The questionnaire covered the following aspects:

- Part 1: 24 statements related to sediment management to indicate whether it was possible to distinguish users, guardians and controllers based on their risk perspective. The statements addressed the protection of nature, legislation, acceptability of risks, and deposition.
- Part 2: Experiences with Water Board Rijnland
- Part 3: Evaluation of the evening
- Part 4: Participation during the next workshops.

The questionnaire was filled out by 26 process participants and by people from HR and Bodem+. In the analysis of the questionnaires attention is paid if perceptions within subgroups differ. The questionnaire also provides insight in the experiences of stakeholders with HR.

F.2 Questionnaire 2

The second questionnaire was filled out at the end or after WS3. This questionnaire has not been used directly in the case study analysis. In the second questionnaire the following topics have been addressed:

- trust of process participants in Rijnland and each other
- the support of process participants
- the commitment of participants towards the process
- the enrichment of the process
- the image of Rijnland

H.1 Questionnaire 3

The third questionnaire was filled out during the closing meeting. Unfortunately only a few process participants filled out this questionnaire. The questionnaire addressed the following issues:

A. Increase in knowledge as a result of the process
B. The source for knowledge increase
C. Opinion about own contribution and the process
D. Opinion about relation between interaction and results

This questionnaire shows that from the people who filled out the questionnaire:
I.1 Everybody supported the results
J.1 Government bodies learned less than other participants
K.1 The workshops were more instructive than the knowledge document, the workshops or the news letter.

Some results of the questionnaire are described in Table F.1. In this table the following groups are distinguished: Residents (Res), Nature (Nat), Government (Gov), Fishery (Fish) and water sports (WSV). Possible reactions about the increase of knowledge varied from a few (1) to much (5). About the other statements people could fill out on a 5-point scale whether they agree or disagree upon the statement.

Table F.1 Selection of the results of the third questionnaire

	Res	Nat	Nat	Gov	Gov	Gov	Gov	Fish	WSV	WSV
Increase in knowledge:										
Costs activities	3	3	5	1	1	2	4	1	3	5
Costs processing	3	2	5	1	1	3	4	3	3	5
Technical possibilities	3	4	5	1	1	3	4	4	4	5
Legislation	4	4	5	3	1	3	3	4	4	3
Role in ecosystem	3	2	1	2	1	2	2	2	5	5
Impacts on surroundings	3	2	3	1	2	1	2	4	5	4
Classification	3	2	1	1	1	1	2	3	4	5
Learned as a result of:										
Instructiveness workshops	4	n.i.	5	5	3	3	5	3	5	5
News letter	3	3.5	5	3	2	2	3	3	4	5
Knowledge document	4	4	5	2	2	2	3	4	4	5
Workshops	3	4	5	4	2	2	3	4	4	5
Own contribution/attitude:										
Feel engaged	4	5	5	5	4	5	4	4	5	4
Contribution taken seriously	4	5	5	5	4	5	4	4	5	4
Support the process	5	5	5	5	5	4	5	4	5	4
Participation not necessary	3	1	4	1	2	2	3	2	3	3
Sufficient possibilities	5	4	5	5	5	5	4	4	4	5
Useful to work in subgroups	4	4	5	5	4	3	4	4	5	5
Full input of own competence	4	5	5	5	5	5	4	5	5	5
Competence others sufficient	4	3	2	2	3	4	4	4	4	4
Not done enough with contributions	3	2	1	1	2	2	2	1	2	1
Results:										
Results will be implemented	4	4	4	4	5	4	4	4	5	4
Contributions are clear	4	4	5	5	5	5	4	4	4	4
Everybody wants consensus	3	4	4	5	5	4	4	5	5	4
Not enough possibilities to react upon	1	4	1	5	1	1	2	2	2	1
Support results	4	4	5	5	4	4	4	5	5	4

G. Case 2: Map with chances

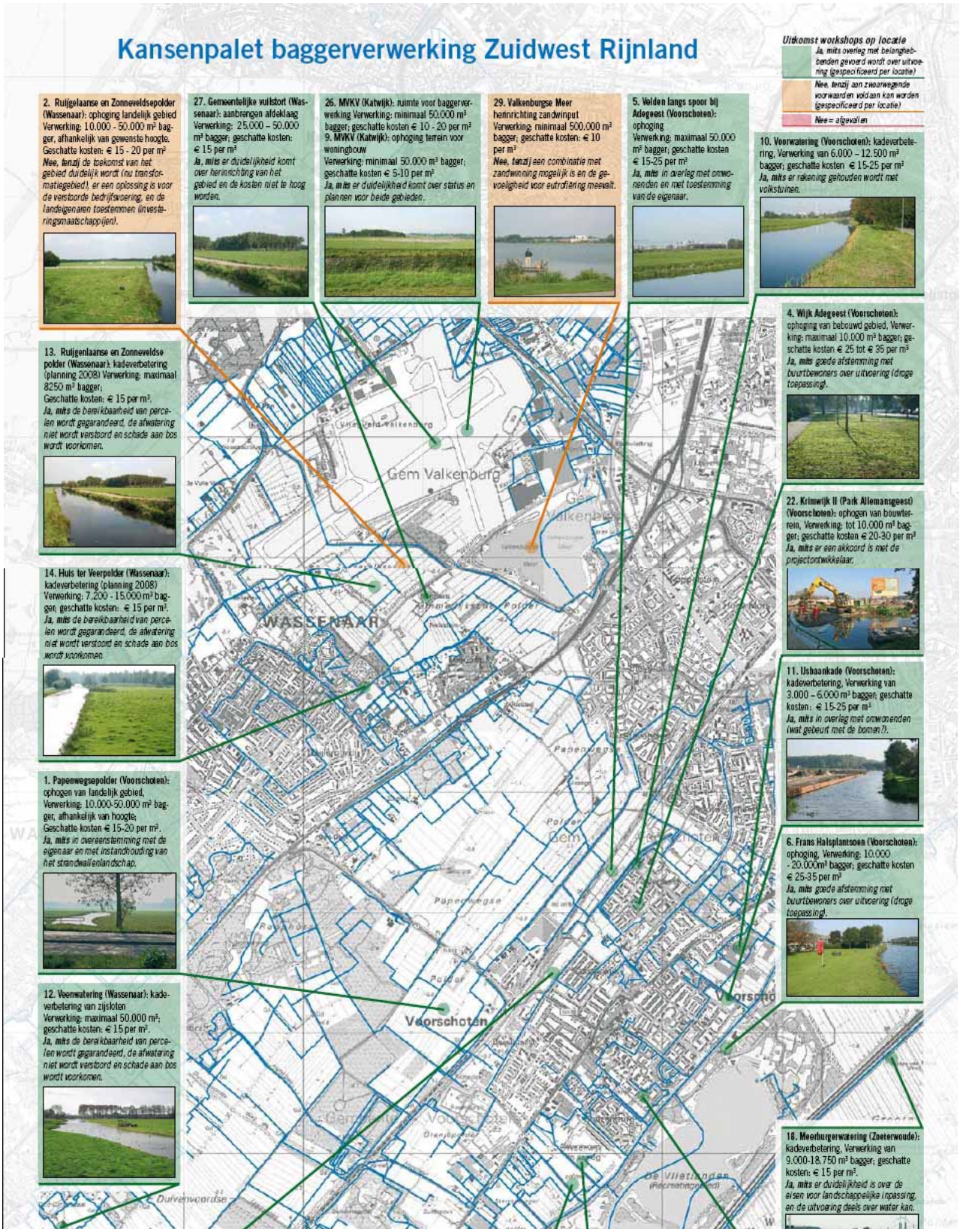

Figure G.1 The outcomes of case Southwest Rijnland: a map with chances.

H. Recommendations for further research

In the reflection of this research it is noticed, that the used conceptual model did not explain all the questions coming up during the process. If someone would like to analyze the process of problem structuring for another interactive decision-making process, it is recommended to investigate the following aspects:

1. The context of the interactive process
2. The perceptions of stakeholders
3. The content of the knowledge base

H.1 Analyze the context

First, it is important to get insight in the background and history of the problem, the policy context, the objectives, and which interactive activities are/were organized. In this exploration it is important to get insight in the role of stakeholders, i.e. which influence do they have on the decision, what will be done with the decision, and are they asked to commit themselves to the outcomes. This exploration should provide an insight in the broader natural and human context of the interactive process, the management of the process and the occasion and background. After this exploration is finished it should be clear who actually structures the problem and what kind of problem it is. It should also be clear how the problem and the final outcomes fit with other policy and policy processes.

H.2 Analyze the development of perceptions

Analysis of perceptions is meant to provide insight how support is created as a result of adjustment of problem perceptions. It is easier to analyze this, if process participants do have a central role in the process of problem structuring, i.e. they determine the outcomes and commit themselves to these outcomes. When analyzing perceptions a distinction should be drawn between stakeholders with a societal perspective (e.g. provinces, municipalities) and stakeholders with a user or supplier perspective (e.g. organizations, interest groups). It may also be useful to distinguish different cultural types. People representing a societal perspective are often hierarchists, i.e. they are highly incorporated in a group and subjected to many regulations. This implies that for these actors individual learning processes do not have the same impact as for individuals. If stakeholders are not able to adjust their perceptions upon individual learning processes, attention should be paid to the learning processes within the group they represent. So, depending on the cultural type people represent more or less attention should be paid to individual or group learning processes.

To get insight in cognitive learning, it is recommended to monitor the problem formulation of (a group of) stakeholders during the process. Suggestions for questions are:

- How would the stakeholder describe the present situation or the existing problem?
- Which developments are to be expected?
- Which chances and opportunities are available or to be expected?
- Which directions for solution(s) are available to solve the problem?

An interesting question to be answered in further research would be ‘How does the development and communication of knowledge affect cognitive learning?’ Van de Riet [2003] suggests stakeholders should trust analysts, stakeholders should get a voice in the analysis, and the analysis should be accessible.

Besides cognitive learning, strategic learning also plays a role. This is what stakeholders learn about other stakeholders and mutual interdependencies. To understand processes within a group of actors, it may be useful to get insight in their actor configuration, see also De Bruijn *et al* [2002]. For the analysis of strategic learning it is important to get insight what stakeholders think about other stakeholders, if they want to cooperate with them, if they feel the need to cooperate and so on.

Preferably, the development of perceptions is analyzed parallel with the interactive process. If this is not possible, it is recommended to use information gathered during the process. It does not make any sense to interview stakeholders afterwards an interactive process about the development of their perceptions. Probably they are not able to recognize changes and their answers are biased by interests and outcomes.

H.3 Analyze the development of the knowledge base

Analysis of the content of the knowledge base should focus on the content of the problem formulation and solutions. In this research attention was paid to the framework of the discussion, the present situation, the future situation and directions for solutions. It is also possible to adapt other frameworks, but to structure the analysis it is useful to select topics or aspects. It is easier to select these topics afterwards, since the outcomes are known. But when it is studied parallel with the interactive process, it becomes very clear which information or knowledge survives and disappears.

Van de Riet [2003] explains that for the creation of a robust knowledge base, research should pay attention to a scientifically sound analysis, a structured search for policy options, and a broad research focus. This report shows that to develop context-specific knowledge, stakeholder knowledge is also important. An interesting question for further research is how it is possible to further the robustness of this stakeholder knowledge. When analyzing this, it may be useful to distinguish different

The analysis should also pay attention, which knowledge is derived from stakeholders and which knowledge from the scientific knowledge arena. Besides a distinction between topics, it may also useful to distinguish data, methods.