

Valuation of Water

The process of economic valuation of ecosystems
in water management

Kirsten Schuijt

Valuation of Water - The process of economic valuation of
ecosystems in water management
Kirsten Schuijt

PhD dissertation, Erasmus University Rotterdam

ISBN 90-6734-009-X

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Printed by Optima Grafische Communicatie, Rotterdam

Cover design: Ingvild Ariens

Valuation of Water

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of ecosystems in water management

Waarderen van water

het proces van economisch waarderen
van ecosystemen in waterbeheer

Proefschrift

ter verkrijging van de graad van doctor aan de
Erasmus Universiteit Rotterdam
op gezag van de Rector Magnificus
Prof.dr.ir. J.H. van Bommel
en volgens besluit van het College voor Promoties.

De openbare verdediging zal plaatsvinden op
donderdag 27 november 2003 om 16:00 uur
door

Kirsten Diane Schuijt

geboren te Haarlem

Promotiecommissie

Promotoren: Prof.dr. H.L.F. Saeijs
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Voor Johan

"Under the general name of commodity, I rank all those advantages which our senses owe to nature. This, of course, is a benefit which is temporary and mediate, not ultimate, like its service to the soul. Yet although low, it is perfect in its kind, and is the only use of nature which all men apprehend. [...] Beasts, fire, water, stones and corn serve him. The field is at once his floor, his work-yard, his playground, his garden and his bed."

*Ralph Waldo Emerson
Nature; Addresses and Lectures (1849)*

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Executive Summary

This dissertation focuses on the process of economic valuation of ecosystems in Dutch water management. As a starting point, it takes the argument that economic valuation has a potential to contribute to decision making processes in integrated water management. It analyzes how different stakeholders use valuation processes and how the context of this process plays a key role in determining the outcome. The goal is to come to conclusions and recommendations for the structure of valuation processes in water management. These recommendations are aimed at limiting inconsistencies in valuation processes.

Economic valuation of ecosystems places a monetary value on the effects of changes in the environment. Valuation processes can play a particularly important role in highlighting the economic importance of ecosystems in addition to their ecological and socio-cultural importance and it also helps to formulate economic arguments for the sustainable management of ecosystems. Despite its important role, however, it has been shown that inconsistencies in outcomes of valuation processes persist. At the basis of these inconsistencies is the observation that economic valuation has an enormous variety of methodological tools that are at the disposal of practitioners with different goals and interests. The possibility exists that these inconsistencies may seriously undermine the usefulness of economic valuation processes in decision making in Dutch water management. Water management in the Netherlands is characterized by 'integrated water management' in which a key element is the balancing of relevant stakeholder interests. In the long-run, the risk prevails that decision makers may become increasingly skeptical to the usefulness of valuation studies if they tend to consist of a combination of methodologies that reflect subjective preferences of one stakeholder, while their decisions need to involve the preferences of all stakeholders. Seeking to limit these inconsistencies, this research analyzes how different stakeholders apply economic valuation in water management. The focus is on the *process* of economic valuation, in which strategic choices are made by actors with different interests and stakes in the outcomes of the valuation study.

The goal is to answer the following main research question:

How are choices in economic valuation processes in water management influenced by the context in which they are made?

The analytical perspective taken in this dissertation to answer this question is based on institutional theory, in which the context of formal and informal institutions influences actor behavior. This perspective views the valuation process within the context of: (1) actors and their relationships; (2) formal and informal institutions, such as rules, regulations, policy and scientific paradigms; and (3) specific characteristics of the economic instrument such as its goal, time and budget constraints. These elements influence the choices made within valuation processes and may explain the inconsistencies in their outcomes.

The analytical perspective is applied to three case studies. These cases consist of cost-benefit analyses in Dutch water management, of which economic valuation processes are part. Both the choices made within these valuation processes as well as the context in which they are applied are analyzed. The focus is on explaining possible relationships between the two.

The conclusions of this dissertation are as follows:

1. Choices within a valuation process are influenced in particular by four elements in its context: (a) the prevalence or absence of guidelines; (b) the goal for which the valuation study is carried out; (c) participation of certain stakeholders within the process and the effectiveness of the communication of their ideas, and; (d) the time and budget constraints imposed on the valuation process.
2. Through applying an institutional theory perspective, this dissertation contributes to the understanding of choices in valuation processes and explains the inconsistencies in their outcomes.
3. Pursuing transparency within valuation processes as part of decision-making tools such as cost-benefit analysis is necessary if these processes are to contribute to balancing stakeholder interests in water management. A transparent valuation process is characterized by a situation in which it is clear who has made the choices and for what reasons.

Executive Summary

4. Transparency in valuation processes is enhanced by the participation of all relevant stakeholders and the effective communication of their interests.
5. Transparency is further improved through the development of guidelines for valuation processes.
6. Sufficient time and budget result in a more transparent valuation process in which inconsistencies of choices and their outcomes are limited. This increases the usefulness of valuation processes to water management decisions.

The contribution of this dissertation to both theory and practice is discussed in line with the six conclusions. First, the theoretical contribution lies in a better understanding of valuation processes and the inconsistencies in their outcomes in particular. Second, this dissertation highlights transparency in the practical application of valuation processes in water management. This is pursued through more structured *guidance* of valuation processes by all relevant stakeholders, the development of guidelines, and direct linkage of valuation processes with Environmental Impact Statements. Furthermore, it is recommended that *public participation processes* be increasingly integrated in valuation processes. This allows not only for stakeholder participation, but also for effective communication of their interests. Finally, it is recommended that *sufficient time and budget* be allocated to at least one elaborate valuation study in the Netherlands to guide subsequent valuation processes.

Valuation of Water

Chapter 1 Introduction

1.1 The Development of Economic Valuation of Ecosystems

This dissertation focuses on the application of the process of economic valuation of ecosystems in Dutch water management. As a starting point, the dissertation takes the argument that economic valuation has a potential to contribute to decision making processes in integrated water management. It analyzes how different stakeholders use economic valuation in water management and how the context of this process plays a key role in determining the outcome. The goal is to come to conclusions and recommendations for the structure of economic valuation processes in water management, aimed at limiting inconsistencies in their outcomes.

As the environmental effects which result directly from human activities become clear, there is a growing awareness in many countries that the environmental costs associated with various policies need to be integrated in water management decision making processes. This requires methods that measure environmental effects. One approach towards environmental valuation is economic valuation of ecosystems, which calculates monetary estimates for a wide variety of ecosystem goods like water and wood, and services such as recycling of nutrients, that reflect the economic value people attach to these goods and services. In this way, environmental consequences of actions are made more explicit and environmental effects of different policies can be weighed against other effects. Over the last 25 years in particular, valuation methods have been developed and improved to value virtually all categories of environmental goods and services, and numerous empirical studies that measure environmental benefits have been carried out (Cropper, 2000). In this respect, a large number of these studies have been performed that estimate the effects of water management decisions on ecosystems, ranging from estimates of environmental effects of the Exxon Valdez oil spill along the Alaskan coast (Carson et al., 1994) to the value of specific ecosystem services such as the value of water quality improvements by wetlands (Ewel, 1997).

Economic valuation of ecosystems was developed from neoclassical economic theory in the 1970s. Over the past twenty-five years, economic valuation has been subject to major development - many different valuation

methods have been developed and improved such that almost all categories of environmental benefits can be valued (Cropper, 2000). As a result, in many countries environmental valuation has been carried out in numerous cases in practice, and its influence in the policy world continues to grow (Grove-White, 1997). Especially in the United States, economic valuation has become an important tool in many government projects. A major turning point was President Reagan's executive order 12291 in 1981, which made it mandatory for the Environmental Protection Agency to perform social cost-benefit analyses for major governmental regulations (Navrud, 1992). In Britain, the promotion of economic valuation can be dated back to 1989, when Chris Patten became Secretary of State for the Environment and appointed Professor David Pearce as his Special Advisor (Grove-White, 1997). David Pearce was perceived as Britain's leading figure when it came to applying cost-benefit analysis and economic valuation of the environment. Within eighteen months of his appointment, "...the tools and techniques, however imperfect, had become established as a mounting preoccupation within many government agencies, and some NGOs in Britain." (Grove-White, 1997: 23). Since then, economic valuation has played an increasingly important role in many Western countries. In Dutch policy-making, interest developed again particularly over the last few years.

The underlying dissertation is in itself an indication of increased interest in economic valuation of ecosystems within the Ministry of Transport, Public Works and Water Management¹ in the Netherlands. The Ministry initiated this dissertation in 1999 and sponsored the entire research program with as a main goal the investigation of possibilities of increased integration of environmental effects in their policies through economic valuation of ecosystems. An important turning point for economic valuation in the Netherlands came with the publication of the so-called OEEI report in 2000, a government-ratified paper in which social cost-benefit analyses were recommended for all large infrastructural projects (Eijgenraam et al., 2000). Although the report itself says little about economic valuation of ecosystems, it formed the basis for discussions and research on how environmental effects of large infrastructural projects should be incorporated in social cost-benefit analyses in which economic valuation played a major role.

¹ Ministerie van Verkeer en Waterstaat

1.2 Application Contexts of Economic Valuation

Despite the popularity of economic valuation in many contexts, and its continuous improvement and development, disagreement prevails concerning the methodological aspects of economic valuation. As a result, overviews of publications show that though a repetition of studies on the same subject is not uncommon, the outcomes of these studies vary enormously (Bal and Nijkamp, 1998). For example, Woodward and Wui (2001) found that the range in wetland economic values varies from \$0.06 per acre to \$22,050 per acre. In environmental valuation in general, the research on these diversities involve the application of statistical meta-analysis (for an overview of case studies of meta-analyses see Brouwer, 2000 and Brouwer et al., 1997). The results of these meta-analyses indicate that differences in study design are an important explanation for the variation in valuation outcomes (Brouwer et al., 1997). Woodward and Wui (2001) evaluate two types of deviations in wetland valuation outcomes: (i) deviation due to bias or errors in estimations and (ii) deviations due to study site characteristics. The first aspect focuses on errors or bias due to study quality (the quality of the data, the theoretical consistency of the methodology, econometric techniques and statistical certainty), and the type of valuation method used. Through the application of a multivariate meta-analysis², the authors derive several conclusions. First, poor econometric quality is strongly significant and tends to yield higher values. Second, Contingent Valuation, which attempts to obtain consumers willingness to pay for (or willingness to accept) a change in the level of an environmental good, generally tends to yield a lower value per acre. A third conclusion is that studies that incorporate the values of bird watching and commercial fishing activities yield higher values. In another study, Brouwer et al. (1997) conclude that use-values exert a stronger influence over willingness to pay than non-use values. Furthermore, the design of contingent valuation studies have a significant effect on the willingness to pay.

At the basis of these inconsistencies in valuation outcomes lies the observation that economic valuation has an enormous variety of methodological tools that can be used by different practitioners with different interests. For example, the application of the discount rate in cost-benefit analyses may differ between studies: in the Netherlands a discount rate of 4% is applied to government projects, while Germany has a rate of

² This is a regression analysis that allows the researchers to incorporate several deviations in a meta-analysis at the same time.

3%, the United Kingdom of 6%, Denmark of 7% and France of 8%. The European Commission applies a discount rate of 5%. In none of these cases it is clear how this rate is defined, nor how it was realized (Eijgenraam et al., 2000). However, different discount rates result in different outcomes, and thus in different economic values. As a result, diverging methodological constructions in economic valuation studies result in diverging outcomes.

Despite these inconsistencies, economic valuation does have important added value in environmental management, including water management. In particular, for decision-makers it can play a very important role in highlighting the economic importance of natural ecosystems, as well as the relative importance of other economic activities that depend on ecosystem functions. Moreover, economic valuation may be useful in countering arguments on ecosystem conversion. Putting a monetary value on activities can highlight the significance of different ecosystems for people and thus provide strong arguments for the conservation of natural lands and water as opposed to reclamation or conversion. In these cases, monetary valuation is an important complementary assessment to other, qualitative or quantitative assessments on ecosystem functions that cannot be monetarized. Since most decisions are based on economic and financial arguments, putting a monetary value on the environment may sometimes be the most effective way to convince decision-makers of the value of the preservation of ecosystems as opposed to the allocation of their lands and waters for other purposes. Furthermore, assigning economic values to certain ecosystem goods and services provides a system to weigh the different economic activities within a particular ecosystem in the development of, for example, management plans for the area.

1.3 Economic Instruments in Dutch Water Management

Life in the Netherlands is closely linked to water. As a result, water is often directly associated with many activities; whether it is the construction of a new bridge, the expansion of a city or the building of new houses - many activities will directly or indirectly affect water systems. Therefore, Dutch water management, both in quantity and quality, is often an integrated part of many other activities. In the case studies of the underlying research, for example, water management activities play an important part in the exploration and production of gas in the Wadden Sea as well as in the expansion of the Rotterdam port.

In particular the inhabitants of the low-lying areas in the Western and Northern parts of the Netherlands have always needed to compete with water, and the present country is largely the result of this struggle. Faced with water surplus in one part of the country and water shortage in another, the Dutch have become masters at adjusting water systems to their needs. The result is a country in which water systems are almost completely managed. The reclamation of land from the sea (called “polders”) mainly for the purpose of agriculture, for example, has led to a situation where salt water is constantly threatening the livability and agricultural productivity of these polders, forcing people to apply expensive methods to keep the salt water out. As a result, an enormous amount of money is spent each year on pumping fresh water through these polders, while simultaneously pumping salt water out. Consequently, surface levels are sinking, which – together with a rising sea level – calls for additional measures to protect land from floods.

The Netherlands are situated in a river delta and more than sixty percent of its land is situated under sea level. As a consequence, it has fought water abundance throughout its history, and initially the main task of the Dutch water manager was flood protection, which involved the management and control of water for the protection of humans. Gradually, the control of water received a more prominent role, which consisted of the management of water aimed at different stakeholders, such as navigation, agriculture and industry (MinV&W, 1985). During the 1950s and 1960s, the Netherlands experienced rapid economic growth that put increasing pressure on spatial planning and has led to major changes in the infrastructure on both land and water. Measures involved the canalization of major rivers, the normalization of rivers and brooks, the adaptation of shorelines, an expansion of the port of Rotterdam and the construction of the Zuiderzee- and Delta projects (MinV&W, 1985). The consequences of the interventions in the water system throughout Dutch history were noticed by the end of the 1960s in the form of water pollution, degradation of nature and landscape, desiccation, and pressures on use functions such as drinking water and recreation. There was a growing awareness that a different approach towards water management issues was needed in order to overcome these problems. Since then, the approach towards water management has shifted towards a ‘water system approach’, often labeled as *integrated water management* - an integrated approach that puts the entire water system at the center, and balances the demands of society with the functioning of water systems (MinV&W, 1985). Integrated water management connects water quantity management with water quality

management and surface water with ground water (van Ast, 2000). Events such as major floods in the 1990s further stimulated the move towards an ecosystem approach to water management, aimed at giving water systems more space and giving an important role to ecosystem functions in flood management.

This transition to an integrated water management approach calls for tools to balance the needs of the water system with the different functions water has for society. There is currently an increased interest with policy makers in the Netherlands to use economic instruments as such balancing tools. These instruments are often characterized by the fact that they are 'market-based' - they use the market mechanism to alter behavior of individuals or groups of individuals. Examples of economic instruments are the direct alteration of prices or cost levels, indirect alteration via financial or fiscal means, and market creation and market support (Opschoor and Turner, 1994). These instruments all provide incentives to actors to behave in a socially more appropriate way.

The increased interest in economic instruments within Dutch water management is linked to a broader trend in the global water management discourse, at the basis of which is a more general move away from "bureaucratic" government regulations towards "more efficient" markets instruments to deal with environmental issues. Since the introduction of the term "world water crisis", water has become a major focus of international discussions. Different groups with divergent backgrounds have proposed solutions to deal with this crisis. A dominant discourse seems to consist of economic approaches to water management issues, a trend that was set in more general environmental policy making by the report "Our Common Future" of the World Commission for Environment and Development (WCED, 1987). This report combined economics with environment in the term "sustainable development", by stating that economic growth was compatible with environmental protection. The role of economics in environmental management has become increasingly important in the 1990s. In this respect the United Conference on Environment and Development in 1992 in Rio de Janeiro must be mentioned as it explicitly recognized the Polluter Pays Principle (PPP) on a global scale. This Principle states that the price of all goods and services should reflect the total cost, which includes environmental costs. The result is that economic approaches and economic instruments play an increasingly important role in many environmental policies in most Western countries, and water management in the Netherlands is no exception.

In the 1980s, the perspective towards water in the Netherlands shifted from "water as a resource" to "water as part of ecosystems" in which the environment was given a more prominent role. The Dutch Ministry of Water Management (MinV&W) in particular has shown serious interest in the possibilities of using one type of economic instrument in their policy-making processes, namely the social cost-benefit analysis. While a financial cost-benefit analysis balances costs and benefits as seen from one particular actor, often businesses, the social cost-benefit analysis balances costs and benefits from the point of view of society. It therefore also includes environmental costs and benefits, which can be measured through economic valuation of ecosystems. The underlying study is an example of one of the studies financed by the Ministry that focuses on such economic instruments. Another study financed by the Ministry is carried out by Boot (forthcoming), and will focus on the different economic approaches in Dutch water management.

1.4 Problem Statement

There is a possibility that the persistent inconsistencies in economic valuation studies as described in the previous section may seriously undermine the value of the economic valuation concept in different decision making contexts in Dutch water management. In the long-run, decision-makers may become increasingly skeptical to valuation studies if these studies tend to consist of a combination of methodologies that reflect the subjective preferences of one stakeholder, while the decisions often need to involve preferences of numerous stakeholders. Therefore, taking as a starting point the argument that economic valuation is potentially useful in certain decision-making contexts, it is necessary to pursue improvements in economic valuation studies by limiting the inconsistencies in these studies.

In the pursuit of limiting these inconsistencies, a focus on the *process* of economic valuation is required in addition to other current research efforts focusing on methodological issues of economic valuation. Valuation is a process in which actors make decisions in a series of operations or actions that are designed to achieve a certain end (or ends). Differences in the process of economic valuation may also contribute to inconsistencies in economic values and may even be at the root of the diverging methodological applications among stakeholders.

This study will take a process approach to economic valuation. Viewing economic valuation as a process, recognizes the fact that it consists of actors with different interests and stakes in the outcome of the economic valuation study, that operate within a specific context. The emphasis on stakeholders in the valuation process is not new in itself; studies have been carried out on how to integrate social aspects into valuation studies. For example, the VALSE project (1996-1998), financed by the European Commission, applied different procedures in case studies to analyze how to bring different actors' views and preferences into environmental decision making processes (O'Connor, 1998). However, these studies focus only on value formation and value statements, while it is equally important to recognize that principals and contracting parties are also part of the valuation process and thus of the value formation. Therefore, by recognizing economic valuation as a process in which a wide variety of stakeholders with different perspectives and goals make choices, this study could further contribute to the integration of stakeholder perspectives in valuation studies. This integration involves stakeholders that are directly responsible for the choices made in the valuation process and those that indirectly influence these choices.

The process approach of this study focuses on stakeholders and their choices and aims at understanding those choices. Economic valuation is based on neoclassical economic theory, where individuals make choices that maximize their utility and firms make choices that maximize profits. The motives behind these choices, however, are exogenous to neoclassical economic analysis. To understand the types of choices that these actors make within the process, therefore, other theories must be consulted to explain the actors and their contexts, thereby making the implicit variables of the valuation process more explicit. Institutional theory provides such an approach.

Institutionalist schools in economics believe that understanding the influence of the institutional structure on economic behavior is necessary for a better understanding of the performance of firms, markets, agents and economies in different settings (Groenewegen et al., 1995). From an institutional perspective, therefore, the behavior of stakeholders in the valuation process is determined by their institutional context, or to put it conversely: stakeholder behavior can only be understood by understanding its institutional context.

Research concerning the institutional effects on economic valuation of the environment has focussed mainly on the effects of institutions on the outcomes of economic valuations. A major aspect of this research involved the contingent valuation method. Among others, institutional analysis was used to understand the influences on the answers consumers give, such as the effects of the construction of the questionnaire, the effects of the perspective of the consumer on the specific problem, and the effects of different preferences of consumers (see for example O'Neill, 1997, Brown and Slovic, 1988, Blamey, 1995).

This study will take an institutional theory approach towards the process of economic valuation in the context of Dutch water management in which multiple perspectives, goals and relationships between actors as well as their institutional context are seen as part of this process. The goal of this study is to understand how choices are made in the valuation process, focussing specifically on this process in water management. These choices can only be understood by analyzing the institutional context of these actors when they make choices. Once choices are understood, this study will draw conclusions and recommendations on how to improve the valuation process in water management, by providing arguments on how to structure the process in order to limit inconsistencies in valuation outcomes.

1.5 Research Questions and Structure

The previous section explained that the goal of this study is to understand how stakeholders make choices in economic valuation processes in Dutch water management. Explanations will be sought in the institutional context in which multiple actors make such choices. Understanding the institutional context and its influence on stakeholder choices can contribute to an explanation of the inconsistencies in such choices which, in turn, can result in inconsistent outcomes of economic valuation processes. The problem statement of this study as discussed in the previous section leads to the following research question:

How are choices in economic valuation processes in water management influenced by the context in which they are made?

To answer this research question, the following two sub-questions must be analyzed:

- 1) Which choices are made in economic valuation processes and how?
- 2) Which factors can be distinguished in the context of choices in economic valuation processes?

These sub-questions will be answered in the following chapters. Chapter 2 will provide answers to the first sub-question from an economic theory perspective. An explanation is given of the theoretical base of economic valuation rooted in neoclassical economics, followed by a discussion on the practical applicability and limitations of economic valuation. The chapter will end with the introduction of economic valuation as a process. In Chapter 3, the second research question will be discussed. The view on economic valuation as a process is further elaborated, and the chapter is dedicated entirely to the explanation and discussion of an institutional theory perspective on the valuation process. In Chapter 4, the empirical case study analysis that follows in Chapters 5 and 6 is introduced. The role of economic valuation of ecosystems in water management in the Netherlands and the methodological approach that will be taken in the empirical analysis are discussed. The chapter will conclude with an analytical model of the economic valuation process, applied to three case studies of cost-benefit analyses in Dutch water management in Chapters 5 and 6. The aim of the case study analysis is to understand the valuation process in practice, guided by the theoretical perspective developed in earlier chapters. Hence, while sub-questions one and two have been addressed from a theoretical perspective in Chapters 2 and 3, these questions will be addressed from an empirical approach in Chapters 5 and 6. In addition, the relationship between the choices of the economic valuation process and their context will be discussed in each of the cases. Chapter 7 provides an overview and will discuss the major findings of the three cases, leading to the answers to the research question from an empirical perspective that will be discussed in Chapter 8. In addition to drawing conclusions regarding the research questions, recommendations will be made for both the theory and the practical application of economic valuation in water management.

Chapter 2 Economic Valuation of Ecosystems in Perspective

2.1 Introduction

In this chapter, the theoretical background of the economic valuation process is given. The field of economic valuation of ecosystems will be explained, which includes both the background of the concept of economic value in economic theory in sections 2.2 and 2.3 as well as perspectives towards the practical application of economic valuation in section 2.4. The chapter will conclude in section 2.5 with the introduction of the perspective that views economic valuation as a process in which an institutional theory perspective towards economic valuation will be introduced. This perspective will form the basis for the next chapters.

2.2 Economics and the Environment

2.2.1 The Economy-Environment Relationship

At the basis of the relationship between the economy and the environment is the relationship between humans and their environment. The term *environment* originates from ecology, in which it is referred to as the natural surroundings that influence an organism (Cunningham and Saigo, 1992). In ecology, the relationship between different living organisms and their environment is studied (Sutton and Harmon, 1973). This relationship may be analyzed from different viewpoints: the energy viewpoint, where the basis is energy flows; the cycle viewpoint, approaching a whole class of phenomena as a sequence of events that recur regularly; the populations viewpoint that studies members of one species of organism; and the communities or ecosystem viewpoint, which studies the interaction of organisms in a given area (Sutton and Harmon, 1973). When the relationship between one specific organism - humans - and the environment is studied the field is called environmental science, which is by definition a populations viewpoint.

The basic unit of the interaction between organisms, including humans, and their environment that results from the complex interplay between living and non-living elements is called an *ecosystem* (Sutton and Harmon, 1973). Fresh water and salt water, and the organisms that live in this water, are part of *aquatic ecosystems*, which include wetlands³, river basins, oceans, and so on. Several approaches towards the relationship between ecosystems and humans exist, and one approach is to focus on the ecosystem functions on which humans depend, an approach developed by de Groot (1992). In this approach, it is useful to distinguish between characteristics, structure, processes and functions of ecosystems (Turner et al., 2000).

Characteristics describe an ecosystem area in the simplest terms, and include biological, chemical, and physical features. The ecosystem *structure* consists of the biotic and abiotic webs of which characteristics are elements, such as vegetation and soil type. Ecosystem *processes* refer to the dynamics of transforming energy into matter. These processes enable the development and maintenance of the ecosystem structure. Lastly, ecosystem *functions* are the result of the interactions between characteristics, structure and processes. These functions can be classified into four categories (de Groot, 1992):

- a) **Regulation Functions:** ecosystems regulate ecological processes that contribute to a healthy environment
- b) **Carrier Functions:** ecosystems provide space for human activities
- c) **Production Functions:** ecosystems provide resources for humans
- d) **Information Functions:** ecosystems contribute to mental health

Taking a fresh water wetland ecosystem as an example, the regulation functions they perform include the recycling of nutrients and human waste and watershed protection. They also provide fertile grounds for agricultural activities as carrier functions, as well as numerous production functions, including water for drinking, washing and cooking; reeds for baskets, mats and roofs; and fish for food. Lastly, wetlands provide scientific, esthetical and spiritual information.

Ecosystem functions therefore are the capacity of natural processes and components to provide goods and services that satisfy human wants

³ Wetlands are defined as “areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters” (Ramsar Convention, 1971).

directly or indirectly (de Groot, 1992). *Ecosystem services*, such as cleansing and recycling, are conditions and processes through which natural ecosystems sustain and fulfill human life. They maintain biodiversity and the production of *ecosystem goods*, like wood, water, and medicine (Daily, 1997).

At the same time, humans also interfere with the ecosystems they depend on (van Ast and Geerlings, 1995). First of all, humans interfere by adding something to ecosystems, which is called pollution. Secondly, humans may interfere by changing the structure of ecosystems, called modification or injury. In aquatic ecosystems, common interferences are canalization of riverbeds and the construction of hydroelectric dams. The last disturbance is called exhaustion, where humans interfere by withdrawing from ecosystems.

As a consequence, while humans are entirely dependent on ecosystems the condition of the world's ecosystems is also for a large part dependent on the activities of humans. This relationship between humans and ecosystems has often been characterized by a conflict. In order to understand this conflict, four types of ecosystems must be distinguished (Sutton and Harmon, 1973):

- **Mature natural ecosystems:** ecosystems in their natural state, such as wilderness, mountains and desert
- **Managed natural ecosystems:** ecosystems managed by man for recreational use or for the production of natural products – examples are parks and managed forests
- **Productive ecosystems:** ecosystems used by man for the intensive production of food or natural resources, such as farms and cattle ranches
- **Urban ecosystems:** ecosystems in which man lives and works, including cities and towns

Over the past centuries, the growth in population has led humans to seek increasingly more space to live, to grow food and to pass their free time. In this process, ecosystems in their natural state were considered of little value to man, mostly because these ecosystems were little understood in terms of their productive capacity (Sutton and Harmon, 1973). As a result, humans have allowed the development of mature natural ecosystems into managed, productive and urban ecosystems, which were believed to be of higher productive value. The consequences of this are increasingly being felt in numerous ways, and one particularly important consequence for humans is the loss of important genetic information. Mature natural ecosystems are a

key source for important genetic information, which is being destroyed with the transformation of these rich ecosystems into younger ecosystems.

The relationship that has been depicted between humans and ecosystems is at the basis of the relationship between ecosystems and the economy. The economy is an open system, which 'extracts, processes and discards large amounts of physical materials' (Turner et al., 1994). For these materials, it is dependent but also constrained by the environment. The relationship between the environment and economy can be presented via the materials balance model, which is shown in Figure 14. The model can be illustrated by applying it to an aquatic ecosystem like wetlands. The economy extracts useful materials from a wetland, such as fish, water and wood. These materials are subsequently changed in the economy, which involves changes in their energy states and entropy states⁵. In the end, output will be produced, where certain output will be recycled in the economy and waste products will be returned to the environment. This perspective makes clear that humans and their economies impact the environment and that environmental quality impacts the economy (Turner et al., 1994).

Although integration between the environment and the economy is important, conflicting perspectives hamper the execution in practice. A key source of conflict is the fact that perspectives of humans towards the environment are often dominated by *anthropocentrism*, a human-based ethic that views the justification of the protection of species or entire ecosystems in terms of their benefits to humans. Once these benefits are unclear or not recognized, humans will transform or destroy ecosystems in the pursuit of gains. This can also be observed in the economic and political perspectives on time. While for economics, long-term thinking usually covers a period of several decades, and for politicians even a few years⁶, this is short-term thinking when it comes to environmental processes. In the environment,

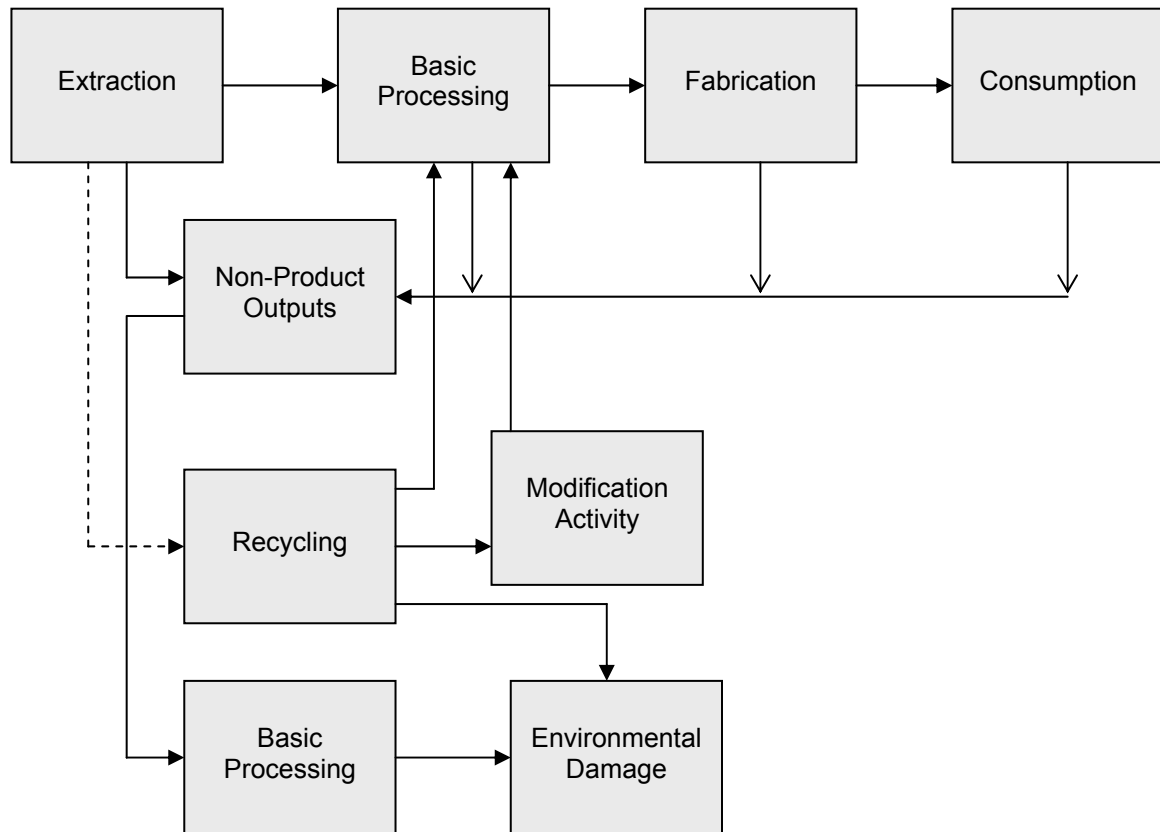
⁴ The model is based on the First and Second Laws of Thermodynamics. The First Law states that we can't create or destroy energy and matter - it ends up somewhere in the environmental system. This points to the boundaries of viewing the economic system as a closed system; instead, it is integrated with the environmental system. The Second Law relates to the fact that materials get used entropically, where "entropy" is a measure of disorder, and includes spread out and diffused. The relevance of the Second Law to economics is that materials that are used get diffused and spread out into the economic system, which places limits on the recycling of wastes. Those materials that cannot be recycled will end up in the environment. Hence, the Second Law further places a boundary on viewing the economic system as a closed system.

⁵ Entropy means 'usefulness': materials enter the economy in a state of low entropy (useful materials) and leave in a state of high entropy (useless materials) (Turner et al., 1994).

⁶ This is also known as the political-ecological anachronism.

long-term thinking implies a period of hundreds or even thousands of years. These different approaches have often resulted in a conflict between economic and environmental interests, where so-called solutions have often been dominated by short-term economic motivations, rooted in anthropocentric perspectives towards the environment.

Figure 1 Simplified Materials-Balance Model



Materials are extracted from the environment, and the primary material and energy inputs are processed and fabricated to result in final product output for consumption. Each of these processes generates non-product outputs, some of which may be recycled and modified to be returned into the economy for basic processing. However, residuals may also be generated during the recycling process that result in environmental damage. Other non-product outputs require direct disposal into the environment, which results in direct environmental damage.

During extraction, certain materials are also directly inputs for recycling, indicated by the dashed arrow. After recycling, the products may be liable for modification so that they may be brought back into the economy for basic processing. The residuals that are generated in the recycling process again result in environmental damage.

Source: Turner et al., 1994

Another body of literature that is important in the context of the economy-environment relationship focuses on the relationship between economic development and the environment. Although it is clear that the environment and the economy are part of the same system and therefore

interdependent, the direction of the impact of economic growth on the environment remains ambiguous. Part of the debate concerns the inputs of economic activities (Perman et al., 1996: 196). When economic growth involves an increase in material and energy inputs, negative environmental effects are more likely to take place. If, on the other hand, growth becomes more efficient such that lower relative quantities of inputs are required for the same outputs, economic growth may not necessarily have such negative environmental effects. Furthermore, changing relative resource scarcities are up to a certain extent reflected in changing resource prices, which may result in substitution effects on both demand and supply side. To what extent such substitutions are possible is another source for debate.

An idea that has become popular is the possibility that economic growth may be necessary for environmental improvement. This view is based on the Environmental Kuznets curve, which states that as per capita income increases in an economy, total environmental impact of economic activity initially grows, reaches a maximum and then falls (Perman et al., 1996: 304). This theory has resulted in opinions (by for example the World Bank) that economic growth results in higher levels of wealth, so incentives to protect the environment become of greater priority in the political agenda (Perman et al., 1996: 302). This stimulates resource substitution, technological innovation and changing patterns of demand. However, these hypotheses are hardly conclusive and are countered by those who claim limits to economic growth do exist, including physical resource constraints (see for example Meadows et al., 1972), social limits (Hirsch, 1977), and biophysical limits (Daly, 1987).

As becomes clear from the preceding paragraphs, there is no consensus on the relationships between economic growth and the environment nor the direction of this relationship. This dissertation will not further elaborate on this debate, but the paragraphs do show that the relationship between the environmental and economic systems are extremely complex and that perspectives on environment and economics relationships are still very much diverged.

2.2.2 Economic Approaches towards the Environment

The concept of economic value has its roots in neoclassical economics. Before explaining the theoretical background and foundations of economic valuation, however, it is important to explain the context in which the theory of neoclassical economics emerged. The perception of natural resources in the history of economic thought varies with time and

economic schools. These perceptions range from natural resources being the source of all value (the physiocrats), to being the most important restriction on the growth of productivity (some classical economists and ecological economists), to natural resources as relatively abundant factors of production (most neoclassical economists) (Dietz et al., 1994: 27).

The *physiocrats*, or Les Économistes, in the eighteenth century emphasized that the value of a good was determined by the natural resources that were processed in the good. Only agriculture and mining were productive in the sense that they added value; handwork and trade only transformed natural material and therefore did not add value. Natural resources received a central place in their economic theories and the economy as a circular course was introduced for the first time (Dietz et al., 1994).

In the last third of the eighteenth century, the Industrial Revolution came to England and with it factories, factory towns, workers and investments in machinery (Galbraith, 1987). Society went from being mercantilist to industrialist and the classical economist tradition emerged.

The *classical economists* at the end of the eighteenth and beginning of the nineteenth centuries mostly concentrated on industrial development – economic growth, formation of capital and income distribution⁷. Classicists had different opinions on how to deal with natural resources. Adam Smith (1723-1780), for example, had a very optimistic view about future production and consumption possibilities - natural resources formed no restrictions (Dietz et al., 1994: 31). As long as economic transactions were allowed to operate on the basis of freely competitive markets, economic and social progress would prevail (Pearce and Turner, 1990: 6). Thomas Malthus (1766-1834) and John Stuart Mill (1806-1873), on the other hand, were more pessimistic about (agrarian) production possibilities in the future (Dietz et al., 1994: 33). Malthus stated that population would keep increasing exponentially while food production increased linearly, and therefore overpopulation would always persist. Only moral restraints on reproduction itself would result in an escape from this pattern. Such a pessimistic view on the prospects of economic growth due to the scarcity of natural resources was shared by David Ricardo (1772-1823) (Pearce and

⁷ Classical tradition is not limited to this time period; the *Austrian school* that emerged in between the two World Wars contained the "...most committed exponents of the classical orthodoxy in its purest form." (Galbraith, 1987: 190). The most well-known of these were von Mises (1880-1973) and von Hayek (1899-). Both believed that socialism was an impossibility and any departure from classicism to be an inevitable step towards socialism.

Turner, 1990: 6). He believed that diminishing returns would set in because the available land varied in quality and society must therefore move on to successively less productive land. John Stuart Mill was also pessimistic about agrarian production possibilities in the future, but viewed the prospect of a 'stationary state', in which population is stable and thus does not exceed food production, with some optimism (Pearce and Turner, 1990: 7; Dietz et al., 1994: 33). The stationary state could only be achieved if nature is no longer over-exploited, welfare is evenly divided and humans restrain their reproduction; or, if these aspects are not achieved, nature itself would force the steady state upon humans (Dietz et al., 1994: 34).

Many criticisms of classical tradition and industrial society (at this time still based mostly in England) came from Germany, France and the United States, but among the greatest critics was *Karl Marx* (1818-1883) (Galbraith, 1987). Pearce and Turner (1990: 8,9) argue that Marx took a "material-balance approach" to the production process over time. Marx emphasized that a viable basis for society could only exist if the production system was capable of reproducing itself, and natural systems could be a limit to reproduction. According to Marx, capitalist economies fail to be reproductive, or sustainable, and one source of this is environmental destruction.

In general, it can be said that the classicists had an integrated view of the economy and the environment, where nature and the economy were viewed as closed systems. However, as societies became more and more industrial in the course of the nineteenth century, the predictions of Malthus and Mill disappeared into the background (Dietz and van der Straaten, 1994: 35). Mass production and the market as a coordination mechanism grew and economists became more interested in the patterns of exchange by agents on markets; in around 1870 the *neoclassical economists* emerged (Pearce and Turner, 1990). They introduced a new analytical instrument called 'marginal analysis', the study of the relationships between small or incremental changes. Economic activity was the result of the interaction between productive activity and the preferences of individual buyers, constrained by the range of income and choice (Pearce and Turner, 1990: 10). This interaction implied that a certain exchange ratio existed among goods; if money was used in this exchange, all exchange ratios could be expressed in terms of money (Dietz, 1994: 41). Hence, the price of a good was the 'exchange value' of the good expressed in monetary terms. In the neoclassical period, the problem of the availability of natural resources that the classical economists recognized was perceived as irrelevant. For

example, Marshall stated that technological development proved that Malthus' pessimistic viewpoints on economic growth were wrong (Dietz, 1994: 43). He discussed ecological processes only insofar as they appeared on the market; goods that were not available on the market do not have a price and therefore seem to be abundant. However, Marshall did introduce the concept of 'external effect', although he explained the concept only on the benefit side. Pigou (1877-1959), Marshall's successor at the University of Cambridge, was aware of both positive and negative externalities (Dietz, 1994: 44), and he discussed negative external effects in terms of environmental problems, where the solution to these negative externalities could be found with government interventions.

The neoclassical views on the environment are generally perceived to be of great influence on *Environmental and Resource Economics* (ERE), although David Pearce and Kerry Turner (1990:5), two well-known advocates of ERE, call this a sub-discipline of economics that consists of a diversity of doctrines, including neoclassical, institutional, Marxist and co-evolutionary economics. ERE views the economy and the environment as two separate systems in which the environment is an asset that provides the economy with a variety of goods and services. This approach is based on the concept of weak sustainability, in which the sum of economic and natural capital be maintained: human-made capital is a perfect substitute for natural capital, and resource scarcity can be continually augmented by technological means (Hussen, 2000). Therefore, economic growth and environmental improvements are compatible. The market is the main medium for resource allocation, where market prices equate supply and demand such that equilibrium is obtained. Environmental degradation is viewed as a market failure because the prices for goods and services either do not exist or do not reflect the true value of the resource. As a result, environmental degradation occurs, which is viewed as a negative externality - negative effects that take place outside the market, caused by one economic agent onto another without any form of compensation being paid (van den Bergh, 2000). These market failures can be corrected through creating markets by attaching a price to previously free services, or through modifying markets by centrally deciding the value of natural goods and services and ensuring those values are incorporated in their prices (Davis, 2001). Creating hypothetical markets of supply and demand allows for the construction of prices of environmental goods and services which results in a more efficient allocation of these resources.

At the beginning of the twentieth century, *Institutional Economics* emerged. Although it consists of a wide variety of views, institutionalist schools in economics believe that the understanding of the influence of the institutional structure on economic behavior is necessary in order to better understand the performance of firms, markets, agents and economies in different settings (Groenewegen et al., 1995). They often stress the importance of the ecological foundations of any economic system (Pearce and Turner, 1990: 16); the economy is an open system that receives impulses from social, political and physical systems. Individuals hold both private and public preferences, and the latter may justify an active public sector in the economy. Institutionalists view the individual either as a cultural product (Old Institutionalism) or as a rational individual (New Institutionalism). While the first perspective criticizes the core assumptions of neoclassical economics, the latter perceive institutional theory as a perspective that can enrich economic theory by creating an awareness of human motivation in economic behavior. The perspectives of the school of Institutional Economics will be further explained in Chapter 3.

The awareness of the environment grew at the end of the 1960s and beginning of 1970s, which stimulated economists to analyze the environment systematically. A minority of economists disagreed with the approach of ERE, in which environmental problems were perceived as externalities that needed to be internalized (Dietz and van der Straaten, 1994: 75). Hence, a second school of thought emerged called *Ecological Economics* (EE), or Co-evolutionary Economics, which was founded at the end of the 1980s (van den Bergh, 2000)⁸. Thinkers in this school such as Norgaard and Daly integrate the disciplines of economics, ecology, thermodynamics, ethics and a range of other natural and social sciences to create an integrated approach towards the environmental-economic system (van den Bergh, 2000). It is based on the concept of strong sustainability, which requires that both economic and natural capital be maintained separately (van den Bergh, 2000). It views the economy as a subsystem of a larger ecosystem - the environment and the economy are integrated and co-evolving systems. It thereby sets limits on the physical growth of the economy and questions whether the world's resources can actually support economic growth on a global scale indefinitely (Hussen, 2000). Limits are placed on the availability of energy and on the resilience of natural ecosystems. Central to the EE perspective is the steady-state economy

⁸ The economists K.E. Boulding, H.E. Daly and N. Georgescu-Roegen, and the ecologists C.S.Holling and H.T. Odum are considered to be the intellectual founders of Ecological Economics (van den Bergh, 2000).

(SSE), a theoretical growth model that incorporates biophysical growth limits and ethical considerations (Hussen, 2000). In SSE, economic growth is bounded by the ecological system such that the stock of physical wealth and people is constant. Ecological economists recognize the limitations to the application of the market mechanism to the environment and instead strive for a dialogue with natural scientists to include both disciplines in the solution to environmental degradation (Gowdy, 1995). The total economic value of changes in the environment is not regarded as the sum of private values since this takes no account of such crucial aspects as internal environmental system functions, life-support functions, future generations and intrinsic values (van den Bergh, 2000). Although the difference in opinion regarding the use of economic values in environmental policy within EE are pronounced, economic values may be used as part of a multiple set of criteria that needs to be considered in the solution (Munda, 1993). This method, called 'multicriteria-analysis', constitutes an integration of economic and ecological tools for the management of ecosystems, as opposed to the direct application of neoclassical-economic theories to ecology (Gowdy, 1995). Decisions regarding the environment are then not made on basis of economic values alone but on a number of criteria, as a dialogue between the ecological and the economic systems. The government, as opposed to the market, ultimately decides how the resources shall be allocated.

Differences in economic approaches towards the environment become more apparent when they are related to different perspectives on sustainability. In this respect, Turner et al. (1994: 60) distinguish four approaches to sustainable development:

- a) Very weak sustainability
- b) Weak sustainability
- c) Strong sustainability
- d) Very strong sustainability

The two weak forms of sustainability can be perceived as *technocentric* approaches, which adhere the position that no constraints should be placed on individual consumers or markets. Technocentrics support an open, free market, which is backed by the belief that technological developments can overcome environmental problems (Turner et al., 1994, p. 60). Very weak sustainability is the approach generally supported by the neoclassical economics school of thought. They support the belief that the overall stock of capital should remain constant over time, but that consumption should only be held constant with respect to exhaustible resources when the rents derived from the intertemporal efficient use of those resources are

reinvested in reproducible capital (Turner, 1993). The London school of thought adhere weak sustainability, which introduces an upper bound on the assimilative capacity and a lower bound on the level of natural stock necessary to support sustainable development. Certain key species and processes cannot be substituted by man-made capital, and therefore some degree of restriction is placed on resource-using economic activities (Turner, 1993). The two strong forms of sustainability are *ecocentric* approaches, which support the belief that the regenerative capacity of renewable natural capital should not be threatened even if the economic benefits outweigh the economic costs to society (Turner et al., 1994). Strong sustainability is supported by the post-Keynesian school of economics, who support the view that whatever benefits foregone, natural capital losses are unacceptable. It is not sufficient to protect the overall level of capital; natural capital must be protected because certain critical natural capital is non-substitutable (Turner, 1993). The very strong sustainability approach is generally supported by the thermodynamic school (including Ecological Economics) who call for a steady-state economic system based on thermodynamic limits and constraints placed on the macro-economy. They plead for zero economic growth and zero population growth (Turner, 1993).

The different sustainability approaches result in different perspectives towards economic valuation (see Turner et al., 1994; Bouma and Schuijt, 2001). In the weak sustainability approach, extended monetary valuation methods are likely to be applied to value those ecosystem functions and services both with and without a market price and hence a full set of ecosystem functions and services may be included in the analysis. Economic valuation in the strong sustainability, on the other hand, may be utilised in decision making only if fixed standards with regard to safeguarding the functions of ecosystems are applied. Under the regime of very strong sustainability, economic valuation of ecosystems is likely to be completely rejected as assessment tools, while very weak sustainability is likely to value only those ecosystem functions and services of water systems that have market prices.

2.3 The Concept of Economic Value

2.3.1 Allocation of Resources

The study object of economics can be explained by distinguishing between 'material object' and 'formal object' (Dietz et al., 1994: 15). The material object indicates what aspect of reality is the subject of study and in

economics this is society. Economics studies human behavior, relationships between humans and social institutions (government, unions) and abstract institutions like money, markets and democracy. Usually, however, economics is defined with respect to its formal object, which states the perspective from which reality is studied. In this respect, economics is concerned with the allocation of scarce resources, including land, labor, capital and natural resources. *Scarcity* refers to a situation where the wants (or preferences) of an individual or group of individuals exceed the resources available to satisfy them (Bannock et al., 1987). Scarcity is therefore a relative concept: resources are scarce relative to the preferences of the individuals for these resources. The term *global water scarcity*, for example, is subject to much debate - while scarcity of fresh water is definitely a serious issue in many countries, including countries in the Middle East and Africa, other countries including many European countries like the Netherlands are often faced with water abundance that results in flooding. Yet other countries may be faced with both extremes: Mozambique has faced water shortages in certain parts of the country, while other parts experience severe flooding. This clearly illustrates the relativity of the term scarcity. As a result, emphasis is increasingly placed on the distribution of fresh water around the globe and less on terms like global water scarcity.

Production aims at meeting the desires of humans for scarce resources. However, in all societies, resources are inadequate to produce all the goods and services necessary to satisfy these wants (Wills, 1997); therefore scarcity is present in any society in which desires can't be completely satisfied. Economists would like to know what choices individuals make when resources are scarce. For example, in consumer choice theory, on which economic valuation of ecosystems is based, the process by which individuals as consumers allocate their income at the margin among an array of consumer goods is described (Gowdy and Mayumi, 2000). These individuals are represented by *Homo Oeconomicus*: an autonomous rational person.

In making their choices, rational individuals as a rule seek to satisfy their preferences, a pursuit of individual welfare maximization. *Individual welfare*, also known as *utility*, is the amount of preferences an individual can satisfy, given the relative scarcity of resources (Dietz, 2000). The preferences that individuals have are revealed by the choices they make, but the reasons for these preferences, or motives, are not explained by this behavior. In economics, the choices of individuals in the context of scarcity are studied,

while the motives on which these choices are based are treated as exogenous variables (Dietz, 2000). The assumptions of rationality and stable preferences, therefore, do not account for preferences that differ among individuals and change over time, nor for the capability of humans to act altruistically (Pearce and Turner, 1994).

Some scarce resources are allocated in the market place, where consumers that demand goods and producers that supply goods meet and interact. In terms of aquatic ecosystems, goods such as fish and in some circumstances clay or gravel are typical resources that are sold in a market place. The fundamental theorem of welfare economics states that in perfect competition, the market mechanism provides an efficient allocation of resources (Nas, 1996). Efficiency in economics is defined as *allocative efficiency*, which is met when the following efficiency criteria are met (Nas, 1996):

- **Production efficiency:** if it is no longer possible to increase the output of one good without reducing the output of some other good
- **Exchange efficiency:** if it is impossible to make a person better off without making another person worse off

If these criteria are met, economists speak of a *Pareto optimum situation*. Such a situation is obtained on the market place through an interaction of supply and demand, which results in resource prices. In a perfect market, prices allow for an optimal allocation of scarce resources and are the main orientation point for consumers and producers in making decisions. In other words, prices, and especially changing prices, have an information function (Dietz, 2000). The relative scarcity positions of resources are reflected in their prices; a change in these relative scarcity positions then results in a change in prices. Changes in prices in turn lead consumers and producers to react and adjust their demand and supply of the resources such that an efficient allocation of the resource is secured (Dietz, 2000).

A Pareto optimum situation in the market place is, however, not always attained - a situation that is characterized by a *market failure*. One cause of market failure is the absence of perfect competition, as is the case with increasing returns to scale⁹ and asymmetric information between buyers

⁹ A production associated with decreasing average costs, such is the case with a monopoly or an oligopoly (Mamuth, 1993).

and sellers¹⁰. Another cause is the prevalence of external effects in production and consumption. *External effects* appear when the consumption or production by one individual or group of individuals affects another party without compensation taking place (Mamuth, 1993). These effects can be both positive and negative¹¹. Mamuth (1993) states two main reasons for external effects:

- The effect is a by-product of consumption or production
- A lack of well-defined property rights

An example of the first aspect is pollution of water, associated with certain production processes of factories – these productions cause negative external effects on surrounding communities. The prevalence of the second aspect, a lack of well-defined property rights, means that it is impossible to determine who should pay for the consumption of a certain good. *Property rights* reflect the owner's right and privilege to use the resource (Tietenberg, 1992). De Vries (1992: 43) explains that the exchange of scarce goods is in fact a trade in 'bundles of property rights'. Money and prices make this trade easier. In this respect, property rights are the total of economic and social relations that determine the position of each and every individual towards the use of the scarce resources (de Vries, 1992: 44). Well-defined property rights are characterized by 4 aspects (Tietenberg, 1992):

- **Universality**: all resources are privately owned and ownership is completely specified
- **Exclusivity**: all costs and benefits as a result of resource ownership accrue only to the owner
- **Transferability** : all property rights are transferable from one owner to another
- **Enforceability**: property rights protect the owner of the resource from involuntary seizure of the resource by others

Natural resources are characterized by the fact that they often lack well-defined property rights. The lack of well-defined property rights results in a characterization of most natural resources into public goods and common

¹⁰ In a perfect competition, it is assumed that all actors have access to perfect information, represented by equilibrium prices; in the absence of perfect competition (in a monopoly or oligopoly), consumers and producers may not have perfect information.

¹¹ David Ricardo (1771-1823), a famous economist, believed that acts of consumption and production result in both positive and negative externalities but, according to Ricardo, externalities are often more negative, and consequently, it is the negative externalities that capture our attention.

pool resources. This characterization is based on two elements (Wills, 1997):

- **Rivalry:** certain environmental goods are *rival* goods when the consumption of the good by one person reduces the amount available to others. Consumption of *non-rival* environmental goods, on the other hand, will not reduce the amount of the same good available to others.
- **Exclusivity:** an *excludable* good is a good whose consumption by non-payers can be excluded by some technical means. Consumption of *non-excludable* goods, on the other hand, cannot be excluded from non-payers.

When goods are both non-rival and non-excludable, these goods are called *public goods*. Examples of public goods are defense and air quality. Many natural resources have public good characteristics – the functions natural retention capacity and flood control of aquatic ecosystems could be considered public goods. If goods are rival but non-excludable, the goods are labeled *common pool resources*. Natural resources provided by aquatic ecosystems such as fish and water are rival since one person's consumption of them decreases the amount of the good available to another but cannot be excluded in consumption from those who are unauthorized users (Wills, 1997).

Both public goods and common pool resources are subject to external effects, and hence markets fail with respect to the efficient allocation of most environmental goods and services. In mainstream economics, market failures can be a motive to allow governments to intervene to protect those who suffer from externalities¹². In this case, government has the following policy instruments at its disposal (Hazeu, 2000):

- **Judicial regulation:** laws and rules
- **Financial regulation:** subsidies, levies and other financial stimuli
- **Social regulation:** discussion, negotiation, and education

Hence, governments may set regulations on behavior, impose quality standards on the environment that actors need to comply with, or negotiate with actors so as to stimulate a change in behavior. In all these cases, the government decides to play an active role. Another solution is to focus on an improvement of the market place by internalizing the environment in the market place. In fresh water management, such discussions are held around issues of water pricing. In most countries, the price paid for water

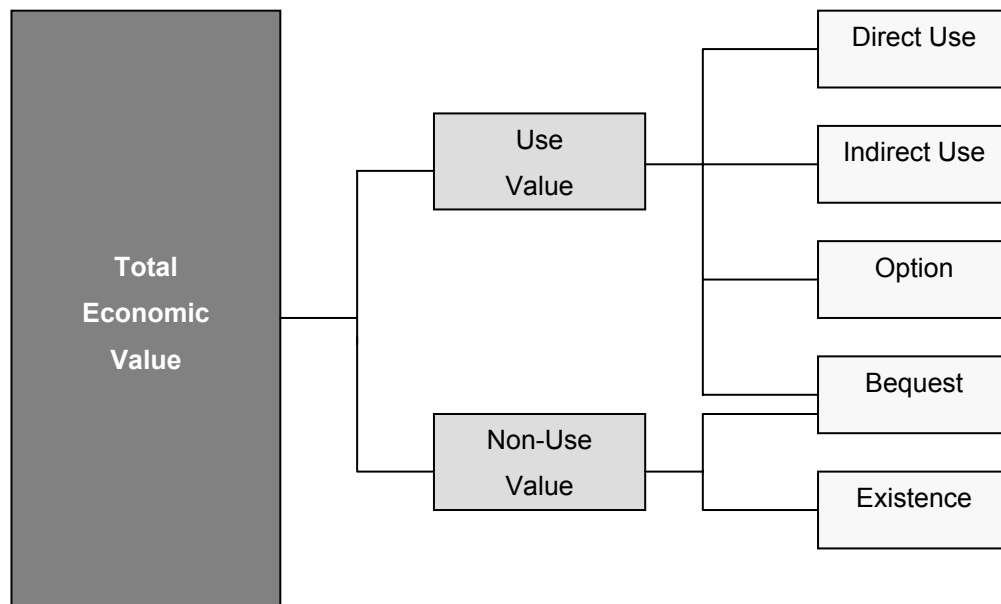
¹² Other motives for government intervention are the provision of public goods and the intervention when imperfect competition prevails (Nas, 1996).

consumption does not represent the true cost of water extraction, which, ideally, should not only include extraction, production and transportation costs but also the costs of extracting fresh water to the environment. An example of such costs is the depletion of groundwater resources in certain areas of the world. In such cases where fresh water is under-priced, the allocation of water is not economically efficient and may result in over-consumption of water that eventually contributes to local water scarcity. One approach to deal with this problem is to value such resources so that they receive a market price and consumers can make a trade-off (Turner et al., 1994) - this is called *economic valuation* of the environment.

2.3.2 Economic Value

Before turning to the concept of economic value, a distinction must be made between 'price' and 'value'. In perfect functioning markets, *prices* of goods reflect the (exchange) value of the good expressed in monetary terms. This exchange value is the result of the interaction between productive activity (supply) and the preferences of individual buyers (demand), constrained by the range of income and choice. However, it was explained in the previous section that for some resources, markets do not always function perfectly, in which case the price for which the resource is traded does not reflect the exchange value. In some cases, goods and services (including many environmental goods and services) are not even traded in the market place and thus have no market price; as was explained in the previous section, these are called externalities. When decisions are made that affect these externalities, however, decision-makers need to know what the *total value* of these externalities is to society. With respect to environmental goods and services, this total value may consist of an ecological value, a socio-aesthetical value, an intrinsic value, and an economic value. Economic values are therefore only one aspect of total resource value.

Economic values are monetary measures for benefits or costs of environmental change (Wills, 1997). They are based on estimates of people's *willingness to pay* for that environmental change or *willingness to accept* compensation for that change. Although there is still considerable disagreement regarding the classification of economic values, one common approach is to distinguish between use values and non-use values (Turner et al., 1994) (see Figure 2).

Figure 2 Total Economic Value

The use value of an environment comprises both *direct use* of the environment, such as the consumption of fish, trees and water, and *indirect use* of the environment, like use of retention capacity of wetlands and oxygen production of forests. Furthermore, option value is distinguished as a use value. *Option value* is defined as the value to humans to preserve an environment as a potential benefit for themselves in the future. It arises from retaining an option to a good or service for which future demand or supply is uncertain: if people are uncertain about their future preferences or the future availability of the good, people might be willing to pay a price to keep the option for future use open (Perman et al., 1996: 277)¹³. The non-use value of an environment refers to the non-instrumental value, not associated with use. This includes *existence value*, a recognition of the value of the very existence of ecosystems. It is based on a sympathy with or concern for the welfare of non-human beings – a desire that ecosystems or species should have a right to exist. *Bequest value* is both a use and a non-use value. It is related to option value, but it is the willingness to pay for the preservation of an environment for the benefit of one's descendants. This

¹³ Option value arises when people are risk averse: it is the amount an individual would be willing to pay today for the right to consume the good tomorrow. In the case of no risk aversion, however, people may still attach value to a resource in the case of uncertainty: an individual might be willing to pay for maintaining options for future use of some resource. This is called *quasi option value* and is based on expectations about future technological advances and development of knowledge. An example is the value individuals might attach to the protection of the rainforests as a potential source for medicinal remedies in the future. (Perman et al., 1996: 277)

benefit incorporates both use and non-use of the environment (Turner et al., 1994)¹⁴.

Economic value must not be confused with *total ecosystem value*. The aggregate ecosystem possesses a primary and a secondary value, together which comprises the total value of an ecosystem (Turner et al., 1994). The *primary value* is the value of a healthy ecosystem that contributes to the aggregate life support, the value of ecosystems as a basis for life on earth. This value is necessary before the range of use and non-use values, the *secondary ecosystem value*, can be utilized by humans. Economic value only captures secondary value – the primary value is not encompassed by total economic value. Moreover, it must be recognized that other types of ecosystem value exist, such as ecological value, socio-cultural value and intrinsic value, which also cannot be fully captured by economic value (de Groot, 1992). *Intrinsic value* is the value that resides in the environmental asset itself (Turner et al., 1994). It is unlike existence value, which is a value humans attach to ecosystems; it is the value intrinsically residing in ecosystems themselves. This value cannot be captured by total economic value. Hence, economic value is purely based on people's explicit willingness-to-pay or willingness-to-accept estimates for ecosystems goods or services - those goods and services for which humans are not willing to pay or accept are not captured and must be estimated through other means.

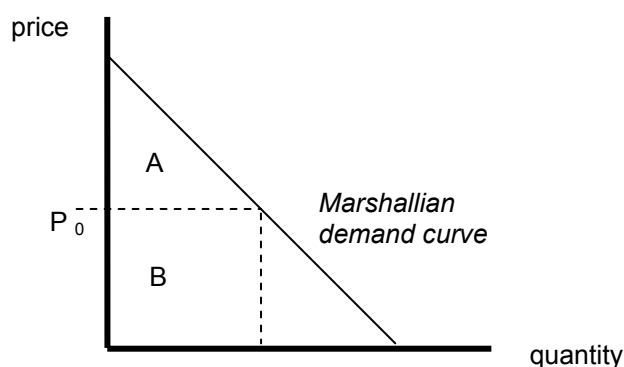
2.3.3 Willingness to Pay and Willingness to Accept

Economic valuation of ecosystem functions measures consumer willingness to pay or willing to accept compensation for changes in the environment. This is based on economic *consumer theory*, where consumers are expected to maximize their utility, or satisfaction derived from consumption, subject to their income. Utility maximization results in a *Marshallian demand curve*, which is represented in Figure 3. If the environmental good or service is provided at price P_0 , all consumers must pay P_0 . Total expenditure, then, is equal to price times quantity, or area B. However, some consumers are willing to pay more for this good – the fact that they pay less results in a *consumer surplus*, the area under the demand curve and above P_0 , or area A in the graph. This is the maximum gain an individual can obtain from the environmental product at price P_0 . The

¹⁴ Option, existence and bequest values are also known as ‘preservation benefits’, and are a major component of total economic value: a study by Walsh (1984) showed that the incorporation of preservation benefits in the consumer surplus of wilderness preservation increased the annual benefits by sixty percent.

economic value, or the total willingness to pay by consumers for the environmental good, is equal to the sum of area A and B, or the area under the demand curve (Pearce and Turner, 1990). Since P_0 can be directly observed in the market, area B, or total expenditure, is usually the first approximation of economic value. However, since this omits consumer surplus, economic value, or total willingness to pay, is more than what we observe from market prices.

Figure 3 Consumer Surplus



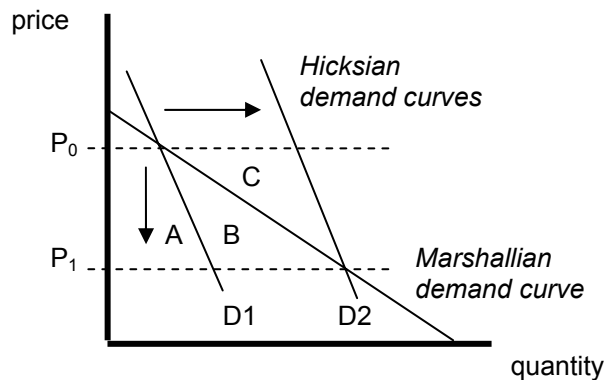
An important objection to using a Marshallian demand curve for measures of consumer surplus is that it assumes money income¹⁵ is constant (Nas, 1996). In other words, it is assumed that an increase in the price of good X will result in a decrease in the quantity demanded of good X. This is called the *substitution effect*: as the price of good X increases, the quantity demanded of good X decreases and people switch to a substitute, good Y. However, an increase in the price of good X simultaneously means a decrease in real income¹⁶, or purchasing power, which is an additional affect on the demand of good X. This effect is known as the *income effect*: as the price of good X increases, real income decreases and the demand for good X decreases. The total change in quantity demanded as a result of price changes that is measured by consumer surplus, therefore, consists of both a substitution and an income effect. In order to determine the economic value of a good it is important to know how much people are willing to pay for a certain good if their real income is held constant. In other words, if real income remains the same, how much would the consumer be willing to pay for the price change?

¹⁵ Money income is income stated at current prices, not adjusted for inflation.

¹⁶ Real income is income adjusted for inflation, or purchasing power.

The *Hicksian compensated demand curve* accounts for the income effect (see Figure 4). Assume a price decrease from price P_0 to price P_1 . According to the Marshallian demand curve, the increase in consumer surplus as a result of this price change is equal to area AB. However, introducing the fact that real income changes as a result of the price change results in the introduction of a compensated demand curve D1. All along the Marshallian demand curve are different compensated demand curves, relating to each constant level of real income (Cullis and Jones, 1992). A decrease in price from P_0 to P_1 , while holding real income constant (at D1) results in a consumer surplus of area A. This area is called *price-compensating variation*, and is smaller than the Marshallian consumer surplus. This is the maximum amount an individual would be willing to pay for the price change (if it is a favorable price change), or the maximum amount an individual would be willing to accept to forego the price change (if it is an unfavorable price change) (Cullis and Jones, 1992).

Figure 4 Willingness to Pay and Willingness to Accept



Source: Cullis and Jones, 1992

Another option is to ask the consumer how much he would need to receive so as to make him as well off as if the price decrease occurred (Cullis and Jones, 1992). If the price had decreased, the individual would be at price P_1 and demand curve D2. The starting point is therefore curve D2 at price P_1 . The amount that would need to be given to the individual that would make him as well off as if the price had fallen to P_1 is area ABC. This measure of consumer surplus is called *price-equivalent variation*, and is larger than the Marshallian consumer surplus. It is the maximum amount individuals would need to receive, or be willing to accept, to make him as well off as if the price change had occurred (in the case of a favorable price change); or the maximum amount an individual would give up, or be willing to pay, to

forego the change in price (in the case of an unfavorable price change) (Cullis and Jones, 1992).

Compensating variation and equivalent variation are not equal, however both measure willingness to pay and willingness to accept. Willingness to pay (WTP) and willingness to accept (WTA) are both technically correct measures for economic value (Pearce and Turner, 1990). According to economic theory, WTP and WTA should be equal. In practice, however, measures of WTP are often less than measures of WTA. Hoevenagel (1994) gives four possible reasons for this discrepancy. First of all, people are not willing to accept deterioration in environmental quality as they feel nobody has the right to pollute. Therefore, they may demand a higher compensation. Secondly, many respondents are careful and insecure, which results in stating a lower WTP and a higher WTA. A third reason is that people may find preventing a welfare loss is more important than gaining a welfare profit. Fourthly, the number of available substitutes influences valuation – the more substitutes or alternatives of behavior are available, the smaller the discrepancy between WTP and WTA. The difference between WTP and WTA is still unresolved in economic literature.

2.3.4 Economic Valuation Methods

Economic theory distinguishes several valuation methods to obtain economic values. For those goods and services that are traded in the market place and whose prices are not distorted due to market imperfections or government policy, market prices can be applied to derive economic values. However, many goods and services of the environment do not have market prices and many who do often have prices that are distorted due to for example government subsidies. In such cases, it is necessary to apply *Shadow Pricing* techniques. Shadow pricing implies directly adjusting for the distortions of financial prices or applying *non-market pricing methods* to derive economic values.

One typology of non-market pricing methods is to distinguish between demand curve approaches and non-demand curve approaches. *Demand curve approaches* use Marshallian or Hicksian demand curves to obtain economic values. These approaches are Contingent Valuation, Travel Cost and Hedonic Pricing. The most well-known demand-curve method is called *Contingent Valuation* (CV). This method directly obtains consumers' WTP (or WTA) for a change in the level of an environmental good, based on a hypothetical market (Hanley and Spash, 1993). It attempts to reveal individuals' stated preferences and is based on the Hicksian demand curve,

in which real income is held constant. The most common method is to state a hypothetical market for an environmental good, and ask consumers (through surveys, questionnaires or experimental techniques) to state their maximum WTP to realize an improvement in the quality of that environmental good, or their minimum WTA compensation for deterioration in the quality of the environmental good (Pearce and Turner, 1990). A major advantage of the CV method is its technical capacity to estimate non-use values, for which it is widely used (Pearce and Turner, 1990). Technically speaking, it is applicable to all circumstances and is therefore often the only technique to measure benefits. However, it also receives much criticism that is mainly directed at the accuracy of CV estimations (Hanley and Spash, 1993):

- a) **Strategic bias:** respondents may understate their bid for an environmental good if they believe the bid is actually going to be collected from them
- b) **Design bias:** the way the information is presented to the respondents may bias the outcome
- c) **Mental account bias:** a fixed amount will be allocated by individuals on specific environmental assets, while this amount may change once other assets enter the picture; a person's entire income may be spent on the protection of the rainforest while he may also care about protecting whales, which is not one of the options
- d) **Hypothetical market error:** responses of individuals are based on a hypothetical market, while the responses in a true market situation may be completely different; a hypothetical market lacks the opportunity for individuals to discuss with each other or to learn by doing

One of the most extensive researches on the scope and validity of the CV method is Hoevenagel (1994). He concludes that the current CV method is useful to improve governmental decisions, but still too crude to actually base governmental decisions upon. The method leads to the most valid results for small, short-term and reversible effects; in the case of insecure, long-term, irreversible, international and difficult to observe environmental changes, the method is less valid.

Research has, however, been performed to improve data obtained from CV studies. For example, much research has focussed on ways to limit the bias in these studies for the transfer of economic values to other studies. The work done by Brouwer (2000), for example, discusses among others the influence of the perception of the interviewed and study design on outcomes of economic valuation studies and ways to deal with these influences. Other research has discussed the use of citizen juries in CV studies to come to a collective conclusion about what it is worth to

preserve an environmental good (Ward, 1999). The group has the chance to discuss, debate, call for additional information from witnesses, and vote. In this way, participants are better informed, measurement errors are less likely to occur and distributional aspects are limited. The problem with this approach, however, is that citizen juries are very expensive to run, so only large government-sponsored projects are potential candidates. The CV method is also known as a "stated preference method" because it attempts to obtain consumer's preferences by directly asking their willingness to pay or accept. Other stated preference methods are contingent ranking and participatory methods.

The *Travel Cost* (TC) method is the oldest non-market pricing valuation method that is widely used. This method measures consumer surplus and is therefore based on a Marshallian demand curve. Since it relies on individual valuations of environmental goods that are revealed in the travel costs made by consumers to obtain the environmental good, this method is known as a "revealed preference technique"¹⁷ (Turner et al., 1994). Travel costs consist of distance costs per kilometer traveled, time costs of the individual, and the entrance fee of the particular environmental good (Hanley and Spash, 1993). These estimates are included in a trip generating function, which also includes factors like income, education and age, to estimate the amount consumers value the environmental good (Hanley and Spash, 1993). A problem with the TC method is the fact that some people have multipurpose trips, so the amount of money they spend on a trip is not entirely dedicated to the environmental good. Other problems concern calculations of travel costs, namely how to calculate the value of travel time.

The *Hedonic Pricing* (HP) method also measures consumer surplus from the Marshallian demand curve, and is also known as a "revealed preference technique"¹⁸. It relies on valuations of environmental goods that are revealed in their purchases of market priced goods (Turner et al., 1994). The method utilizes statistical techniques, such as multiple regression, to find a relationship between, for example, the level of pollution in a specific area and the prices of houses in the same area. The HP method attempts to (i) identify how much of a property differential is due to a particular environmental difference between two properties, and; (ii) infer how much people are willing to pay for an improvement in environmental quality that

¹⁷ Another categorization for the TC method is as a "surrogate market" approach.

¹⁸ Like the TC method, the HP method is also categorized as a "surrogate market" approach.

they face (Turner et al., 1994). Problems with the HP method concern the fact that housing prices are, for example, not only related to actual environmental quality, but also expected quality levels. Not taking account of expectations will bias the outcome. Another problem concerns the effect of market segmentation: housing markets are segregated on basis of ethnicity or income group, which significantly influences the outcome (Hanley and Spash, 1993).

The *non-demand curve approaches* are Dose-Response, Replacement Cost, Mitigation Behavior and Opportunity Cost and do not measure economic value via a demand curve for the environmental good. These methods, therefore, do not provide 'true' measures of value, however, the information they provide is useful to policy makers (Turner, et al., 1994). *Dose-Response*, also known as the production-function approach or input-output approach, is based on the relationship between an environmental good and a marketed good. The costs of air pollution can be derived from, for example, the effects on agricultural crop production – an increase in pollution causes a decrease in crop quality and therefore constitutes a decrease in benefits for farmers. It will, however, be difficult to find perfect relationships between environmental and marketed goods (Hanley and Spash, 1993). The *Replacement Cost* approach looks at the cost of replacing or restoring a damaged natural asset, which is used as a measure of the benefit of restoring that natural asset. For example, the replacement of wetlands (through wetland restoration elsewhere in a region, wetland relocation, or new wetland creation) can be used to value the economic benefits of wetland conservation (Turner et al., 1994). The valuation method *Mitigation Behavior*, also known as 'averting expenditure', is based on the relationship between an environmental good and its perfect substitute. For example, the benefits of water cleaning capacity of wetlands can be estimated by the avoidance of expenditure on drinking water cleaning facilities. The difficulty with both Replacement Cost and Mitigation Behavior approaches arises with how to find perfect substitutes (Hanley and Spash, 1993). In the *Opportunity Cost* approach, environmental benefits are not directly valued; instead, the benefits of the activity that causes the environmental degradation are estimated to indicate what the benefits of the environment would have to be for the activity not to take place (Turner et al., 1994). For example, the value of agricultural output after wetland reclamation is an estimation of the minimum value the wetland would have to represent for the reclamation not to take place. Replacement Cost, Mitigation Behavior and Opportunity Cost methods are also known as "cost-based approaches".

Not every valuation method can be applied to obtain specific economic values. Although consensus has not been reached on which methods are most appropriate to obtain specific economic values, certain types of classifications do exist. For example, Barbier (1997) gives an overview of the types of valuation methods that may be applied to obtain different types of wetland economic values. Direct use values may be calculated using a wide variety of valuation methods, including Market Pricing, Production Function, Travel Cost, Hedonic Pricing, Contingent Valuation and Replacement Cost methods. The same goes for indirect use values, which may be valued with, for example, Production Function, Replacement Cost, Mitigation Behavior, Contingent Valuation and Travel Cost methods. The non-use values are, however, more complicated: it is generally accepted that Option, Existence and Bequest values can only be valued with the application of Contingent Valuation.

2.4 Practical Application of Economic Valuation

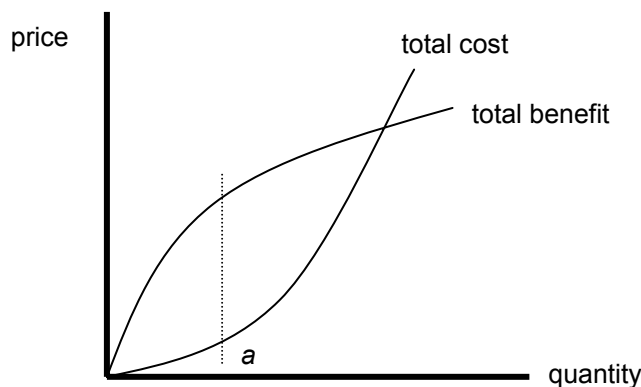
2.4.1 Economic Value and Decision making Tools

There are several approaches towards the application of economic valuation of ecosystems. Pearce (2001) identifies three approaches: green accounting, proper pricing of biological resources and cost-benefit analysis. First, economic valuation allows the expansion of gross national product (GNP) measures. Economic valuation can be used to measure the depreciation of environmental assets, which together with depreciation of other assets can be subtracted from GNP to derive net national product (NNP). According to Pearce, NNP comes closest to measuring goods and services available for individual consumption. Secondly, economic valuation can be used to properly price biological resources. Such valuations allow for the incorporation of biological resources in the market place so that demand for these resources may be compared to demand for alternatives. Third, economic valuation may be applied within a cost-benefit analysis framework to incorporate environmental effects of policies in such analyses.

Cost-benefit analysis is part of a wider range of decision making tools. Economic valuations may be carried out as part of such tools to obtain quantitative values for environmental effects that allows these effects to be compared or balanced with other effects. In water management in the Netherlands in general, a wide variety of such decision making tools in which economic valuation is applied can be distinguished, but four instruments are the most common.

The first of these economic instruments is the *Cost-Benefit Analysis*. Cost-benefit analysis is a formal procedure for evaluating private or public actions (Wills, 1997). It involves the identification, quantification and weighing of costs and benefits associated with a certain action to determine the efficiency of this action. This indicates that cost-benefit analysis is not concerned with distributional or intertemporal efficiency and equity. For a project to be accepted in line with cost-benefit analysis, therefore, requires the present value of benefits to exceed the present value of costs, independent of who reaps the benefits and who must bear the costs. The potential Pareto criterion of welfare economics is translated to cost-benefit analysis into the Net Present Value criterion¹⁹. This states that a project should be accepted when the discounted stream of benefits is larger than the discounted stream of costs (Hanley and Spash, 1993). Furthermore, the maximum Net Present Value criterion suggests that resources should be allocated to that project maximizing the Net Present Value of benefits²⁰. This is explained in Figure 5.

Figure 5 *Cost-Benefit Analysis and Efficiency*



Source: Tietenberg, 1992

The most efficient allocation is at quantity *a* where total benefits exceed total costs by the maximum amount.

¹⁹ Net Present Value (NPV) = The flow of net benefits (benefits - costs) accruing to a project over a certain time period discounted into present values.

²⁰ Other criteria also exist (Nas, 1996), such as the positive NPV criterion (an activity should be carried out when the NPV is greater than zero); the benefit/cost criterion (a project is accepted when the ratio of the PV of benefits to the PV of costs is larger than one); and the internal rate of return (use of a specific discount rate that results in a zero NPV). Only the maximum NPV criterion leads to efficiency.

According to Hanley and Spash (1993), a cost-benefit analysis involves the following steps or stages:

1) Definition of a Project

This includes:

- definition of the reallocation of resources being proposed;
- definition of the population of gainers and losers to be considered.

2) Identification of Project Impacts

Identification of all impacts resulting from the implementation of the project.

3) Which Impacts are Economically Relevant

This includes both costs and benefits. The benefits to be considered are those positive impacts that increase the quantity or quality of goods that generate positive utility or reduce price at which they are supplied. Costs are those negative impacts that decrease the quality or quantity of such goods or increase their price. Environmental impacts count so long as:

- they cause a person to be more or less happy;
- they change the level or quality of output of some positively valued commodity.

4) Physical Quantification of Relevant Impacts

Determine the physical amounts of costs and benefits.

5) Monetary Valuation of Relevant Effects

The physical impacts are valued in common units, often money. Furthermore, the price value flows extending into the future need to be predicted and the market prices need to be corrected where necessary. Lastly, prices need to be calculated where market prices don't exist. Section 2.3.4 explained the different valuation methods that exist in the literature.

6) Discounting

Flows of future costs and benefits are converted into present value terms.

7) Apply NPV Test

This test asks whether the sum of the discounted gains exceed the sum of the discounted costs. Or, in other words: is the net present value larger than zero? Alternative tests may also be used, including the Internal Rate of Return and Benefit-Cost Ratio.

8) Sensitivity Analysis

This requires the changing of certain data to see what happens to the net present value. The following key parameters may be changed:

- discount rate;
- physical quantities and qualities of inputs and outputs;
- shadow prices of inputs and outputs;
- project life span.

There are different types of cost-benefit analyses. A financial cost-benefit analysis evaluates these actions from the point of view of the individual (for example a company), while the social cost-benefit analysis evaluates actions from the point of view of society (Eijgenraam et al., 2000). If the effects of a project on the environment are incorporated in the cost-benefit analysis,

a specific type of social cost-benefit analysis is sometimes distinguished which some call the eco-cost-benefit analysis or ecosystem-oriented cost-benefit analysis (Bouma and Saeijs, 2000). Through applying economic valuation techniques to the project's environmental effects, these effects can be quantified and weighed against other effects.

A second instrument that is sometimes depicted as a form of cost-benefit analysis is the *Cost-Effectiveness Analysis*. Cost-effectiveness analysis aims at finding the lowest cost means of accomplishing an objective (Tietenberg, 1992). Unlike cost-benefit analysis, it is only concerned with effectiveness and not with efficiency - efficiency is only attained when the objective itself is efficient. Economic valuation may be incorporated in a Cost-effectiveness analysis when it is desired that the environmental costs of accomplishing an objective be included in the analysis.

Impact Analysis is a third instrument that attempts to quantify the effects of various actions on the environment (Tietenberg, 1992). It does not necessarily attempt to convert all effects into a one-dimensional figure and it does not attempt to optimize. Impact analysis places a large load of information at the disposal of the policy maker; it is up to the policy maker to act accordingly. Economic valuation may be part of an impact analysis, for example, to assess the damage inflicted on a specific nature area or ecosystem.

Lastly, an instrument that is not necessarily an economic instrument is *Multicriteria Analysis*. Unlike a cost-benefit analysis, multicriteria analysis is generally not based on monetary valuation alone but on a weighing system of multiple criteria presented in their own dimensions (Nijkamp, 1977). These dimensions may be quantitative and qualitative, monetary and non-monetary. A common method of multi-criteria analysis is concordance analysis (Nijkamp, 1977). This is based on ranking techniques for the outcomes of decision criteria related to a set of alternative plans. The central aim of this analysis is to select an optimal plan from these alternatives as can be done with a cost-benefit analysis. The difference is that in a multi-criteria analysis the outcomes of the different plans are measured in any unit, while for a cost-benefit analysis it is measured in monetary units per se. Economic values may thus be incorporated in a multicriteria analysis as one set of effects in combination with other effects that are expressed in other units of measure.

2.4.2 Perspectives on Economic Valuation

The concept of economic value has been much debated in the literature. The debate within neoclassical economics has been largely about technical and methodological issues, while outside neoclassical economics, both the rational economic man and normative role of individualism have been drawn into the debate (Turner, 1993). Similar to the debate among different schools of economic thought, discussed in section 2.2.2, a large portion of this debate is based on ethical and implicit value judgements or attitudes on sustainability and the relationship between humans and nature. These attitudes can be summed under anthropocentric and ecocentric worldviews. *Anthropocentrism* is based on the assumption that there is a moral division between human and non-human nature (Vellinga et al., 1996). Humans are the only source of value in the world (Achterberg, 1994) and things only have a value when humans can derive satisfaction from it. The *ecocentric* worldview recognizes that natural entities have the freedom to develop and function separate from human interventions (Achterberg, 1994). All organisms have an intrinsic value, whether humans derive satisfaction from them or not. Although in practice views are never as black and white, certain groups of people will lean towards a more anthropocentric perspective and others towards a more ecocentric perspective towards the relationship between humans and nature. Economic valuation is generally rooted in anthropocentrism, which has implications for its approach towards value – value is limited to value to man and something has economic value only when man derives utility from it. Economic values will, therefore, always depend on the type of ecosystem functions that are perceived as valuable to society – what people perceive as having of value to them (Turner et al., 2000). Hence, not all functions have an economic value. Only functions that provide goods and services that satisfy human wants directly or indirectly have an economic value.

Due to these different perspectives on key concepts in which economic value is rooted, groups emerge ranging from those that completely oppose economic valuation to those fully supporting it. The debate covers a wide range of topics, and in the remaining paragraphs some of the key discussions will be summarized.

A significant part of the debate on economic valuation of ecosystems concerns the role of economic valuation in decision making. Proponents of economic valuation argue that it has significant added value in the decision making process as part of information tools like cost-benefit analysis (Common, 1996; Nas, 1996). Economic valuation allows for the

identification, quantification and weighing of environmental effects of decisions such that clear and comprehensive information is available to the decision-maker. Other groups, however, argue that economic valuation, especially when applied in such decision making tools like cost-benefit analysis, does not take account of sustainability and distributional aspects. Daily (1997) distinguishes three goals of community, society and culture regarding the environment:

- Ecological sustainability
- Fair distribution of resources and property rights
- Efficient allocation of resources

Economic valuation only deals with the last goal of economic efficiency and is therefore not sufficient in answering the question of which decision or policy is the preferred alternative – such decisions need to be based on all three goals. Furthermore, it is argued that many environmental effects are irreversible; a cost-benefit analysis incorporates benefits of nature that are lost for a certain period of time, while in reality these benefits are lost forever (Hanley and Spash, 1993). Economic valuation, therefore, cannot guide decision making in the appropriate directions.

Other groups state that through economic valuation a monetary value is placed on the environment that helps create an awareness of the value of the world's ecosystems (Pearce and Turner, 1990; Costanza, 1997). It helps create the '...effectiveness of environmental arguments and thereby influence environmental policy' (Norgaard, 1998). Heal (2000) states three methods for obtaining conservation:

- **Regulation:** society instructs people to conserve
- **Environmental activism:** conservation is a matter of principle
- **Economic incentives:** conservation is in people's economic interest

Heal explains that the last method is probably the most appealing to people. Ideally, we would like people to conserve as a matter of principle, but historically, this has not worked. The valuation of ecosystem services itself is something we do implicitly when a choice concerning the environment has to be made (Costanza et al., 1998); monetization helps making these values more explicit and recognizable. Furthermore, using money for estimating the values is convenient because this is the way humans value all goods and services: '...for those who only hear dollars, let us scream now and then in dollars!' (Daly, 1998). Other groups argue that people's decisions for protecting a commodity may be motivated by altruism and ethical considerations, that may not be quantifiable in prices

(Stevens, 1991). Therefore, using money as a tool for environmental protection is not adequate since this is only attained by affecting people's principles. Furthermore, pricing can also have the opposite effect: if the benefits of a natural resource are less than the benefits of project development in a cost-benefit analysis, decisions based on cost-benefit analyses may result in the destruction of this natural resource.

Advocates of economic valuation often argue that the concept places ecosystem goods and services automatically in the market (Pearce and Turner, 1990; Costanza, 1997), which allows for an efficient allocation of these resources. According to economic theory, the calculation of a price on environmental goods implies that the environmental good is scarce. This means that prices rise as scarcity of the good rises, which must be perceived as a cost of economic growth (Serafy, 1998). Omission of environmental goods from the market leads to a zero price on these goods and results in ignorance and under-valuation of the earth's ecosystems that in turn results in errors of constructing projects when their costs actually outweigh their benefits (Costanza et al., 1997). In other words, 'some valuation...is better than none, because none can mean some implicit valuation shrouded from public scrutiny.' (Turner, et al., 1994). However, others argue that the market is not the appropriate basis for dealing with the allocation of scarce environmental resources. Markets do not automatically lead to sustainable outcomes; market systems cannot show whether a system is approaching its limits and fails to see the context of or the interconnections between species as well as resource quality (Gowdy, 1995). Instead, a system of democracy should be utilized to allocate natural resources, as part of the legislative process (Sagoff, 1988).

Risk and uncertainty also surround the process of economic valuation of the environment. Ecosystems are very complex systems, which makes modeling of ecological processes very difficult (Hanley and Spash, 1993). Interactions within and between systems are so complex that it is difficult to incorporate all feedback effects in an analysis (van den Bergh and Baaijens, 1997). Related to this aspect is that forecasting such ecosystem effects into the future, as is often done in valuation studies, is surrounded with uncertainty. Future states of the world are very difficult to assess, making valuation of the environment into the future a very ambiguous process (Tietenberg, 1992).

Economic valuation implies that all environmental goods are valued into monetary terms based on their usefulness to humans. Thus, natural resources are valued once they enter human utility functions. However, it is

argued that many people are not willing to pay for species as they believe they have an inherent right to life independent of their value to humans (Hanley and Spash, 1993). Some people are motivated by altruism and ethical considerations, which do not show up in a quantifiable pricing system (Stevens et al., 1991). As Nijkamp (1977) argues: 'one may question whether ecological functions are evaluated or whether the output for man is evaluated'. Instead, monetary values should be replaced by multiple (qualitative and quantitative) values (Munda, 1993).

In economic valuation, prices are utilized to determine values of ecosystems. Sagoff (1988) argues that we are acting immorally by pricing environmental goods. Although certain things in life are of immense value, they cannot be given a price: love is priceless, but nobody would ever think of paying for it (Sagoff, 1988). A typical example of the discrepancy between price and value concerns the price of water and of diamonds: although water is of immense value to all life on earth and diamonds are not, the price of diamonds is much higher than the price of water. Martinez-Alier (1987) criticizes economists for their claim that market prices are decisive elements in explaining the allocation of resources. When dealing with environmental goods, most potential buyers cannot come to the market – future generations cannot make their preferences felt in today's market for environmental goods (Martinez-Alier, 1987).

Lastly, a significant part of the debate deals with the practice of discounting and the choice of the discount rate. Hanley and Spash (1993) state that the practice of discounting makes actions responsible for long-term losses attractive. Effects of projects that take place in the future are given less weight when they are being discounted with a positive discount rate. Furthermore, environmental effects often arise after a long period of time, so that discounting gives these effects less weight in the decision making process. Hence, discounting discriminates against future generations. The choice of the discount rate is also a source for debate since it biases outcomes: policymakers may act in their selfish short-term interest in order to maximize their votes, which leads them to prefer a higher discount rate such that benefits accruing today are increased (Wills, 1997). The choice of the discount rate is therefore prone to manipulation for the benefit of policy-makers, not the environment. On the other side, Pearce and Turner (1990) dispute the fact that discounting leads to environmental degradation. They argue that there is no unique relationship between discount rates and environmental deterioration; research has shown positive discount rates can result in diverging effects on the environment. Furthermore, research

by Cropper and Portney (1992) has shown that the public is generally very present oriented, which justifies the use of positive as opposed to zero or even negative discount rates.

2.4.3 Applicability and Restrictions

The previous section has shown that economic valuation is not undisputed and, as a result, application of economic valuation in practice must be done with care. Nevertheless, economic valuation does have an important added value. First, economic valuation is important to highlight the relative (economic) importance of different economic activities that depend on ecosystem functions. In this way, it can make important contributions to management plans of ecosystems²¹. Secondly, economic valuation may be useful in supporting arguments on ecosystem conservation. Putting a monetary value on activities can highlight the significance of ecosystems for people and thus provide strong arguments for the conservation of ecosystem lands and water as opposed to reclamation or diversion. In both cases, monetary valuation is an important complementary assessment to other, qualitative assessments on ecosystem functions that cannot be monetarized.

An important role for economic valuation lies in integrated ecological-economic modeling. Turner et al. (2000) suggest an integrated research framework, which combines economic valuation, integrated modeling, stakeholder analysis, and multi-criteria evaluation²². It is the combination of social and natural sciences that "...can help in part to solve the information failure to achieve the required consistency across various government policies" (Turner et al., 2000: 7). Integrated ecological-economic models are analytical, numerical or statistical and describe either steady state or dynamic change. Aerial photography and satellite imaging can be integrated through GIS-systems to add spatial dimensions. As a result, integrated models may provide important information about eco-hydrological consequences and the associated costs and benefits of land-use policies (Turner, et al., 2000). Economic valuation plays an important role in these models by providing data on the economic costs and benefits related to environmental change resulting from these policies.

²¹ See Schuijt, 2002 for an overview of economic valuation studies in the management of African wetlands.

²² See also van den Bergh, 1996 for ecological-economic modeling applications.

2.5 Economic Valuation as a Process

2.5.1 The Importance of Actors in the Process

The Merriam-Webster dictionary defines a process as “a series of actions or operations conducing to an end” (Merriam-Webster, 2002). The process perspective on economic valuation taken in this thesis, therefore, indicates that economic valuation involves a series of actions, within which actors make choices with the aim of pursuing "an end" (or ends). The key to understanding this process is understanding the set of actors and their choices that have a stake in the outcome of the study. These stakeholders range from people that are interviewed to obtain the data for the value calculations to those that are involved in the execution of the study itself. These stakeholders shape the valuation process and hence the outcome of the study towards "an end". The understanding of the economic valuation process therefore requires an understanding of how choices are made by the stakeholders of the economic valuation process and for what end or purpose. For this analysis, it is first necessary to derive an actor perspective, which is developed in the following sections.

2.5.2 Choices in Neoclassical Economics

Different views of actor behavior can be found both between different sciences as well as within these sciences that are at the basis of explanations of certain phenomena. For example, in political science *Homo Politicus* is a “...human being who tries to consider what is best for society...” (Faber et al., 2002). The individual is a citizen that is concerned with public interest and the community, and its main characteristic is to strive for political justice. In sociology, *Homo Sociologicus* is an individual that is connected to other actors in a variety of ways and embedded in society in general – the actor is a social one (Swedberg, 1987). Man is not viewed only as rational, but as having a variety of behavior. Economic valuation of ecosystems is based on an actor perspective known as the neoclassical theory of consumer behavior. The consumer is *Homo Oeconomicus*, an “...autonomous rational consumer [who] allocates his/her income at the margin among an array of consumer goods.” (Gowdy and Mayumi, 2001). Economists attempt to explain and discover patterns of behavior as to why people make certain choices under scarcity. In these choices, the motivation of *homo oeconomicus* is self-interest - choice is a problem of optimization, known as utility or welfare maximization. Although rationality is the common denominator in all neoclassical analyses, different approaches towards rationality do exist. For example, the principle of

bounded rationality is sometimes used, where humans are viewed as having a very small capacity to formulate and solve complex problems compared to the size of the problems for which a solution is needed in line with rational behavior (van den Bergh, 2000). The fundament of this principle is *satisficing*, where humans pursue acceptable levels of welfare, profit or other indicators as opposed to the neo-classical assumptions of welfare or utility maximization (van den Bergh, 2000).

An important characteristic of neoclassical economic analysis is that a boundary is drawn around the consumer, thereby ignoring the influence of social and ecological contexts on the choices actors make. This is also known as methodological individualism, where “...all explanations of social phenomena start from descriptions of individuals” (van den Bergh, 2000: 48). Choices are made based on a rational balancing of costs and benefits, where individuals make choices that maximize their utility and firms make choices that maximize profits - the motives for these choices are exogenous to the analysis. Neoclassical economic theory can therefore not be applied to understand why actors make different choices in different contexts.

2.5.3 The Role of Power

As was explained in the previous section, the perspective of the actor in neoclassical economics is based on rational action. Other approaches have different perspectives as to why actors make certain choices in the economic valuation process, and one approach that is particularly interesting for answering the research questions of this thesis allows for the integration of motivations associated with power into choices made in economic valuation processes.

Self (1975), for example, questions the objectivity of economic instruments like cost-benefit analysis based on the perspective that the information presented by a cost-benefit analysis is compromised by both policy and organizational bias on the part of the analyst, as well as an intellectual bias that his techniques introduce. Although Self recognizes that such statements are true for any expert advice and information, he states that the objectivity of cost-benefit analysis is more dependent on value judgements incorporated in the analysis than is true for most other types of information. Cost-benefit analysis lends itself easily for subjective positions – “Every slight variation in the methods of analysis and calculation will affect the results of the analysis...” (p. 11), also without intentional bias. Self continues that cost-benefit analysis is therefore easily structured deliberately “...to show costs and benefits in relation to a series of

specified goals...” (p. 6), where different ways of construction reflect different kinds of policy judgements and often different sets of political and social values. Such activities have been observed in the United States, where cost-benefit analysis “...has been easily assimilated as one weapon to be employed in the pluralistic conflict of interests.” (p.11). He concludes that social values determine choice and thereby prices. When the processes of evaluation are studied more holistically, Self says, we may find the possible explanations as to why a different price is attached to one decision than to another decision that looks quite similar.

Goodstein (1995) presents a speculative scenario on political influence in cost-benefit analyses. Although the options for political influence are somewhat constrained by the accepted range of valuation methods, numbers used in cost-benefit analyses often reflect the analyst's viewpoint, Goodstein states. He continues with an analysis that speculates about the political influence in a cost-benefit analysis study of the Environmental Protection Agency (EPA) in the United States on the siting, construction and maintenance of municipal landfills. Since the analysis was also carried out by the EPA, some pressure on the analysts from their superiors must have been felt, Goodstein argues. Public resistance to landfill siting probably further pressured the analysts. Two ways politics may have had influence on the outcome is by boosting the benefits of one of the landfill options that best suited the will of the general public, and through the timing of the analysis - putting off the cost-benefit analysis until the political decision had already been made.

Spash and Carter (2001) also refer to the aspect of power in choices of actors involved in economic instruments. They state that cost-benefit analysis is often a justification for a decision already made: “Environmental values which are commonly expressed, say, through economic models, become institutionalized justifications for policy.” (p. 11). Economic values are often handled by a political process that is left outside the analysis and no reference is made to the “...institutions which lie beyond the economic analysis.” (p. 12). These different institutions result in values being expressed, and therefore, can only be understood as being embedded in a political and social structure. They continue that valuation is a process in which “...multiple values, multiple perspectives and the role of institutional arrangements...” (p. 13) are central. Recognition that valuation is a process implies it is a process of expression within society, where “...values can be purposefully lost...”, and where “...humans choose those bits of the world to value and those bits to throw away.” (p.13). They

conclude that motives behind behavior in economics have been largely neglected, but that an interdisciplinary perspective on valuation is required to provide a more dynamic theory.

The discussion in this section shows the importance of recognizing the role of power in economic valuation processes. Different stakeholders are involved in the valuation process and it is likely that each stakeholder will impose their personal values on the process. In order to understand the role of power in valuation processes, theories must be applied that explicitly identify and explain the roles of power and subjective values in valuation processes. Such a perspective is provided by institutional theory.

2.5.4 Towards an Institutional Theory Perspective

An institutional perspective on the economic valuation process implies that *how* stakeholders make choices in this process and for what purpose matters and can be explained by analyzing the institutional context in which these choices are made. Institutions in this thesis are defined as informal and formal institutions (North, 1992). *Informal institutions* are part of the culture of society where they provide order, and include:

- **Extensions of formal rules:** rules that are fully recognized by society, but are not officially recorded as rules
- **Norms of behavior:** a principle of correctness that is binding upon members of a certain group
- **Internally enforced standards of conduct:** include ideas, ideologies and choice

Formal institutions complement the effectiveness of informal constraints, and North distinguishes three types of formal constraints:

- **Political Rules:** enforcement of agreements about co-operation by political decision making
- **Economic Rules:** construction of property rights, implemented when the costs allow implementation
- **Contracts:** binding agreements between people or groups of people

Institutions exist wherever individuals live and work – they establish the framework in which social interactions take place.

An institutional analysis can be applied to answer different types of questions (Knight, 1992). Institutional analysis can be used from an *explanatory perspective*, where explanations of institutional development and

change can be used to understand, for example, the history of society and its current events. From a *critical perspective*, institutional analysis may be applied to determine whether existing institutions pursue the goals for which they were developed. Alternatively, from a *normative perspective* institutional analysis helps us to understand the development of institutions, which may give us a direction as to how to reform them. Other applications exist, but it is clear that institutional analysis can be applied to study many different aspects of social and economic life.

The key to any institutional analysis is social interaction – institutions determine human behavior. It is therefore a very useful perspective for answering the research question of this thesis, which asks what factors influence the choices of stakeholders in the process of economic valuation. According to institutional theory, these factors must be sought in the institutional context in which these stakeholders are situated. The next chapter will elaborate on this perspective, in which the focus is on *choices, stakeholders* and their *institutional context*.

Chapter 3 An Institutional Perspective on Economic Valuation

3.1 Introduction

In Chapter 2, the field of the concept of economic value was explained that ended with the introduction of a perspective that views economic valuation as a process. In this perspective, the actors of the valuation process and their contexts play a key role. In the last section (section 2.5) it was explained how understanding stakeholders and stakeholder behavior in valuation processes requires theories other than economic theory, and institutional theory was introduced as one theory that specifically incorporates the importance of actor behavior in relation to their context. This institutional theory perspective will be further developed in this chapter and states that the context in which the economic valuation process is carried out determines the choices made within this process.

The goal of this chapter is to provide a basis for analysis of economic valuation processes in water management that will be carried out in the next chapters. Section 3.2 discusses the types of choices made in these processes, based mainly on economic theory. These choices are made by actors that are stakeholders of the valuation process, who will be discussed in section 3.3. In section 3.4, institutional theory is applied to discuss the influences on the choices of these stakeholders in the valuation process. The chapter will finish in section 3.5 with a comprehensive discussion that explains the perspective on the valuation process in water management that is taken in the following chapters.

3.2 Choices in the Economic Valuation Process

3.2.1 Formal Stages

In theory, the economic valuation process involves several stages. Distinguishing these stages in economic valuation is useful to discern the different types of choices that need to be made by actors in the valuation

process. Barbier et al. (1997), for example, identify three stages of analysis in an economic valuation process:

- **Stage 1:** Defining the problem and choosing the correct economic assessment approach
- **Stage 2:** Defining the scope and limits of the analysis and the information required for the chosen assessment approach
- **Stage 3:** Defining data collection methods and valuation techniques required for the economic appraisal, including any analysis of distributional impacts

The first stage determines the assessment approach for the particular area, while during the second stage it is decided which information is needed to carry out the assessment. In stage three, the appropriate appraisal methods and valuation techniques are determined. In practice however, these three stages are not necessarily sequential – a different order of choices within these stages is possible and feedback to previous stages is often necessary.

Another useful approach to distinguish stages in an economic valuation process is to focus on the stages of an economic instrument of which the economic valuation is part. For example, Hanley and Spash (1993) distinguish 8 stages in a cost-benefit analysis that can be directly applied to the economic valuation process when it is applied as part of a cost-benefit analysis (see section 2.3.1): (1) a clear definition of the project; (2) identification of project impacts; (3) determination of which impacts are economically relevant; (4) quantifying the relevant impacts into physical terms; (5) quantifying the relevant impacts into monetary terms; (6) discounting costs and benefits into present value terms; (7) applying the net present value test; (8) sensitivity analysis.

The distinction of stages in an economic valuation process is a useful framework for extracting the different types of choices that need to be made by actors within the stages of the economic valuation process. These choices will be explained in the next section.

3.2.2 Choices

Within the broader stages defined in the previous section, actors involved in the economic valuation process need to make several choices. An important initial choice is to define the phenomenon that is being studied, which can range from a dam construction to a wetland reclamation. This is a very important choice that will guide the choices during the rest of the

economic valuation process. After the phenomenon is defined, the project alternative needs to be selected. Eijgenraam et al. (2000) specifically bring the attention to the importance of this specific choice in a cost-benefit analysis. The project alternative, or "zero-alternative" as the authors call it, is the alternative with which the project will be compared with in a cost-benefit analysis. This is the best alternative to the project, and is not equal to "doing nothing" or "existing policy". Instead, it is a combination of the best alternative allocation of the available investment sources and the best alternative solutions to the problem that is the focus of the project. The actors also need to decide on who will be the gainers and losers of the activities and which resources are being reallocated. Furthermore, an important choice may be to define the geographical boundaries of the area that is being assessed. This may already have been decided by the context of the study, but is not always apparent and important decisions need to be made to delineate these boundaries (Barbier et al., 1997). For example, the object can be studied at several system levels (van Ast en Geerlings, 1995): (i) at the level of ecological systems, or ecosystems - a space where a collection of living organisms and non-living material exchange material and energy and thereby function as a self-sustaining unit; (ii) at the level of environmental compartments, the major pillars of the environment – water, air, soil, and organisms; and (iii) at the level of factors - specific physical or chemical components such as molecules and biological elements. Each of these system levels can furthermore be studied at different spatial scales. This scale can be (i) global; (ii) national; (iii) regional; or (iv) fluvial. The latter refers to the aquatic ecosystems of rivers, which may be studied at the scale of the river basin. Thus, the actor also needs to make a choice about the scale at which the impacts will be studied.

Other decisions need to be made concerning the attributes of the object under study to take into account. In Chapter 2, four environmental functions were identified: regulation, carrier, production and information functions. It needs to be decided which of these functions need to be incorporated in the study and valued. Barbier et al. (1997) suggest first ranking or prioritizing these functions in order of importance, with the aim to value at least the most important functions. The last choice before the actual assessment takes place concerns the linking of these functions to the type of economic value - use values or non-use values.

Once such choices are made, the actual economic assessment can take place, and at this stage more choices need to be made. An important decision concerns the valuation method that actors will utilize to derive the

economic values. When environmental functions consist of goods and services that are traded in the market place and whose prices are not distorted, market prices can be used as indicators for economic values. Often, however, goods and services do not have a market price and/or are distorted. In these cases, shadow-pricing techniques must be applied. One approach is to adjust financial prices to correct for market and policy distortions. Another approach is to apply non-market pricing. Economic theory distinguishes several non-market economic valuation methods, including demand curve approaches like Contingent Valuation, Travel Cost and Hedonic Pricing, and non-demand curve approaches, such as Dose-Response, Replacement Cost, Mitigation Behavior and Opportunity Cost. These approaches were explained in section 2.2.5.

Another element of the economic valuation process that requires important choices in the assessment stage is the discounting of economic values. Economic values that are calculated are typically estimated as monthly or annual values – most of these values, however, do not accrue in only one specific time period, but over a number of years. These annual values must then be added over a longer time period. The annual values that accrue to the environmental good over this entire time period are usually expressed in present value terms, which is the current value of a discounted stream of values into the future. The reason that economic values into the future are not simply aggregated is twofold (Pearce and Turner, 1990). First, it is argued that people have a positive rate of time preference or Social Time Preference Rate (STPR), which implies that people value income received today higher than income received tomorrow. Secondly, capital is productive; if it is received today, it may be invested (for example in a bank account) to yield profits in the future. This is also called the Social Opportunity cost of Capital (SOC). Thus, economic values into the future are given less importance and weight than current values, a process that is called discounting. Through the application of a discount rate, future economic values are discounted into present values by the following formula:

$$\sum_t \frac{B_t}{(1+r)^t}$$

Economic values, or benefits B_t are discounted with a discount rate r over time period t . Within this discounting process, two elements require important choices by actors that significantly influences the outcome of the process. First of all, the height of the discount rate r needs to be

determined. The sources for the discount rate come from either the SOC or the STPR. In perfectly functioning capital markets and no taxes, both rates are equal (Pearce and Turner, 1990). In practice, however, markets are not perfect and choices need to be made as to which of the two sources to use. In both theory and practice, there is little agreement on which of the two sources to apply. In practice, the choice of the discount rate is often left to decision-makers including politicians, civil servants and corporate planning divisions (Pearce and Nash, 1981). This choice often requires a moral judgement on intertemporal distribution (Hanley and Spash, 1993):

- **Infinite discount rate:** no moral obligations beyond the immediate future exist
- **Discount rate greater than zero, but less than infinity:** moral obligations towards the future exist, but are given less weight than the present
- **Zero discount rate:** the right and interests of future generations are equal to those of current generations
- **Negative discount rate:** moral obligations to the future exist and are given more weight than the present

Due to the positive rate of time preference, discount rates are usually positive over a wide range. The practice of discounting and the choice of the discount rate are subject to many debates, which was briefly discussed in section 2.3.3.

A second choice in the discounting process is the choice of time horizon, t . When the economic valuation is carried out for a specific project, t is usually equal to the project's life span. The time horizon, however, is limited by the height of the discount rate. The higher the discount rate, the shorter the time period over which the economic values can be discounted. For example, with a discount rate of 4%, the time period is limited to around 50 years; after this period, all economic values approach zero. This often poses a serious problem and is a major source for debate in projects that affect the environment since many environmental effects are likely to take more than fifty years to become noticed.

Many choices made in the economic valuation process are based on assumptions about future states of the world. To deal with the uncertainty that necessarily surrounds these assumptions, it is necessary to perform a sensitivity analysis. In the sensitivity analysis, key assumptions of the economic valuation study over which uncertainty exists are changed to test their relative effects on the outcome of the valuation process. Hence,

choices need to be made about which parameters to test. The most common parameters in this respect are (Hanley and Spash, 1992):

- Discount rate
- Physical quantities and qualities of inputs and outputs
- Shadow prices of inputs and outputs
- Project life span

The different choices involved in the economic valuation process as explained in the previous section are made by the different stakeholders of the economic valuation process. These stakeholders, their relationships and their relative influence in the economic valuation process are explained in the next section.

3.3 Stakeholders in the Economic Valuation Process

3.3.1 Types of Stakeholders

The perspective of economic valuation as a process implies that different actors play a role in this process. These actors all have a stake in the valuation process, albeit in different degrees. In this respect, it is important to distinguish two groups of stakeholders: stakeholders actively involved in the valuation process and stakeholders not actively involved in the process. Those stakeholders involved in the process itself often includes a principal, a contracting party, a committee that guides the economic valuation process, interviewed and consulted persons, and perhaps a peer review group. A *principal* gives the assignment for the valuation study. These principals can be government departments whose policies affect the environment; governmental and non-governmental organizations (NGOs) that deal with the environment; financial institutions that finance projects that affect the environment; scientific institutions as part of their scientific research; and companies whose decisions affect the environment. These principals give the assignment for the economic valuation study to one or more *contracting parties* - usually research institutes specialized in economic or in environmental research. In the economic valuation process, the contracting party may be advised or steered by a separate *committee* that may consist of experts in the field for which the economic valuation study is carried out. The committee's role is usually to safeguard the process and give advice or structure to certain aspects of the process. Other important stakeholders in the valuation process are those people that are *interviewed and consulted* by the contracting party for information that is utilized as input for the valuation calculations. Once the economic valuation study has been

drafted, it is often presented to a *peer review group* that reads the report and gives their final comments and advice.

A second group of stakeholders of the economic valuation process are those stakeholders not directly involved in the process itself, but who may influence the process from the outside through pressure and lobbying. A wide variety of stakeholders may be identified, depending on the subject under study. One may think of nature organizations, tourists, people living in the vicinity of the project, political parties, government departments, industry, farmers, and so on.

The two broad groups of direct and indirect stakeholders influence the choices made in the economic valuation process. The stakeholders directly involved in the valuation process influence the process directly through the choices they make and relationships they maintain with other stakeholders. The second group of stakeholders that are outside the valuation process itself influences the choices of the valuation process through exerting pressure on the direct stakeholders and their relationships.

3.3.2 Stakeholder Relationships

Numerous relationships emerge between various stakeholders in the economic valuation process, which differ between each valuation study carried out. One relationship that is central in the economic valuation process, for example, is between the principal and the contracting party. A useful perspective on this is provided by In 't Veld (2000). In 't Veld (2000: 117-119) distinguishes between knowledge suppliers on the one hand and actors in policy arenas on the other. Policy-makers demand knowledge from knowledge institutes, sustain hierarchical relationships with these institutes and simultaneously give them assignments. In this process, knowledge institutes often form coalitions with the actors in policy arenas in the form of, for example, a personal affiliation with certain thoughts or goals of policy makers. According to In 't Veld, this means that no knowledge institute is value-free in its research and that politicians will try to influence the struggle in knowledge arenas to pursue their own goals. This perspective on policy-makers may be extended to any other principal of a valuation process that demands information from knowledge institutes.

Numerous relationship characterizations between the different stakeholders in the economic valuation process can be distinguished, building on the coalition-building perspective introduced in the previous paragraph. For

this, the theory of coalitions and interest group politics of Bacharach and Lawler (1980) provides a useful approach. This theory views organizations as networks of individuals with goals that may form *interest groups* both within their organization and with individuals from other organizations. These interest groups must decide whether to pursue their political goals in isolation or to form a coalition with other interest groups in the pursuit of a common goal. This perspective is based on subjective-expected utility theory, which assumes that (i) in any relationship, parties will attempt to maximize their gain, and; (ii) parties will subjectively attach utility to different courses of action. Interest groups will generally form a coalition when the expected outcome as part of the coalition multiplied by the probability of achieving this outcome as a coalition exceeds the expected outcome multiplied by the probability of outcome as part of a single interest group.

The convergence of interests is an important stimulus for forming a *coalition*. These interests consist of a normative framework, the ideology or set of political and social beliefs that the parties have in common, as well as the functional goals - the pragmatic result pursued by the groups. If both the ideology and the functional goals of interest groups converge, a coalition will form; on the other hand if these interests are non-convergent, interest group politics will prevail. If either the ideology or the functional goal differ, however, whether the groups will form a coalition or engage in interest group politics depends on the issue at hand. When this is the case, Bacharach and Lawler (1980: 94) distinguish two characteristics of the issue that must be considered to evaluate whether the groups are likely to form a coalition. The first characteristic is the scope of the study: the more specific the issues at stake, the greater the likelihood that a temporary coalition will form. Second, the longer the time period between emergence of an issue and the point at which final action is necessary, the greater the likelihood of a coalition. In this respect, if the ideological differences are large between the two actors and the time period is too short to overcome these differences, it is unlikely that the actors will form a coalition.

Bacharach and Lawler analyze the politics of coalitions through an analysis of the *power* relations among the actors between and within such groups. Power is a function of one actor's dependence on another actor: the greater the dependence, the greater the power of the other actor in the relationship. In addition, Bacharach and Lawler identify sanctioning as an element of power, which refers to the "...changes actors can and do make in each other's outcomes." (p. 23). It is the potential or actual direct

manipulation of the other's outcomes, including manipulation of rewards, punishments or both.

In economic valuation processes, it is possible that several coalitions will form among different stakeholders. Which specific coalitions are formed depends on the valuation process. Furthermore, if the respective goals and perspectives of these different coalitions diverge, they are likely to compete with each other in interest group politics. For example, differing functional goals, such as organizational goals, may exist between coalitions. These differences can be along the lines of the organization's mission (the general goal that represents the incentive of the organization and the function that the organization fulfills), the organizational goal (a goal for the entire organization that often expresses expectations - financial or non-financial - of the organization over a certain period of time), or the operational goal (related to the sub-functions of an organization, such as certain departments, and expresses concrete activities of the organization) (Kunst, 1991).

It is also possible that the ideology may diverge among stakeholder coalitions in the valuation process. First, there may be differences in stakeholders' support of a specific economic paradigm. In Chapter 2 these different paradigms within economics and towards economic valuation were explained. Support of a certain perspective may have consequences for the choices made in the valuation process - for example, support of a more neoclassical economic paradigm may result in valuing all possible environmental functions, whereas support of the ecological economics paradigm may place limits on the possibility of quantification of certain environmental functions.

Second, the perspective towards nature may differ among coalitions. The perspectives of people towards their relationship with nature is "...one of the most important aspects of any strategy for human development, though they are often implicit." (Colby, 1990: 5). Although a variety of classifications exist, one is to distinguish between three views (Ruijgrok, 1999):

- a) Conservation view
- b) Functionality view
- c) Coevolution view

Stakeholders supporting a conservation view believe that nature is valuable regardless of human use. Nature should be conserved and restored at all

costs. Those supporting a functionality view, on the other hand, believe that nature derives its values from the functions it performs for society. Endless substitution between natural and capital is possible and nature has value only to man. Lastly, the coevolution view chooses a middle road in that they believe that nature has both an ecological and socio-economic value. Ecosystems have both an intrinsic value and a functional value to man and both interests need to be balanced.

Third, stakeholders may have different ideologies towards water management issues. Hoekstra (1998) uses cultural theory to provide four different perspectives on water:

- a) Hierarchist
- b) Egalitarian
- c) Individualist
- d) Fatalist

The hierarchists regard water scarcity as a supply problem and they look for solutions for how to increase supply to meet demand. Demand is a given need; groundwater should be exploited and dams may need to be constructed to meet these demands. The egalitarian perspective views, however, water scarcity as a problem caused by a growing demand and pollution. They look for ways to manage human needs through, for example, policy incentives and changes in social customs and preferences. Hence, demand for water needs to be altered as opposed to exploiting water systems to meet the demands. The individualist perspective, on the other hand, perceives water as an economic good that should be managed as such. All options to increase water supply to meet demand are realistic as long as they are cost-effective. They support a mixture of demand and supply management to solve the problems of water scarcity. Lastly, the fatalist perspective views water scarcity as a problem of individuals: water is always given to the rich, and it is a matter of individual luck if you are born rich and thus receive enough clean water. Their strategy is to do nothing and try to cope with whatever situation evolves.

The discussion in this section has shown that different functional goals and perspectives of stakeholders on issues like economics and nature result in different stakeholder relationships. Stakeholders in coalitions may form interest groups to pursue their specific goals and perspectives and compete with other interest groups that have different goals and perspectives. In this process, stakeholders are likely to apply specific tools such as economic valuation that aid them in this pursuit.

3.4 Influences on Choices in Economic Valuation Processes

3.4.1 An Institutional Theory Perspective

Institutional theory explains on how actors behave and what factors in the institutional context of these actors influence their behavior. Taking an institutional theory perspective on valuation processes recognizes that actors and their contexts play a key role in these processes. It therefore makes the context that is implicit to the choices in the valuation process more explicit.

Institutions play an important role in economics. In neoclassical economics, the institutions of the market are designed to provide actors with complete information so that efficient outcomes are achieved. The primary institutions facilitating exchange are private ownership and legally enforceable contracts (Tool, 1995): ownership is transferred by agreed-upon exchange, which is stipulated in contracts. These institutions of the market play a major role in many economic analyses. For example, to Adam Smith and his classical followers, the market system was perceived as being guided by an “invisible hand”, a combination of invisible institutions that forces the market automatically into an equilibrium (Nelson and Sampat, 2001). Furthermore, in environmental economics, the lack of institutions labeled “property rights” play an important role in the misallocation of environmental goods that may result in exploitation and degradation of these environmental goods. However, in most economic analyses institutions are regarded as given and play no *independent* role in economic performance (North, 1990); the effects of changing institutions on the allocation of resources are largely left out of economic analysis. Markets themselves remain unspecified; the effects of behavior, roles and customs, the patterns and criteria of choice-making are all largely ignored (Tool, 1995).

Institutionalist schools in economics believe that the understanding of the influence of the institutional structure on economic behavior is necessary in order to better understand the performance of firms, markets, agents, and economies in different settings (Groenewegen et al, 1995). However, as Nabli and Nugent (1989: 7) state “The consensus on the centrality of institutions to development has not been matched by one on its definition”. The approaches towards institutional thinking and the underlying definitions of institutions have been different. De Vries (1992) gives an overview of some of the different definitions and accents in institutional thinking by referring to different authors. Matthews (1986:

904), for example, states that each definition of institutions defines a certain problem area that is to be studied by institutional economics. In this respect he defines three areas: institutions as property rights, as contracts, and as conventions or norms of economic behavior. Nabli and Nugent (1989) provide a second, additional dimension to Matthews' explanations, namely institutions as behavior of governments, based on theories of collective action and interest groups. Yet another explanation is given by Künneke (1991), who explains how different perspectives exist even within the property-rights approach.

Although many streams of institutional economic thought exist, two major schools of thought can be distinguished: Old Institutional Economics (OIE) and New Institutional Economics (NIE). Both schools grew out of the critique on neoclassical economics for their lack of consideration given to institutions in their analyses. The old institutionalist school of thought reached its peak in the 1920s and 1930s, and among its most well known members are Ayres, Commons, Veblen, and Mitchell. The new institutionalists are more recent and among its most prominent advocates are Williamson and North. Both schools recognize that the structure and performance of the economy is a consequence of institutions and can only be fully understood if economic analysis is complemented with institutional analysis. The most significant difference between the two schools is their view on the individual: OIE abandons the rational actor completely in favor of human behavior as a product of culture, while NEI bases its analysis on the neoclassical rational actor that needs to be extended (Rutherford, 1995).

Old institutionalism views mankind as a cultural product, where norms and ideologies are important influences on behavior: institutions depend on choices of individuals and individuals are 'molded' by institutions (Hodgson, 2000). The critique of old institutionalists on economics is directed at the core assumptions of neoclassical economics (Hodgson, 1994). These assumptions are as follows:

- **Rational choice and stable preferences:** a rational, maximizing behavior by agents with given, stable preferences
- **Equilibrium structures:** a focus on attained, or a movement towards, equilibrium states
- **Perfect information:** the absence of chronic information problems

According to old institutionalists, individuals are influenced by institutions; these institutions create and reinforce habits of action and thought.

Preferences and beliefs are therefore not given but created and transformed by institutions. Furthermore, the economy is viewed as an open system that receives impulses from social, political and physical systems. The formation of an equilibrium, therefore, relies on positive and negative feedback and depends on disturbances and exogenous shocks. Lastly, old institutionalists recognize the severe information problems that exist in economic systems.

New institutionalism focuses on explaining institutions in standard economic theory: the individual is a rational actor who affects institutions in the economy (Groenewegen et al., 1995). Although new institutionalism consists of a diverse collection of views, it perceives the performance of the economy as being affected by institutions that arise out of the complexity of problems to be solved and information to be processed to simplify these processes (North, 1990). The institutional framework that arises thereby limits the set of choices to the actor. The consequences of institutions for economic analysis are as follows (North, 1990):

- Economic models are institutional specific and sensitive to altered institutional constraints
- Institutional theory can enrich economic theory by creating an awareness of human motivation
- Ideas and ideologies matter in economic theory
- The polity and the economy are interlinked, affected by institutional constraints

The new institutional perspective can therefore be perceived as an enrichment of (mainstream) economic theory. It complements economic theory with perspectives on human behavior.

Although composed of a variety of different opinions, institutional economics in general recognizes that institutions are the key element of any economy and therefore a major aspect that needs to be studied. As a result, the economy (and all its facets) is an open and evolving system that is situated in a broader environment. This environment is in turn embedded in a broader set of social, cultural, political and power relationships (Hodgson, 2000). Any analysis of the economic system, therefore, must start with the institutional environment in which the economic system is embedded (Groenewegen, 1995).

3.4.2 The Role of Institutions in Valuation Processes

In explaining the influence of institutions on the economic valuation process, a useful theoretical perspective is the institutional theory perspective of Douglas North. North (1990) states that the total of formal and informal institutions (see section 2.4.4) influence actor behavior by determining the costs of transacting. In the neoclassical economics situation these transaction costs are zero all welfare effects are internalized and prices reflect prevailing scarcity relationships. In many situations, however, as is the case with public goods and common pool resources, welfare effects are not fully internalized and external effects emerge. Property rights are not completely specified and enforced, which results in transaction costs, such as information problems, measurement and enforcement costs. In order to limit uncertainty in the exchange of these goods, institutions are developed that affect the economy through affecting the transaction costs. Institutions impose constraints on individual choices – they provide a framework of constraints, where some individuals are permitted to undertake certain activities (North, 1990: 4). Greater uncertainty in transactions leads to higher transaction costs and an increase in the development of institutions.

North (1990: 73-82) explains that the institutional framework of a society provides incentives that will shape the direction of the development of skills and knowledge. In other words, understanding the institutional context will allow us to understand what kind of demand for knowledge and skills exists. This perspective is based on *adaptive efficiency*, which is concerned with the kinds of rules that shape the way the economy evolves over time. Adaptive efficiency provides incentives for societies to maximize efforts in the exploration of alternative ways of problem solving, resulting in decision making processes that are different from existing ones.

The perspective provided by North gives an important dimension to the economic valuation process, namely that in order to understand why stakeholders use and apply economic valuation, the institutional structure surrounding this process must be understood. In this structure, incentives can be found that direct stakeholders towards the application of economic valuation. However, North's perspective says little about incentives of the stakeholders themselves that guide them to use economic valuation and make certain choices in the valuation process. Although the institutional context as defined by North is very important for understanding the influence of the context of stakeholders on the valuation process, a better understanding of the behavioral aspects of these stakeholders may

contribute to an improved explanation of their choices. It is therefore important to consult other institutional theories that may enrich our current understanding of the economic valuation process.

While North explains institutions as formal and informal institutions, alternative definitions of institutions exist. For example, institutions may be perceived as contracts that specify the terms of exchange. A useful theory along these lines is provided by Tool (1995), who views prices as institutions. Tool (1995: 73) states that price setting is an 'exercise of institutional creation and implementation'. Agents in the market determine prices based on their individual choice or judgment. These agents acquire and exercise the power to determine prices to whatever extent. Thus, prices are ratios of exchange that specify the terms of exchange, defined by people according to rules, schedules and patterns that support such pricing judgments. Pricing activities are therefore characterized as purposive, deliberate acts by persons that are situated in institutional contexts.

A similar perspective may be applied to economic values. Economic values are influenced deliberately by people to lower the transaction costs involved in the 'exchange' of natural resources. Therefore, economic values are institutions that specify the terms of exchange of natural resources.

3.4.3 Institutions and Behavior

An interesting perspective on the behavior of actors is given by Knight (1992) and is based on the theory of strategic behavior. According to Knight, rational agents with competing interests are involved in a conflict, and in this conflict institutions are developed as a by-product to gain a strategic advantage over other agents involved in the conflict of interests. The resulting institutions may be efficient or inefficient, but all institutions are developed to produce benefits in the pursuit of individual gain. These benefits result in a strategic advantage of certain agents over others, characterized by power asymmetries. Applying this perspective to economic valuation as an institution (defined in section 3.4.2) results in the view that economic valuation is developed and utilized as a by-product in a conflict of interest among different stakeholders in order to provide these stakeholders with a strategic advantage over others. In this process, whether economic valuation or economic values result in efficient outcomes (as is the perspective in neoclassical economics) is irrelevant, as long as they provide the stakeholders with a strategic advantage.

Institutions like economic valuation provide actors with a strategic advantage because they constrain the actions of other actors, thereby securing the actor's preferred alternative. This is what Knight calls 'power': to exercise power over a person is to affect the alternatives available to that person. Through the mechanisms of information about the choices of other actors or the threat of sanctions in the event of non-compliance, institutions formulate agents' expectations so that strategic action becomes possible - without institutions, strategic action would not be possible because all behavior is surrounded by uncertainty. Institutions thus establish expectations by providing information or sanctions from which agents learn the information that formulates their expectations about the actions of those with whom they interact. In this respect, institutions like economic valuation aid stakeholders particularly in the provision of information about behavior. Economic values, just like prices, convey information about the scarcity of the environment, which affects the expectations of stakeholders' behavior concerning the environment. For example, low economic values form expectations that the environment is relatively abundant which may support behavior of stakeholders who aim to intervene in ecosystems; high economic values, on the other hand, form the expectation that the environment is relatively scarce and thereby support behavior of stakeholders who oppose interventions in ecosystems. The specific institutional arrangement of economic valuation (the functions valued, the valuation method employed, the height of the discount rate, and so on) that is chosen by a stakeholder affects the expectations of other stakeholders in such a way as to produce outcomes that give them a distributional advantage over other stakeholders they interact with.

The next question that arises is why stakeholders apply economic valuation as part of their strategic behavior, and how strategic behavior affects the choices they make in the valuation process. In this respect, an important starting point is to recognize that these choices are related to two other activities, for which the theory of Callon (1998) is very useful. First of all, the choices of actors are related to their demand for a certain type of knowledge and information. A key determinant in this demand is that information helps shape a reality on which actors base their decisions. According to Callon (1998), the process of collecting, comparing and generalizing information actually creates the reality that calculative actors take into account when making decisions. In other words, calculating tools like economic valuation shape the reality that they measure (Callon, 1998). A similar perspective is also shared by North (1990; p. 76), who views the relationship between perceptions of reality and knowledge as a two-way

relationship: "...the way knowledge develops shapes our perceptions of the world around us and in turn those perceptions shape the search for knowledge". In this way, whatever environmental functions are valued into monetary measures through the process of economic valuation in fact constitute the reality of the environment for the decisions of those stakeholders that utilize the concept. In this process, the stakeholders' understanding of the environment develops; increasingly more ecological effects are discovered, which leads to an increased demand for measuring these additional environmental aspects so as to incorporate them in calculative decisions.

Second, the choices stakeholders make are related to specific actions so that economic valuation becomes a 'calculating tool' that allows for the framing of actions. Callon (1998) identifies the process of framing as the internalization of overflows. Rational, calculating agents create a boundary within which interactions take place independent of their context. Frames contain a list of entities, states of the world, possible actions of agents and the outcomes of those actions, which the agent will take into account in his calculations. However, not all externalities can be placed within this frame, and agents are constantly tracking down the overflows in order to place them within the frame so as to become part of the agent's calculations. More importantly, if externalities are framed, they need to be measured; calculativeness of agents cannot exist without measurement tools. Therefore, institutions are created to track these overflows and express them in a common language. These institutions constitute equipment and devices like accounting and marketing tools, and economic valuation can also be perceived as such a framing device. Economic valuation aids stakeholders in tracking down the external environmental effects (overflows) of their actions, and allows them to be expressed in common units so that the decisions of these stakeholders are more informed and calculative. It thereby facilitates the process of framing. Miller (1998) continues that whatever practices we observe in these measurement concepts, including discounting and costing practices, are 'produced'. Tools are a continuous target for criticism and in this process, new calculating practices are brought within the boundaries of these tools. The transformation of these tools takes place within and through a historical ensemble of relations between actors, agencies, calculative devices and mechanisms. For example, before 1974 economic valuation techniques were aimed mostly at use values; since then, techniques have been developed that allow for the possibility of valuing also non-use values, such as existence value. Furthermore, it has been noted that calculating tools are

constantly reconfigured to take more information into account – as a result, decisions become increasingly more calculated and rational (Callon, 1998). There is, therefore, no ‘core’ to economic valuation – it is adapted to the materials that are available, and what is not included in the process of valuation today may be a common practice tomorrow.

The availability and quality of calculating devices is, however, not equally distributed among different actors. The quality of an instrument is higher the more externalities or overflows it can take into account; possession of higher quality instruments thus lead to more successful actions. Agents that have higher quality measurement instruments can create an asymmetry between themselves and other agents, thereby endowing them with more ‘calculating power’ (Callon, 1998). Power can be defined as ‘the possibility of imposing one’s will upon the behavior of other persons’ (Weber, M., in: Galbraith, 1983), or in other words, the ‘capacity to communicate views and opinions and to persuade those who think differently’ (Hisschemöller et al., 1998). The reason that actors in environmental management demand this power in the first place is because transactions and trade in a market are characterized by competition over scarce natural resources, where actors compete to secure dominant positions. In this process, calculating power allows agents to impose certain events, actions and relations that other, less powerful actors in other interest groups, have to take into account. The imposition of calculating tools like economic valuation that incorporate rules that guide decisions is therefore an important starting point in domination on the market.

3.4.4 Formal and Informal Institutions

The previous section has developed an actor perspective based on strategic behavior. Actors are stakeholders of valuation processes that apply valuation studies as tools in their pursuit for a strategic advantage over other stakeholders. This strategic advantage is often related to power. These stakeholders, however, are embedded within a broader institutional context, consisting of informal and formal institutions, which also exert influences on the choices made in valuation processes. This will be further discussed in this section.

According to North (1992), *informal institutions* include ideas, ideologies and principles. When ideas become somehow organized, one can speak of paradigms. In this thesis, two types of paradigms are distinguished as being of influence on the choices in the economic valuation process: scientific paradigms and policy paradigms.

Scientific paradigms are defined by Kuhn (1962, 1970: 8) as “...universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners.” As long as a certain paradigm allows researchers to find answers to these social questions, we speak of a ‘ruling paradigm’. When, on the other hand, social questions change such that science cannot find the answers with the ruling paradigms, scientists search for new theories and methods until a new paradigm is found (Dietz and van der Straaten, 1994). In Chapter 2 (section 2.2.1), several scientific paradigms towards the environment within the economics discipline were distinguished. It was explained how adherence to a specific economic paradigm determines the way the environment is treated in economic theories. This in turn may be of influence on the types of choices that are made in economic instruments applied to the environment like economic valuation.

A *policy paradigm* “...provides policy-makers with the terminology and a set of taken-for-granted assumptions about the way they communicate and think about a policy area.” (Carter, 2001: 169). Policy paradigms change throughout history and different ruling paradigms may be dominant at various stages. For example, policy paradigms towards the environment may be dominated by more anthropocentric or ecocentric approaches, which in turn influence which choices are made regarding the environment. These choices may include the choices made in policy instruments in environmental decision making, including economic valuation. An aspect of policy paradigms that is particularly relevant for economic valuation of the environment is the way the environment is generally perceived. In Chapters 1 and 2, it was explained how environmental awareness has increased and changed in most western societies. People have come to place a higher importance on environmental issues and a shift has taken place from an emphasis on the economy as a closed system, separate from the environment, to the economy and environment as two interrelated and interdependent systems. Such changing general perceptions towards the relationship between man and the environment determines policy paradigms concerning the environment and, in turn, choices humans make with respect to the environment, including those choices in the economic valuation process.

North (1992) defines *formal institutions* as rules and regulations. These rules must be perceived as covering general rules regarding the environment and the economy as well as more specific rules or guidelines regarding the process of economic valuation. Both the prevalence as well as the absence

of formal institutions can directly influence choices made in economic valuation processes.

3.4.5 Characteristics of the Economic Instrument

In addition to the elements in the formal and informal institutional structure, a very important element in the context of the valuation process is the set of characteristics of the economic instrument in which the economic valuation process is used. In this context, three aspects are of particular importance in influencing the choices actors make in the valuation process: (1) the use type of economic valuation; (2) the goal of the economic instrument; and (3) the time and budget constraints imposed on the economic instrument. Each of these aspects will be discussed below.

Economic valuation of ecosystems may be applied for different types of *uses*. Navrud and Pruckner (1997: 3) distinguish five use types of economic valuation:

- Project Evaluation
- Regulatory Review
- Natural Resource Damage Assessment
- Environmental Costing
- Environmental Accounting

First, when the effects of projects on the environment need to be evaluated, economic valuation may be applied as part of an economic instrument like cost-benefit analysis. In the USA and in Europe, economic valuation has been mostly used at the project level. Second, new regulations might need to be evaluated and in the United States economic valuation as part of a cost-benefit analysis has been applied for this purpose. A third type of use is the Natural Resource Damage Assessment (NRDA). The specific objective of NRDA is to estimate the value of the damages to an injured resource. Reasons for doing this may be either to convince the general public of the value of natural ecosystems or in order to determine the amounts to be recovered from parties held liable by the courts (Cangelosi et al., 2001). The process includes three steps: (i) injury determination; (ii) quantification of service effects; and (iii) damage determination (Cangelosi et al., 2001). Economic valuation plays an important role in the third step, where the damage to the natural resource is

expressed in monetary terms²³. A fourth use type of economic valuation is environmental costing, which can be used to influence decisions about investments and operation in the presence of externalities (Navrud and Pruckner, 1997). Economic valuation may be applied to derive the costs of the decision on the environment so that prices may reflect both the marginal private cost of production and the marginal social cost on the environment. The last use type is environmental accounting, where economic valuation may be utilized to convey the environmental costs in an accounting framework. Each type of use results in a different demand for information and hence different types of environmental functions valued.

Second, the *goal* for which an economic valuation study itself is carried out may also differ among studies (Navrud, 1992). In some studies, the economic valuation process is conducted to create public awareness for environmental damage or environmental benefit. In other studies, the goal is to identify decisions by establishing a priority ranking between different potential actions. It is also possible to influence decisions through using economic valuations, to justify decisions, either *ex ante* or *ex post*, or to justify the existence of a particular program by pointing at the positive side effects of its activities on the environment. In this way, different goals exist for economic valuation studies that may influence the choices in the valuation process. While a study aimed at influencing public awareness on the value of the environment may motivate actors to value as many environmental functions with the highest value as possible, a study aimed at justifying the decision of a dam construction may want to underestimate the effects of the dam on the environment. Therefore, different choices result from different goals.

²³ For example, in 1988, the barge *Nestucca* ruptured off the coast of Washington state, where oil spills killed birds and soiled beaches (Navrud, 1992). Both Washington state and the Canadian government conducted a Contingent Valuation study at the end of 1990 to measure the damages to be used in a law suit. Another example is the estimation of natural resource damage of the Exxon Valdez tanker, which ran into a reef in Prince William Sound, Alaska, in 1989. The tanker spilled eleven million gallons of crude oil in the water (Navrud, 1992), the largest oil spill ever in United States history. The state and federal governments sued Exxon, and in 1991 it was announced that state and federal governments settled with Exxon for fines of \$900 million in natural resource damages. This fine was estimated by environmental economists through the application of contingent valuation.

3.5 Influences on the Economic Valuation Process

At the basis of the perspective developed in this chapter is that economic valuation processes consist of different stakeholders and their contexts who make choices in the valuation process. Examples of direct stakeholders are a principal and contracting party, a steering or advisory committee, a peer review group, and interviewed and consulted persons. Indirect stakeholders were identified as those actors that influence the process through pressure and lobby activities and can include politicians, tourists and recreationists. Some of these stakeholders need to make choices on, for example, the phenomenon to be studied, which parties are affected by the activities for which the economic valuation study is carried out, which economic valuation method to apply and which discount rate to apply for the discounting process. An institutional theory perspective was developed to understand the behavior of these different stakeholders in relation to such choices.

The actor perspective developed from institutional theory is one of strategic behavior. Stakeholders are strategic individuals that apply economic valuation studies to pursue advantages over other stakeholders. These advantages are often related to power. At the same time, these stakeholders are situated within a broader institutional context consisting of informal and formal institutions. These institutions also exert influence on the choices stakeholders make in valuation processes. Policy paradigms, scientific paradigms and paradigms in environmental thinking were identified as key informal institutions, while the prevalence or absence of rules, regulations and guidelines regarding the environment and the valuation process were identified as important formal institutions. In addition to these institutions, it was noted that the characteristics of the economic instrument of which the valuation process is part are also important determinants of the choices of stakeholders in the valuation process. In this respect, the specific use type of the valuation process, the goal of the economic instrument of which the valuation process is part as well as time and budget constraints were identified as important determinants of the choices in the valuation process. This theoretical perspective has been developed over the last three chapters and will be specifically applied to valuation processes in Dutch water management in the following chapters.

Chapter 4 Application of Economic Valuation in Dutch Water Management

4.1 Introduction

In the previous chapters, a theoretical perspective on the economic valuation process has been developed. This perspective is based on institutional theory. First, an actor perspective was developed in which stakeholders behave strategically and apply economic valuation in the pursuit of a strategic advantage over other stakeholders. Second, these stakeholders are situated in a context of formal and informal institutions that influence their behavior. These strategic actors within their institutional context of rules, regulations, scientific and policy paradigms determine the choices in valuation processes.

The goal of this chapter is to apply this perspective to Dutch water management. First, a general discussion of economic valuation in water management is held in section 4.2, with a focus on the institutional context of informal and formal institutions. In this context, scientific paradigms, policy paradigms and rules and regulations are distinguished. The next section of this chapter, section 4.3, describes the results of a participant observation in two valuation processes in Dutch water management from which observations on choices and stakeholders involved in these processes are made. These observations and the discussion on the institutional context discussion will form the basis of the analytical model of section 4.4. This model focuses on: (1) the choices of the economic valuation process, and; (2) the context in which these choices are made. This model therefore is an integration of theory and practice. This analytical model will be applied to three case studies of valuation processes in Dutch water management in subsequent chapters. The methodological approach and key research questions addressed in these cases will be presented in section 4.5.

4.2 The Context of the Economic Valuation Process in Dutch Water Management

4.2.1 Short Historical Overview

Economic valuation of the environment in the Netherlands can be traced back to around 1973, at which time several valuation studies were being carried out. However, in these early times the usefulness of economic valuation for public-policy making was doubted, mainly due to methodological weaknesses of the available valuation methods and a lack of reliable data (Opschoor and Turner, 1987). An important stimulus for economic valuation, however, came from the United States in 1981, when President Reagan's executive order 12291 made it mandatory for the Environmental Protection Agency to perform social cost-benefit analyses for its major regulations (Navrud, 1992). This stimulated interest for valuation in the Netherlands, but the studies still lacked both completeness and comprehensiveness (Kuik et al., 1991). At the end of the 1980s, government application of monetary valuation slowly diminished. Over the last years, however, economic valuation seems to be back on the agenda. After the success of tools like multi-criteria analysis, social cost-benefit analyses that include economic values of environmental effects are now increasingly being applied in different policy-making contexts, including water management²⁴.

4.2.2 Scientific Paradigms²⁵

Before the 1960s, environmental economics in the Netherlands was still part of welfare economics, and actually grew out of regional economics, which was a popular economic sub-discipline at the time. In regional economics, environmental problems like pollution were playing an increasingly important role and thus were progressively integrated in its models. During the 1960s and 1970s, environmental economics gradually developed into a discipline of its own, and was adjusted over time with, for example, increased incorporation of life-cycles in economic models and decreased substitution possibilities between different sorts of capital in

²⁴ See, for example, the cost-benefit analyses carried out for the expansion of the Rotterdam port (CPB/NEI/RIVM, 2001), and the creation of 750 hectares of new nature and recreation area (NEI/RIVM, 2001).

²⁵ The image in this section is created primarily from Navrud (1992) and interviews with six selected environmental economists in the Netherlands that are active in analyzing and informing environmental policy analysis: Hans Opschoor, Henk Folmer, Wim Hafkamp, Jeroen van den Bergh, Frank Dietz, and Harmen Verbruggen.

their theories. Interest in the environment generally subsided in the 1980s and there was little focus on environmental issues in scientific research throughout the most part of this decade. In December 1988, however, the National Institute for Public Health and the Environment (RIVM) published the report “Zorgen voor Morgen”, that made headlines in the media due to its alarming character. It had an important influence on the environmental awareness in the Netherlands and acted as a catalyst in environmental discussions in science.

The first major economic valuation study that was carried out in the Netherlands was in 1973 by Jansen and Opschoor (Jansen and Opschoor, 1973). This study was based on a survey of home owners in Dutch cities in order to measure the social costs of aircraft noise. After that, other major valuation studies followed, such as the valuation of the vitality of Dutch forests by van de Linden and Oosterhuis (1987) and valuing a clean environment by Hoevenagel and Verbruggen (1989). However, not many additional studies followed and application of economic valuation remained relatively limited. A major motivation for this lack of interest was the limited demand for these studies from policy makers in the Netherlands (Navrud, 1992), mainly due to a lack of confidence in willingness-to-pay estimates, and in particular in the Contingent Valuation approach.

Only towards the end of the 1980s interest resurfaced with the study on the Contingent Valuation method by Ruud Hoevenagel at the Institute of Environmental Studies (IVM) of the Free University of Amsterdam (see Hoevenagel, 1994). This study was financed by the Netherlands Institute for Science (NWO) and provided recommendations for minimizing the various biases surrounding this valuation method. A number of valuation studies were carried out in this period, however many lacked completeness and comprehensiveness – studies were carried out with extreme cautiousness and only use values were included in the analyses. Little use was made of valuation methods like Hedonic Pricing and Travel Cost, while Contingent Valuation was only occasionally applied. In the beginning of the 1990s application still remained limited, and it is only since the last two years that economic valuation is playing an increasingly important role in the Netherlands.

A major reason for the increased popularity of valuation is the rising demand for it in policy making (see the previous section). Science often follows the developments in policy making. Furthermore, the relative success of economic valuation in the United States results in increasing

numbers of proponents that want to take part in this success in the Netherlands. Consequently, a number of valuation studies have been carried out at different scientific institutes in the Netherlands in the last years in which attention also focused on the valuation of non-use values²⁶. Another important development for the application of valuation is that the ecological economics paradigm is becoming increasingly popular in environmental valuation. Within this paradigm, economic valuation of the environment is often accepted as an input for broader models, such as ecological-economic models (see for example van den Bergh, 1996 and Turner et al., 2000). However, the neoclassical environmental economics paradigm still also has many adherents, so development in economic valuation in scientific institutes takes place in different scientific paradigms.

4.2.3 Policy Paradigms

The policy paradigms that are specific to water management in the Netherlands, are directly linked to the changing perception of environmental issues at a more general level. This change is along two lines: (1) institutionalization of environmental problems, and; (2) rationalization of society. First, since the 1960s, environmental problems have become *institutionalized* in most Western countries as important social problems. Leroy and de Geest (1985) state that this was influenced by three other related processes. One was the framing of environmental problems in a broader, more general context and meaning – environmental problems were presented not as incidents but as structural, global problems of all societies. A large number of scientific and popular papers were published that described environmental problems in a very dramatic and alarming voice (Leroy and de Geest, 1985). A prominent example is ‘Silent Spring’ by R. Carson (1962), which focused the attention on the negative effects of the use of DDT and pesticides in general. In 1972, the environment was officially put on the agenda for the first time when the Club of Rome published its ‘Limits to Growth’ report (Hajer, 1995). This report stated that the depletion of the world’s natural resources in the foreseeable future would result in a substantial decrease in industrial growth. This conclusion was substantiated by the report ‘Blueprint for Survival’ in 1973: sooner or later, industrial society would come to an end unless a radical change would take place. The only solution was to recognize the limits to economic and population growth. Second, major awareness campaigns were undertaken

²⁶ However, critics say that major economic valuation studies are still scarce. This is due to a limited amount of resources and time which these studies get in the Netherlands.

by the environmental movement, government and other organizations that led to a broad social interest, awareness and concern for the environment (Leroy and de Geest, 1985). On 22 April 1972, the then largest environmental demonstration in history was held, called 'Earth Day' (MacCormick, 1995). Approximately 300,000 Americans gathered, both houses of Congress recessed, and cars were banned from New York's Fifth Avenue. For Time magazine, the environment was the major issue of 1970, and Life magazine stated it was a movement that would dominate the new decade (MacCormick, 1995). A third process that can be distinguished is that the environment, once framed as a social problem, became a political problem when it passed the 'political filter and selection mechanism' (Leroy and de Geest, 1985; p. 16). At a certain point, the environment was perceived significant enough to receive political attention and treatment. The most prominent example of this is the 1972 United Nations Conference on the Human Environment in Stockholm, during which political, economic and social problems of the environment were discussed for the first time at an inter-governmental forum (MacCormick, 1995). The United Nations Environmental Program (UNEP) was created at this conference, which marked a transition from the "...naive environmentalism of the 1960s to the more rational, political and global perspective of the 1970s." (MacCormick, 1995; p. 107). A very important conclusion of this conference was that a new emphasis was placed on the human environment: a rational and global perspective highlighting the understanding of the nature of environmental problems as well as the development of agreements.

A major result of the Stockholm conference was that numerous government policies on the environment were developed. McCormick (1995) explains that between 1956 and 1960, four major pieces of legislation were passed in OECD member states; ten were passed in the period 1961-65; eighteen between 1966 and 1970; and a total of thirty-one in the early seventies. By the 1980s, environmental awareness was as big as it was in the 1960s, but had transformed into a more public policy oriented perspective on environmental problems. In 1987, the World Commission on the Environment and Development (WCED) published a report called 'Our Common Future', also known as the Brundtland report. The main focus of this report was the relationship between the environment and economic development. Its conclusion was that economic policy needed to be concerned with sustainable management of natural resources and the environment (Geerlings/van Ast, 1995). All economic sectors needed to focus on sustainable development.

In addition to the institutionalization of environmental problems, the environmental movement has witnessed a second major change, namely a serious change in attitude. While the 1960s and 1970s were dominated by romantic and esthetical motives for environmental protection, the 1980s were characterized by a more pragmatic focus on environmental problems, based on the concepts of scientific ecology (Leroy and de Geest, 1985). Scientific foundations of protection and management of ecosystems were more important, a process known in the literature as 'scientification of nature protection' (Leroy and de Geest, 1985; p. 32). In the 1990s, a further shift in the environmental movement was witnessed, in which the lifestyle in Western countries had moved towards increased green consumerism, and the introduction of new techniques that allowed firms to integrate the environment into their overall cost-benefit calculations (MacCormick, 1995). By today, much more information has been collected on the state of the environment, on the nature and scope of the consequences of human action, and on the nature of environmental protection. As a result, environmental awareness has evolved into a pragmatic, problem-oriented perspective, in which solutions to environmental problems are increasingly being perceived as part of a positive-sum solution in which environmental protection and economic development go hand in hand.

The shift in environmental thinking can be linked to a broader process witnessed in western societies, namely the *rationalization of society*. The concept of rationality has different meanings, and van Doorn (1989) provides several explanations. In the first place, rationality can be related to a reasonable creature, with cerebral and sedate actions. Rational action shows self-constraint and civilized appearance. Secondly, van Doorn distinguishes rationality in which behavior is calculative, disciplined and pacified. A third definition, which is often adhered by supporters of the Enlightenment, is the belief that the world must be perceived as a rational construction and therefore can only be understood through mere cerebral means. This relates to a strong belief in the superiority of science, which embodies rational thought of reality, also known as 'scientism'. Another explanation of rationality is that rational action is selective and purposive. The rational human being knows his interests and pursues these interests, is perfectly informed about the possibilities and means, which he consciously applies in order to attain his selected goals. This is a definition that is supported by utilitarianism, which lies at the basis of neoclassical economics.

The roots of modern thinking on rationality lie in the work of the German sociologist Max Weber. In his work, Weber distinguishes different types of rationality, such as *wertrationalität* and *zweckerationalität* (in: Zandstra-Andela, 1982). *Wertrationalität* prevails when actions are influenced by values, and the direct consequences of these actions are surpassed (van Doorn, 1989). *Zweckerationalität*, on the other hand, is related to actions that pursue a balanced goal with certain means, and thus a direct causal relationship exists between means and goals (Zandstra-Andela, 1982). The use of action lies therefore not in the action itself, but in a specific goal, also known as instrumental, functional or strategic action (van Doorn, 1989). While *wertrationalität* can lead to a certain life-orientation, *zweckerationalität* results in limited, methodic combinations of practical goals and adequate means (van Doorn, 1989). According to Weber, the Western world had developed a specific type of rationality called *formal rationality*: the search by people for an optimum means to a given end that is shaped by rules and regulations (Ritzer, 1996). In this respect, bureaucracy is the ultimate paradigm for formal rationality. Its formal structure, according to Weber, allows for greater efficiency, and the institutionalized rules result in its users choosing the best means to arrive at their ends (Ritzer, 1996).

Rationality encompasses not only the actions of human beings, but also of systems. System rationality refers to rational actions of such systems like markets and organizations (van Doorn, 1989). Both are rational mechanisms that reduce reality to manageable processes. A market, for example, reduces the reality of scarcity - scarcity is institutionalized in the market in a comprehensive and controllable way through trade. Market processes are made calculable through the use of a similar unit of exchange for all transactions (money), allowing universal comparison.

Van Doorn (1989) explains that there is a tendency towards a process of rationalization of society. While cultural, moral, political and ideological values and goals disappear to the background, organizational, bureaucratic, technocratic and formalistic orientations are becoming more pronounced (van Doorn, 1989; p. 139). This tendency is also observed by the 'McDonaldization thesis' of Ritzer (1996), which is based on Weber's theory on rationality. McDonaldization is "...the process by which principles of the fast-food restaurant are coming to dominate more and more sectors of American society as well as of the rest of the world." (Ritzer, 1996). While Weber used bureaucracy as a paradigm for rationalization, Ritzer applies McDonald's as the major example of a rational entity. Ritzer (1996; p. 174) states that "...society and the world are

growing progressively rationalized...”, and that rationalization is characterized by an emphasis on the following four dimensions (Ritzer, 1996):

- **Efficiency:** the optimum method for getting from one point to another
- **Calculability:** an emphasis on quantitative aspects
- **Predictability:** the assurance that products and services are the same everywhere
- **Control:** especially through a substitution of non-human for human technologies

These four dimensions of a rational system are becoming more and more dominant in all aspects of society; as a result America, Europe and the rest of the world together are moving towards a business and cultural world dominated by these dimensions. The first dimension, efficiency, refers to optimum methods for satisfying many needs. Rules and regulations often help ensure highly efficient work in organizations, for example. Calculability is an emphasis on aspects that can be calculated, counted and quantified (Ritzer, 1996). Calculability makes it easier to determine efficiency, and products and processes become more predictable. This increasing emphasis on calculability and numbers is also stressed by Jennings (2001), who states that modern life is permeated by a fascination with numbers, measurement and quantification. Therefore, the process of rationalization, which is felt throughout society, results in more emphasis on information that is presented in quantitative terms. The third dimension, predictability, results in a world in which there are few surprises. For example, with the aid of rules, people behave in a highly predictable way in what they say and what they do. Lastly, control results in an increasing substitution of human technology (which is controlled by people) by non-human technology (which controls people). Technologies in a corporation increase its control over its workers and ensure that production and service will be consistent.

The combination of the two processes discussed so far - institutionalization of environmental problems and rationalization of society - influences specific policy paradigms, including paradigms in water management. An increasing environmental awareness calls for increased integration of environmental effects in decision making processes, while rationalization introduces concepts that make environmental issues calculable so that they can be integrated in existing institutions. New techniques are necessary that allow organizations to integrate environmental policies into their cost-

benefit calculations. This is reflected in a belief that hard data lead to hard facts and thus to a higher validity of these facts (in 't Veld, 2000).

The policy paradigm that dominated water management in the Netherlands in the period after the great flood in 1953 may be characterized as a technocentric approach, based on the scientific and technological optimism that humans can deal with water problems. Since then, however, the approach towards water management has shifted towards a *water system approach*, an integrated approach that puts the entire water system at the center and balances the demands of society against the functioning of water systems (MinV&W, 1985). This concept, which seeks to achieve a safe and liveable country with healthy and sustainable water systems, has been developed in several policy documents on water (see for example Nota Waterhuishouding 3 (MinV&W, 1989) and Nota Waterhuishouding 4 (MinV&W, 1998)). A further development of the concept on a European-wide level was made explicit in the European Water Framework Directive in 2000, which also seeks to establish an integrated water management approach at the level of river basins, to ensure a sustainable water management throughout Europe. At the end of the 1990s, several parts of the Netherlands experienced severe floods and the social and political question furthermore arose whether the country is actually sufficiently prepared for the challenges of the twenty-first century, including climate change, availability of space and land use. These events stimulated the move towards a more ecosystem approach to water management, aimed at giving water systems more space and letting ecosystem functions play an important role in flood management - a process that had already been initiated through the introduction of the concept of integrated water management.

An interesting discussion about the change in perspective towards water management issues in the Netherlands over the past centuries is presented by Saeijs et al. (1999), who discuss the changing approaches in Dutch water management issues in terms of the development of different (policy) paradigms. Although these paradigms emerged in different periods, all still somehow prevail in current water management issues in the Netherlands. The first paradigm arose more than ten thousand years ago when farmers took simple measures to manage the high water levels on their lands and large swampy areas were drained for agriculture. In other, higher areas in the Netherlands, however, water shortage was forming a major problem and, as a result, farmland was irrigated in areas of water shortage and drained in areas of water surplus – the ruling paradigm was “an adjustable

water system”. In approximately 1000 A.D., the first flood-protection measures were taken by settlements that lived along rivers and by the sea. Rich farmers constructed dikes around their farmlands, and the paradigm in this time was “protect humans from water”. The first land reclamations from lakes and the sea in the Netherlands started around four hundred years ago when lakes were drained using windmills. Paradigms of such reclamations were associated with other paradigms that still prevail, such as “pump or drown” – a paradigm associated with the subsidence in land that results from land reclamation. In the twentieth century, the developments were somewhat faster. In the 1960s, a large part of the Delta plan was realized, which closed most of the large sea arms of the delta in the South-West of the Netherlands as an answer to disastrous flooding in this part of the Netherlands in 1953. The paradigm becomes “safety above all”, which is still the major starting-point in water management today. At the end of the 1960s, the environmental aspects of water management were suddenly noticed. The effects of water systems as cheap waste deposits became apparent in terms of pollution, and another paradigm entered the field, namely “protect water from humans”. In the 1980s, it became clear from the Deltaworks project and the closing of the Zuiderzee that the construction of dams may also have disastrous environmental effects. To an increasing degree, water managers realized the importance of the functioning of entire water systems, and the new paradigm became “water system approach”. The developments in lake Grevelingen in the Dutch delta furthermore showed that a water system approach towards water management could no longer be limited to one single interest, but that ecological, economic and social interests are closely related. The latest paradigm in Dutch water management is therefore called “integrated water system approach”.

Processes outside the context of the Netherlands have also had a major influence on the way policy in water management is being perceived. With a global population now exceeding 6 billion and growing at a rate of 1.2% per year, there is an increasing pressure on the world’s water resources. At the same time, the increase in consumption patterns results in a rising demand for land and water. Although the world has an abundant supply of water, only 3% of the total volume is fresh water, most of which is stored in glaciers and polar caps (Daily, 1997). Four major problems concerning fresh water may be defined as (Saeijs and van Berkel, 1994):

- A shortage of renewable fresh water supplies
- Unequal distribution of fresh water supplies
- Problems of water quality and health
- Negative effects of unrestrained fresh water ecosystem developments

These issues have resulted in increasing global attention for topics concerning water pricing, flood management, dam construction and wetland reclamation. An emphasis on the importance of involving stakeholders in decision making processes in water management has been introduced with the concept of integrated water management, a system approach with a focus upon the long-term survival of the entire water system (van Ast, 2000).

At the Dublin Conference on Water and the Environment in 1992, water was termed an 'economic good' for the first time and the concept of 'Integrated Water Resources Management' was introduced. The following four principles were developed (ICWE, 1992):

- Water is a finite, vulnerable and essential resource, which should be managed in an integrated manner.
- Water resources development and management should be based on a participatory approach, involving all relevant stakeholders.
- Women play a central role in the provision, management and safeguarding of water.
- Water has an economic value and should be recognized as an economic good, taking into account affordability and equity criteria.

Although the notion of water as an economic good has been generally accepted since the conference, the interpretation of this concept is under dispute. In this respect, Van der Zaag and Savenije (2000; 51) distinguish two schools of thought. One school believes that water should be priced at its economic value, so that the market will ensure water is allocated to its best use. A second school maintains that 'water as an economic good' refers to the process of integrated decision making on the allocation of scarce resources, which may not necessarily involve financial transactions. Instead, decisions on water allocation and use should be based on multi-sectoral, multi-interest and multi-objective analysis.

In March 1997, the World Water Council received its mandate to develop a Vision for Water, Life and the Environment during the First World Water Forum in Marrakech. This common Vision was seen as a necessary first step towards solving the global water crisis, and was debated during the Second World Water Forum in The Hague in 2000. The Vision provides a

thorough diagnosis of water resources and the steps that need to be taken to relieve the pressure on these resources. During this Second World Water Forum, people from all over the world participated in debates on major water-related issues, including 'water for food', 'water and economics', 'water and health', 'water and gender', and 'water and ethics'.

In the year 2000, the debate on dams reached its climax with the publication of the World Commission on Dams (WCD) report, 'Dams and Development – A New Framework for Decision Making'. The WCD was established in 1997 by the IUCN - The World Conservation Union and World Bank to discuss the complex and controversial issues surrounding large dams. The report discussed social, environmental and safety aspects of large dams, and recommended that the core values on which any decision on water and energy development should be based are equity, efficiency, participatory decision making, sustainability and accountability (WCD, 2000).

Each of the reports and conferences described, shows that water has become a hot issue on the global agenda. Water is no longer seen as the abundant resource it once seemed to be, and it becomes increasingly important to meet the different interests in water. At the same time, however, the general perspective towards water management and environmental issues has shifted towards a pragmatic, problem-oriented perspective in which current institutions are perceived as capable to deal with most environmental issues. This is part of what Hajer (1995) and Tatenhove (2000) call *ecological modernization*. Ecological modernization has its roots in the work of Joseph Huber, a German social scientist who observed that policy-makers in Germany and the Netherlands in particular started applying a "...more strategic and preventive approach to environmental problems." (Carter, 2001: 211).

Ecological modernization is a policy-oriented process that started in the Netherlands and many other Western countries in the 1970s and 1980s. Tatenhove (2000: 3) defines ecological modernization as an "...ecological transformation of the industrialization process towards a direction in which the maintenance of the 'sustenance base of society' can be guaranteed, while also reconciling economic growth and the ecological imperative". Tatenhove (2000) links this to a broader process observed in Europe, which he calls political modernization, the processes of transformation within the political domain of society. Ecological modernization recognizes the structural character of the environmental problems but assumes that

current political, economic and social institutions can deal with these environmental issues. A key characteristic of ecological modernization is that it "...introduces concepts that make issues of environmental degradation calculable." (Hajer, 1995: 26). The market plays a central role in environmental management, where calculability of environmental effects is the key to internalization of environmental costs.

Economic valuation is a key issue in current policy paradigms dominated by ecological modernization, because it makes the environment more calculable and in fact aims to integrate environmental effects in current decision making institutions, including cost-benefit analyses. It provides a common denominator through which costs and benefits of environmental degradation can be taken into account (Hajer, 1995). The environment is therewith portrayed as a management problem and a positive-sum game. In 't Veld (2000) also shares the point of view that in the demand for environmental knowledge, emphasis is placed on quantifiable norms. Stakeholders of projects prefer quantitative information - the environment, nature and economics are treated as objective entities and the more numbers and mathematical formulae are used, the stronger the facts. This demand is based on the belief that such information has absolute value, is objective and lowers the insecurities in decision making. In 't Veld calls this an 'engineering-knowledge paradigm', which dominates all decision making processes, including decision making in water management.

Policy paradigms in water management, dominated by a combination of a growing environmental awareness and ecological modernization, may influence choices stakeholders make in the economic valuation process. Growing environmental awareness may lead to an increase in the number of environmental functions that need to be incorporated in decision making and decision making tools. Similarly, it may influence the way geographical boundaries of ecosystems are drawn, and the parties that are affected. Moreover, ecological modernization may affect choices in the economic valuation process as it calls for increasing calculability of aspects, including environmental effects of decisions. Hence, it may stimulate quantification of environmental effects, which can result in an increased amount of environmental functions that are deemed quantifiable and included in economic instruments.

4.2.4 Rules and Regulations

According to the institutional theory of North, the development of informal institutions influences the development of formal institutions like rules and regulations. In this dissertation, informal institutions were defined as paradigms, which were discussed in the previous two sections. Following from North, therefore, these paradigms – policy paradigms and scientific paradigms – have contributed to the range of policy documents that have been developed in the past years in integrated water management in the Netherlands. These documents enhance the importance of the ecosystem approach in water management and the integration of environmental effects in water management issues.

Rules and regulations regarding economic instruments and, more specifically, the economic valuation process are important elements in the formal institutional context. A major impetus to the use of economic valuation in the Netherlands seems to have been the publication of the NEI/CPB “OEEI” report in the year 2000 (see Eijgenraam et al., 2000). This report recommends the application of a social cost-benefit analysis as an evaluation of government investments for large infrastructural projects. A social cost-benefit analysis evaluates costs and benefits of actions from the point of view of society, which may incorporate external effects. Since many natural resources are subject to external effects, a social cost-benefit analysis may call for the application of economic valuation to measure the effects of an action that causes external environmental effects. Since the publication of the report, several social cost-benefit analyses have been carried out by the different government departments in the Netherlands for major projects, such as the expansion of the Rotterdam port and the construction of sea sluices at IJsselstijn. Although still met with skepticism by many, general government interests for economic valuation as a method to incorporate environmental information in decision making among several government departments seems to have been on the rise since this report.

The OEEI report, however, does not provide a guideline to economic valuation. In fact, no such guidelines exist in the Netherlands. The result is that although economic valuation is increasingly applied by different actors in water management due to the developments in the informal institutional structure as explained in the previous sections, there are no standardized procedures or guidelines on how to structure the economic valuation process. No guidelines exist as to which choices actors need to make concerning, for example, which environmental functions to incorporate,

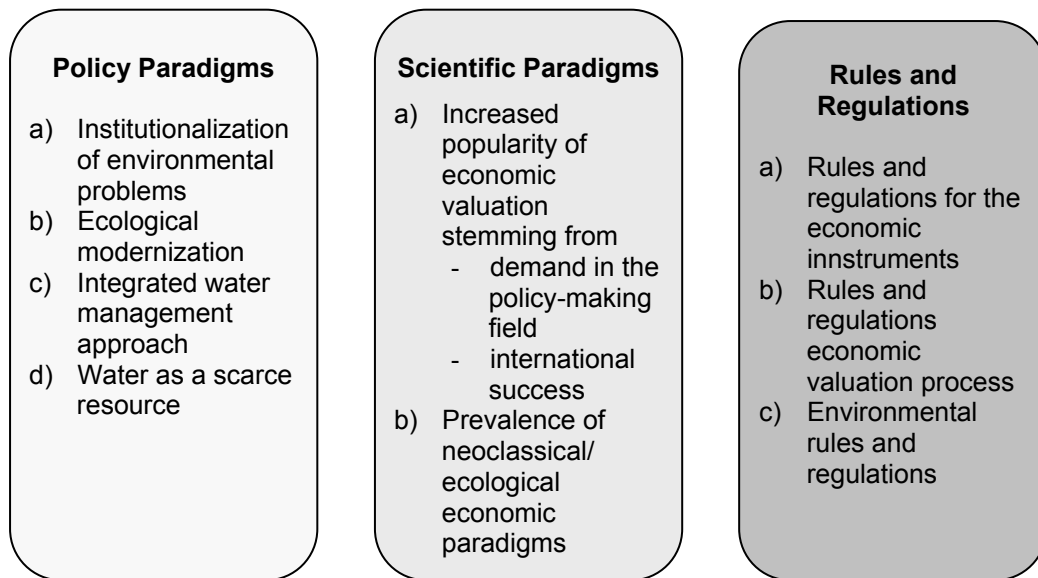
which valuation method to apply, which variables to include in a sensitivity analysis, and so on. This seriously affects the choices of actors in the economic valuation process as, in principle, actors are free to choose whatever seems right or appropriate. Hence, a general lack of rules and guidelines regarding the economic valuation process in the Netherlands may play an important role in the choices of stakeholders in the valuation process.

Other important formal institutions include rules and regulations regarding the environment. Here, one must think of national and European-wide regulations that affect projects concerning the environment. An example is the EU Water Framework Directive. Such regulations may influence the choices in economic valuation processes that are carried out for such environmental projects.

4.2.5 Summarizing the Institutional Context

The previous three sections have discussed the key elements in the informal and formal institutional context of economic valuation processes. These elements are summarized in Figure 6. In the informal institutional context, the first element that was abstracted from theory was scientific paradigms. In the Netherlands, a first scientific paradigm is the increasing popularity of economic valuation. This was attributed to an increased demand in the policy-making field and a high success of valuation studies in other countries like the United States. Furthermore, it was discovered that the scientific paradigms within economics in the Netherlands are dominated by a combination of neoclassical and ecological economics. Both scientific paradigms may influence choices in valuation processes. The second element distinguished in the informal institutional context of valuation processes was policy paradigms. In this context, several elements were noted. First, a process of institutionalization of environmental problems has taken place, often based on an increase in environmental awareness due to an increase in knowledge and information about the environment. Second, policy paradigms are dominated by ecological modernization, in which the environment is approached in a pragmatic, problem-oriented way in which rational solutions and arguments play an important role. Third, water management is approached from an ecosystem perspective in which ecosystems play a central role. The last policy paradigm is that water (in all its facets) is increasingly recognized as a scarce resource.

Figure 6 Institutional Context of the Economic Valuation Process



In the formal institutional context of valuation processes in the Netherlands two key aspects were distinguished. First, rules and regulations concerning economic instruments in general are important influences on valuation choices, like the OEEI report that calls for the execution of social cost-benefit analyses for large infrastructural projects. The report, however, says little about economic valuation of ecosystems, which brings us to the second element in the formal institutional context, namely rules and regulations for the economic valuation process. Lastly, it was explained that rules and regulations concerning the environment may be of importance to the economic valuation process of environmental issues.

4.3 Choices in the Valuation Process in Dutch Water Management

4.3.1 Participant Observation

Now that the context of economic valuation processes in Dutch water management has been discussed, it is necessary to analyze the valuation process within this context. For this reason, participant observation was carried out in two economic valuation processes in Dutch water management that involved two different principals. The first study was called "The Economic Value of Lost Natural Functions of the Rhine River Basin" and was carried out for a Dutch non-governmental organization (see Schuijt, 2001a). The second study was called "Costs and Benefits of an Alternative Safety Concept", which was carried out for a Dutch government department (see Schuijt, 2001b). Through conducting these

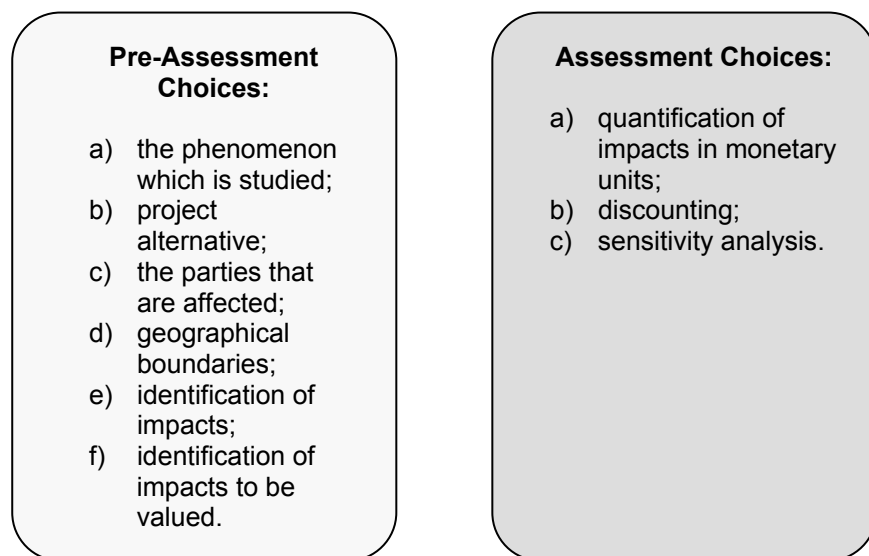
two economic valuation studies, it was possible to observe the economic valuation process, particularly focussing on the types of choices that need to be made, as well as the role of different stakeholders in the valuation process and their relationships. The focus of the observations, therefore, was on the process of structuring and application. In addition to inside information due to direct participation in the process, an important aspect of the participant observation was the ethnographic interview, which attempts to obtain information from the stakeholders on the subject through conversations and spontaneous interviews. The following section summarizes the main observations of these economic valuation processes.

4.3.2 Observations on the Economic Valuation Processes

The participation in the two economic valuation processes led to several observations relevant for this research. These observations all focus on the choices made in the valuation processes and the role of the stakeholders in the development of these choices.

The *first* observation concerns the types of choices that need to be made in the valuation processes. It was observed that the choices as identified in theory could be structured according to those choices that need to be made before the actual assessment takes place (pre-assessment choices) and choices which are part of the assessment itself (assessment choices). In line with this, the range of choices that needed to be made in both valuation processes is presented in Figure 7.

Figure 7 Choices in the Economic Valuation Process



The *second* observation concerns the role of the principal in the choices of the valuation processes. In both studies, the definition of the phenomenon to be studied was done by the principal. Hence, the first choice that guides the remaining choices throughout the valuation process is defined by one set of stakeholders. Furthermore, in one valuation process, the remaining choices were also directed by the principals of the study. It was observed that in these choices, suggestions were made to guide the outcome of the process in a direction that would benefit the principal. This substantiates the observation made from theory in Chapter 3, namely that stakeholders behave strategically and apply economic valuation to gain a strategic advantage over other stakeholders.

The *third* observation concerns the strong influence of time and budget constraints on choices made in both valuation processes. In both processes, a limited time and a limited to no budget was available for the studies. It was observed, however that (1) the collection of data necessary to carry out the valuations was very time-consuming, and (2) certain valuations could not take place with the preferred methods suggested by theory. For example, in the valuation process on the Rhine River basin, it was necessary to calculate the economic value of "existence value of nature", and theory only provides Contingent Valuation method to calculate this. However, the Contingent Valuation method is both relatively time consuming and expensive due to the process of interviewing consumers to obtain their willingness-to-pay estimates. Since both time and money were not available, however, it was not possible to perform a Contingent Valuation study and instead other approaches were sought to value the existence value of nature. Hence, time and budget constraints must be added as a key influence on the choices made in the valuation process.

The *fourth* and last observation concerns the participation of different stakeholders in the valuation process. In general, there are different ways of integrating stakeholders in valuation processes, and the two most common approaches are through a steering committee and through a peer review group (see Chapter 3). Both should preferably consist of a wide range of stakeholders that give input into the valuation process. In both valuation processes, however, there was no steering or guidance committee consisting of external stakeholders. Interestingly, in one of the processes the principals gave guidance themselves. As a result, in both valuation processes the principal and contracting party made the relevant choices with no input from other stakeholders during the process. As for the second approach to stakeholder integration, in one of the valuation

processes a peer review of external stakeholders was executed while this was not done in the other study. It was observed that a peer review significantly altered some of the choices made in the valuation process and in general improved the substantiation of the calculations. This observation supports the need to analyze the types of stakeholders involved in the valuation process and their respective influences on the choices.

In conclusion, the participant observation observed the following four aspects:

- 1) The valuation process can be divided into six pre-assessment choices and three assessment choices;
- 2) Stakeholders of valuation processes and the principal in particular behave strategically when making choices;
- 3) Time and budget constraints imposed on valuation processes influence choices;
- 4) Participation of all relevant stakeholders is important in the types of choices made in valuation processes.

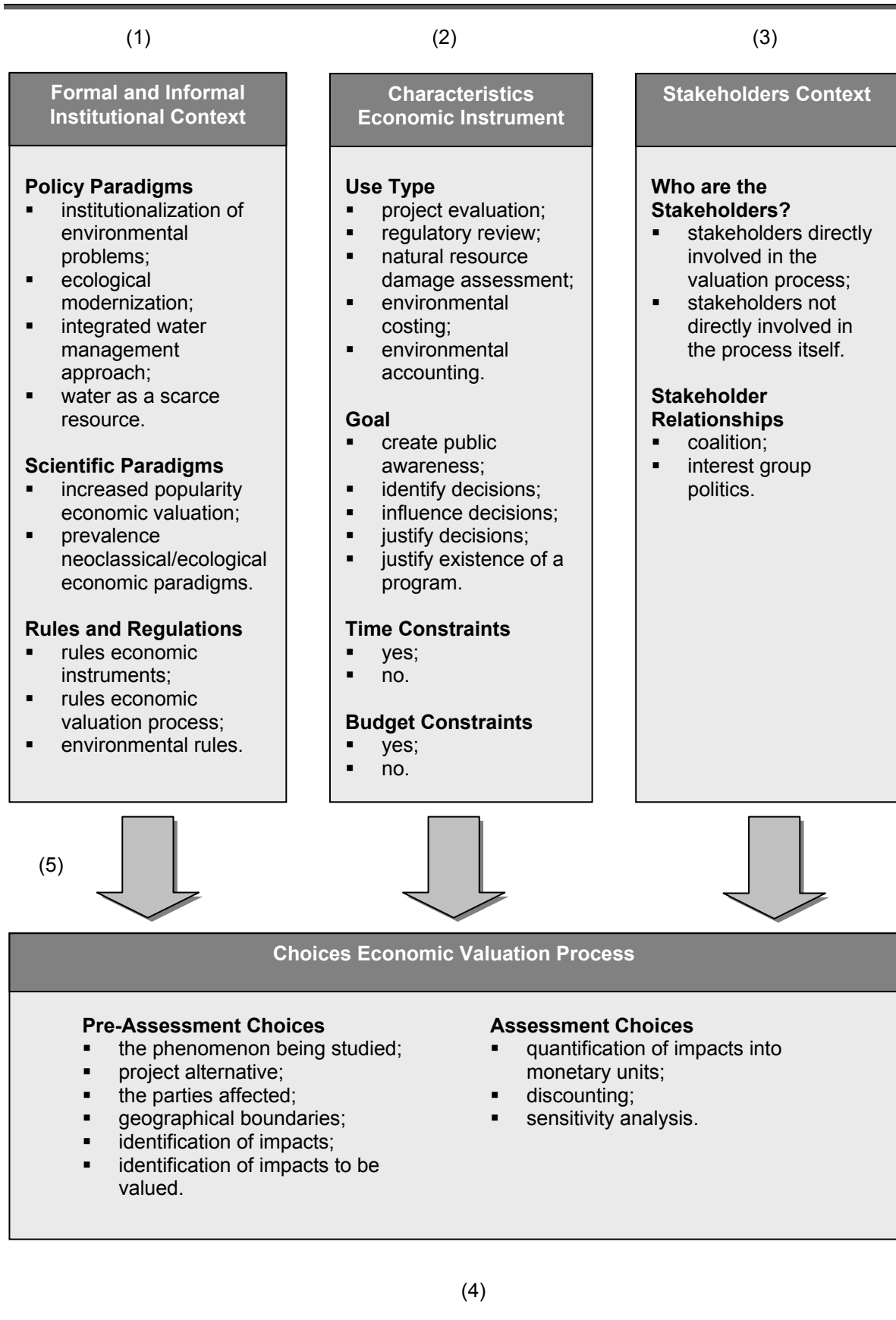
These observations will be combined with the observations from theory to develop the analytical model. This is discussed in the next section.

4.4 Analytical Model

The combination of observations on the application of the economic valuation process in Dutch water management with the observations derived from theory leads to the analytical framework of this dissertation. The framework is therefore a combination of observations from theory and practice.

The analytical model is presented in Figure 8.

Figure 8 The Context of the Economic Valuation Process in Water Management



As can be seen, it is divided into two main parts. On the bottom are the choices of the economic valuation process, which are directly taken from Figure 7. This list of choices is based on a combination of the theory of Hanley and Spash (1993), Barbier (1997) and Eijgenraam et al. (2000) and participant observation. The top part of the model represents the context in which these choices are made. This is also based on a combination of the theoretical discussions of the previous chapter and practical observations about economic valuation processes in Dutch water management of section 4.2 in this chapter. An important aspect of the participant observation in the previous section is the influence of time and budget constraints on choices in the valuation process, and therefore it is added to the framework as a characteristic of the economic instrument.

An important part of the framework however consists of the arrows that flow from top to bottom. These arrows show that the context of institutions, actors and characteristics of the economic instrument influence the choices of valuation process.

The framework of Figure 8 will serve as a basis for further empirical analysis in the next chapters, the goal of which is to understand how choices in the economic valuation process are made within the context of Dutch water management. For this reason, the analytical model will be applied to three case studies: a cost-benefit analysis of gas extraction in the Wadden Sea and two cost-benefit analyses for the port development in Rotterdam. The identification of the variables in the analytical model involves the filling in of the analytical model for each case. This raises the following research questions:

- 1) In which formal and informal institutional context at project level is the valuation process carried out?
- 2) What are the characteristics of the economic instrument (cost-benefit analysis) of which the valuation process is part?
- 3) Who are the stakeholders of the valuation process and what are their relationships?
- 4) What do the valuation process and choices within this process look like?
- 5) Which relationships can be depicted between the valuation process and its context?

Each case study will be structured along these research questions. In Figure 8, the research questions are represented by the numbers in brackets.

In terms of the analytical model, two aspects are left out of the analysis in the next chapters that nevertheless deserve brief attention. First, the

interrelationships between the elements in the context of the economic valuation process are not studied. For example, relationships could perhaps be found in which elements in the formal and informal institutional context influence the stakeholders and their relationships or the characteristics of the economic instrument. Conversely, the stakeholder context may influence the characteristics of the economic instrument. However, these interrelationships among elements in the context will not be studied in the case studies because this thesis is only interested in the factors that influence the choices in the valuation process.

Secondly, feedback loops are not analyzed. The choices that are made in the valuation process may influence behavior in society, including decisions or actions that affect the environment. Through the reactions that economic valuations provoke, new calculating strategies emerge that may lead to a changing of goals (Callon, 1998: 24). Changing behavior, in turn, influences the context of the economic valuation variables. The contribution of the valuation process to the behavior in society will determine what choices are made in the variables of this process over time. For example, if an economic valuation study succeeds in influencing a decision on the construction of a dam in such a way that the dam is not constructed, the position of the stakeholders who carried out this economic valuation study becomes stronger relative to the position of the construction companies. Furthermore, such a study may also stimulate environmental awareness in society and influence scientific research on economic valuation in support of current scientific paradigms. This influence of behavior on the context of economic valuation variables, or feedback, however, is not incorporated in the analysis of the next chapters, where the focus lies on the one-way effects of the context on the choices in the economic valuation process.

The methodology that will be applied in the following chapters is discussed in the next section.

4.5 Methodological Approach

4.5.1 Case Study Analysis

The next two chapters (Chapters 5 and 6) will provide the empirical analysis, where the methodological approach is a *qualitative* research approach. The units of analysis are behavioral aspects, such as interests, relationships and influences that are of a qualitative nature. The goal is to explore the economic valuation process and to find relationships and

patterns between the characteristics of the valuation process and its context. Since the nature of these relationships is unknown and these characteristics are not always quantifiable, qualitative analysis is a more appropriate form of exploratory analysis for this research.

The method that will be applied in this analysis is *case-study analysis*. Yin (1994:13) defines a case study as an empirical inquiry that:

- investigates a contemporary phenomenon within its real-life context, especially when
- the boundaries between a phenomenon and its context are not clearly evident.

In other words, case studies specifically include the context of the phenomenon that is being studied, which makes this strategy particularly suitable for this research in which the context of the studies plays a key role. Case studies rely on multiple sources of data, including interviews and document analysis, and benefit from the prior development of theoretical propositions to guide data collection and analysis (Yin, 1994: 13). Therefore, it is a comprehensive research strategy that allows for an integrated analysis and explanation of the complex factors in the context of the valuation process.

The case-study analysis in each of the following chapters will be applied to pursue a combination of the following two *goals*:

- 1) **Explore** the economic valuation process and the context in which it is carried out
- 2) **Explain** possible relationships between the valuation process and its context

Both goals contain activities that are guided by the theory developed in the previous two chapters. In this theory, the economic valuation process consists of stakeholders that make specific choices, so the activity in the first goal, therefore, is to explore how this process is carried out in practice. Additionally, theory explained the importance of the context in which the valuation process is carried out. Hence, the second and third activities in the case-study analysis are therefore to explore this context and to explain its relations with the choices in the valuation process.

A selection is made of multiple case studies of valuation processes in the Netherlands. The first criterion for selection of a case is that it involves an economic instrument in which the effects of the project on nature are

included through economic valuation. Secondly, they must be carried out in the Netherlands and involve water management issues. The reason for the choice of the Netherlands is that the effects of differences in contexts between countries on the valuation process are not studied. This would make the study too complex for the time period available for this study. The context is further specified to water management in the Netherlands. The reason for the choice of one specific policy field is that it isolates factors that are of importance to this study; for example, studies in an entirely different policy field such as healthcare would imply that the choices made in the valuation studies differ not only because of their context of actors, project and informal and formal institutions, but also because the subject under study calls for different choices in the valuation process. The choice for water management has been made because this sector has been subject to major developments in the Netherlands and the interest in economic valuation studies in this sector is growing, allowing for a sufficient availability of case studies. As a result, the following three case studies of valuation processes in the Netherlands were selected:

- a) Cost-benefit analysis for the extraction of gas in the Wadden Sea
- b) Cost-benefit analysis land reclamation for the expansion of the Rotterdam port
- c) Cost-benefit analysis 750 hectares nature and recreation area as a result of the expansion of the Rotterdam port

The first case study will be presented in Chapter 5, while the second and third case studies will be discussed in Chapter 6.

The *sources of evidence* to obtain answers to the research questions are a combination of interviews and document analysis. The document analysis focuses on an analysis of administrative documents, newspaper articles, internet sites and formal studies concerning the case studies. This will attempt to obtain information on all elements in the context of the valuation processes, but focuses particularly on the formal and informal institutional context. Additionally, the interviews focus more specifically on the stakeholders, their choices in the valuation process and their relationships, and are directed at key persons involved in the economic valuation process. These people are direct stakeholders or representatives of direct stakeholders of the economic valuation processes: principal (s), contracting party/parties, steering committee, interviewed and consulted persons and peer review group. In some cases, it is also necessary to interview indirect stakeholders like companies or government officials.

The interviews are structured as semi-standardized interviews. In semi-standardized interviews, open-ended questions on facts of matter and opinions or insights are combined with theory-driven questions based on theoretical propositions (Flick, 1998: 84). Such interviews are suitable in situations where the interviewee has a complex stock of knowledge at his disposal about the topic, including both assumptions that can be answered spontaneously in open-ended questions as well as implicit assumptions, which may be articulated through the more theory-driven questions (Flick, 1998: 82). It is therefore a very suitable interview technique for the questions posed in this research: the exploratory questions will be researched through open-ended questions while the explanatory questions will be researched through the theory-driven questions.

The process of interviewing in the case study analysis consists of the following elements. The starting point for the interviews is the cost-benefit analysis. Each study is analyzed and key persons who carried out the study as well as those who gave the assignment for the study will be interviewed. At the end of each interview, the person will be asked whether he or she could recommend other people to talk to that may be able to present additional information. This process will continue until no new implications for theory can be made. After the interview, an interview report will be written and sent to the interviewed persons for a check - comments and corrections are processed.

Once the cases have been analyzed in Chapter five and six, the three cases will be compared and contrasted. For this cross-case analysis, Yin (1994: 46) explains the importance of the careful selection of case studies so that they either (a) predict similar results (literal replication) or (b) produce contrasting results but for predictable reasons (theoretical replication). In this respect, the first two case studies on the extraction of gas and expansion of the Rotterdam port were selected for theoretical replication. Both cost-benefit analyses were carried out in different contexts – a completely different project with different actors and in a different time period. It is therefore expected that the contextual influences on choices made in the economic valuation processes differ between the two case studies. The third case study on the creation of 750 hectares nature and recreation area was chosen for comparison with case study two on the expansion of the Rotterdam port, and hence selected for literal replication.

These two cases seem to have similar contexts: the analyses were carried out within a similar larger project (expansion of the Rotterdam port) and within the same time period, by the same contracting parties and for a similar principal²⁷. Hence, it is expected that similar influences on valuation choices can be found. The major similarities and differences between the cases and their consequences for the economic valuation process will be discussed in Chapter seven.

²⁷ The two cost-benefit analyses are part of two sub-projects that both fall under the same larger project – Rotterdam Mainport Development (PMR). The two analyses were separated in the PMR project because within this project a double-objective existed: one aimed at extending the Rotterdam port and another aimed at improving the quality of the social environment in the Rotterdam area. Hence, each cost-benefit analysis deals with one of these objectives, under the PMR. Furthermore, the principals are similar in the sense that in both cases the principal was PMR, but in the second cost-benefit analysis on the 750 hectares of nature and recreation area, this leadership was delegated to the Province of South-Holland. The contracting parties are similar because in the first case study, three parties carried out the analyses together, while in the second case study, two out of these three parties carried out the analysis.

Chapter 5 Cost-Benefit Analysis of Gas Extraction in the Wadden Sea

5.1 Introduction

This chapter will build on the perspective that was developed in the previous chapters. In this perspective, the context in which the economic valuation process is carried out influences the choices made within this process. This perspective was the basis for the analytical model in section 4.4. In this model, key influences on the choices were the formal and informal institutional context, the characteristics of the economic instrument and the stakeholders' context. Understanding this context in which the valuation process is carried out is important in understanding the choices that are made in the process of economic valuation that may lead to inconsistent outcomes.

In the underlying chapter, the analytical model will be applied to one case study: a cost-benefit analysis of gas extraction in the Wadden Sea. The aim of this case study analysis is to map both the choices within the valuation process and the context of institutions, economic instrument and stakeholders in which the process is carried out. An introduction to this context was already given in the previous chapter, where the formal and informal institutions of water management in the Netherlands were discussed at a more general level. This case study will focus on the context at project level.

5.2 Formal and Informal Institutional Context

5.2.1 Emergence of Formal and Informal Institutions

In September 1999, AIDEnvironment published their report called “The Shadow-Side of Wadden Sea Gas” (De Schaduwkant van Waddengas), which it had carried out on assignment of Greenpeace Netherlands (Wetten et al., 1999). In this report, a social cost-benefit analysis was carried out on gas extraction in the Wadden Sea. These gas extraction are

carried out by the Netherlands Petroleum Company (NAM), a company consisting of two shareholders Shell and Esso who carry out explorations and extraction for oil and gas in the Netherlands. The study was published within a complex political and economic context, in which formal institutions (rules and regulations) and informal institutions (policy and scientific paradigms) can be distinguished. In order to understand this context, it is necessary to go back in time and explain the emergence of institutions concerning gas extraction in the Wadden Sea in the Netherlands. This discussion will be held according to the time line presented in Table 1.

The Wadden Sea is situated in the North Sea between Den Helder (the Netherlands) and Esbjerg (Denmark). The area is a wetland that falls periodically dry at low tide and then gets flooded again, and is the world's largest coherent habitat of its kind. It is home to a diversity of animals, including mussels and cockles, birds of passage like the barnacle goose and the knot, many kinds of fish like the plaice and the sole, and the common seal, the shore crab and the oyster catcher. The Wadden Sea also houses an estimated 70 to 170 billion cubic meters of gas (NAM, 2001) and over the past forty years approximately sixty drills have been carried out in the area. As a result, the Wadden Sea has been subject to numerous debates over the past fifty to sixty years dominated by conflicting interests. Already in the 1960s, for example, plans were investigated for the possibilities of reclaiming the Wadden Sea and to connect one of the Wadden Sea islands, Ameland, with the mainland through the construction of two dams. Also at this time, however, a diversity of activities were taking place in the Wadden Sea, including tourism and recreation, military activities and extraction of natural resources, and as a result diverging opinions often confronted each other in these discussions (Zwiep, 1988).

Table 1 Time Line Gas Extraction Wadden Sea

1947	1965	1969	1974
→ Foundation of NAM	→ Dam plan of Ameland	→ Everlasting concession Wadden sea gas NAM	→ Mazure report
1976	1980	1984	1994
→ Waddenzee bill: decision to follow a PKB	→ PKB is laid down	→ Agreement NAM and 2nd chamber on 10-year moratorium on gas extraction	→ Expiry moratorium NAM gas extraction → Revision PKB Upper and Lower House → 12 nature organizations submit petition with EU for more research on gas extraction → Obligation EIA (MER) before test drills
1995	1996	1997	1998
→ Wadden association calls against PKB revision	→ Wadden association calls for suspension PKB revision → Creation Wadden Advisory Board	→ Elections and new cabinet → Answer from State Council to Wadden association on call for suspension PKB: no → Report Ministry of Economic Affairs to court in Leeuwarden with argumentation favoring test drills	→ Counter-arguments Prof. Heertje and Wadden association to court in Leeuwarden against test drills → Agreement 2nd chamber with expansion PKB → Study NAM on the effects of test drills on the bottom of the Wadden Sea
1999	2000	2000	2002
→ Agreement cabinet & mining corp. ends → Conflict Jorritsma and Pronk → Minister Jorritsma grants allowance for test drills at Laauwersoog under protest from other political parties → AIDEnvironment report presented at press conference of nature organizations	→ Cabinet requests NAM to postpone test drills to decide on decision of minister Jorritsma → Compromise Prime minister Kok fails → Hiring 7 experts: no uniform agreement on environmental effects test drills → Motion Witteveen to stop test drills → Decision cabinet: no test drills, first more research	→ Study NAM: effects of test drills on the bottom of the Wadden Sea at Ameland	→ Ending of the Wadden Advisory Board; creation Board for Wadden Advise → Motion Witteveen ban on all activities in the Wadden Sea → Unanimous position Lower House: no test drills despite other research → NAM calls against Lower House decision, State Council rejects call → New cabinet: no agreement on Wadden Sea

In 1969, NAM, Mobil and Elf Petroland received an ‘everlasting concession’ to drill for gas in the Wadden Sea - the importance of gas for the Dutch economy was being recognized. Five years later however, in 1974, the Mazure report was published in which a negative advice was given on all reclamation plans. Many arguments were based on the ecological value of the Wadden Sea and a call for protection of these

values. The government backed the report and with it recognized the Wadden Sea as a valuable ecosystem (Zwiep, 1988). In 1976, the Wadden Sea bill was accepted, which stated that the decision making procedures concerning the Wadden Sea would follow a Core Planning Decision Procedure (PKB). The result of a PKB procedure is a government decision that cannot be reversed – the concrete policy decisions are no longer liable for discussion at decision making processes of the national government or other governments. This PKB was eventually laid down in 1980.

Since 1969, when NAM received an everlasting concession, the environment had come to play an increasingly important role in the Netherlands. The effects of human interventions in water systems throughout Dutch history began to be noticed in the form of water pollution, degradation of nature and landscape, desiccation, and pressures on use functions. As a result of these changing policy paradigms, discussions on the effects of gas drills on the environment grew and in 1983 the government and NAM agreed on a moratorium on additional gas projects in the Wadden Sea until 1994.

Ever since this moratorium expired, heated discussions on gas extraction in the Wadden Sea emerged. Towards the end of the moratorium, the Dutch government had to decide about the new status of gas explorations and extraction in the Wadden Sea in a revised PKB. NAM demanded its activities be resumed based on the terms of the contract on an everlasting concession. However, new environmental laws had since then been developed which were in contradiction to the extraction of gas in the area. For example, large parts of the Wadden Sea were by that time covered by both the EU Birds Directive and EU Habitat Directive, which call for an obligation to prevent any pollution or disturbance to birds in the area and prohibit any activities that may affect the protected area. Whether and to what extent gas extraction actually affect the environment of the Wadden Sea remained a point of dispute and a large number of Dutch nature and environmental organizations submitted a petition with the European Union for more research on gas extraction. The Lower House, however, decided with a small majority to allow gas extraction.

By 1994, it had become compulsory in the Netherlands to perform an Environmental Impact Assessment (MER) for test-drills, and NAM and the government agreed that NAM would carry out a study on the possible environmental effects of gas extraction coming from a decrease in the bottom of the Wadden Sea (Marquenie and Gussinklo, 1998). This process

is a relative decrease of land to sea level, which partly takes place naturally, but can be enhanced by human interventions such as gas extraction. The question is what the effects of such a decrease will have on nature in the Wadden Sea. The study was carried out by several specialists of Dutch research institutes. In the meantime, NAM invested 700 million guilders to carry out several test drills in the Wadden Sea, which resulted in the discovery of 40 billion cubic meters of gas (NAM, 2001).

In 1995, the Wadden Association together with eight nature and environmental organizations called against the PKB revision that allowed NAM to extract gas in the Wadden Sea. The Wadden Association (Waddenvereniging) is an organization that defends the Wadden Sea as a nature and recreation area. One of the aspects of the protest was their opinion that an Environmental Impact Assessment should be carried out for all gas extraction that take place in the Wadden Sea, as opposed to assessments for each separate location. The Wadden Association had not received an answer to their protest by 1996 and it pursued its goals further by calling for a suspension of the PKB revision with the State Council. The answer from the State Council finally came towards the end of 1996 – the Council supported the text of the original PKB revision. At the same time, discussions in the government were becoming quite intense and a Wadden Advisory Board was created at the end of 1996. The Board advised the government and the Upper and Lower Houses about issues of general importance for the Wadden Sea.

Elections in May 1997 resulted in a new cabinet and the question on gas exploration and extraction in the Wadden Sea was once more put on the agenda for discussion within the government. After receiving the negative answer from the State Council, the Wadden Association decided instead to focus their protests on the provincial and municipal levels and it requested the court of Leeuwarden in the Province of Friesland (one of the provinces bordering the Wadden Sea) to end the concessions for test drills. The Court agreed on the basis of a lack of insight into the environmental effects and questions concerning the necessity for test drills for Dutch society. The Ministry of Economic Affairs, in favor of the test drills due to its positive effects on the economy as a source of income derived from the export of gas, wrote its reaction together with three other ministries to the Court's sentence in a report (MinEZ, LNV, VROM and VWS, 1997) accompanied by an independent auditor letter (Meijer and Witsen, 1997). The letter's conclusions were that the report provided sufficient arguments for the necessity of test drills for society. This Court struggle continued into 1998,

when the Wadden Association asked Professor Heertje, a well-known Dutch economist, to respond to the report of the Ministry of Economic Affairs and the accompanying auditor's letter. He concluded among others that the potential harm to nature and the environment of the Wadden Sea must be included as negative effects of test drills on the entire economy. This could lead to different outcomes on the Dutch economy and hence a different decision. Some of these arguments were subsequently used by the Wadden Association in a letter to the Leeuwarden Court, in which it stated that the societal need for test drills were based entirely on the commercial interests of NAM and economic interests for the state.

The revised PKB on the Wadden Sea would end in December 1998 and in November of the same year the Lower House agreed to extend the revised PKB. This was necessary since the agreement between the government and the mining corporations ended in January 1999 and the government still needed more time to decide on the follow-up of this agreement. In the meantime, the study of NAM on the environmental effects of gas extraction due to a decrease in the bottom of the Wadden Sea was published, which concluded that no measurable effects of gas extraction on nature in the Wadden Sea were to be expected (NAM, 1998).

Major discussions erupted in the government at the start of 1999, dominated by a conflict between the Minister of Environment and the Minister of Economic Affairs²⁸. While the former wanted to end the everlasting concession completely, the latter supported the concessions. Despite these disagreements, the Minister of Economic Affairs suddenly gave NAM permission to drill for gas near the island of Laauwersoog in April. This was met with enormous protests from most of the political parties. In June, the coalition of nature organizations held a press conference, during which they presented "innovative research". This research was the report of AIDEnvironment (Wetten, et al., 1999), a Dutch consultancy firm, in which they conducted a social cost-benefit analysis on gas extraction in the Wadden Sea on assignment of Greenpeace Netherlands. The main result of the study was that the extraction of gas would lead to a net loss of ten to forty-two billion guilders for Dutch society. When the study was finished, Greenpeace widely distributed the report among all the major actors in the Lower House, right before the final discussions in the government.

²⁸ At this time, the Environment Minister was Mr. Pronk and the Economic Affairs Minister was Ms. Jorritsma-Lebbink.

5.2.2 Institutional Context of the Economic Valuation Process

In Section 3.4, it was explained how the set of formal and informal institutions in the context of the economic valuation process influence the choices of stakeholders in the economic valuation process. In this context, the following institutions were distinguished: scientific paradigms, policy paradigms and rules and regulations. This section will explain these institutions in the context of the economic valuation process for the gas extraction in the Wadden Sea.

Policy paradigms of the political actors involved in the Wadden Sea discussions at this time were still generally dominated by rational and economic arguments. The Ministry of Economic Affairs especially kept firing with arguments favoring gas extraction based on the fact that the extraction would be beneficial for the Dutch economy through gas exports. Policies concerning gas extraction in the Wadden Sea were therefore dominated by ecological modernization. This paradigm was at the basis of the Greenpeace decision to perform a social cost-benefit analysis on gas extraction - Greenpeace was convinced the study would be successful in its campaign by coming up with rational economic counter-arguments. Towards the end, the debate on gas extraction shifted from rational to emotional discussions for the conservation of the Wadden Sea, one of the main reasons that the Greenpeace study eventually played a very limited role in the discussions and final decision to end gas extraction.

Other policy paradigms also played an important role in the context of the economic valuation process. First, the environmental problems concerning the Wadden Sea were very much institutionalized at a broad level in Dutch society. The general public as well as government departments were aware of the ecological importance and vulnerability of the Wadden Sea. Secondly, government policy towards the management of the Wadden Sea was dominated by an integrated water management approach. The different functions and stakeholders of the Wadden Sea were being recognized, and the policy making process was very much oriented towards the ecological value and functioning of the Wadden Sea as opposed to a focus entirely on anthropocentric benefits. Third, the Wadden Sea was recognized as a scarce resource – it was being perceived as the Netherlands’ “last wilderness area”.

The *scientific paradigms* regarding economics at the time of the Greenpeace report that were dominant in the context of the project were an interesting combination of both neoclassical and ecological economics paradigms.

Most of the key stakeholders that were directly involved in the economic valuation study, such as Greenpeace, AIDEnvironment and the Wadden Association (see section 5.4) believed in quantification of ecological functions in monetary terms, at the base of which is the neoclassical economics paradigm. However, their view of natural resource allocation was that markets should play a limited role while governments should be the institutions to make such allocation decisions. In other words, quantification of natural functions should only be done to raise public awareness, not for the allocation of natural resources. The neoclassical economics paradigm was supported only insofar as it supported their subjective opinions and interests. Beyond this, the stakeholders approached the ecological economics paradigm. Their scientific paradigm towards the environment was dominated by a hands-off approach, where human interventions in natural ecosystems like the Wadden Sea should be completely banned.

Other stakeholders in the economic valuation process, like the Ministry of Economic Affairs and NAM, supported a more neoclassical economic paradigm on gas extraction. In this perspective, the economy as opposed to ecosystems plays a key role. Their scientific paradigm towards the environment was dominated by economic motivations, where human interference in natural ecosystems like the Wadden Sea is accepted as long as economic benefits exceed the costs.

Another important characteristic in scientific paradigms was the publication of several scientific studies. Although economic valuation was still not very popular in the policy field in the Netherlands, it was during this period that several scientific studies were published in international journals in which economic valuation of ecosystems were carried out. Probably the most famous study in this time was published by Costanza et al. (1997) in the well-read journal *Nature*. Costanza et al. attempted to place an economic value on the world's ecosystems, and provided arguments based on conservation issues that support the use of economic valuation. The study triggered many discussions and received a lot of publicity, also in the Netherlands. Those that gave the assignment within Greenpeace stated their inspiration for the cost-benefit analysis came from reading such economic valuation studies that could possibly provide them with the right ammunition.

In the formal institutional context of the economic valuation process, no significant rules existed regarding economic instruments - the OEEI report, a guideline for social cost-benefit analysis, was not yet published. Furthermore, rules regarding the economic valuation process were also absent. The absence of *rules and regulations* concerning the economic valuation process in the Netherlands played a major role in the choices of the economic valuation process itself. No guidelines and agreements existed for the contracting party who carried out the economic valuation study for Greenpeace. The only agreement that existed in the Netherlands concerned the discount rate, which was set at 4% for government projects. The fact that almost no economic valuation studies had been carried out in the Netherlands since the 1970s also gave little guidance to those wanting to carry out these type of studies. Rules and regulations concerning the environment, however, did exist. More specifically, the European Birds and Habitat Directives, which applied to the Wadden Sea, gave direction to the management of the Wadden Sea and may have influenced choices in the economic valuation process that concentrated on the Wadden Sea.

5.2.3 Institutional Context Following the Economic Valuation Process

The Greenpeace report was officially published in September 1999, after which it was subject to much debate. Unexpectedly for the contracting party, most of the critique came from biologists and ecologists, and not from economists. The economists seemed to understand the difficulties of such a study, while ecologists and biologists thought the study contained inconsistencies and often disagreed with the fundamental aspects of the study, namely putting a monetary value on nature.

In the summer of 1999, NAM was asked to agree with a postponement of the decision by Ms. Jorritsma, which allowed NAM to extract gas near the island of Laauwersoog. The cabinet required three more months to make this decision. In November, discussions on gas extraction in the Wadden Sea within the government became intense. Interestingly, these discussions were dominated by emotional arguments. While former discussions were dominated by effects of gas extraction on a decrease in the bottom of the Wadden Sea, arguments were now based on the Wadden Sea as the Netherlands' last 'wilderness area' and therefore should be left untouched. The prime minister Premier Kok attempted a compromise that allowed gas extraction under very strict conditions from three places from the shoreline, an act that was labeled as being "...typical for the way the government deals with the opposition of economics and environment." (NRC, 6 November 1999). His attempt at compromise failed.

At this time, the discussions in the government were fed by Ms. Tineke Witteveen of the Labor Party (PvdA), a long-time fervent opponent of gas extraction, who initiated a motion in November that called for the cabinet not to support new mining activities in the Wadden Sea (NRC, 11 November 1999). All parties in the Lower House, except for the Liberal Party (VVD), supported the motion and thus voted against gas extraction. The Cabinet however still needed to decide on the matter. To make an informed decision, the cabinet assigned seven experts to study the effects of gas extraction on the decrease in the bottom of the Wadden Sea, and had extensive discussions with NAM. This research needed to be conducted in a very limited time period as the concessions for gas extraction were postponed until 8 December. On 7 December 1999, the cabinet decided not to provide NAM with a license for new test-drills for gas in the Wadden Sea. Essentially, the seven experts could not provide the cabinet with a clear answer on the effects of gas extraction on the environment, and the cabinet viewed the insecurities concerning these effects as too big. The cabinet proposed more research needed to be carried out that guaranteed gas extraction could be carried out without damaging effects on the environment (NRC, 7 December 1999).

In the year 2000, a study was published on assignment of NAM on the effects of gas extraction on decreases in the bottom of the Wadden Sea (WL/Delft Hydraulics, Alterra, 2000). The effects were monitored over a period of thirteen years. The report stated that the maximum decrease over ten years of gas extraction would be approximately twenty-eight centimeter. The effects on nature would be limited and the value of nature would be protected.

In 2002, the Council for Wadden Advice replaced the Wadden Advisory Board after their task ended and the functions of the Council were similar to those of the Board. In March, the discussions in the government once more erupted on the decision of the wording of the new PKB on the Wadden Sea. In the old decision, the possibilities for gas extraction were still open and four parties presented a motion, again initiated by Ms. Tineke Witteveen, to replace this text with a ban on all activities in the entire Wadden Sea area that may have a negative influence on the area (Financieel Dagblad, 28 Maart 2002). These activities included gas extraction, windmills, patrol airplanes and harbor expansions. The majority of the Lower House accepted the motion, which meant a blocking of the 1999 cabinet decision to await the results of further research on the effects of gas extraction on nature. While former policy paradigms on the Wadden Sea

were led by a care for the environment on the one hand and support for economic growth on the other hand, in this period policy paradigms were led by insecurity but above all emotional aspects. Later that year, elections resulted in a new cabinet. As of today, the parties have not agreed on their position towards the Wadden Sea.

5.3 Characteristics of the Cost-benefit analysis

Section 3.4.5 explained how the characteristics of the economic instrument of which the economic valuation process is part are important influences on the choices in the economic valuation process. Important characteristics that were identified are: the use type of the economic instrument, its goal, and its time and budget constraints. This section will explain these characteristics for the cost-benefit analysis of gas extraction in the Wadden Sea, of which the economic valuation process was part.

As part of their campaign, Greenpeace assigned AIDEnvironment to carry out a social cost-benefit analysis on the extraction of gas in the Wadden Sea. This cost-benefit analysis was to specifically include the expected damage of gas extraction on the natural functions of the Wadden Sea. The *use type* of the economic valuation process, therefore, was project evaluation. The project was the gas extraction by NAM in the Wadden Sea, which would be evaluated using a social cost-benefit analysis in which ecosystem functions played a key role.

The *goal* of the study as stated in the report was to show that certain assumptions made in the NAM studies on the effects of gas extraction resulting in a decrease of the bottom of the Wadden Sea were disputable, and to make the exchange of different activities in the Wadden Sea quantitative. Any intervention in the Wadden Sea should rest on a social cost-benefit analysis that incorporates the effects of these interventions on the ecosystem. Quantification of these effects would allow for an integrated analysis that may result in a different outcome than NAM had stated in the results of their analyses (Wetten, et al., 1999: 2). Ultimately, however, the goal of the cost-benefit analysis was to influence political decision making. The study was published in a time when the debates on gas extraction within the governments were at its peak, and the study was assigned to be used as ammunition by Greenpeace in their political lobbying activities²⁹.

²⁹ The report was followed-up by a second separate report in which the support and opinions of Dutch economists for a social cost-benefit analysis was researched (Joordens et al., 2000).

Initially, the assignment was to carry out a long-term in-depth research on the Wadden Sea in which AIDEnvironment would act as a project leader. AIDEnvironment would co-operate with the Center for Energy-Saving and Clean Technology, CE (Centrum voor Energiebesparing en Schone Technologie), where CE would provide the economic expertise. The research was to be exhaustive (one to two years), the *budget* was extensive, and many different institutes were to be involved. However, a few weeks after the start of the research, the discussion on gas extraction in the Wadden Sea entered political debate and Greenpeace asked AIDEnvironment whether they would speed up the research and perform the research by themselves - CE was asked to peer review the draft report. AIDEnvironment accepted as they shared the sympathies of Greenpeace with the Wadden Sea, and the result was an economic valuation study performed in a relatively short time period (within half a year), based on quick estimates. The first draft, a first summary of the main report, was made under great *time-pressure*: a conflict was developing in the beginning of 1999 in the Dutch cabinet when Minister Pronk stated he wanted to end the everlasting concession for gas extraction, and Greenpeace wanted the study results to play a role in the discussions that followed. The summary report was published in June 1999, and its conclusions were that the damage caused by gas extraction exceeded the benefits of gas extraction as calculated by NAM. The final report was published in September 1999.

5.4 The Stakeholders Context

5.4.1 Direct and Indirect Stakeholders

In the discussion of the stakeholders' context of the economic valuation process in section 3.3.1, two groups were classified: (i) stakeholders directly involved in the economic valuation process; and (ii) stakeholders not directly involved in the economic valuation process. For the economic valuation process of the Wadden Sea, the following key *direct stakeholders* are distinguished:

1. **Principal:** Greenpeace Netherlands
2. **Contracting party:** AIDEnvironment
3. **Steering/Advisory Committee:** van den Bergh (Vrije Universiteit Amsterdam), de Groot (Wageningen Universiteit) en van Gelder (Contrast Advies)
4. **Interviewed and Consulted Persons:** miscellaneous
5. **Peer Review Group:** Pen, Heertje, Brans (University of Amsterdam, Faculty of Law), and Davidson (Centrum voor Energiebesparing en Schonere Energie).

The *principal* of the cost-benefit analysis of which the economic valuation process is part is Greenpeace Netherlands. Since 1993, when the moratorium on gas extraction in the Wadden Sea was coming to an end, Greenpeace had been campaigning against gas extraction in the Wadden Sea as part of a coalition of 12 Dutch environmental organizations. Each organization approached the Wadden Sea dispute from its own strategic viewpoints. Greenpeace objects to any gas drills in the Wadden Sea and pursues a "...moratorium on the drilling and extraction of gas, also from land and the North Sea." (Greenpeace, 1998). According to Greenpeace, gas extraction result in unacceptable risks in terms of accidents (such as blow-outs and accidents with ships running into drilling platforms) and a decrease in the bottom of the Wadden Sea that, in combination with a rising sea level, affects particularly the migratory birds that rest in the Wadden Sea twice a year. As the area is such a unique ecosystem, any human interventions that may affect the existence of this ecosystem should be prohibited.

Greenpeace Netherlands was established in March 1978, initially as a support committee for Greenpeace International³⁰. It is now one of the largest environmental organizations in the Netherlands. Greenpeace describes itself as an "...international, independent environmental organization that challenges global environmental problems and extorts solutions that are essential for a healthy, 'green' future." (Greenpeace, 2002). The focus of Greenpeace used to be predominantly on oceans, seas and rivers, but has tackled other problems in the past years, including climate change and genetic manipulation. From Greenpeace, two people initiated the study of the Wadden Sea, and neither of the two had a background in economics. Both persons supported a belief that economic valuation could result in useful, additional arguments in their campaign against gas extraction in the Wadden Sea - as a strategic application.

Greenpeace selected AIDEnvironment as their *contracting party* to carry out the cost-benefit analysis. AIDEnvironment was selected because they were perceived by Greenpeace to have similar viewpoints, and the line they intended to follow in their research seemed attractive to Greenpeace. AIDEnvironment is an "independent, non-profit research and consultancy company" that works on the "...conservation and reparation of diversity

³⁰ Greenpeace International was established in 1971 when the United States wanted to perform nuclear tests on the Island of Amchitka, Alaska. A group of Canadians decided to go to the island to direct the attention of the world on the activities of the United States on this island (Greenpeace website, March 2002).

and resilience of the natural environment.” (AIDEnvironment, March 2002). Although it is a commercial organization, it pursues ideological goals. Its clients are Dutch ministries and provinces, non-governmental organizations, businesses, the European Commission, the United Nations and the World Bank. The assignment on the Wadden Sea was their first assignment for Greenpeace in the area of water management. Their key disciplines are ecology, biology, nature management and spatial arrangements.

From AIDEnvironment, four people worked on the study of the Wadden Sea, of which one had an economics background, while the others had an ecological background. The expertise of AIDEnvironment therefore lay in the field of ecology and less in economics. In the initial plan, CE would provide the economic expertise, while AIDEnvironment would provide ecological advice. As was explained in the previous section, time constraints changed the situation and AIDEnvironment was asked to perform the study on their own, requiring them to obtain economic expertise elsewhere. For these reasons, AIDEnvironment consulted Professor van den Bergh of the Free University of Amsterdam for the theoretical background on economics, Dr. de Groot of Wageningen University for theoretical background on ecology, and Mr. van Gelder of Contrast Advies as a gas-expert. The three people together formed what was similar to a *steering committee*. The steering committee gave guidance on theory and basic understanding of economic principles, rather than guiding the calculations and assumptions.

After Greenpeace had asked AIDEnvironment to speed up the research, time placed major constraints on the research activities. While the initial objective was to perform an extensive research on the economic values of the Wadden Sea, AIDEnvironment was suddenly faced with a situation in which numbers needed to be on the table within a very short time. There was no time to interview people and collect extensive data. Instead, the *interviewed and consulted people* consisted of anybody they could obtain relevant data from that would allow them to make their calculations. Most of these conversations were held by telephone.

When the first summary report was published, it was proofread by a *peer review group* consisting of four experts: Professor Dr. Pen, Professor Dr. Heertje, Dr. E. Brans (University of Amsterdam, Faculty of Law), and Dr. Davidson (Centrum voor Energiebesparing en Schonere Energie). The reactions to the report were to be done in writing, and other than this no

contact was established between the experts and AIDEnvironment. According to Dr. Davidson, his comments were quite fundamental to the research and, seen the time limit and importance of the research in the Greenpeace campaign, therefore little of his comments were processed.

In the second group of stakeholders, *indirect stakeholders* involved in the economic valuation process, the following key actors can be distinguished:

1. Netherlands Petroleum Company (NAM)
2. Tineke Witteveen
3. Minister of Economic Affairs
4. Minister of Environment
5. Wadden Association

One of the key indirect stakeholders in the economic valuation process was the Netherlands Petroleum Company (*NAM*). This is the company that wanted to extract gas in the Wadden Sea in the first place and against whom Greenpeace aimed their campaign in which the economic valuation was to play an important role. Its stake lay in the fact that it desired an outcome of the cost-benefit analysis of gas extraction in which economic benefits would exceed the costs (including environmental costs). *NAM* therefore disagreed with the negative outcome of the study, even more since their extensive and expensive studies by experts showed very limited environmental effects of gas extraction. These studies were immediately blown away by what *NAM* perceived to be a very quick-and dirty cost-benefit analysis.

NAM consists of two shareholders Shell and Esso that each own fifty percent of the stock. Its activities concentrate on the exploration and extraction of petroleum and gas in the Netherlands and in the Dutch part of the Continental Plate. It was formed in 1947 after a Shell company discovered the oil field Schoonebeek in 1943 and Esso and Shell decided to unite forces. It is now the largest producer of gas in the Netherlands.

NAM's interest in gas extraction in the Wadden Sea are commercial. After the extraction of gas, it sells this gas to the Netherlands Gas Union (*Gasunie*). It has been calculated that the Wadden Sea houses at least forty billion m³ of gas and *NAM* has already mobilized its equipment to extract this gas – it only needs to start the production from certain places on the mainland. According to *NAM*, gas extraction form no threat to the environment. Furthermore, the Netherlands needs gas and it may be even more environmentally friendly to extract it in the Netherlands under very

strict supervision and environmental laws then to import it from a country like Russia where such supervision and laws are often lacking. Another argument concerns the “small-field policy” (*kleine velden beleid*) of the government in which the large gas field in Groningen is to be spared as much as possible. A ban on extraction in the Wadden Sea may require a breaking of this policy as gas continues to be in demand.

A second important stakeholder in the economic valuation process was Ms. *Tineke Witteveen*. Tineke Witteveen was a member of the Labor Party (PvdA) in the Lower House, where she focussed on economic affairs, finances, water and nature management. In 2000 she became the official spokesperson in the debate about gas extraction in the Wadden Sea. She is known to oppose gas extraction in the Wadden Sea and has presented motions in the Lower House to stop gas extraction. She had close contact with Greenpeace and was aware of the cost-benefit analysis on gas extraction that AIDEnvironment was carrying out. Her stake in the economic valuation process was a positive outcome such that it would be applicable in her arguments in the government and as such use the study in the Lower House debates.

From the government arena, two further stakeholders can be distinguished: the *Minister of Economic Affairs* (MinEZ) and the *Minister of Environment* (VROM). The mission of the MinEZ is the promote sustainable economic growth (MinEZ, 2002), and its minister (Ms. Jorritsma) has been a fervent supporter of gas extraction in the Wadden Sea. From a (narrow) economic perspective, gas extraction are profitable for the Dutch economy and, in the case of gas exports, for the state income. The mission of the Ministry of VROM, on the other hand, is care for a sustainable quality of living space (VROM, 2002). Its minister (Mr. Pronk) has been opposing gas extraction in the Wadden Sea, and although officially opposed to the latest government decision to completely ban gas extraction, he claimed not to be unhappy with the decision either (Volkskrant, 2002). Mr. Pronk was aware of the cost-benefit analysis of Greenpeace and like Tineke Witteveen had a stake in a positive outcome of the economic valuation process as an alibi in the Lower House debates in November 2002.

The fifth key stakeholder in the economic valuation process is the *Wadden Association*. This association was established in 1965 as a result of the government plans to construct two dams from the Wadden Sea island of Ameland to the mainland. Its short-term goals are to pursue a ban on gas extraction, mussel seed fishery and on mechanical cockle fishery in the

Wadden Sea. In the long run, its goals are to create efficient national and international rules and regulations that protect the Wadden Sea (Waddenvereniging, 2002). It has approximately 50,000 members and receives its income from donations. The Wadden Association formed a coalition with Greenpeace and several other nature and environmental organizations against the gas extraction in the Wadden Sea. It was aware of the intentions of Greenpeace to assign AIDEnvironment the cost-benefit analysis on gas extraction, but played a limited role in the study itself. However, it had a similar stake in the outcome of the study as Greenpeace did in the sense that it desired a positive outcome that could be used in their collective campaign against gas extraction. The Wadden Association was also present during the official presentation of the study to the media, as were the other nature organizations of the coalition.

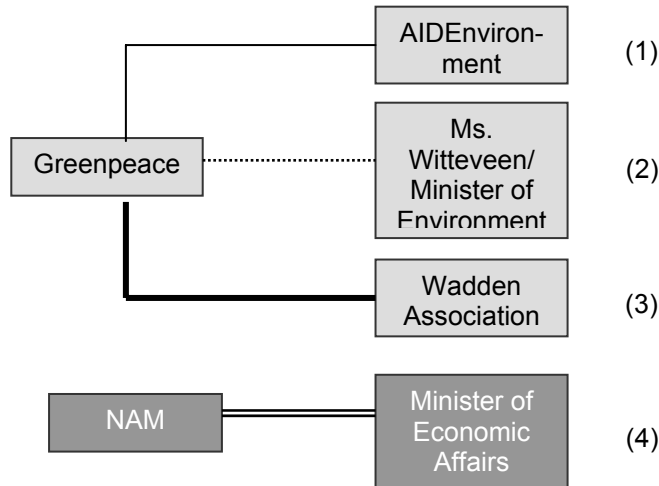
5.4.2 Stakeholder Relationships

In the previous section the key stakeholders in the economic valuation process were distinguished. This section will explain the most important relationships between these stakeholders in terms of the theoretical discussions of section 3.3.2. In this section, two types of relationships were distinguished - coalitions and interest groups. The key relationship in any economic valuation study is between the principal and the contracting party. These stakeholders will generally form a coalition when the pay-off of forming a coalition exceeds the pay-off of engaging in interest group politics. The pay-off will be higher when interests between the two stakeholders converge, which is likely to happen when ideology or beliefs converge and when functional goals converge. It was explained that the principal and the contracting party have at least one functional goal in common, namely the execution of the economic valuation study; whether their ideology and beliefs converge depends on the valuation study and stakeholders involved.

The relationships between other stakeholders in the economic valuation process may also be analyzed along the lines of coalitions and interest group politics. It is likely that different coalitions will form among the stakeholders, and that some of these coalitions will compete with other coalitions in interest group politics. Coalitions will form among stakeholders with converging functional goals and converging perspectives towards nature and economic issues. Conversely, coalitions will compete with other coalitions that have different goals and perspectives.

In the cost-benefit analysis process of gas extraction of which the economic valuation study was part, four *coalitions* can be distinguished. These coalitions are presented in Figure 9.

Figure 9 Coalitions in the Cost-Benefit Analysis of Gas Extraction in the Wadden Sea



The *first* coalition is formed between the two key stakeholders in the valuation process: the principal of the valuation study, Greenpeace, and the contracting party, AIDEnvironment. Recognizing that both parties have different subjective goals and objectives as organizations, they nevertheless share similar interests within the project. Their most important functional goal concerning this economic valuation process converged in the sense that both were interested in carrying out the economic valuation study and more importantly a positive outcome where costs of gas extraction would exceed the benefits. A more specific shared functional goal within the economic valuation process was that both parties were determined to show that certain assumptions made in the NAM studies on the effects of gas extraction were disputable.

The ideology of AIDEnvironment and Greenpeace regarding the extraction of gas from the Wadden Sea also generally converged. First of all, their general viewpoint on the Wadden Sea was a hands-off approach: the area being a unique ecosystem in which any human interventions possible harming this ecosystem must be prohibited. Secondly, both Greenpeace and AIDEnvironment rejected fundamental assumptions regarding gas extraction made by NAM in their studies on the effects of gas extraction on the environment. Their criticism on NAM studies was based on the argument that NAM did not take account of the possibility of a total

collapse of the Wadden Sea. Both AIDEnvironment and Greenpeace view the Wadden Sea as a vulnerable, self-organizing and non-linear system that is already affected by natural forces such as winds that increase the possibility of a total ecosystem collapse. Human interventions may bring this point of collapse closer. The problem is that nobody knows exactly where this point is - once the system collapses, however, there is no point of return. Greenpeace and AIDEnvironment therefore believe that in view of the precautionary principle, even the slightest possibility of a total system collapse is reason enough to leave the Wadden Sea alone. One of the interviewed persons clearly stated that AIDEnvironment shared sympathies with the viewpoints of Greenpeace on this aspect. The distribution of power within this coalition among the principal and contracting party is relatively even – there was a common understanding that the goal to stop NAM from extracting gas in the Wadden Sea was important and both stakeholders pursued this goal together.

Two other coalitions are formed between the principal and indirect stakeholders. The *second* coalition is between the principal (Greenpeace), Ms. Tineke Witteveen and the Minister of Environment, Mr. Pronk. First of all, Greenpeace, Mr. Pronk and particularly Ms. Tineke Witteveen shared the same ideology towards nature and economics – the Wadden Sea is a valuable and vulnerable nature area that should not be affected by human influences, no matter what the economic benefits. Therefore, gas extraction in the Wadden Sea should never be allowed. Secondly, their functional goal regarding the economic valuation process was equal: both were interested in the economic valuation study such that it may provide additional arguments and thus be of use in the debate on gas extraction. The power within this coalition lies with the politicians as they are the ones eventually making the decisions on gas extraction.

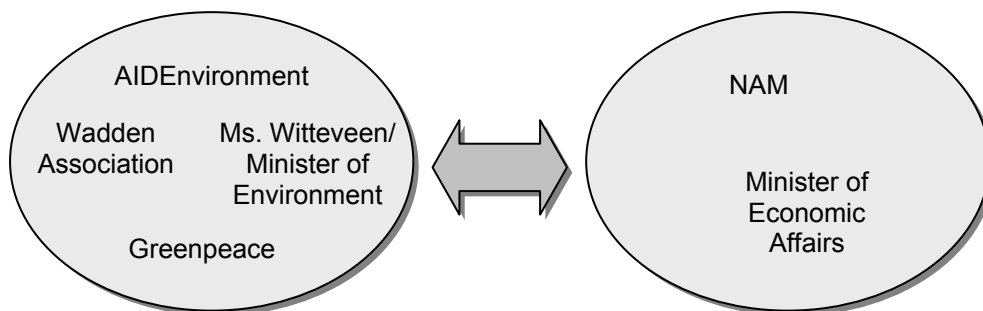
The *third* coalition is formed between the principal (Greenpeace) and the Wadden Association. Their perspectives towards nature and economics converge in the sense that both demand a stop on gas extraction in the Wadden Sea due to the possible negative effects it may have on nature and the environment, no matter how high the economic benefits may be. Furthermore, their functional goals in this economic valuation process also converged as both were interested in the outcome of the economic valuation study to be used as part of their campaign against gas extraction. The power within this coalition is relatively evenly distributed, although it tends slightly towards the Wadden Association as a stakeholder with a

stronger support group among the general public when it comes to the Wadden Sea.

The *fourth* and last coalition in this economic valuation process is formed between two indirect stakeholders of the economic valuation process - NAM and the Minister of Economic Affairs, Ms. Jorritsma. Both parties have the same perspectives towards nature and economics - if it can be shown that the effects on the environment are limited, gas extraction can take place in the Wadden Sea based on economic motivations. Both NAM and the Minister of Economic Affairs would derive a substantial amount of income from the exports of gas extracted in the Wadden Sea, hence their arguments in support of gas extraction are entirely economic. Furthermore, their functional goals with respect to the economic valuation process also converge since both were not interested in the economic valuation study and its outcome. Instead, both parties were interested in the outcome of their own studies on gas extraction in the Wadden Sea that showed gas extraction could take place without risk to the environment. The power within this coalition is relatively evenly distributed – while the minister eventually makes the decision and therefore has political power, NAM has economic power by extracting and selling the gas, which the state then exports for income.

Now that the different coalitions have been explained, it is interesting to see how the different coalitions act in terms of interest group politics. This is presented in Figure 10.

Figure 10 Interest Group Politics in the Cost-Benefit Analysis of Gas Extraction



The four coalitions are engaged in *interest group politics* along one major line. Greenpeace and its three different coalitions form one larger coalition, while the coalition between NAM and the Minister of Economic Affairs, forms the other. These two larger coalitions are engaged in interest group politics with each other. Both coalitions have diverging ideologies and functional goals. While the larger coalition formed by Greenpeace pursues protection of the Wadden Sea based on conservation arguments, no matter what the economic benefits, and have a common goal to carry out the economic valuation study, the coalition between NAM and the Minister of Economic Affairs desires to extract gas from the Wadden Sea based on economic arguments and are not interested in (a positive outcome of) the economic valuation study. During the entire study, neither Greenpeace nor AIDEnvironment contacted NAM concerning the assumptions and calculations in their previous studies, while NAM on the other hand never reacted to the Greenpeace study³¹.

In this economic valuation process, the other stakeholders (Steering Committee, Interviewed and Consulted Persons and Peer Review Group) are less significant in the choices that were made. The Steering Committee played a role in providing the theoretical background and understanding, but had little input in the choices of the economic valuation process. The Peer Review Group was given the chance to give input into the choices that were made, but it became clear that little use was made of their comments³². Lastly, the Interviewed and Consulted Persons had input in the form of data input and in that sense had a major influence on the outcome of the valuation process, but less so on the actual choices made during the process itself.

5.5 Choices in the Economic Valuation Process

This section will discuss the characteristics of the economic valuation process based on the theory of section 3.2, where it was explained how the different formal stages in an economic valuation process can be summarized under pre-assessment choices and assessment choices. This

³¹ According to the interviewed of NAM, in the time period the report of AIDEnvironment was published NAM was a somewhat “closed” organization that basically had limited contact with other stakeholders. The result is that no stakeholders desired to discuss aspects on gas extraction with NAM.

³² One of the interviewed that formed part of the Peer Review group stated that his comments were quite fundamental, so that the changes he recommended would have taken too long a time, which neither the principal nor the contracting party had. As a result, he stated, little was done with his comments.

section will not explain and account for the types of choices made in the economic valuation process as this will be the task of the next section. Hence, only a characterization of the choices in the economic valuation process will be given.

In the *pre-assessment choices*, five decisions need to be made. A *first* decision concerns the definition of the phenomenon that is being studied, which is one of the key decisions in the economic valuation process as it completely influences the choices that follow. In the economic valuation study on gas extraction, the phenomenon is defined as gas extraction in the Wadden Sea. This decision was made by Greenpeace and was part of the assignment they gave to AIDEnvironment. *Secondly*, after the phenomenon is defined, the stakeholders need to decide on the project-alternative, the best alternative to the project. In this cost-benefit analysis, the project-alternative is defined as doing nothing or current policy, which is compared to a scenario of a total blowout.

Third, the stakeholders need to decide on the parties that are affected and hence to be included in the analysis. In this study, the selected economic instrument was a social cost-benefit analysis, and therefore parties bearing the costs as well as parties reaping the benefits of gas extraction are included. This choice was made by Greenpeace, who intended to apply the tool in order to create a more coherent image of the net benefits of gas extraction for the Dutch society (Wetten et al., 1999: 2). The ecological functions that could possibly be affected by gas extraction played a particularly significant role. According to AIDEnvironment and Greenpeace, ecological effects of gas extraction had largely been ignored in the calculations thus far carried out by the government and NAM, and hence an integrated analysis was necessary that particularly incorporated these effects. The *fourth* choice is where to draw the geographical boundaries of the area that will form the focus of the economic valuation process. In the valuation process, the Wadden Sea area is delineated according to “ecological functioning” (AIDEnvironment, 1999: 13). This is a delineation that describes the Wadden Sea in a broad sense³³, and is based on ecological processes and functions. The total area of the Wadden Sea in the study is set at 662.451 hectares, compared to an area of 488.000 hectares that was used in the government bill. AIDEnvironment made these choices, in consultation with Greenpeace. A *fifth* choice is to identify the impacts. In this economic valuation study, the choice was approached

³³ As opposed to the delineation of the Wadden Sea according to the definition of the Ramsar Convention, which is smaller.

by first making an exhaustive inventory of all ecological functions in the Wadden Sea, and secondly making a selection of relevant functions to be quantified. The inventory of functions was made by AIDEnvironment, based both on the publication of de Groot's (1992) publication "Functions of Nature" and on their own expertise. This inventory was for a large part already presented as part of the initial quotation of AIDEnvironment. The *sixth* and last step in the formal pre-assessment choices is to identify the impacts to actually be valued. This selection was made from the inventory of functions in step four and was based on the following selection criteria: (1) the function contributes to the sustenance of the typical characteristics of the Wadden Sea; (2) the function is relevant in respect to the possible effects of gas extraction in the Wadden Sea; (3) the function and its related values can be monetarized; and (4) the function makes a significant contribution in monetary terms to the total economic value of the Wadden Sea. As a result, the following functions were selected and quantified:

- CO2 storage
- Flood protection
- Mitigation of salt spray
- Strategic drinking water stock
- Purification of water
- Pest control
- Natural growth of land
- Nature
- Nursery mussel
- Nursery plaice and sole
- Nursery shrimp
- Recreation and tourism
- Production of mussels
- Production of cockles
- Production of worms
- Production of shrimp

Interestingly, not all of these quantified functions were actually destined to be part of the cost-benefit analysis. A second selection was made from the above list of functions to be included in the cost-benefit analysis. These are functions actually affected by the gas extraction of NAM in the Wadden Sea based on their own analysis. In other words, an *additional step* in this cost-benefit analysis was made – before the relevant functions for the cost-benefit analysis were selected and monetarized, the entire Wadden Sea ecosystem was quantified. The selection of the effects of gas extraction to actually be included in the cost-benefit analysis resulted in the following functions:

Valuation of Water

1. Effects on dike safety
2. Strategic drinking water stock
3. Water purification
4. Floods
5. Loss of land
6. Nature
7. Nursery function
8. Recreation and tourism
9. Production function

In the *assessment choices*, the *first* decision concerns how to quantify the functions into economic values. These choices were made by AIDEnvironment. For the quantification of all ecological functions of the Wadden Sea during the additional step of the cost-benefit analysis, different valuation methods were applied:

- CO2 storage: Benefit Transfer
- Flood protection: Mitigation Behavior
- Mitigation of salt spray: Dose-Response
- Strategic drinking water stock: Replacement Cost
- Purification of water: Benefit Transfer
- Pest control: Dose-Response
- Natural growth of land: Replacement Cost
- Nature: 'Investment by Public Bodies'³⁴
- Nursery mussel: Market Pricing
- Nursery plaice and sole: Market Pricing
- Nursery shrimp: Market Pricing
- Recreation and tourism: Market Pricing
- Production of mussels: Market Pricing
- Production of cockles: Market Pricing
- Production of worms: Market Pricing
- Production of shrimp: Market Pricing

For the functions that were selected as effects of gas extraction on nature for the social cost-benefit analysis, an interesting distinction in functions was made before quantification. For the functions that are significantly dependent on beaches, dunes, gullies, tidal flats and mud flats, the economic value is calculated as being one-third of the value of the total value of the same environmental functions of the Wadden Sea. This fraction was chosen based on projections that approximately one-third of

³⁴ Explained by AIDEnvironment as "...investments in ecosystem protection by public (government) institutions, which can be perceived as reflecting the aggregated individual Willingness to Pay..." (AIDEnvironment, 1999: 16).

the natural functions of the Wadden Sea (between Harlingen/West point of Terschelling and Pieterburen/East point of Schiermonnikoog) would disappear as a result of gas extraction in the Wadden Sea. The researchers expect that one-third of the following functions would be affected:

1. Water purification
2. Nature
3. Nursery functions
4. Recreation and tourism
5. Production functions

For the remaining effects of gas extraction, separate valuation methods were applied:

6. Effects on dike safety: Market Pricing, based on NAM study
7. Strategic drinking water stock: Replacement Cost
8. Floods: Mitigation Behavior
9. Loss of land: Dose-Response

The *second* element in the assessment choices involves choices in the discounting process. In this valuation study, a time period of 50 years was taken with a discount rate of 4%. The *third* and last step is to select elements to be incorporated in the sensitivity analysis. The sensitivity analysis was carried out for both discount rate and time period: three different discount rates (2%, 4% and 6%) and three different time periods (30, 50, and 70 years) were analyzed. Furthermore, three different scenarios were tested - (i) complete damage one year after gas extraction; (ii) no damage 1-5 years after gas extraction and complete damage 6 years after gas extraction; (iii) no damage 1-5 years after gas extraction, 50% damage 6-10 years after gas extraction and complete damage after 11 years of gas extraction.

5.6 Relationship Between Choices and Their Context

5.6.1 Influences of the Institutional Context

In section 5.2 of this chapter, the context of formal and informal institutions was described for the economic valuation process of gas extraction in the Wadden Sea. The next question becomes what influence elements in this context had on choices made in the economic valuation process.

In the informal institutional context, policy paradigms and scientific paradigms were distinguished. Regarding *policy paradigms*, four key elements can be distinguished for which it can be argued that they played an important role in the economic valuation process. These are:

1. dominance of rational and economic arguments at the time of the economic valuation process
2. institutionalization of environmental problems of the Wadden Sea
3. dominance of an integrated water management approach
4. perception of the Wadden Sea as the Netherlands' last wilderness area

The major influence of these four elements was on one of the first pre-assessment choices, and as such a key choice for the entire economic valuation process – definition of the phenomenon being studied. The phenomenon was defined as the environmental effects of gas extraction in the Wadden Sea. Greenpeace chose this phenomenon as the object of their study in first instance because policy paradigms in the Netherlands made it interesting for them to define it in this way. *First* of all, the discussions in the government at this time were dominated by rational and economic arguments mostly favoring gas extraction in the Wadden Sea. Carrying out a social cost-benefit analysis implied a focus on the economic effects in the broadest sense – not only traditional economic effects were included but also environmental and social effects that have an effect on the economy were part of the analysis. By linking the gas extraction to these broader economic effects, and aiming to derive economic arguments of why gas extraction should not take place, Greenpeace links with the prevailing policy paradigms, dominated by such economic aspects.

Secondly, Greenpeace knew a broad public would be interested in an economic valuation study because the environmental problems of the Wadden Sea had become institutionalized in the minds of many people. The general public in particular but also certain politicians like Tineke Witteveen and the Minister of Environmental Affairs, had become convinced that the Wadden Sea was a vulnerable and valuable nature area that should not be influenced by human actions. Carrying out a study aimed at the negative effects of gas extraction on the Wadden Sea in economic terms in addition to more general environment conservation arguments would further mobilize such people and thus Greenpeace's supporters.

The *third* aspect of influence is the dominance of an integrated water management approach in the Netherlands. Such an approach implies a more ecosystem approach towards water management issues in which

different stakeholders are taken into account. This means that policy had to incorporate not only a single stakeholder of the Wadden Sea (such as the NAM), but also stakeholders like nature organizations, tourists and recreationists. Greenpeace therefore knew that it had an audience also in the government in their campaign against gas extraction. Hence, giving an assignment focussing on the negative aspects of gas extraction again links with the prevailing policy paradigms in which people would actually listen to such arguments.

The *fourth* aspect, the perception of the Wadden Sea as the Netherlands' last wilderness area was also of influence on choices in the economic valuation process. The Wadden Sea was perceived by many, especially towards the end of the governmental discussions, as the Netherlands' last wilderness area. The Netherlands being as heavily populated as it is, has very little nature areas perceived as wilderness areas in which the interventions of humans, although present, remain relatively unnoticed. Hence, the focus of Greenpeace on the negative effects of gas extraction in the Netherlands' last wilderness area was in part determined by the fact that people generally felt sympathy towards this particular nature area.

In the second aspect of the informal institutional context of the economic valuation process are *scientific paradigms*. Two elements of scientific paradigms were distinguished that are likely to influence the choices in the economic valuation process:

1. increased popularity of economic valuation studies
2. dominance of certain economic paradigms

The *first* aspect influences in particular the first element in the pre-assessment choices – the definition of the phenomenon being studied. It was explained in section 5.2.2 that economic valuation was still not very popular in the Netherlands at the time of the gas extraction discussions, however several scientific economic valuation studies were carried out outside the Netherlands that had gained much publicity in the Netherlands. The most notable study was an economic valuation of the world's ecosystems by Costanza et al. (1997). After reading such studies Greenpeace learned the added value of economic valuation studies for their campaigns, namely the possibility to highlight the economic value of ecosystems and thereby utilize it as ammunition in their campaign. It is for this reason that they approached the economic side of Wadden Sea gas extraction, as opposed to a tradition of only focussing on ecological and

biological effects. They knew that the term ‘economic’ would gain them support, while at the same time allowing them to pursue their goals.

The dominance of certain economic paradigms with the key stakeholders, the *second* element of influence, influenced choices throughout the economic valuation process. In particular, it influenced the last two elements in the pre-assessment choices and the first element in the assessment choices. In all these elements, it can be seen that an interesting mix of paradigms leaning towards a more traditional neoclassical economics and a more ecological economics is supported, depending on how well each of the paradigms supported the goal of the principal. In the determination of which impacts to identify, ecological economics, due to its basis in ecology, was more dominant since it allowed a broader perspective towards ecological functions and, more importantly, ecological relationships. It therefore allowed the stakeholders to integrate an extensive list of functions in their study, ranging from the more typical economic analysis functions like production functions to the less typical functions to be included in an economic valuation study like pest control, mitigation of salt spray and natural growth of land.

The next step, identification of impacts to be valued however takes a more neoclassical economics approach due to the additional step that was taken in the economic valuation process. This step involved the quantification of the entire Wadden Sea before choosing which functions to incorporate in the cost-benefit analysis. The approach is more neoclassical because the authors quantify all ecosystem functions, even those that most ecological economists would never do. The most notable one is “nature”, a controversial function to be valued among economists. Generally, the neoclassical economists would support quantification of such a function, while ecological economists oppose this quantification since nature cannot and should not be quantified (see the discussion in section 2.3.2). Obviously, taking a more neoclassical approach to the quantification of Wadden Sea functions allows the stakeholders to derive a higher economic value.

In the first element of the assessment choices, the quantification of impacts into monetary units, the neoclassical economics paradigm also dominated. While ecological economics often questions the use of many economic valuation methods, neoclassical economics has a wide range of valuation methods at hand. The authors of the study applied a relatively large number of different valuation methods to obtain their quantitative values: dose-

response, mitigation behavior, replacement cost, benefit transfer (receiving much criticism even among neoclassical economists), market pricing, and the most interesting one, a non-textbook valuation method “investment by public bodies”. The latter method was based on the income derived from members’ donations and payments to a Dutch nature organization (Natuurmonumenten) and was applied to calculate the economic value of nature. It was argued this represented people’s willingness to pay for nature. This method, however, raises many questions – for example, are all these people would actually willing to pay this money for the nature function of the Wadden Sea or do they donate to protect other nature areas? Or perhaps do the people donate based on other motivations like buying off guilt?

The third element in the institutional context of the economic valuation process is the set of formal institutions, or *rules and regulations*. With respect to the economic valuation process, one must think in terms of guidelines or standards of procedure. The following three aspects were distinguished in section 4.2.4 as being of influence on the choices in the economic valuation process:

1. Rules and regulations for the economic instruments
2. Rules and regulations economic valuation process
3. Environmental rules and regulations

First, no rules and regulations existed regarding economic instruments. The OEEI report (a guideline for social cost-benefit analysis) was not yet published. Although this guideline says little about economic valuation of ecosystems, it does provide guidance for such economic instrument in this case study (Eijgenraam et al., 2000). It can be argued that the lack of such guidelines influenced some of the choices made in the economic valuation process – in other words, some of these choices may have been made differently had such guidelines existed. The basis for these arguments is the OEEI guidelines themselves, which have influence on the following choices. Its first influence is on the definition of the project-alternative, one of the most criticized aspects of the analysis. The guidelines are clear that this alternative is not necessarily “doing nothing” or based on current policy, but instead a combination of the best alternative allocation of the available investment means and the best possible alternative solution to the problem the project deals with. The project alternative in this cost-benefit analysis, however, was defined as “doing nothing”, and may have been defined differently had the guidelines been available. The second influence

is on the identification of impacts. The OEEI guidelines state that the environmental impacts should be linked to the impacts identified in the Environmental Impact Assessment (or MER). Although the principal of this study was not a public organization, it could have followed the MER reports or other environmental studies that had been carried out on gas extraction in the Wadden Sea. Instead, the principal and contracting parties decided not to follow the MER reports and define their own environmental impacts of gas extraction. The third influence is on the identification of impacts to be valued. The OEEI guidelines explain how only those effects that can actually be quantified should also be quantified, and for those functions for which this may be difficult, PM-posts should be created in which these effects are qualitatively incorporated in the analysis. In the analysis on gas extraction, however, no effects were incorporated qualitatively and hence no PM-posts were created. Instead, all effects were quantified, no matter how difficult this process was.

Secondly, it can be argued that the lack of formal institutions or guidelines for the economic valuation process had influence on the choices in the process. Such guidelines could hypothetically influence all of the choices in the valuation process except for the first choice, definition of the phenomenon, which is entirely dependent on the principal. However, some of these choices could also be covered by other guidelines, such as the rules and regulations for the economic instrument, as was explained in the previous section. Nevertheless, choices remain that are more specific to the economic valuation process that are not covered by these guidelines. For these choices, specific guidelines could be set up to guide decisions. Guidelines for the economic valuation process could direct the definition of the affected parties, about how to define geographical boundaries, which valuation methods are the most appropriate for the valuation of certain environmental impacts, the height of the discount rate for projects that specifically affect the environment as well as the length of the time span in the discounting process (see section 3.2 on discussions about the height of the discount rate and length of the time period for projects that affect nature) and, lastly, what factors to test in the sensitivity analysis.

Third, the EU Birds and Habitat directives were the most important environmental regulations affecting the Wadden Sea, and they were likely to have had influence on choices in the economic valuation process. More specifically, they affected the definition of the phenomenon being studied – gas extraction in the Wadden Sea. Greenpeace knew the Wadden Sea was covered by the Directives, and by showing that gas extraction would result

in major environmental costs would be countering the EU Directives. On basis of these Directives, NAM would then not be allowed to extract gas in the Wadden Sea.

5.6.2 Influences of the Characteristics of the Economic Instrument

A second element in the context of the economic valuation process that was distinguished in section 3.4.5 are the characteristics of the economic instrument in which the economic valuation process is applied. In this case study the economic instrument is the social cost-benefit analysis. The following elements are likely to have had an influence on the choices of the economic valuation process:

1. Use type
2. Goal
3. Time constraints
4. Budget constraints

While the first three elements had significant influence on the choices in the valuation process, the last element (*budget constraints*) played no role. There was plenty of money to carry out the valuation study and any potential limits were completely overshadowed by the time constraints.

The first characteristic of the cost-benefit analysis is its *use type*, which in this case study was project evaluation. This use type probably had an influence in particular on the second choice of the economic valuation process, determination of the parties affected, as well as the choice of impacts to identify. Its influence on the choice of parties can be found in the fact that the project was being evaluated with a social cost-benefit analysis. Hence, the parties to take into account are those that lose (for example the environment) and those that benefit (NAM). The use type also influenced the choice in the identification of impacts. Greenpeace and AIDEnvironment felt that the studies carried out by NAM on gas extraction in the Wadden Sea only illuminated the benefits. Since a social cost-benefit analysis includes both social benefits and social costs, it provided Greenpeace with the mechanism to also integrate the environmental costs of gas extraction. To make this as extensive as possible, an exhaustive range of functions was selected.

The second characteristic of the cost-benefit analysis is the *goal* of the cost-benefit analysis. This goal was to influence the political decision making process on gas extraction in the Wadden Sea, and was a key influence on the choices throughout the economic valuation process. The goal was part of a larger campaign of the environmental organizations including

Greenpeace to completely ban human activities in the Wadden Sea. The goal influenced the decision on the phenomenon that would be studied in the economic valuation process. The study focussed on the economic value of environmental effects of gas extraction in the Wadden Sea and aided Greenpeace in the pursuit of their goals – it allowed Greenpeace to show what the economic consequences would be for Dutch society if the cabinet decided to allow gas extraction. Secondly, the goal influenced the determination of the project alternative. The project-alternative was defined as “doing nothing”, which was compared with a scenario of a total blowout. These are two extremes being compared, which result in the highest possible outcomes of negative effects of gas extraction on the Wadden Sea and hence best serves the goal of the economic valuation process.

Third, the goal influenced the choice of parties that are affected. Valuing, and thereby highlighting, the parties that bear the costs of gas extraction in addition to those benefiting would provide Greenpeace with additional ammunition in their campaign. The goal also influenced the drawing of the geographical boundaries. Greenpeace decided to draw these boundaries according to ‘ecological functioning’ that sets the area in relatively broad dimensions. Other boundaries could have been used, such as those of the Ramsar Convention on Wetlands. However, these provide smaller areas. By choosing a larger area, the outcome of the economic valuation process of ecological functions would be higher and hence the cost-benefit analysis would be more likely to lean towards a net cost of gas extraction. Another influence of the economic instrument goal is on the choice of impacts to identify. As was explained in section 5.5, a wide range of functions was selected for quantification. It was also explained that an additional step was taken in this economic valuation process, namely a quantification of the entire Wadden Sea ecosystem before a selection of the functions that would actually be affected by gas extraction and thus be incorporated in the cost-benefit analysis. This additional step in the selection of functions serves the goal of the cost-benefit analysis well. By valuing the entire Wadden Sea first, the study has the opportunity to show what the value of such an ecosystem actually is before cutting into this value to select the functions actually affected by gas extraction. The selection of functions to be incorporated in the social cost-benefit analysis, the sixth step, was furthermore quite extensive. The most notable choice here was nature, a relatively vague and disputed value to be quantified. However, in light of the goal of the study, as many functions as possible needed to be quantified to obtain a higher value on the cost side of gas extraction.

Another choice affected by the goal of the economic instrument is the quantification of impacts into monetary units. All sorts of valuation methodologies were applied, depending on what type of data was available, but no explanations were given as to why a particular valuation method was applied. Furthermore, many of the methods were applied in a “quick and dirty” manner, where the valuation method itself played the role of guiding the contracting party for types of information. Anything was done to obtain as many economic values as possible. Once more the most notable valuation method was “investment by public bodies” for the nature function. This method is not a standard textbook valuation methodology and receives much criticism. In theory, the only method that can calculate (existence value of) nature is Contingent Valuation. However, there was not enough time available, so one option could have been to leave this function out of the actual quantification of impacts and instead mention the impact qualitatively. The party, however, decided to apply a less conventional valuation method so that the economic value of the negative effects due to gas extraction would increase, and thereby better pursue their goal. Another interesting calculation approach was performed during the quantification of functions to actually be incorporated in the cost-benefit analysis. The economic value of five functions was first calculated for the entire Wadden Sea, and then multiplied by one-third to obtain the costs of gas extraction. This fraction is based on their own projections and although the effects on each function will differ, this approach was taken as there was not enough time to calculate the effects on each function separately. In light of the goal of the valuation study, some value may be better than none. This brings us to the last interesting quantification approach, namely that all the values are based on a worse case scenario - a total collapse of one-third of the Wadden Sea ecosystem. The likelihood of this scenario is still heavily disputed, but use of this scenario in the calculations provided the contracting party and more importantly the principal with much higher economic values, which suits their goal.

The last two choices on which the goal had an influence are discounting and sensitivity analysis. In the discounting process, the choice of the discount rate was not so much influenced by the goal of the cost-benefit analysis since the contracting party applied the standard discount rate for government projects in the Netherlands. However, the choice for the time span over which the economic values were discounted may have been influenced by the goal, since the maximum time period possible under a discount rate of 4% was applied. Any economic values after a period of fifty years would approach zero when discounted. A maximum time period over which functions are discounted result in a higher total economic value

on the cost side of the cost-benefit calculations of gas extraction. This is clearly in the interest of the principal's goals. In the sensitivity analysis, the elements that were tested were the discount rate, the time period and three different scenarios at which the gas damage would take place. The first two elements are almost standard in sensitivity analyses, but the third element still assumes a complete collapse of one third of the system. No factors that are at the basis of the calculations were however tested, such as physical quantities, assumptions, and shadow prices. Especially these factors are very uncertain in the calculations, and should probably have been tested in a sensitivity analysis. However, this would most likely undermine the economic value calculations and make the entire study less reliable as ammunition in the Greenpeace campaign.

Time constraints, the third element, had a significant influence on the quantification of impacts into monetary units. While initially the study had a time span of approximately two years, time was suddenly limited by Greenpeace due to an eruption of the debate on gas extraction in the government. If the study was to play an important role in these discussions, as Greenpeace had planned, the study had to be completed before a final decision was made. Due to this time pressure, AIDEnvironment had to find (sometimes innovative) ways to quantify the ecosystem functions. The most notable one is the valuation approach towards "nature", which, had there been enough time, would probably have been approached with a time-consuming Contingent Valuation approach. Since this time was not available, the authors needed to find other ways to calculate the economic value of this function and they chose "investment by public bodies", a non-conventional and controversial valuation method.

5.6.3 Influences of the Stakeholders Context

In section 5.4, two aspects in the stakeholders' context of the economic valuation process were distinguished: who these stakeholders are and what their relationships are. In terms of the first aspect, the stakeholders were divided into direct and indirect stakeholders. With respect to the *direct stakeholders*, it was explained that the following key actors had an influence on choices in the economic valuation process :

1. Principal
2. Contracting party
3. Steering Committee
4. Interviewed and consulted persons
5. Peer review group

The stakeholders of most significant influence were the principal, Greenpeace, and the contracting party, AIDEnvironment. The steering committee, peer review group and interviewed and consulted people played a limited role in the choices of the economic valuation process.

The *first* direct stakeholder, the principal, had the most influence on the first four choices in the economic valuation process: decisions concerning the phenomenon being studied, the project alternative, the parties affected, and geographical boundaries. In the economic valuation process, the contracting party and principal both indicated that these choices were made either by Greenpeace or in consultation with Greenpeace. Greenpeace's main goal as an environmental organization is to challenge global environmental problems. With respect to the Wadden Sea, Greenpeace pursues a moratorium on gas drilling and extraction, aiming to keep the area free from human interventions. The fact that the phenomenon was defined as gas extraction in the Wadden Sea is therefore in line with Greenpeace's goals and approaches to protect the environment. The same argument can be made for the second choice, definition of the project-alternative, namely "doing nothing". A comparison of this alternative with a worst-case scenario results in the highest possible economic effects of gas extraction and thus links well with the goals and approaches of Greenpeace to protect the Wadden Sea from human interference. The identification of the parties affected by the project is also influenced by the characteristics of the principal in the sense that the focus was on the parties that would lose from gas extraction in the Wadden Sea. Highlighting the environmental costs of gas extraction converges with Greenpeace's goals to protect the Wadden Sea. Lastly, the drawing of the geographical boundaries was done in consultation with Greenpeace. The fact that this boundary was relatively broadly defined also relates to the goals and approaches of Greenpeace – such a broad definition ensures a higher economic value of ecosystems. A higher economic value implies stronger arguments for the support of a protection of the Wadden Sea.

The *second* direct stakeholder of key importance in the choices of the valuation process was the contracting party, AIDEnvironment. Its main influence was particularly on the last three pre-assessment choices and all assessment choices. AIDEnvironment in fact made most of these choices alone. AIDEnvironment is a non-profit research and consulting company focussing most of its projects on the conservation of ecosystems. Their expertise lies in the field of ecology and biology and they had sympathies with the viewpoints of Greenpeace towards the Wadden Sea. Their goals

are therefore ideological. The determination of geographical boundaries was done in consultation with Greenpeace, and the fact that a broad definition of the Wadden Sea was chosen was, in line with their ideological standpoint towards the protection of the environment. The next choice made by AIDEnvironment concerned the identification of impacts. Again, a large and relatively exhaustive number of functions were included in the analysis, closely related to the ecological concerns of the contracting party. The linking of functions with values is yet another important element that may be related to the goals and ideologies of AIDEnvironment. In first instance, all of the selected functions were in fact selected for quantification, no matter how difficult the process. More economic values would obviously increase the total economic value of the Wadden Sea, which is what AIDEnvironment wanted. However, only some of these quantified functions were to be incorporated in the cost-benefit analysis as effects of gas extraction. The functions that were chosen were, on the other hand, also extensive. Such behavior is also seen in the first choice in the assessment, namely the quantification of functions. All sorts of valuation methods were applied to value environmental functions, even a relatively unknown valuation method “investment by public bodies” to value a relatively debated function “nature”. The goal was again to increase the economic value as much as possible in line with their ideology and goal. The same arguments can be made for the choices in the discounting process, where a maximum time period was applied to increase the present values, and in the sensitivity analysis, where key elements of the economic valuation process were not tested.

The most important *indirect stakeholders* of the economic valuation process were:

1. NAM
2. Tineke Witteveen
3. Minister of Economic Affairs
4. Minister of Environment
5. Wadden Association

Their influence was indirectly on all the choices of the valuation process. However, it is not so much through their individual existence, but through the actual forming of coalitions with other indirect stakeholders and direct stakeholders, and the resulting interest group politics among these coalitions that their influence on the valuation process becomes clear and can be understood. More specifically, the influence of these indirect stakeholders was through their relationship with the principal.

In this case study, four different *coalitions* were formed, as was explained in section 5.4.2 (Figure 11):

1. Principal and contracting party
2. Principal, Minister of Environment and Tineke Witteveen
3. Principal and Wadden Association
4. NAM and Minister of Economic Affairs

The key to the first three coalitions is the principal, Greenpeace. Through its *first* coalition with AIDEnvironment, the contracting party, it could steer the research in a certain direction, even if only through choosing a specific contracting party that fits its goals and perspectives. The existence of this coalition was of major influence on all choices in the economic valuation process as discussed in the previous paragraphs. These choices were made in the interest of the goals and perspectives of both parties in the coalition - the principal and contracting party. Greenpeace's *second* coalition with the Minister of Environment and Tineke Witteveen was also crucial – Greenpeace knew that a positive outcome of the economic valuation process could play a role in the government discussions. Both the Minister and Tineke Witteveen were aware of the economic valuation study and supported the execution of this study due to its possible contribution to their debates. The influence of this coalition was also on choices throughout the valuation process that were likely to result in a positive outcome for the parties in the coalition – Greenpeace, the Minister and Tineke Witteveen. The *third* coalition that Greenpeace formed was with the Wadden Association. This was a relationship that surpassed the time span of the economic valuation study and was thus much older. Both stakeholders shared similar goals and interests in the Wadden Sea. This coalition influenced all choices to pursue a positive outcome of the valuation study – a positive outcome would benefit the strength of their coalition against gas extraction in the Wadden Sea.

The first three coalitions form a larger coalition and engage in interest group politics with a fourth coalition (see Figure 12). The *fourth* coalition is formed between two indirect stakeholders, NAM and the Minister of Economic Affairs. This coalition is of importance for the economic valuation process since these were the two key stakeholders that opposed a ban on gas drills, which resulted in an *interest group politics* relationship with the other three coalitions. The relationship of interest group politics between the two key stakeholders on opposite sides, Greenpeace and NAM, in fact goes back to other incidents. The two most notable incidents are the Brent Spar and Shells' (one of the two shareholders of NAM) role

in Nigeria. In both cases, Greenpeace fought (and in the case of Nigeria still fights) the position Shell took towards the environment; for its one-sided economic interests and environmental negligence. Greenpeace thus had a motivation to increase their power in this interest group politics with NAM. It pursued this power through attempting to fight NAM with their own economic arguments. It is thus likely that most choices in the economic valuation process were made to increase the economic costs of gas extraction so Greenpeace could gain power in their struggle for interests with NAM.

Chapter 6 Two Cost-Benefit Analyses Related to the Rotterdam Port Development

6.1 Introduction

In this chapter, the analytical model presented at the end of Chapter 4 will be applied to two other case studies: a cost-benefit analysis of land reclamation and a cost-benefit analysis of the development of 750 hectares nature and recreation area. The two cases are combined in one single chapter because they have similar elements in their context since both are related to the expansion of the Rotterdam port – the two cost-benefit analyses were executed for two sub-projects that were both related to the port expansion. As was the case in the previous chapter, the aim of the case study analysis is to map both the choices within the process of economic valuation and the context of institutions, economic instrument and stakeholders in which the process is carried out. This is guided by the analytical model of section 4.4. These two case studies will then be compared and contrasted with the first case study of the previous chapter - costs and benefits of gas extraction in the Wadden Sea - in Chapter 7.

6.2 Formal and Informal Institutional Context

6.2.1 Emergence of Formal and Informal Institutions

On 28 May 2001, the Central Planning Bureau (CPB), Netherlands Economic Institute (NEI) and the National Institute of Public Health and the Environment (RIVM) published their cost-benefit analysis on the reclamation of land for the expansion of the Rotterdam port. This was followed by the publication of a second cost-benefit analysis also published in May 2001, carried out by NEI and RIVM on the creation of 750 hectares of new nature and recreation area. Both cost-benefit analyses were carried out as part of the Project Mainport Development Rotterdam (PMR) that

researched the options of an expansion of the Rotterdam port. The PMR consisted of three sub-projects:

1. Land reclamation and nature compensation
2. Creation of 750 hectares new nature and recreation area
3. Improvement of existing port space

The cost-benefit analyses concerned the first two sub-projects. Both studies were published within a complex political and economic context, in which formal (rules and regulations) and informal institutions (policy and scientific paradigms) can be distinguished. In order to understand this context, it is necessary to go back in time and explain the emergence of institutions concerning the expansion of the Rotterdam port in the Netherlands. This discussion will be held according to the time line presented in Table 2.

The city of Rotterdam, situated in the West of the Netherlands on the North Sea, houses the world's largest port, simultaneously the most important port for Europe's mainland. Covering an area of 10,400 hectares, more than 300 million tons of goods are handled every year in the Rotterdam port (RMPM, 2002). Due to an enormous growth in the port's activities, land was reclaimed from the sea between 1970 and 1985 and the first "Maasvlakte", or Meuse plain, was created. This extended the harbor with 3000 hectares. In the decade that followed, activities further increased, and growth projections of the port of Rotterdam showed that in order to meet the increase in demand and thus maintain its competitive position, more land would have to become available for the port (RMPM, 2002). The shortage of space, in particular for the chemical industry, was also discussed in several policy documents (see for example "Port Plan 2010" of the Municipality of Rotterdam, 1993).

In 1993, twenty-three private and public parties agreed to a balanced development of both the economic performance and the quality of the social environment in the Rijnmond area (PMR, 2002). This agreement was called the ROM-Rijnmond agreement, which presented a list of projects and measures that were to lead to a balanced development. One of these projects focused on the possibilities of an expansion of the Rotterdam port through further land reclamations in the sea; the second Meuse Plain. The agreement was followed by a ROM-report in 1995, in which the shortage of space in the port was substantiated. In 1996, the Dutch cabinet recognized the shortage of space in the port and decided to initiate an

exploration into both the need and necessity (in terms of the effects of a shortage on the Dutch economy) and possible solutions to deal with this shortage of space. The starting point in this research was to be the so-called “double objective”: to strengthen the position of the Rotterdam port and simultaneously improve the quality of the social environment. This exploration, called VERM (Verkenning Ruimtetekort Mainport Rotterdam), focussed on a wide range of issues including economics, environment, spatial development, nature, mobility, social costs and benefits as well as the business-economics dimension, and the results were to lead to a cabinet decision in 1997.

Table 2 Time Line Port Development of Rotterdam

1993	1995	1996	1997
→ ROM-Rijnmond agreement	→ Report ROM project	→ Initial decision cabinet & start VERM procedure	→ Nyfer report "Maa\$vlakte" → Project decision following VERM procedure → CPB statement questioning amount of port expansion
1998	1999	2000	2001
→ Starting Note PKB+ procedure & EIA IEE → Nyfer report Golden Brim of Rotterdam	→ PMR Interim Report: "PMR On Course"	→ Unanimous advise ONR to cabinet → Letter to the Lower House: tentative conclusion need port expansion → Press release CPB: no capacity problems → Reaction RMPM on CPB press release	→ Cabinet presents PKB-I and EIA → CPB/NEI/RIVM cost-benefit analyses published & presented → Debate cost-benefit analyses → Report advisory board on cost-benefit analyses → Reaction RMPM on cost-benefit analysis land reclamation → Cabinet agrees with PKB-III
2002			
→ Lower House agrees with cabinet proposal PKB-III → Upper House agrees with cabinet proposal PKB-III			

In May 1997, the research institute Nyfer published a report called “Maa\$vlakte” (Nyfer, 1997), which it had conducted on assignment of the Rotterdam Municipal Port Management (RMPM). This report explained how investments in the Rotterdam port were important for the development of the port and the entire Dutch economy. It also criticized

the calculations that had earlier been carried out by the CPB, in which CPB explained how investments in infrastructure projects could lead to negative economic effects.

The VERM exploration ended and halfway 1997 the cabinet decided that the need and necessity for additional space in the Rotterdam port had been justified. The results of the research showed that the chances of a shortage of space in the Rotterdam port in the near future were pronounced and that this situation was undesirable due to the importance of the port for the Dutch economy. The cabinet recognized that expansion of the port was both necessary and useful and that in light of these spatial developments, the possibilities for an improvement in the quality of the social environment would be utilized. In order to perform more research and set up project activities, the Rotterdam Mainport Development Project (PMR) was established, which consisted of five ministries, the city of Rotterdam, the municipality of Rotterdam and the province of South-Holland (PMR, 2002). The assignment for PMR was very broad, but in principle consisted of an investigation of possible solutions to reach the double objective. When PMR began her tasks in 1998, however, the Rotterdam Municipal Port Management (RMPM) did not receive PMR “with a very warm welcome” (PMR, 2002: 11). In Rotterdam, the RMPM had already decided in its Port Plan of 1993 that an expansion of the port was necessary. Furthermore, RMPM had already started a project for possible land acquisitions in 1994. The RMPM realized, however, that government intervention in this project was necessary for the procedures of spatial planning and financing, and eventually co-operated with PMR (PMR, 2002).

In May 1998 the cabinet decided that the decision making process for the expansion of the Rotterdam port would follow a Core Planning Decision (PKB) procedure. The result of a PKB procedure is a government decision that cannot be reversed – the concrete policy decisions are no longer liable for discussion at decision making processes of the national government or other governments. In addition to the PKB procedure, the cabinet also decided that an Environmental Impact Assessment (EIA) and an Inventory Economic Effects (IEE) would be carried out. The IEE was to focus on the social costs and benefits of the Rotterdam port expansion.

Opinions on the dimensions of the shortage of space in the Rotterdam port were, however, still ambiguous. While the RMPM had published data that showed the necessity for the port expansion by 1000 hectares, CPB

had provided arguments that showed 650 hectares would be sufficient. In September 1998, the research institute Nyfer published another report on assignment of RMPM called “Golden Brims of Rotterdam” (Gouden Randen van Rotterdam, Nyfer, 1998). The argumentation was that old port areas could be used for expensive housing and offices that would result in a value increase of the land. This value increase constitutes income that could then be allocated to the financing of the Rotterdam port expansion. The study received much criticism. Mr. Stekelenburg from the South-Holland Environmental Federation (Zuid-Hollandse Milieu Federatie, ZHF) argued that although such an idea sounded attractive, it was unthinkable as most of the land was already owned by people who would not want to move. Professor Pols of Delft University furthermore criticized Nyfer for stating an idea that is already twenty years old and only benefits RMPM while criticizing its rival CPB. Both statements were made during radio interviews (Argos, Radio 1, 18 October 2002) in the context of a program on the “scientific independence” of Nyfer in its research for such principals as the RMPM. It shows how the conflict between CPB and the RMPM existed from the start of the port expansion project.

After PMR was established, a first key document that was published in June 1999 was called “PMR on Course” (PMR op Koers) (PMR, 1999). In this report PMR concluded that the need and necessity for a port expansion had been substantiated. The path to be taken to deal with the port expansion would be (1) to make the use of existing port space more efficient; (2) to reclaim land from the sea; and (3) to link the port development to the development of 750 hectares of new nature and recreation area. A year later, in June 2000, a compromise was reached with the Consultation Non-Governmental Partners (ONR), a panel of different stakeholders, including environmental organizations, the Province of South-Holland, the Municipality of Rotterdam and the City of Rotterdam. The ONR agreed on 1000 hectares port expansion and 750 hectares of new nature and recreation area and presented a unanimous advice to the cabinet. In July, the cabinet presented its decisions in a letter to the Lower House, where much of the ONR advice had been incorporated. The research task of PMR ended and its activities were now aimed at the preparation of political decision making and establishing the public-private cooperation for further planning and execution of the project (PMR, 2002).

Already in the initial decision of the cabinet in 1996, it was decided that social costs and benefits of the Rotterdam port development would need to be identified. Initially, only an analysis of land reclamation was to be

performed, but the environmental organizations were very interested in a cost-benefit analysis of the 750 hectares nature and recreation area as well, as a support for government decisions. The Province of South-Holland, the delegated principal of this sub-project, was also in favor of such a cost-benefit analysis and the organizations lobbied with PMR for the analysis to be carried out. They succeeded. In August 2000, the social cost-benefit analysis process on the reclamation of land was started and later that year the cost-benefit analysis on the development of 750 hectares of nature and recreation area.

While still working on the cost-benefit analyses, CPB, NEI and RIVM made the press by stating in a tentative report that in the short run no capacity problems were to be expected in the Rotterdam port. They further substantiated these statements in a letter to the Ministry of Transport, Public Works and Water Management (CPB, 2000). In this letter, CPB explained how it did not expect major bottlenecks in the capacity of the port and instead supported the use of markets that would stimulate competition to provoke an increase of space in the port. The RMPM reacted to this letter (RMPM, 2000) by stating that the figures used by the CPB were still in the process of being discussed since the research was still in progress. RMPM questioned whether the Steering Committee and Advisory Board of the cost-benefit analysis would agree with CPB's interpretation of the numbers. Major discussions erupted between CPB and RMPM, in which the point of dispute lay in particular in expected future norms of noise pollution.

In May 2001, the cabinet initiated part I of the PKB. Two of the sub-projects (land reclamation and improving use of current port space) would be delegated to the Municipality of Rotterdam, while the other project (750 hectares of nature and recreation area) would be delegated to the Province of South-Holland.

Both cost-benefit analyses were published in May 2001. The result of the cost-benefit analysis of land reclamation was that in light of the shortage of space in the Rotterdam port, reclamation of land for the second Meuse plain would contribute positively to welfare in the Netherlands. However, the benefits would be dependent on when this shortage of space would occur – if shortage of space remains limited until 2035, the costs of land reclamation would exceed its benefits. Benefits would furthermore be dependent upon future economic growth scenario's and future norms on noise pollution. These elements would also influence the phases in which

the land is to be reclaimed. If more than 3% economic growth is realized, land reclamation should be performed between 2007 and 2010. If economic growth is approximately equal to 2.5%, land reclamation should be postponed. Similarly, when the current space in the port can't be increased within existing norms on noise pollution, benefits of land reclamation would exceed its costs. If, on the other hand, current space can be increased within noise pollution norms, land reclamation would result in net costs. The results of the second cost-benefit analysis on the development of 750 hectares of new nature and recreation area show that in the long run (more than 35 years), the willingness to pay by Dutch society for the 750 hectares exceeds the investment costs.

6.2.2 Institutional Context of the Economic Valuation Process

Choices in the economic valuation process are made within a context of formal and informal institutions (see section 3.4). In this context, scientific paradigms, policy paradigms and rules and regulations can be distinguished. This section will explain these institutions in the context of the two economic valuation processes in relation to the port development in Rotterdam.

The discussions in the policy arena were dominated by *policy paradigms* of rational economic arguments. This is a long-standing tradition in decisions of large governmental infrastructural projects in the Netherlands, where the amounts of money invested in these projects are enormous and therefore, understandably, would need to be compensated by at least the same amount of benefits. Hence, decisions on infrastructural projects needed to be substantiated with quantitative economic analyses. Any decision in this context is a political decision and both cost-benefit analyses played a limited role in the discussions, although the cost-benefit analysis on land reclamation played a more prominent role than the analysis of the 750 hectares of nature and recreation area. Its major role lay in the recommendations regarding the phasing of the land reclamation. As conveyed by many of the interviewed, however, the fact was that the outcome of the cost-benefit analysis was relatively positive in terms of benefits of reclamations, and the question remains what role it would have played in policy making had the outcome been negative. Would this have led to a negative decision by the cabinet on land reclamation and thus have played a more important role? Nevertheless, both cost-benefit analyses linked well with existing policy paradigms on infrastructural projects that remain dominated by rational economic arguments in the Netherlands.

Other policy paradigms also played an important role in the context of the port development in Rotterdam. First, environmental problems in general were institutionalized in Dutch society, which was reflected in the large number of environmental organizations, backed by an enormous number of supporters that were involved in the decision making process of the Rotterdam port expansion. Furthermore, the government accepted that nature should play a key role in the port developments since activities that would affect the environment would be compensated and, additionally, the plans were linked to a development of 750 hectares of new nature area. Secondly, government policy towards infrastructural projects in water management were dominated by an integrated water management approach. In fact, the decision making process of the port expansion was labeled as the Netherlands' first 'green polder model', where all stakeholders of the project were integrated. All functions and parties affected, including those representing the ecological functions that would be affected by the port expansion, were recognized and played an important role in the decision making processes. Third, the area in the North Sea that would be reclaimed for the port expansion was recognized as a scarce resource since the entire area would be compensated by the creation of an exact same area somewhere else.

The second element in the informal institutional context are *scientific paradigms*. In this element, two aspects were distinguished as being of influence on choices in the economic valuation process - domination of certain economic paradigms and a general increase in popularity of economic valuation studies. In the cost-benefit analysis on land reclamation, the first aspect plays an important role, while the second aspect is less important. The interviewed clearly stated that the increasing popularity of economic valuation was not a motivation for certain choices in this economic valuation study and is thus disregarded as a key influence on valuation choices. The dominance of certain economic paradigms, however, did play an important role. It can be argued that the scientific economic paradigm in the context of the economic valuation process was slightly dominated by more traditional, neoclassical economic viewpoints. Standard economic arguments on economic profitability played a major role in the political motivations to allow land reclamation for the port expansion in the first place, even if this would involve human interference with the ecosystem. As long as nature is compensated and the benefits of land reclamation would exceed its costs, land reclamation would in principal be supported. The scientific paradigms of the CPB and NEI, the economic research institutes involved in this study, also slightly lean

towards a more traditional economic approach as opposed to for example a more ecological economics approach. The starting point in both research institutes is the economic system, not the integrated economic-ecological system.

In the second cost-benefit analysis on the development of 750 hectares nature and recreation area, the other aspect of scientific paradigms played an important role in the choices of the economic valuation process – increased popularity in economic valuation studies. The dominance of certain economics paradigms was less significant since one of the two contracting parties (NEI) was dominated by a more traditional economics approach, while the second stakeholder (RIVM), as a more environment and healthcare oriented research institute was dominated by a less traditional economics approach. It is unclear as to which of the two dominated. The increase in popularity in economic valuation studies, however, did play a clear role in the choices of the economic valuation process. The interviewed principals of this valuation study stated that the publication of economic valuation studies had given them the impression that such studies could be carried out and could be useful in certain decision making contexts concerning the environment. It stimulated them in carrying out the economic valuation studies.

In the formal institutional context, major *rules and regulations* on the economic valuation process were absent, however a significant report was published that provided guidelines to the process of social cost-benefit analysis. In the 1990s, major discussions erupted on the benefits of various large infrastructure projects, especially in the development of the “Betuwelijn”, a railroad track for the transport of goods from the port of Rotterdam to Germany. The effects of government investments differed according to each study, which could often be explained by the application of different terms, disagreement on the type of benefits that may be attributed to a certain project and even political games (Volkskrant, 2000). Following these discussions, the Ministries of Transport and Economic Affairs initiated the Research Program on the Economic Effects of Infrastructure (OEEI). The program produced about ten reports, which were integrated into a guide for cost-benefit analysis. This guide was published in 2000 (Eijgenraam, et al., 2000). The essence of the report was that all large infrastructural projects should be subject to a social cost-benefit analysis, and the report provided guidelines on how such an analysis should be performed. The report was written by the same organizations that carried out the cost-benefit analyses related to the port development of Rotterdam (CPB and NEI), and served as a basis for both analyses.

Although the OEEI report doesn't provide specific guidelines on economic valuation of ecosystems, it mentions economic valuation and its methods as an approach to integrate environmental effects in a social cost-benefit analysis. It thereby stimulated discussions on economic valuation and raised awareness among both scientists and policy-makers on the possibilities and limitations of economic valuation.

An important element in the formal institutional context of the Rotterdam port expansion were the EU Birds and Habitat Directives, which had been adopted by the Netherlands. These directives call for an obligation to prevent any pollution or disturbance to birds in a certain area and prohibit any activities that may affect the protected area. The area designated for reclamation in the project fell under these Directives. This meant that the area affected would need to be compensated by the exact same type of nature area. It therefore steered the identification of the area Midden-IJsselmonde as compensation area in the Rotterdam port project.

6.2.3 Institutional Context Following the Economic Valuation Process

After the two cost-benefit analyses were published, a debate was organized to discuss specific aspects of the studies. The reactions in this debate were more or less positive. This was followed by a report of the Advisory Board (KPMG, 2001). In addition to a role as supervisor, it was asked to examine and judge both cost-benefit analyses. Its report stated among others that the researchers had worked and delivered their reports in a responsible way. The Advisory Board criticized the contents of the land reclamation cost-benefit analysis based on non-transparency of the calculations as well as the decision made by the researchers that no empirical research was carried out on use and existence values for the study on 750 hectares of nature and recreation area. The Board was less satisfied with the process in the cost-benefit analyses – it was unclear who was the principal of the research: the PMR and its delegated principals or the researchers (contracting parties).

In December 2001, the RMPM gave an official reaction to the cost-benefit analysis on land reclamation (RMPM, 2001). In this report, RMPM argued why the numbers presented by CPB, NEI and RIVM should be perceived as a minimum. It provided arguments that substantiated the need and necessity of the port expansion and that, based on these arguments, the outcome of the cost-benefit analysis is in actual fact a worse case scenario.

Also in December 2001, the cabinet presented Part III of the PKB together with both cost-benefit analyses to the Lower House. The Lower House agreed half a year later, followed by the Upper House in July 2002. In February of that same year, a request for advice had been sent to the European Commission on the Bird and Habitat Directives. At the moment of writing, the European Commission still needs to decide whether the European Bird and Habitat Directives have been properly followed in the PKB decision making procedure. Once this has been received, the government decision about the project is officially published in Part IV of the PKB+, and, followed by possible procedures of appeal, made irrevocable.

6.3 Characteristics of the Two Cost-Benefit Analyses

6.3.1 Land Reclamation

Section 3.4.5 explained that characteristics of the economic instrument of which the economic valuation process is part are important influences on the choices of the economic valuation process. The economic instrument used in these case studies is social cost-benefit analysis, and the following characteristics may be identified as influences: the use type of the economic instrument, its goal, and its time and budget constraints. This section will explain these characteristics for the cost-benefit analysis on land reclamation, while the next section will discuss the cost-benefit analysis on the development of 750 hectares nature and recreation area.

The social cost-benefit analysis was applied as part of the Core Planning Decision Procedure (PKB), the political decision making process concerning the expansion of the Rotterdam port. The *use type* is project evaluation – an evaluation of all direct social welfare effects of the project land reclamation in comparison with a situation without land reclamation.

The *goal* of the study is less clear cut. In first instance, one may think in terms of decision identification – the government needs to make a decision on how to deal with the shortage of space in the port and one solution is to reclaim land from the sea. The cost-benefit analysis is applied to identify whether the option to reclaim land is economically interesting. On the other hand, a very likely goal was also to justify political decisions that have already been made based on other (political) factors. This is, however, difficult to say since the outcome of the cost-benefit analysis was in favor of the decision to reclaim land for the port expansion. Had the outcome of the study been negative, it remains unclear, according to the interviewed,

what the consequences of this for the decision making process would have been. Hence, due to a lack of argumentation, it is assumed that the goal of the cost-benefit analysis is to identify a decision on the port expansion.

Both *time constraints* and *budget constraints* did not significantly exist for this cost-benefit analysis. The interviewed clearly stated their choices were not affected by these elements.

6.3.2 Development of 750 Hectares Nature and Recreation Area

The social cost-benefit analysis on the development of 750 hectares new nature and recreation area was also applied as part of the Core Planning Decision Procedure (PKB), the political decision making process concerning the expansion of the Rotterdam port. The *use type* was project evaluation, where the cost-benefit analysis is applied to identify all direct effects of the creation of 750 hectares new nature and recreation area compared to a situation without this area.

Although it may be argued that the *goal* of this cost-benefit analysis was also to identify decisions, arguments can be made that support the goal as being a justification of decisions. The interviewed stated clearly that the political decision for the development of 750 hectares nature and recreation area had already been made. Additionally, there was no initial need from the government to carry out a cost-benefit analysis - it was only after demands from Consept and the Province of South-Holland, that the assignment for this cost-benefit analysis was given. Both Consept and the Province of South-Holland viewed the economic valuation as an extra support, a solid economic base, to further justify the political decisions.

Both *time constraints* and *budget constraints* played a major role in this cost-benefit analysis. The time available for this study was several months less than the cost-benefit analysis on land reclamation. Furthermore, the budget necessary for a decent quantification of ecosystem functions was also lacking. The interviewed stated that both aspects played a major role in the choices of the cost-benefit analysis.

6.4 The Stakeholders Context

6.4.1 Direct and Indirect Stakeholders

The stakeholder context of the two processes of economic valuation is very complex. Since the valuation study was applied as part of a political decision making process, dominated by what was called the “first green polder model” (PMR, 2002), numerous stakeholders were involved, both in the direct and in the indirect context of the valuation study. In this section, the key direct and indirect stakeholders in the context of the two valuation processes will be explained. If necessary, a distinction will be made between the stakeholder context of the cost-benefit analysis of land reclamation and the cost-benefit analysis of the development of 750 hectares of nature and recreation area.

With respect to the cost-benefit analysis on land reclamation, the following *direct stakeholders* are distinguished:

1. **Principal:** PMR
2. **Contracting party:** CPB, NEI, RIVM
3. **Steering Committee:** Ministry of Transport, Public Works and Water Management, Ministry of Housing, Spatial Planning and Environment, Ministry of Agriculture, Nature Management and Fisheries, Ministry of Economic Affairs, Ministry of Finances, City of Rotterdam, Municipality of Rotterdam, Province of South-Holland, representatives of the PMR Board and representatives of the Expertise Center of PMR.
4. **Interviewed and Consulted Persons**
5. **Advisory Board:** Mr. Blankert, Mr. Jonkhart, Professor Mennes, Professor Opschoor and Mrs. van Lier Lels.

For the cost-benefit analysis on the development of 750 hectares of nature and recreation area, the following *direct stakeholders* are distinguished:

1. **Principal:** Province of South-Holland
2. **Contracting party:** NEI, RIVM
3. **Steering Committee:** Ministry of Transport, Public Works and Water Management, Ministry of Housing, Spatial Planning and Environment, Ministry of Agriculture, Nature Management and Fisheries, Ministry of Economic Affairs, Ministry of Finances, City of Rotterdam, Municipality of Rotterdam, Province of South-Holland, representatives of the PMR Board and representatives of the Expertise Center of PMR.
4. **Interviewed and Consulted Persons**
5. **Advisory Board:** Mr. Blankert, Mr. Jonkhart, Professor Mennes, Professor Opschoor and Mrs. van Lier Lels.

In the starting bill of the project in 1998, it was decided that a cost-benefit analysis was to be carried out as an integrated assessment of the costs and benefits of land reclamation for Dutch society. Mr. Bas van Holst was asked to become the manager of this project, and one of his first tasks was to find the contracting party to carry out the analysis. The Central Planning Bureau (CPB) was the most obvious and interested party to take this position, but RMPM, the Rotterdam Municipal Port Management, objected (PMR, 2002). As was explained in section 6.2, the relationship between CPB and RMPM was dominated by conflict and RMPM saw CPB in the position of contracting party as an organization with double interests: its official role as advisor to the Dutch government and an “impartial” executor of the cost-benefit analysis. The problem for the principal of the analysis, PMR, was that not many other organizations in the Netherlands existed with the required expertise to carry out a cost-benefit analysis³⁵. A solution was at first sought in a cooperation between private and public partners: private parties would provide project proposals and the CPB would test these proposals together with the Netherlands Economic Institute (NEI) and the National Institute of Public Health and the Environment (RIVM) (PMR, 2002). The latter three public organizations would develop a guideline for cost-benefit analysis, which the private parties could apply to their proposals. The cabinet, however, decided it would not support such a public-private cooperation and new solutions needed to be sought. This was eventually found in a cooperation between the three organizations CPB, NEI and RIVM as contracting parties of the analysis, while an Advisory Board with external experts would guard the process and quality of the research (PMR, 2002).

The principal of the cost-benefit analysis of land reclamation was the *Project Mainport Development Rotterdam* (PMR). This organization, which started its activities in 1998, consisted of representatives from the following organizations:

- Ministry of Transport, Public Works and Water Management (V&W)
- Ministry of Housing, Spatial Planning and Environment (VROM)
- Ministry of Agriculture, Nature Management and Fisheries (LNV)
- Ministry of Economic Affairs (EZ)
- Ministry of Finances (Fin)
- City of Rotterdam

³⁵ This situation is also highlighted by Buck Consultants in their evaluation of the OEEI guidelines (Buck Consultants, 2002), who state that many parties view the position of the CPB in the Netherlands as too dominant in the execution of cost-benefit analyses.

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- Municipality of Rotterdam
- Province of South-Holland

In the logbook, of PMR (PMR, 2002), it is explained how each of these organizations had different interests in the expansion of the Rotterdam port project. Although stated somewhat simplistically, it shows how the principal was not one single stakeholder but that the cost-benefit analysis already from the principal perspective was carried out in a context of stakeholders with diverse interests. For example, the main interests of the Ministry of Agriculture, Nature Management and Fisheries regarding the port expansion was mainly nature protection and development. The Ministry of Housing, Spatial Planning and Environment, on the other hand, wanted houses in the Waal port and an improvement in the quality of the social environment. The Ministry of Finance did not want to “waste” any money, while the Ministry of Economic Affairs pursued economic growth. Furthermore, the Province of South-Holland particularly desired a better position within public management of the Netherlands, and the municipality of Rotterdam (which includes - and was often represented by - the RMPM) wanted to finally realize the expansion of the Rotterdam port it had made clear years before. It is evident that the principal of the cost-benefit analysis PMR consisted of a wide variety of interests and stakes.

Within PMR, a special project on cost-benefit analysis was established. This group was led by Mr. Bas van Holst, himself an economist. Mr. van Holst had been involved with many cost-benefit analyses and had extensive knowledge of the procedures and calculations. Therefore, he was asked by the Dutch Ministry of Public Works, Transport and Water Management as an expert in cost-benefit analysis to lead the group.

The principal of the other cost-benefit analysis on the development of 750 hectares of nature and recreation area was also PMR, but was delegated to the *Province of South Holland*. The Province strongly supported the execution of this cost-benefit analysis, and together with the environmental organizations, of which the South-Holland Environmental Federation (Zuid-Hollandse Milieu Federatie) was the most important one, could be seen as the initiators of this cost-benefit analysis. They believed that a secure economic substantiation would be important for the decision making process. After discussions between CPB, NEI, PMR and other stakeholders, it was decided that the Province would lead the cost-benefit analysis as they were also leading the project 750 hectares nature and recreation area. From the Province, Mr. Ron Houterman led the cost-benefit analysis, and Mr. Slootweg provided the link between the cost-

benefit analysis and the project 750 hectares nature and recreation area and consistency on the contents.

As was explained earlier, the cost-benefit analysis on land reclamation was carried out by three organizations: the *Central Planning Bureau (CPB)*, the *Netherlands Economic Institute (NEI)* and the *National Institute of Public Health and the Environment (RIVM)*. Initially, the other cost-benefit analysis on the development of 750 hectares of nature and recreation area was also to involve these three organizations, but the CPB had both difficulties with this analysis and little time due to its leading role in the cost-benefit analysis on land reclamation, and decided not to co-operate. As a result, NEI and RIVM together carried out the second cost-benefit analysis.

In the mission statement of the *CPB*, it says that it aims to make independent economic analyses and prognoses, with a scientific base (CPB, 2002). Their research is relevant for policies of government, the parliament and other organizations like political parties and businesses within the Netherlands. It has much in-house economic expertise, and most economic research for the government is carried out by the CPB. Its research has a good reputation, and thus it is often asked to carry out economic research. The CPB was very interested to carry out the cost-benefit analysis on the expansion of the Rotterdam port and was asked by PMR to perform the cost-benefit analysis because (i) the CPB had already been involved in research on the Rotterdam port, and (ii) the CPB was involved with the “Research Program on the Economic Effects of Infrastructure” (OEI), which was to produce a guideline for cost-benefit analysis. The CPB was assigned as head contractor for the cost-benefit analysis on land reclamation.

The *NEI* (now called ECORYS-NEI) was established in 1929 and is now a major institute in the field of economic research and consulting in the Netherlands. It is an independent organization that performs research and gives policy advice globally in the fields of applied economics, technical assistance, training and knowledge transfer (NEI, 2002). According to Mr. van Holst of PMR, NEI was asked to join the CPB in the execution of the cost-benefit analysis because he had particularly good contacts with NEI: one member of NEI, Mr. Nol Verster, was his personal advisor in the PMR project, and Mr. van Holst had also worked for the NEI in the past.

Co-operation in the cost-benefit analyses with RIVM was suggested to PMR by CPB. RIVM is an institute that falls under the Ministry of Health, Welfare and Sports, which carries out activities that aid policy development and inspection in the areas of healthcare, environment and nature. It also carries out research for other parties. The organization was included in the cost-benefit analysis of land reclamation mainly for their expertise regarding the environment. However, in the second cost-benefit analysis on the development of 750 hectares of nature and recreation area, it was actually the key organization to carry out the economic valuations of nature.

To supervise both cost-benefit analyses, a *Steering Committee* was formed. This Steering Committee consisted of representatives from all PMR partners: the Ministry of Transport, Public Works and Water Management; the Ministry of Housing, Spatial Planning and Environment; the Ministry of Agriculture, Nature Management and Fisheries; the Ministry of Economic Affairs; the Ministry of Finances; the City of Rotterdam; the Municipality of Rotterdam; and the Province of South-Holland. Furthermore, representatives of the PMR Board and of the Expertise Center of PMR were members. The PMR Board consisted of eleven representatives from the concerned Ministries, as well as the municipality of Rotterdam, who was represented by the Rotterdam Municipality Port Management, RMPM. The Expertise Center of PMR consisted of about twenty-five people and its main role was to generate information and supervise the Environmental Effects Report (MER). The Center grew out of the SM2V, a cooperation between the RMPM and the regional office of the Ministry of Public Works, Transport and Water Management, set up during the preliminary discussions on the Rotterdam port. The contracting parties who carried out the cost-benefit analyses (CPB, NEI, RIVM) met with the Steering Committee approximately every three weeks for the entire period. The steering committee could ask questions and give feedback on the work that had been done.

In both cost-benefit analyses, the *interviewed and consulted persons* were relatively limited. In general, the information and data input as well as the calculations were based on sources internal to the contracting parties. Although certain information was obtained from other parties such as PMR or the municipality of Rotterdam, no significant amount of stakeholders were interviewed that may have provided major inputs to the calculations. Other than the direct influence of the MER commission (which will be discussed separately in one of the following sections)

influences from interviewed and consulted persons on the choices made in both economic valuation processes was limited.

An *Advisory Board* for both cost-benefit analyses was also established, which consisted of external experts. The Board was led by Mr. Blankert, and members were Mr. Jonkhart, Professor Mennes, Professor Opschoor and Mrs. van Lier Lels. The secretariat of the Board was provided by KPMG/BEA. The role of the Board was to “guard the quality of the cost-benefit analyses” (PMR, 2002). They judged the professionalism and scientific accountability of the approach, guarded the process and reported to the Project Minister, Ms. Tineke Netelenbos, about the quality of the research. The organizations that carried out the cost-benefit analyses met with the Board ten times during the entire period. The Board evaluated both cost-benefit analyses after its publication in a letter to the project Minister.

The second group of stakeholders of economic valuation processes are *indirect stakeholders*. For the cost-benefit analysis on land reclamation, the following key indirect stakeholders can be distinguished:

1. Consept
2. ONR
3. RMPM
4. Users of the services of the project
5. MER Commission

For the cost-benefit analysis on the development of 750 hectares of nature and recreation area, RMPM and users of the services of the project played a very limited role since the project was only indirectly related to the port developed – unlike the other cost-benefit analysis on land reclamation, the outcome of this cost-benefit analysis had no effect on the decision whether the port would be extended or not. Therefore, the key indirect stakeholders of this analysis were:

1. Consept
2. ONR
3. MER Commission

The major environmental organizations in the Province of South Holland had united in a coalition called *Consept* (Stekelenburg, 2002):

- Zuid-Hollands Landschap
- Stichting Duinbehoud

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- Consulentschap Natuur en Milieu
- Zuid-Hollands Landschapsbeheer
- Vereniging tegen Milieubedreiging
- Vereniging Natuurmonumenten Zuid-West
- Zuid-Hollandse Milieufederatie (South-Holland Environment Federation)

The leader of Consept was Arno Stekelenburg of the South-Holland Environment Federation (Zuid-Hollandse Milieufederatie). Consept's main interest in the cost-benefit analyses lay in the environmental consequences of the analyses on land reclamation and the realization of the development of 750 hectares nature and recreation area. Their attitude towards the expansion of the Rotterdam port was proactive and it was perceived as one of their own projects. One year before the inception of PMR, the organizations had made their own analysis of the port situation in Rotterdam, which was used as a basis for the governmental starting note. In fact, many of the texts were actually adopted in the starting note (PMR, 2002). Consept fully supported both cost-benefit analyses as necessary supports for the political decisions, and lobbied especially for the cost-benefit analysis of the 750 hectares nature and recreation area (Stekelenburg, 2002).

An important second group of stakeholders were united in the *Consultation Non-Governmental Parties (ONR)*. The ONR was led by Mr. Hans Alders, the Commissary of the Queen in Groningen. Three groups can be distinguished in the ONR. The first group is Consept, which has been explained in the previous paragraph. Secondly, seven national organizations were invited to join Consept in a discussion panel to contribute to the discussions with PMR:

- VNO-NCW
- FNV
- Nederland Distributieland (NDL)
- ANWB
- Unie van Waterschappen
- Vereniging Natuurmonumenten
- Stichting Natuur en Milieu

The criteria for joining this panel were that the organizations should have some influence on management, a variety and high quality of social contributions to discussions with PMR and an interest in a dialogue with representatives of other groups with different stakes. The panel discussed with other stakeholders in the ONR.

The panel organizations represented a diversity of interests. VNO-NCW is the largest organization for Dutch companies – its members represent 80% of employment in the Netherlands. It promotes the interests of Dutch business both nationally and internationally. FNV is the largest trade-union in the Netherlands, and its area of interest concerns work and income. NDL represents the logistics sector of the Netherlands. Its goals are to promote the Dutch position in international logistics competition and to increase the knowledge base about the Dutch logistics sector. The ANWB sells all sorts of products in the areas of recreation, tourism, traffic and transport. In terms of interest promotion, its goals run along the following seven aspects: availability, approachability, livability, safety, affordability, freedom of choice and security. The Unie van Waterschappen is an umbrella organization that represents 53 water boards. Water boards are responsible for water management tasks in the Netherlands, such as flood control and drink water management. Both Stichting Natuur en Milieu and Natuurmonumenten are environmental organizations. Natuurmonumenten is an independent organization that promotes a “livable Netherlands” with sufficient space for nature. Its main activities include buying and managing nature areas. Stichting Natuur en Milieu also promotes a healthy nature and clean environment, but they are more a lobbying organization that aims to influence decisions in both the Netherlands and Europe. The main interest of both organizations lay therefore in the environmental aspects of the cost-benefit analyses.

A third group of stakeholders in the ONR was the Province of South-Holland, the Municipality of Rotterdam and the city of Rotterdam. The Province of South-Holland particularly desired a better position within public management of the Netherlands, and the municipality of Rotterdam (which includes - and was often represented by - the RMPM) wanted to finally realize the expansion of the Rotterdam port it had made clear years before. The city of Rotterdam pursued both an improvement of livability in the city and an improvement in its (future) economic position through an expansion of its port.

As can be concluded from the previous sections, it cannot be said that the ONR represented a single interest. Moreover, it is such a complex organization that makes it impossible to state how each of the stakeholders within ONR may have influenced choices in the economic valuation process within the time available for this research. On the other hand, it can also be argued that although their stake in the entire project was big, in the economic valuation process itself the stake of the organizations other

than those united in Consept and the RMPM was less significant. These two stakeholders are discussed separately. To simplify the analysis, and thereby make the stakeholder context more manageable for the analysis in section 6.6, ONR as one stakeholder will be excluded from the analysis concerning the effects of elements in the context of the economic valuation process on its choices.

The Rotterdam Municipal Port Management (*RMPM*) is another key indirect stakeholder in the economic valuation process, in particular with respect to the cost-benefit analysis on land reclamation. *RMPM* is authorized by the Municipality of Rotterdam to manage the port and industrial zone. Among other, its main tasks are the development, construction, management and operation of the port. Its goal is to “strengthen the position of the Rotterdam port and industrial zone within a European perspective” (*RMPM*, 2002).

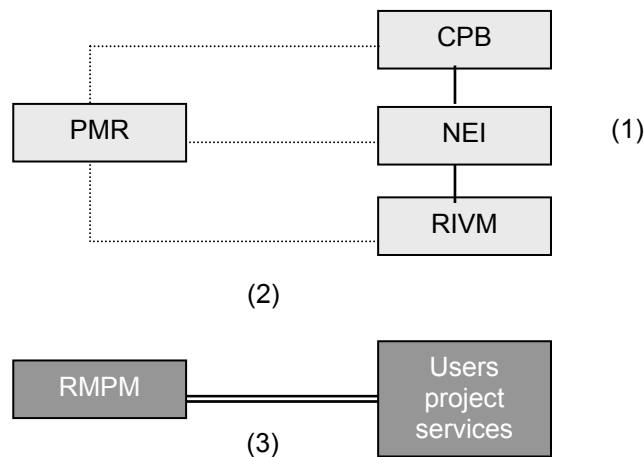
Other major organizations that had a stake in and influence on the project and cost-benefit analyses were the users of the services provided by the project and the Commission Environmental Effects Report (*MER Commission*). The *users of the services of the project* had a major stake in the cost-benefit analysis because they would be the organizations using the space and services provided by the expansion of the Rotterdam port. Here one must think of large container companies and particularly the chemical industry. Secondly, the *MER Commission* had an influence on the project because it decided what the environmental impacts of the cost-benefit analysis were and finally what environmental impacts were to be incorporated in the cost-benefit analyses. Since the cost-benefit analyses were to follow the *MER* directly, the choices made in the analyses concerning environmental effects were very much guided by the *MER*.

6.4.2 Stakeholder Relationships

In this section, the key stakeholder relationships will be explained for those direct and indirect stakeholders identified in the previous section. Two types of relationships will be distinguished according to the discussion in section 3.3.2: coalitions and interest groups. It was explained that stakeholders are most likely to form a coalition when the pay-off of forming a coalition exceeds the pay-off of engaging in interest group politics. This pay-off is related to the amount functional goals and ideologies converge. As a result, different coalitions will form that may compete with each other in interest group politics.

Coalitions are likely to form among stakeholders with converging goals and perspectives towards nature and economic issues. In the cost-benefit analysis on land reclamation, two key coalitions can be distinguished, which are depicted in Figure 11. The *first* coalition is formed between the different contracting parties, CPB, NEI and RIVM. These three stakeholders had one functional goal in common, namely to carry out the economic valuation study in order to identify the economic profitability of the project land reclamation. In the cost-benefit analysis on land reclamation, the CPB was the head-contractor. This implied that CPB decided, in consultation with NEI and RIVM, how the study and calculations were to be carried out. The three organizations divided up the tasks on who would carry out what aspects of the cost-benefit analysis - RIVM carried out most of the environmental calculations, while NEI and CPB shared the economic calculations. Hence, no conflict of interest existed with respect to ideology between RIVM on one side and CPB and NEI on the other side. Furthermore, the economic approaches of NEI and CPB converged in relation to this cost-benefit analysis. Due to the convergence of functional goals and no conflict in ideological standpoints, it is likely that the three contracting parties formed a coalition. The power within this coalition tends towards the CPB as the head contractor. Furthermore, it also receives the highest respect out of the three contractors when it comes to economic research in the Netherlands.

Figure 11 Coalitions in the Cost-Benefit Analysis of Land Reclamation



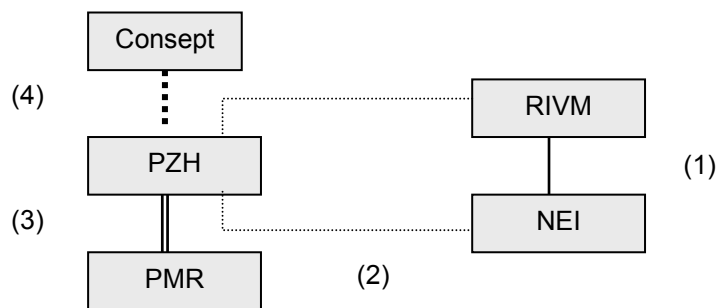
The *second* coalition in this cost-benefit analysis is formed between the principal PMR and the contracting parties CPB, NEI and RIVM. The four parties had converging functional goals, namely to carry out the cost-

benefit analysis to identify the decision on land reclamation. Concerning their ideologies, the perspective of the three contracting parties towards economics more or less converged with the economics perspective of the cost-benefit analysis project leader within PMR, Mr. Bas van Holst. Mr. van Holst had been an employer of one of the contracting parties, the NEI. On most aspects, the principal and contracting parties therefore formed a coalition. Power within this coalition seems to lean towards the contracting parties, with the CPB as the head contractor. This can be argued by looking at the advise of the Advisory Board, who found it difficult to see in both cost-benefit analyses who was actually the principal and who was the contracting party. Its overall impression of the process of the cost-benefit analyses was that the organizations delivered good work and operated in a responsible way, but one of its main criticisms was that in the process of both of the cost-benefit analyses it was unclear as to who directed the analyses: PMR and the Province of South-Holland, or the contracting parties. The Board therefore did not find a “standard principal-contractor relationship” but signals that this relationship was often perceived to be dominated by the contracting parties.

The *third* coalition is formed between the Rotterdam Municipal Port Management (RMPM) and the users of the project’s services. The latter are companies that rely on the Rotterdam port, such as container companies and chemical companies. Their goals regarding the Rotterdam port and the outcome of the cost-benefit analysis converge: both want an expansion of the Rotterdam port and a positive outcome of the cost-benefit analysis that allows them to further pursue this expansion. Their interests are completely economic: while the port wants to retain its competitive position as the world’s largest port, the users of the services of the project want enough space to store their goods and containers. The power within this coalition increasingly leans towards the users of the services. This can be illustrated by a newspaper article of January 2001 (NRC, 2001), where it was explained how the Rotterdam port is slowly losing its competitive position, while other ports (like the port of Antwerp) improve their position. Hence, if space in the Rotterdam port does not increase, users will go to other ports. This provides them with more power relative to the RMPM, who will lose if the users go somewhere else. An example is the recent diversion of the Rotterdam’s largest customer, Maersk/Sealand, to the Bremerhaven port in Germany.

In the second cost-benefit analysis on the development of 750 hectares nature and recreation area, four coalitions were formed (see Figure 12). The *first* coalition is between the two contracting parties RIVM and NEI. Their common functional goal was to perform the cost-benefit analysis and, furthermore, their perspectives towards nature and economics in relation to this cost-benefit analysis more or less converged. Hence, their relationship can be characterized as a coalition. The *second* coalition is formed between these contracting parties and the principal, the Province of South-Holland (PZH). Their common functional goal was to perform this cost-benefit analysis, while their perspective at least towards economics also converged.

Figure 12 Coalitions in the Cost-Benefit Analysis of 750 Hectares

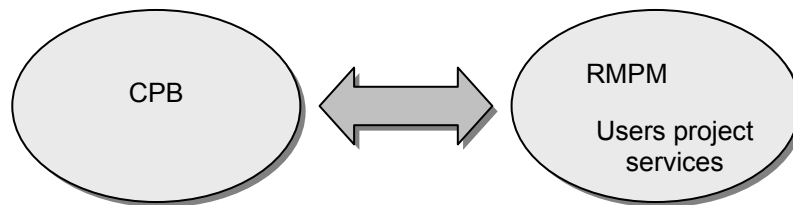


The *third* coalition in this cost-benefit analysis is formed between the principal PZH and the principal of the project, PMR. PMR was officially the principal of both cost-benefit analyses, but had delegated it to the PZH. Their functional goal regarding the cost-benefit analysis converged, namely to carry out the cost-benefit analysis to justify the political decision, and so did their general viewpoints towards nature and economics. The *fourth* and last coalition of importance in this cost-benefit analysis is formed between the principal PZH and the coalition of environmental organizations Consept. The PZH stated to have sympathies with the environmental organizations and shared a similar perspective towards environmental aspects regarding this cost-benefit analysis. Furthermore, their common functional goal was to carry out this cost-benefit analysis and both were the key initiators of this study. The power in all these coalitions did not significantly lean towards one of the stakeholders, except for the second coalition. Here, the same arguments apply as in the coalition between principal and contracting parties in the other cost-benefit analysis on land reclamation. Based on the advice of the Advisory Board, it was unclear as to who directed the analyses: the Province of South-Holland, or the contracting parties. Also in this analysis, the Board did not find a “standard

principal-contractor relationship” but signals that this relationship was often perceived to be the other way around. Power, therefore, leaned towards the contracting parties.

Although a large number of stakeholders existed in both cost-benefit analyses, each with different interests, the most significant relationship in terms of *interest group politics* was formed between the CPB (one of the contracting parties) on the one hand and the coalition of the Rotterdam Municipal Port Management (RMPM) with the users of the project’s services on the other hand (see Figure 13).

Figure 13 *Interest Group Politics in the Cost-Benefit Analysis of Land Reclamation*



The core of the conflict is the relationship between the CPB and the RMPM, where the latter forms a coalition with the users of the port (container companies and chemical companies) and therefore does not stand alone in this conflict. Section 6.2 explained how this relationship was formed and what it looked like. For example, in November 2000, when the CPB, NEI and RIVM were still working on the first cost-benefit analysis but had not yet presented their results, the CPB published data that showed that a shortage of space in the Rotterdam port was not expected in the immediate future (Netelenbos, 13 November 2000). This contradicted completely with the claims of the RMPM that were based on a market consultation with large shipping companies, namely that a shortage of space was looming and thus an expansion of the Rotterdam port necessary. This led to major disagreements between the two organizations, where the RMPM reacted by stating that the CPB’s statements were based on wrong calculations and above all did not take the increasing noise limitations in the port into account. These noise limitations became a second major point for dispute and dominated discussions with the Steering Committee and Advisory Board in which the RMPM took part. To solve the dispute, KPMG was contracted to research the effects of noise limitations and PMR organized several debates between RMPM, CPB and container

companies (PMR, 2002). Eventually, research showed that the effects of noise limitations were small (PMR, 2002), and CPB decided to include the post in the cost-benefit analysis, but without quantitative information – only stating that the effects were unknown and still needed to be determined. After the publication of the cost-benefit analysis, the RMPM published a reaction to the study “of the CPB, in cooperation with NEI and RIVM” (RMPM, 2001: 5). In this report, the RMPM explained why it viewed the results of the cost-benefit analysis as minimum estimations. It perceived the role of the cost-benefit analysis as a tool for evaluation as limited and stated that the analysis did not provide a correct total picture of the project. Therefore, the RMPM concluded, the end result of the cost-benefit analysis is in actual fact more positive, which “suggests a larger credit balance of the expansion of the port than calculated in the cost-benefit analysis.” (RMPM, 2001: 30).

The base of this conflict of interest between these two organizations lies in conflicting goals and interests regarding the port expansion and the cost-benefit analysis. While the coalitions are characterized by stakeholders that have converging goals and interests, these two stakeholders' goals and interests conflict. For example, while the RMPM desires the expansion of the Rotterdam port and sees the cost-benefit analysis either as a hindrance to this desire or as a substantiation, the CPB wants to carry out the analysis to identify whether the decision to extend the port through land reclamation is economically justified. The CPB is the key government economics advisor and has a high reputation to live up to when it comes to making economic projections. When other organizations make different projections that are not based on CPB models, its reputation is attacked. At the same time, the RMPM has a strong interest in extending the Rotterdam port so that it can continue to live up to its reputation as the world's largest port. When an organization states that an expansion of the port may not be necessary, its interests in the port expansion are attacked.

In both cost-benefit analyses, the other indirect and direct stakeholders are less important for the choices made in the economic valuation processes.

6.5 Choices in the Two Economic Valuation Processes

6.5.1 Land Reclamation

In the next two sections, the characteristics of the economic valuation processes in the two cost-benefit analyses will be explained. This will be based on the theory of section 3.2, where it was explained how the

different formal stages in an economic valuation process can be summarized under pre-assessment and assessment choices. This section will not explain or account for these choices since this will be the task of the next section. Only a characterization of the choices in the valuation processes will be given.

In the *pre-assessment choices*, five decisions need to be made. The *first* choice is to decide on the phenomenon that is being studied. In this study, the phenomenon was defined as land reclamation for the expansion of the Rotterdam port, which was made by the Dutch cabinet. The leadership for this project was given to PMR, who gave the assignment to carry out the cost-benefit analysis to CPB, NEI and RIVM. The *second* choice concerns the definition of the project-alternative. In this cost-benefit analysis, the project alternative was not defined as “doing nothing” or “current policy” (like in the cost-benefit analysis on gas extraction in the Wadden Sea) but as follows. If land would not be reclaimed, the result would be a shortage in port capacity, which would lead to an increase in rental price of space and measures to decrease the port customers or, alternatively, increase port space productivity. No land reclamation also leads to less reservation of port space for infrastructure. This project alternative allowed the contractors to develop scenario’s for noise pollution (yes or no), for potential demand and for the supply of current port areas based on information from the RMPM (“Vervolgstappen BRG”).

The *third* choice is to decide which parties will be affected. The economic valuation process in this case study was part of a cost-benefit analysis so all relevant parties that loose and gain were identified. The exploiters of the Rotterdam port were identified as the first group who would profit by an increase in income, and users of the Rotterdam port were identified as the second group of gainers by increasing space available to them. The exploiter of the port was also identified as a stakeholder that would lose from the land reclamation project as it would have to compensate for nature that would be lost as a result of extending the port. Furthermore, parts of society would pay due to an increase in pollution as well as the chemical and container companies who would be facing increased environmental regulation burdens as a result of increased pollution. Of course, these are all gross losses: most groups both benefit and lose and the net effect is to be determined in the analysis. Additionally, the focus of the analysis was on the social effects of the port expansion in the Netherlands – this therefore includes environmental effects, but excludes the positive effects of the port expansion on the rest of Europe. These decisions were all made by PMR.

The *fourth* choice involves drawing the geographical boundaries. These were clearly drawn around the Netherlands – all effects of the Rotterdam port expansion outside the Netherlands were to be ignored in the economic valuation study. This choice was made by PMR. A *fifth* choice in the economic valuation process is to identify the impacts. These were:

- Decrease in less important nature types
- Decrease in important nature types
- Increase in very important nature types through land reclamation
- Increase in dunes through compensation
- Increase in sea reserve through compensation
- Possible negative effects on the Wadden Sea
- Negative effects on landscape (such as view)
- Air pollution
- Water quality
- Inconvenience due to smell

Interestingly, effects as opposed to functions were selected, the reason being that the cost-benefit analysis had to connect with the Environmental Impact Statement of the MER Commission. All the selected environmental effects were in fact taken from the MER report. Not all of these impacts were, however, quantified, which brings us to the *sixth* and last step of the pre-assessment choices. First, the contracting parties CPB, NEI and RIVM decided that the quantification of the first five effects should be based on the costs of compensating the loss in nature elsewhere. The monetary values of these effects were calculated with the costs of the loss of nature as a result of the expansion of the Rotterdam port, which were set equal to the investment and management costs of a compensation area that would be created. However, since nature was being compensated, the net effects of the port expansion such as the decrease in less important nature types and important nature types, an increase in very important nature types through land reclamation, in dunes through compensation and in sea reserve through compensation in the Netherlands as a whole would equal zero. Therefore, the effects of the Rotterdam port on nature in the cost-benefit analysis were set at zero. The only cost would be investment costs of compensating nature areas, which were incorporated in the construction costs of the land reclamation. Furthermore, possible negative effects on the Wadden Sea were uncertain so it was decided not to value them and exclude them from the cost-benefit analysis. The same decision was made for the effects on landscape. As for effects on water quality and smell, it was expected that the net effect of the expansion of the harbor would also be zero, so they were not quantified either. Thus, only air pollution effects were quantified. However, increased pollution due to more traffic entering

and leaving the area where the land reclamation would take place was analyzed but not valued. The reason is that without expansion of the port, containers for the Netherlands would need to be detoured to other ports, and so the net effects of pollution were set at zero.

In the *assessment choices*, the *first* decision concerns how to quantify the effects into economic values. In this cost-benefit analysis, these choices concern the quantification of the effects of a port expansion on air pollution. This valuation first involved the quantification of pollution of CO₂, NO_x, SO₂, VOS and PM₁₀ into physical terms (tons or kilos) and later into monetary terms. The following valuation methods were applied:

- CO₂ pollution: Dose-Response approach
- NO_x and SO₂: a combination of Dose-Response approach, Mitigation Behavior approach and cost-effectiveness of NO_x reduction regulations
- VOS and PM₁₀: Dose-Response approach

The information was taken from existing databases and publications and no new data was gathered. These decisions were made by the contracting parties CPB, NEI, and RIVM. The *second* step involves discounting the economic values. For this process, a discount rate of 4% was used and a time period of 35 years. The time period was selected because it was expected that most of the land reclamation could be finished by then and it therefore equals the project life span. The *third* and last step was a sensitivity analysis, which was carried out for three different scenarios for economic development into the future: (1) Divided Europe (GDP growth of 1.5 % per year); (2) European Co-ordination (GDP growth of 2³/₄ % per year); and (3) Global Competition (GDP growth of 3¹/₄ % per year). These scenarios were developed by the CPB. Secondly, for each scenario two different perspectives on the capacity within the noise norms were applied: (1) much capacity within the noise norms; and (2) little capacity within the noise norms. This grew out of the discussions with the RMPM.

6.5.2 Development of 750 Hectares Nature and Recreation Area

In the *pre-assessment choices* of this second cost-benefit analysis in relation to the expansion of the Rotterdam port, the *first* choice concerns the definition of the phenomenon being studied. In this valuation process, the object is the construction and exploitation of 750 hectares of new nature and recreation area in the Rotterdam region to improve living conditions. The decision for the execution of the project was made by the cabinet, but the decision that a separate cost-benefit analysis would be carried out for this project was made by PMR after pressures from Consept and the

Province of South Holland. In the study, ten different options for this project were studied and compared with the alternative of not creating the 750 hectares of nature and recreation area such that other developments would take place in the area. The *second* choice is the definition of the project alternative. Like in the cost-benefit analysis on land reclamation, the project alternative was not defined as “doing nothing” or “current policy” but as follows. In the situation that the 750 hectares of nature and recreation area is not realized, other nature development projects like the Main Ecological Structure (Ecologische Hoofdstructuur, EHS) and the 1000 hectares ROM-Green agreement would still be completely realized. As a result, the 750 hectares is additional nature area in the Netherlands. Furthermore, when the 750 hectares is not developed, the land remains agricultural ground as it is today.

The *third* step is to determine the parties that will be affected by the project. In this study, both costs and benefits in the Netherlands were analyzed, where the major costs were the development and exploitation costs of the nature area, and the major benefits were the development of new nature and recreation areas (the creation of use and non-use values). This was all decided by the contracting parties NEI and RIVM. The *fourth* choice was to draw the geographical boundaries, which were set around the Netherlands. *Fifth*, the following impacts of the creation of 750 hectares nature and recreation area were selected:

- Costs of the initial investment;
- Costs for management and maintenance
- Benefits of exploitation of the areas
- Costs and benefits to current inhabitants and owners of land (such as the sacrifice of agricultural land)
- Benefits of an increase in use and existence value of nature and recreation area for surrounding communities
- External effects

The last two effects were taken from the MER, while the first were determined by NEI and RIVM. The *sixth* and last step in the pre-assessment choices is to determine which impacts to value. Not all of the effects selected in the previous step were chosen to be quantified. The costs and benefits to current inhabitants were largely not quantified because (1) forced movements to other areas would not be required; and (2) only approximately 50 houses exist in the area so the effects on use and existence values are negligible and were included in the effects on surrounding communities. Hence, only part of this effect was selected for

quantification. The increase in existence value for surrounding communities, part of the fifth effect, was not quantified into monetary terms either but listed qualitatively, including its relative importance. The major reason was that in order to value these effects, it was necessary to carry out surveys (through for example the Contingent Valuation Method). Since the time was limited, but more importantly because of a limited budget, this was not possible. The same goes for the last effect, external effects of the project.

In the *assessment choices*, the *first* decision is how to quantify the functions or effects into economic values. The following valuation methods were applied :

- Costs of the initial investment: Market Pricing
- Costs for management and maintenance: Market Pricing
- Benefits of exploitation of the areas: Market Pricing
- Costs and benefits to current owners of land: Dose-Response
- Use value: both Hedonic Pricing Method and Travel Cost Method

The *second* step involves the discounting process. For this process, a 4% discount rate was used and a time period of 35 years, the same as for the expansion of the Rotterdam port. The *third* step was a sensitivity analysis, which was carried out on ten scenarios concerning the types of nature areas developed. These scenarios were based on information from the Environmental Impact Assessment of the MER commission.

6.6 Relationship Between Choices Valuation Processes and Their Contexts

6.6.1 Influences of the Institutional Context

So far, this chapter has explained the economic valuation processes and their contexts that are part of two cost-benefit analyses. These cost-benefit analyses, one on land reclamation and the other on the development of 750 hectares new nature and recreation area, are both related to the expansion of the Rotterdam port. In section 6.2 of this chapter, the context of formal and informal institutions was explained, which was similar for both economic valuation processes as both were related to the same project. This section will explain what the influence of these institutions was on the different choices made in the two valuation processes that were described in section 6.5.

In the informal institutional context, three elements can be distinguished namely policy paradigms, scientific paradigms and rules and regulations. The influence of these elements was generally the same for both economic valuation processes, as will be further explained below. *Policy paradigms* contain the following three key elements that are likely to play an important role in the choices of the economic valuation processes:

1. institutionalization of environmental problems
2. dominance of rational and economic arguments
3. dominance of an integrated water management approach
4. perception of water as a scarce resource

In the first cost-benefit analysis on *land reclamation*, all four elements of the policy paradigm context were of importance for the choices made during the economic valuation process. In particular, the first decision in the pre-assessment choices was influenced, definition of the phenomenon being studied. The phenomenon of the economic valuation process was defined as the environmental consequences of land reclamation. These environmental consequences were incorporated in the social cost-benefit analysis due to the existing policy paradigms. *First* of all, environmental effects were integrated in the decision making process because environmental problems were institutionalized. Policy makers accepted the importance of the environment and the fact that nature areas affected by the land reclamation would need to be compensated. Furthermore, environmental organizations were involved in the decision making process from the start and were invited to voice their opinions in negotiations on how and how much the nature area would need to be compensated. This compensation formed the basis for the environmental valuations. *Secondly*, the discussions within the policy-making process were dominated by rational and economic arguments. The expansion of the Rotterdam port through land reclamation would be beneficial for the Dutch economy. Furthermore, since the expansion would be associated with huge sums of investments, the economic aspects of this project were of crucial importance. Therefore, a social cost-benefit analysis needed to be carried out as an economic substantiation of the political decision. Quantifying the environmental effects of the project and integrating them into the cost-benefit analysis finalizes this economic substantiation. The *third* aspect is the integrated water management approach in policy making. Such an approach implies a more ecosystem approach towards water management issues in which different stakeholders are taken into account. This means that policy makers had to take the environment into account as well as the different stakeholders of the land reclamation project, which included

environmental organizations. The integration of the environmental organizations led to the definition of the compensated nature area, which formed the base for the economic calculations. Lastly, the *fourth* aspect, the perception of water as a scarce resource, also influenced the definition of the phenomenon. Aquatic ecosystems were increasingly recognized as valuable nature areas. The negative effects of human interventions in these ecosystems would therefore need to be compensated. The compensated nature area forms the basis of the phenomenon that is being studied by the economic valuation process.

In the second cost-benefit analysis on the *development of 750 hectares new nature and recreation area*, the most important influence of these four elements was particularly on the first pre-assessment choice, definition of the phenomenon being studied. The phenomenon was defined as the costs and benefits of the development of 750 hectares nature and recreation area to improve living conditions in the Rotterdam area. This area, however, was not defined as an aquatic ecosystem. Therefore, the last two elements in the informal institutional context (dominance of an integrated water management approach and perception of water as a scarce resource) were not of significant influence on the first choice made in this valuation process because the phenomenon itself was not defined as a water management issue. The other two elements, however, were of key influence.

The *first* element in the policy paradigm context concerns the fact that environmental problems had been institutionalized in the Netherlands. A high level of environmental awareness existed in society and the environmental movement had been mobilized. In fact, the environmental organizations were included in the decision making process on the Rotterdam port from the start. It was also the environmental movement that initiated the cost-benefit analysis on the 750 hectares in the first place and therefore played a key role in the determination of the phenomenon of the economic valuation process. *Secondly*, the discussion on the Rotterdam port expansion was dominated by rational arguments. The environmental movement and the principal of this valuation study, the Province of South-Holland, were both interested in the development of 750 hectares new nature and recreation area, and knew that it would connect well with prevailing rational discussions by carrying out a cost-benefit analysis. This would aid in their pursuit to obtain the 750 hectares. Not only a traditional environmental or ecological analysis but also an economic analysis would

show that the development of this nature and recreation area would be beneficial to Dutch society.

In the second aspect of the institutional context, *scientific paradigms* were distinguished. Two elements within this context were seen as important influences on choices in the economic valuation processes:

1. Increased popularity economic valuation
2. Dominance neoclassical and ecological economics

The *first* element influences in particular the definition of the phenomenon in the economic valuation study on the development of 750 hectares new nature and recreation area. This element is less important in the cost-benefit analysis on land reclamation – the principal (PMR) was convinced economic valuation should be carried out because it concerned a large infrastructural project for which social cost-benefit analyses had to be carried out according to government guidelines (see next section). In the cost-benefit analysis on 750 hectares of nature and recreation area, it was, however, less evident that a social cost-benefit analysis had to be carried out as it was not covered by the guidelines as a project. The principal (Province of South-Holland) and the coalition of nature organizations Consept, who initiated this cost-benefit analysis, stated they were influenced by reading other valuation studies in their demand for an economic valuation study. During this period, economic valuation of ecosystems gained more attention, partly due to an increase in international economic valuation studies, published in well-read journals in the Netherlands. The stakeholders knew the cost-benefit analysis could have added value in decision making on this project and were very optimistic about the possibilities of such a study.

The *second* element is a dominance of certain economic paradigms with the key stakeholders of the economic valuation studies. While in the other case study on gas extraction (see chapter 5), the dominance of a combination of two economic paradigms with the two key stakeholders led to very interesting choices in the economic valuation process that were often not substantiated, such a situation does not prevail in these two case studies. Throughout the choices in both economic valuation processes, a balance is found between different economics paradigms, leading to relatively stable choices that are substantiated throughout the analysis. A very likely reason for this balance is that a wide variety of stakeholders with different perspectives were integrated in the cost-benefit analysis calculations, mitigating the effects of an economics paradigm residing within one or two

stakeholders as was the case in the previous chapter. For example, the NEI and CPB are institutes with more traditional economics paradigms, but RIVM is an environment institute that, according to the interviewed, is still skeptical about economic valuation of the environment. Furthermore, both the Steering Committee and the Advisory Board had a wide mix of people with diverging opinions, viewpoints and economic paradigms. As a result, the different scientific paradigms were mixed in both economic valuation studies to derive balanced choices throughout the economic valuation process.

The third element in the institutional context of the economic valuation process is the set of formal institutions, or *rules and regulations*. With respect to the economic valuation process and economic instrument, one must think in term of guidelines or standards of procedure. The following three aspects were distinguished in section 4.2.4:

1. rules economic instruments
2. rules economic valuation process
3. rules environment

First, while in the previous chapter, no guidelines for cost-benefit analysis existed, such a guideline had been produced by the time these cost-benefit analyses were carried out (see Eijgenraam et al., 2000). This guideline was abbreviated to “OEEI” (Research Program on the Economic Effects of Infrastructure), and was set up by the same organizations that carried out the cost-benefit analyses related to the Rotterdam port expansion – CPB and NEI. More specifically, the same people within these organizations were involved in both studies. Although the guidelines particularly emphasized the different steps that should be taken in a cost-benefit analysis, it also gave guidance to more specific choices within these steps. It can be argued that the OEEI guidelines particularly influenced three steps in both economic valuation processes. The first is the definition of the project alternative. The guidelines clearly state that this should equal neither “doing nothing” nor “current policy”. Instead, it should equal the best possible alternative, which is exactly how the project alternatives were defined in both cost-benefit analyses. Secondly, the guidelines influenced the identification of impacts to take into account, namely that the cost-benefit analysis should follow the MER report and both cost-benefit analyses followed the MER report on the identification of environmental impacts. The third choice is the identification of impacts to be valued. The OEEI guidelines state that quantification of certain external effects are associated with uncertainties. In this case, attempts should not necessarily

be made to quantify these effects, depending on time and money. All those effects not quantified should be included in the cost-benefit analysis as PM (pro memory) posts. In the cost-benefit analysis on land reclamation the noise effects were included as a PM-post, while in the cost-benefit analysis on 750 hectares nature and recreation area, the external effects of vaults were a PM-post.

There is at this point, however, still a lack of formal institutions or guidelines concerning the economic valuation process, the *second* element. This lack of guidelines also influenced the choices in the process. Only for those choices that are covered by the cost-benefit guidelines do agreements exist - the determination of the project-alternative, the identification of impacts, and the identification of impacts to be valued. The other choices of the valuation process had no such agreements. As was explained in the previous chapter, in the United States the NOAA panel developed guidelines for the Contingent Valuation method (Arrow et al., 1993), in which they cover guidelines for sampling, questionnaires and interviews, the elicitation format, present value calculations and so on. It can be argued that specific economic valuation guidelines can influence especially those choices not covered by the OEEI cost-benefit analysis guidelines. These choices are the definition of the affected parties, how to define geographical boundaries, which valuation methods are the most appropriate for the valuation of certain ecosystem functions, which discount rate and which time span to apply in the discounting process, and, lastly, which factors to assess in the sensitivity analysis.

Third, environmental regulations played a key role in the choices of the economic valuation processes. The EU Birds and Habitat Directives were important environmental regulations affecting the expansion of the Rotterdam port, and they were likely to have had influence especially on choices in the economic valuation process on land reclamation. In the other economic valuation process on the development of 750 hectares nature and recreation area, environmental regulations played a less prominent role in influencing the choices of the economic valuation process. In the study on land reclamation, they affected choices on which impacts to identify, which impacts to value and how to value them. The Habitat Directives state that any affected nature area that falls under these Directives needs to be compensated by developing exactly the same area somewhere else. The area designated for the port expansion falls under these Directives and therefore needs to be compensated. For the effects of the port expansion on the aquatic ecosystem, therefore, the choice on

which effects to take into account, which to value and how to value them became relatively straightforward – these choices would be completely covered by the investment and management costs of the compensated area.

6.6.2 Influences of the Characteristics of the Economic Instrument

The second element in the context of the economic valuation processes are the characteristics of the economic instrument in which the economic valuation process is applied. In both case studies, the economic instrument is the social cost-benefit analysis. The following elements were identified as likely influences on the choices in the economic valuation process:

1. Use type
2. Goal
3. Time constraints
4. Budget constraints

The first characteristic of the cost-benefit analysis is its *use type*. In both case studies, this was defined as project evaluation. This use type probably had an influence on two of the pre-assessment choices, namely the parties affected and the impacts to identify. Its influence on the determination of the parties to take into account in both economic valuation processes is related to the fact that the project was being evaluated by a cost-benefit analysis. This implies that those parties that lose and those that gain from the projects need to be incorporated. The same argument can be made for the environmental impacts. Since the projects were being evaluated with a social cost-benefit analysis, all effects of the projects needed to be taken into account, including external environmental effects. Therefore, a wide range of environmental effects was selected to be taken into account.

The second characteristic is the *goal* of the cost-benefit analysis. In the first cost-benefit analysis on land reclamation, the goal was to identify the decision on land reclamation, which influenced particularly the pre-assessment choices. The first element it influenced was the identification of the project alternative, which was not set equal to “doing nothing” or “current policy”. Instead this situation was described according scenarios on noise pollution, potential demand and so on. Had the project-alternative been described as the situation equal to doing nothing, the decision on land reclamation would not be truly identified since the project alternative to which the decision is compared to would be unrealistic. The second choice influenced by the goal was the selection of parties affected by the project. Since a decision was to be made based on a social cost-benefit analysis, both parties that lose and win as a result of the project needed to be

identified. The goal of the cost-benefit analysis also influenced the geographical boundaries of the economic valuation study. The goal was to identify decisions for Dutch society, and therefore the geographical boundary was drawn around the Netherlands. Especially the benefits, however, also fell outside these boundaries, in particular in Germany. These benefits have been presented in an appendix to the cost-benefit analysis, but were never incorporated in the analysis itself since this would not relate to the goal of the study. The next choice influenced by the goal was the identification of impacts. As the goal was to determine whether the option of land reclamation would be economically interesting from a social perspective, it meant that also social and environmental effects would need to be identified.

The assessment choices in this cost-benefit analysis were less likely to be influenced by the goal of the cost-benefit analysis. For example, the choice on how to quantify the impacts into monetary units was based on available studies that allowed the contracting parties to quantify the effects on the one hand and the fact that nature would be completely compensated on the other. Standard and accepted valuation methods were applied for the quantification of pollution, like dose-response and mitigation behavior. This data was available. Furthermore, since nature would be completely compensated, the investment and management costs of new nature area would equal the economic value of the affected nature due to land reclamation. The choices for discounting variables were based on the OEEI guidelines for cost-benefit analysis, while the variables tested in the sensitivity analysis were substantiated as being the key factors of uncertainty in the cost-benefit analysis – future economic growth and future noise pollution levels. The goal of the cost-benefit analysis therefore played a limited role in these choices.

It can be argued that the influence of the goal of the second cost-benefit analysis concerning the development of 750 hectares nature and recreation area was mainly on the first five choices - definition of the phenomenon being studied, the project alternative, the parties affected, geographical boundaries, identification of impacts and identification of impacts to be valued. The goal of this cost-benefit analysis was to justify the decision on the development of 750 hectares nature and recreation area. The phenomenon was defined as the costs and benefits of the development and exploitation of this nature and recreation area. Focussing on both costs and benefits, and presenting these aspects quantitatively would link very well with the goal of justifying political decisions. This way, the outcome of any possible future discussion on whether such a project could be justified in

terms of investment and exploitation costs versus the benefits of the project could be immediately influenced by such an analysis that showed positive net benefits. Secondly, the goal influenced the definition of the project alternative. The project alternative was not set equal to “doing nothing” or “current policy” – instead, this situation was described according to future scenario’s on land use. Had the project-alternative been described as the situation equal to doing nothing, the decision on land reclamation would not be truly justified since the project alternative to which the decision is compared to is unrealistic. The third choice influenced by the goal was the selection of parties affected by the project. Since a decision was to be substantiated by a social cost-benefit analysis, both parties that lose and win as a result of the project needed to be identified. The goal of the cost-benefit analysis also influenced the geographical boundaries of the economic valuation study. The goal was to justify decisions for Dutch society, and therefore the geographical boundary was drawn around the Netherlands. The last choice influenced by the goal was the identification of impacts. As the goal was to determine whether the option of developing 750 hectares nature and recreation area could economically be justified from a societal perspective, it meant that also social and environmental effects would need to be identified.

The other two elements of the characteristics of the cost-benefit analysis, *time and budget constraints*, played a very important role in the cost-benefit analysis on 750 hectares nature and recreation area, but none in the choices of the cost-benefit analysis of land reclamation. In the latter analysis, neither time nor budget constraints were said to be significant. In the other cost-benefit analysis, however, both constraints existed and played a key role in one of the choices in the economic valuation process - the identification of impacts to be valued. The fact that both time and budget constraints existed seriously influenced the choice that not every impact could be quantified. The valuation of existence value, for example, is very time intensive and costs quite a lot of money – as this was not available, the contracting parties decided not to carry out the quantification.

6.6.3 Influences of the Stakeholders Context

In section 6.4, two aspects in the stakeholder context of the economic valuation process were distinguished – the stakeholders and their relationships. In terms of the first aspect, stakeholders were divided into direct and indirect stakeholders of the valuation process. The following *direct stakeholders* were distinguished for both cost-benefit analyses on land

reclamation and the development of 750 hectares of nature and recreation area:

1. Principal
2. Contracting parties
3. Steering committee
4. Interviewed and consulted persons
5. Advisory board

The key stakeholders in both valuation processes were the principal, the contracting parties, the steering committee and the advisory board. The influence of the set of interviewed and consulted persons was limited as in both case studies data was primarily obtained from sources internal to the contracting parties or principal. The *first* important direct stakeholder in both economic valuation processes is the principal and its main influence was on the definition of the phenomenon being studied. Both PMR and the Province of South-Holland defined the subject of the cost-benefit analyses, which was the economic analysis of land reclamation and development of 750 hectares. The *second* direct stakeholder is the group of contracting parties, who in the first cost-benefit analysis consisted of CPB, NEI and RIVM, and in the second study of NEI and RIVM. Their main influences were throughout the economic valuation processes, as most of these choices were in fact made by the contracting parties. The exception is the first pre-assessment choice, the definition of the phenomenon, which was made by the principals. The *third* and *fourth* important direct stakeholders are the steering committee and advisory board. Through constant and regular discussions with the contracting parties, and the possibilities to ask critical questions, their influence on all choices, except for the definition of the phenomenon, was crucial.

The most important *indirect stakeholders* of the first economic valuation process on *land reclamation* were defined as:

1. Consept
2. MER commission
3. RMPM
4. Users of the services of the project

The *first* indirect stakeholder is the coalition of nature organizations Consept. It was involved in the negotiations on land reclamation and in particular in negotiations on nature compensation for the land reclamation. In that sense, it played an important role behind the scenes in this cost-benefit analysis, but had little influence on the actual choices made in the valuation process. Its influence on choices was, however, important in the

other cost-benefit analysis, which will be discussed in the next paragraph. The MER commission was a *second* key indirect stakeholder in the economic valuation process, and its influence on the choices in the economic valuation process was direct, not through forming coalitions or engaging in interest group politics, as is the case with most other indirect stakeholders. The MER commission's influence was in particular on the identification of impacts to take into account. The MER commission had identified all environmental impacts of land reclamation and the cost-benefit analysis was to be exactly linked to the findings of the MER. Hence, the MER primarily determined the identification of impacts to take into account. The *third* and *fourth* indirect stakeholders of importance for the economic valuation process are RMPM and the users of the services of the project. Both had an indirect influence on choices in the valuation process through the forming of coalitions and engaging in interest group politics, which will be explained in the next paragraphs.

In section 6.4.2, it was explained that two coalitions were formed in the cost-benefit analysis on land reclamation, namely:

1. Contracting parties
2. Principal and contracting parties
3. RMPM and users project services

First, a coalition was formed between the three contracting parties, in which power leaned towards the CPB. Since the contracting parties determined all the choices in the valuation process except for the first choice, this coalition influenced eight out of nine choices. A *second* crucial coalition is formed between the principal and the contracting parties. It was explained how power within this coalition leaned towards the contracting parties. This coalition also influenced all of the choices throughout the valuation process except for the first choice, which means that as the contracting parties had most of the power, they determined the choices in the valuation process. The *third* and last coalition was formed between the RMPM and users of the project services, such as container companies. The influence of this coalition was through engaging in interest group politics with another stakeholder, the CPB.

The *interest group politics* relationship between the coalition of RMPM with the users of the project's services on the one hand and the CPB on the other hand influenced particularly two choices in the economic valuation process. Both of these choices relate to the expected future norms on noise pollution, a major source of conflict between the CPB and RMPM. The

RMPM expected these norms to increase in the future, and was convinced this would form a major limitation to the expansion of current port space. They felt that the CPB did not take these expectations enough into account in their cost-benefit calculations. The first choice affected by the interest group politics is determination of the project alternative. This project alternative consisted among others of scenarios of future noise pollution. The second choice affected was the sensitivity analysis, where the expected future noise pollution scenario's also played a key role.

The two most important *indirect stakeholders* of the second cost-benefit analysis on the *development of 750 hectares nature and recreation area* were defined as:

1. MER commission
2. Consept

The *first* indirect stakeholder is the MER commission. Although all indirect stakeholders up until now have had influences on economic valuation choices through forming coalitions or engaging in interest group politics, the MER commission's influence on the valuation process was direct. More specifically, its influence was directly on the identification of impacts to take into account. The MER commission had identified all environmental impacts of land reclamation and the cost-benefit analysis was to be exactly linked to the findings of the MER. Therefore, the MER actually determined the identification of impacts to take into account. The influence of the *second* indirect stakeholder, Consept, however must be explained by looking at the coalition it formed.

In the cost-benefit analysis on the development of 750 hectares nature and recreation area, three *coalitions* were formed:

1. Contracting parties
2. Principal and contracting parties
3. Delegated principal cost-benefit analysis and principal project
4. Principal and Consept

The *first* coalition was formed between the two contracting parties, NEI and RIVM. Its influence was on all the choices of the economic valuation process since these were made by the coalition except for the first choice, which was made by the principal. The *second* coalition was formed between the principal and contracting parties, in which power, as was explained in section 6.4.2, leaned towards the contracting parties. This coalition also influenced all the choices except for the first choice. In other words, the

contracting parties made the choices in a coalition with the principal, however as power within this coalition leaned towards the contracting parties they dominated in the choices. *Third*, a coalition was formed between the delegated principal of the cost-benefit analysis and the principal of the project. Its influence was only on the first choice of the economic valuation process – definition of the phenomenon being studied. Both principals together determined that the development of 750 hectares nature and recreation area should be justified with a cost-benefit analysis. The *fourth* and last coalition was formed between the principal and the coalition of nature organizations, Consept. Both stakeholders initiated the execution of the cost-benefit analysis on 750 hectares nature and recreation area. This coalition, therefore, particularly influenced the first choice in the economic valuation process – definition of the phenomenon to be studied.

Chapter 7 Significance of the Context of Valuation Processes

7.1 Introduction

In this chapter, a comparison will be made between three cost-benefit analyses: a cost-benefit analysis on gas extraction, a cost-benefit analysis on land reclamation, and a cost-benefit analysis on the development of 750 hectares new nature and recreation area. These cases were analyzed in Chapters 5 and 6. In this analysis, the focus was on the influence of elements in the context of the valuation process on the choices made within this process. This context consisted of formal and informal institutions, the characteristics of the economic instrument and the stakeholders and their relationships.

For each of the three case studies, the key influences on the choices have been extracted and are summarized in tables A1, A2 and A3 in the Appendix. This will form the basis for the discussion in this chapter, in which the three case studies are compared and contrasted. Although the answer to the main research question of this dissertation will be given in the concluding chapter of this thesis (Chapter 8), the underlying chapter will provide the guidance for this discussion. Differences and similarities of influences on choices among the three cases will be discussed, where the emphasis is on the following seven most noted differences and similarities: (1) rules and regulations for the economic instrument; (2) scientific paradigms; (3) policy paradigms; (4) goal of the economic instrument; (5) time and budget constraints; (6) stakeholder participation; and (7) stakeholder communication.

7.2 Formal and Informal Institutional Influences

7.2.1 Formal Institutions: Rules and Regulations for the Economic Instrument

In the formal institutional context, a *first* important difference between the three cases is the prevalence or absence of guidelines for the cost-benefit analysis of which the economic valuation processes were part. While the two cost-benefit analyses related to the expansion of the Rotterdam port were subject to guidelines (see sections 6.2 and 6.6.1), the cost-benefit analysis on gas extraction in the Wadden Sea was not (see sections 5.2 and 5.6.1). This difference had a strong influence on the analyses, to the extent that different choices were made. The cost-benefit analysis guidelines that existed in the two case studies related to the Rotterdam port were called “OEEI” guidelines. These guidelines were initiated by the government particularly to guide cost-benefit analyses of large infrastructural projects - typically government-financed projects. Consequently, the guidelines provided a structure to several steps in the cost-benefit analyses of the port expansion. One example where this can be observed is in the selection of the project alternative, the alternative situation to which the costs and benefits of the project must be compared. The OEEI guidelines clearly state that this alternative should not be set equal to “doing nothing” but instead should be defined as the best alternative to the project. In line with this guideline, the project alternative was defined as the best alternative in both studies on the port expansion. In the cost-benefit analysis on land reclamation, the project alternative was explained as the situation without land reclamation, which would inevitably lead to a shortage in port space. The consequences of this shortage in space were explained, which formed the basis for the project alternative. A similar approach is taken in the cost-benefit analysis on the development of 750 hectares nature and recreation area: the project alternative is explained as the situation where this nature development would not take place. In other words: what would happen to the land designated for nature development and which other projects would be realized? Clearly, both studies were guided by the OEEI guidelines. In the other case study on gas extraction, however, no such guidelines existed. It was argued in Chapter 5 that the absence of such guidelines was of particular influence on the choice for the project alternative. Contrary to what is suggested in the OEEI guidelines, the project alternative was defined as “doing nothing” or “current policy”. Consequently, the project itself, defined by the researchers as a total collapse of the Wadden Sea ecosystem, was compared with the project alternative defined as the current situation in the Wadden Sea.

Second, the OEEI guidelines recommend that a cost-benefit analysis should be directly linked to an Environmental Impact Statement, or MER. The economic and the environmental studies should be attuned to one another, and the cost-benefit analysis should generally follow the framework of environmental impacts derived in the MER. The prevalence of these OEEI guidelines for the two studies on the port expansion consequently resulted in a situation where both cost-benefit analyses followed the MER. In fact, the MER was used as a guide in step five of the economic valuation process - the identification of impacts. On the other hand, the absence of OEEI guidelines during the study of gas extractions led to a situation where neither the MERs carried out for the Wadden Sea nor other environmental studies, were used as a reference in the identification of impacts in the other cost-benefit analysis on gas extraction in the Wadden Sea. Instead, the contracting party selected the list of Wadden Sea functions that could possibly be affected by the gas extraction themselves and were not guided by official environmental impact studies.

Third, the OEEI guidelines clearly explain that not every impact necessarily needs to be quantified in a cost-benefit analysis. When uncertainty prevails in the economic valuation process, there is a preference to list these impacts as so-called pro-memory or “PM-posts”. In the two studies of the port expansion that were subject to these OEEI guidelines, the impacts surrounded by too much uncertainty were indeed not selected for valuation and instead were included in the cost-benefit analysis as PM-posts. However, in the other study on gas extraction in the Wadden Sea, during which these same guidelines were lacking, no PM-posts were included and instead all impacts were selected for quantification.

7.2.2 Informal Institutions: Scientific Paradigms

In the informal institutional context, scientific paradigms played a more prominent role in the cost-benefit analysis on gas extraction in the Wadden Sea (see sections 5.2 and 5.6.1) than in the two cost-benefit analyses related to the expansion of the Rotterdam port (see sections 6.2 and 6.6.1). More specifically, this difference lies in the prevalence of scientific paradigms in three choices of the economic valuation process on gas extraction. *First*, in the identification of impacts, the ecological economics paradigm prevailed, which allowed the stakeholders to integrate an extensive list of impacts in their analysis. *Second*, the neoclassical economics paradigm prevailed at the next step - identification of impacts to be valued. This approach allowed the stakeholders to quantify an extensive number of impacts, even a relatively controversial impact, namely “nature”. The *third* choice

influenced by scientific paradigms is the quantification of impacts into monetary units, where the neoclassical economics paradigm also prevailed. This allowed the stakeholders to apply a wide range of valuation methods to obtain their quantitative values, even the application of non-conventional methods the researchers call “investment by public bodies”.

In the cost-benefit analyses related to the Rotterdam port, a more balanced approach was taken throughout the processes, which means that neither of the choices in the valuation process was particularly dominated by a specific scientific paradigm. As a result, the identification of impacts was carefully performed and substantiated with clear arguments, not all impacts were identified for valuation (if it was not possible to quantify an impact, the impact was included as a PM-post), and only scientifically accepted valuation methods were applied.

7.2.3 Informal Institutions: Policy Paradigms

An interesting common element in all three case studies is the observation that policy paradigms in the informal institutional context influenced only the first choice in the three economic valuation processes: definition of the phenomenon (see sections 5.2, 5.6.1, 6.2 and 6.6.1). Four policy paradigms were identified as significant influences: (1) ecological modernization; (2) institutionalization of environmental problems; (3) an integrated water management approach; and (4) perception of water as a scarce resource. It was argued that all four paradigms influenced the definition of the phenomenon in the valuation processes on gas extraction and land reclamation, while for the study on the development of 750 hectares, only the first two paradigms were significant. This results from the fact that this particular study did not concern the development of an aquatic ecosystem and thus the latter two paradigms didn't influence the choices in the valuation process. In the other two studies, however, the focus was on aquatic systems and so it was argued that a combination of the four paradigms influenced the phenomenon being studied.

7.3 Influences of the Characteristics of the Economic Instrument

7.3.1 Goal

In relation to the characteristics of the economic instrument, a major difference between the three cases is that the goal of the economic instrument has less influence on choices in both cost-benefit analyses related to the port expansion than on choices in the study on gas

extraction. Two important observations can be made with respect to this difference. *First*, the goal influenced a larger number of choices in the gas extraction analysis. The goal of this study was to influence political decision making on gas extraction in the Wadden Sea, and it was argued that this influenced all nine choices made in the economic valuation process (see sections 5.3 and 5.6.2). In the other studies related to the port expansion, however, the goal was of less influence. In the analysis on land reclamation, the goal was to identify the political decision. This influenced particularly four choices in the valuation process, namely (1) definition of the project alternative; (2) the parties affected; (3) geographical boundaries; and (4) the identification of impacts. In the second study related to the Rotterdam port, the goal was defined as the justification of political decisions and it was argued that this particularly influenced the first five choices in the valuation process : (1) definition of the phenomenon being studied; (2) project alternative; (3) parties affected; (4) geographical boundaries; and (5) identification of impacts. A *second* observation in relation to the goal is that the different goals of the three studies also resulted in completely different choices in some of the steps of the valuation processes. This difference can particularly be found between the cost-benefit analysis on gas extraction on the one hand and the two cost-benefit analyses related to the Rotterdam port on the other. The differences will be elaborated in the next paragraph. Interestingly, the choices in the two studies on the Rotterdam port were similar, despite their different goals.

The differences between the three economic valuation processes is most prominent in five choices (see sections 5.6.2 and 6.6.2). *First*, the project alternative was defined differently. In the study on gas extraction, the project alternative was defined as the situation of “doing nothing”, which was compared to a situation of a total collapse of (part of) the Wadden Sea ecosystem. This allowed the stakeholders to increase the outcome of the economic valuation study, which would best serve their goal. In the other two studies related to the Rotterdam port, however, the project alternatives were not defined as “doing nothing” but were explained and substantiated as representing the best alternative allocation of means to the project. *Second*, in the study on gas extraction, the geographical boundaries were drawn so that the area on which the valuation process would focus would be as large as possible. The more conventional geographical boundaries of the Wadden Sea, drawn by other (scientific) institutes, were not applied - the stakeholder preferred to draw their own boundaries around the Wadden Sea, which resulted in a larger map of the area than under the conventional boundaries. Again, such choices allowed the stakeholders to

increase the outcome of the economic valuation study, which would best serve their goal. In the other two studies on the port expansion, however, the geographical boundaries were simply drawn around the Netherlands, even though many of the benefits (some say most of the benefits) of the Rotterdam port expansion would accrue to stakeholders outside the Netherlands, namely in Germany. *Third*, in the cost-benefit analysis of gas extraction, a wide range of impacts were selected for quantification. In fact, all impacts selected were also quantified. Even more interestingly, an unusual step was taken by the stakeholder: first all functions of the Wadden Sea were identified and quantified in economic valuation (in other words, a total economic value of the Wadden Sea was calculated), then a selection was made as to which of these functions would actually be affected by gas extraction, followed by the application of formulae to determine what the loss in economic value as a result of gas extraction would be. In both studies related to the Rotterdam port, on the other hand, no such additional step was made – only those elements identified as actual impacts of the land reclamation or of the development of 750 hectares nature and recreation area were selected, and from this a separate selection was made for those impacts to quantify. Which brings us to the *fourth* difference: while in the study on gas extraction, all impacts were quantified, leading to a higher economic value, in the analyses related to the Rotterdam port only selected impacts were quantified. The *fifth* and last difference between the studies is the actual quantification of impacts into monetary terms and in particular the quantification of one impact: the loss in existence value of nature. In the literature, it is generally accepted that existence value is most appropriately quantified using the Contingent Valuation method. However, in the cost-benefit analysis of gas extraction, this impact was quantified with a non-conventional method, namely investment by public bodies. The reason was that, since Contingent Valuation is both expensive and time-consuming and both time and budget were limited, this analysis was not possible. As opposed to choosing not to quantify existence value, the stakeholders decided to apply this alternative method, thereby increasing the outcome of the economic valuation study. Again, this best serves their goal. In the other two studies, however, existence value was not quantified. Time and budget were too limited for a Contingent Valuation approach, and the stakeholders chose not to quantify the existence value. In line with the literature, the principal and contracting parties decided only contingent valuation was an appropriate method to calculate existence value and instead included this value qualitatively as a PM-post.

7.3.2 Time and Budget Constraints

Observations on time and budget constraints can be made for two of the three studies in which these constraints played an important role: the cost-benefit analysis on gas extraction (time constraints) and the cost-benefit analysis on the development of 750 hectares nature and recreation area (time and budget constraints). In both studies, time constraints influenced particularly one of the choices in the valuation processes, albeit different ones. In the study on gas extraction, time constraints particularly influenced the quantification of impacts into monetary units (see section 5.6.2). While at the start of this study, the time span available was long, after the study commenced the time span was significantly shortened. Due to the imposition of this time constraint, the contracting party had to find ways to quantify the different impacts within a limited time period. Sometimes unconventional methods were applied, such as the quantification of existence value, which was discussed in the previous section.

In the other study, the development of nature and recreation area, both time and budget constraints played an important role in particular in the identification of impacts to be valued (see section 6.6.2). Both constraints led to the decision that not every impact could be selected for quantification. For example, existence value was not quantified for the simple reason that a good analysis would cost a lot of time and money – instead, it was included in the analysis as a PM-post.

7.4 Stakeholder Influences

7.4.1 Organization of Stakeholders

In this section, the influence of direct and indirect stakeholders on the three economic valuation processes will be discussed in relation to the organization of these stakeholders in the valuation processes. This discussion will be held along the lines of stakeholders' *participation* in the process and the *communication* of their ideas, goals and viewpoints to choices made in the valuation process. This will be compared and contrasted between the three case studies in the following two sections. The last section will discuss the prevalence and influence of interest group politics, in which both participation and communication of certain stakeholders come together.

7.4.2 Participation of Stakeholders in the Valuation Process

In terms of participation of stakeholders, a *first* important difference between the three case studies is the role of the principal and the contracting party (or parties). In the cost-benefit analyses related to the Rotterdam port development, the principal participated less in the making of choices in the valuation process than in the cost-benefit analysis on gas extraction. Conversely, the contracting parties' role in making choices was more dominant in the cost-benefit analyses related to the Rotterdam port.

A *second* difference between the three case studies is the role of stakeholders organized in different committees that guide the economic valuation processes. In short, one can state that the different committees in both analyses related to the port expansion played a more prominent role in the making of choices of the valuation process than those involved in the other analysis on gas extraction. In the latter, two committees were involved: a steering committee and a peer review group (see sections 5.4 and 5.6.3). The peer review group was exactly that - it read the draft manuscript and provided comments. According to the interviewed, however, very little was done with these comments in the drafting of the final document. The steering committee consisted of three people with a scientific background, but was to provide more of a theoretical guidance concerning environmental economics than steering the process. On the other hand, the steering committees for the two studies related to the port expansion (see sections 6.4 and 6.6.4) consisted of carefully-selected representatives of different stakeholder groups of the two projects. The contracting parties and steering committee had regular meeting in which questions were answered and feedback was given. Their advisory boards consisted of several external experts who judged the professionalism and scientific accountability of the approach, guarded the process and reported to the project minister. The contracting parties directly dealt with the advisory board's concerns and questions.

A *third* difference between the cases was the participation of indirect stakeholders. Coalitions of indirect stakeholders participated more prominently in the choices of the valuation process on gas extraction than in the other processes related to the Rotterdam port expansion. In the study on gas extraction, it was explained that five indirect stakeholders played a key role (see section 5.6.3) throughout the valuation process. More specifically, their influence was through their relationship with other stakeholders. Three of these indirect stakeholders (the Minister of Environment, Ms. Tineke Witteveen and the Wadden Association)

participated in the valuation process by forming a coalition with the principal of the study. The other two stakeholders (the Minister of Economic Affairs and NAM) together formed a separate coalition and engaged in interest group politics with the other three coalitions. In the other two case studies, however, coalitions of indirect stakeholders participated less prominently in the valuation processes (see section 6.6.3). In the first study on land reclamation, four key indirect stakeholders were identified. One of these (Consept) played a very limited role in this valuation process, while a second stakeholder, the MER commission, did not need to form coalitions but directly participated in the valuation process through the identification of the environmental effects that would need to be taken into account in the valuation process. The other two stakeholders (RMPM and the users of the project's services) did form a coalition, whose participation was somewhat limited. In the second study on the development of 750 hectares nature and recreation area, two key indirect stakeholders were identified (see section 6.6.3). One of these stakeholders was the MER commission who, like in the other study, directly participated in the valuation process by identifying the impacts. The other stakeholder (Consept) formed a coalition with the principal of the cost-benefit analysis. Their participation was also limited.

7.4.3 Communication of Stakeholders in the Valuation Process

This section will discuss whether the goals, interests and viewpoints of the stakeholders influence the choices in the three economic valuation processes. *First*, observations on the communication of interests of the principal and contracting parties will be made. The previous section explained that the principal participated more prominently in the making of choices in the cost-benefit analysis on gas extraction than in the two cost-benefit analyses related to the Rotterdam port. On the other hand, the participation of contracting parties was more prominent in the two cost-benefit analyses related to the Rotterdam port. The next question is whether this difference in participation of principals and contracting parties also resulted in a difference in the communication of their ideas to the choices in the valuation processes. In the analysis of the previous chapters, it has been difficult to measure exactly which choices would have been made differently if the principal would have had more or less influence. However, it can be argued that in general different choices will be made, depending of course on the principal and contracting party. In the case on gas extraction, for example, the principal had a very clear position, namely gas extraction should be banned from the Wadden Sea. If the principal then participates significantly in the making of choices in the valuation

process, these choices are likely to be influenced by the communication of the (subjective) ideas and preferences of the principal. This is further enhanced when the principal forms a coalition with a contracting party in which power leans towards the principal, as was also the case in the gas extraction study. If, on the other hand, the principal participates less in the making of choices than the contracting parties, as was the case in the two other studies, the communication of ideas and preferences of the principal will most likely be less. Furthermore, if the principal forms a coalition with contracting parties, in which they behave relatively independent and hence power leans towards the contracting parties, as was also the case in these two studies, the interests of the principal are even less communicated.

More specifically, the principal in the gas extraction study was in the position to communicate its goals particularly to the first four choices in the economic valuation process (see section 5.6.3): the principal determined the phenomenon to be studied; the project alternative; the parties affected; and the geographical boundaries. The last choice was made by the principal and contracting party together. The contracting party, in turn, determined the remaining choices of the economic valuation process: identification of impacts; identification of impacts to be valued; quantification of impacts into monetary units; discounting; and sensitivity analysis.

In both studies on the port expansion, however, the communication of the principal's goals was much more limited. It can be argued that the principal only determined the first choice – definition of the phenomenon being studied. In the study on the development of 750 hectares nature and recreation area, the principal did this in co-operation with the principal of the larger project “Rotterdam port expansion”, with whom the principal had formed a coalition. The contracting parties then made the other choices in the valuation processes and in both studies the contracting parties made these choices as part of a coalition.

The *second* difference in communication between the three case studies involves the communication of the perspectives of the different stakeholders that were organized in committees. As was also explained in the previous section, the participation of committees and their communication in the cost-benefit analyses related to the Rotterdam port was more prominent than in the cost-benefit analysis of gas extraction. Through regular meetings between the committees and the contracting parties, they were able to have influence on most choices in the economic valuation process except for the first choice, definition of the phenomenon. This decision was made by the principal. In the other study,

however, it can be argued that although committees were officially included in the valuation process of gas extraction, the communication of their perspectives to the choices in the economic valuation process was very much limited. The next question is whether the difference in the communication of committees in these three cases also resulted in different choices in the economic valuation process. It can be argued that different choices are likely to result. For example, if committees consist of stakeholders and experts that have a serious say in the choices of the valuation process, as was the case in both studies related to the Rotterdam port, subjective preferences and interests of specific principals and contracting parties in the valuation process may be limited.

The *third* difference in communication among the three case studies is related to the indirect stakeholders. The previous section explained that coalitions of indirect stakeholders in the cost-benefit analysis related to the Rotterdam port expansion participated relatively less in the process than in the cost-benefit analysis on gas extraction. Only one stakeholder directly communicated its ideas to choices in the valuation process on the cost-benefit analysis on land reclamation - the MER commission directly determined the identification of impacts. Two other stakeholders, RMPM and the users of the project services, formed a coalition and communicated their ideas in two choices, namely defining the project alternative and the sensitivity analysis. In the other study on the 750 hectares new nature and recreation area, similar communication of indirect stakeholders can be found: the MER commission also directly determined the identification of impacts. A second indirect stakeholder, Consept, formed a coalition with the principal of the study and through this communicated its ideas to one of the choices in the valuation process, namely the definition of the phenomenon being studied. In the cost-benefit analysis of gas extraction, on the other hand, three indirect stakeholders formed a coalition through which they were able to communicate their ideas to all choices in the valuation process. Two additional indirect stakeholders formed a separate coalition to engage in interest group politics, through which they also communicated their ideas on all choices in the valuation process, as will be further explained in the next section.

The question that remains is whether the different abilities of indirect stakeholders to communicate their ideas in these three cases also resulted in different choices in the economic valuation processes. It can be argued that different choices may result and that this is influenced particularly by the way in which these stakeholders communicate their ideas. In the case on gas extraction, indirect stakeholders communicated their ideas by forming

different coalitions, among others with the principal. Through these coalitions, choices were influenced but in a non-transparent way. In the other studies of the Rotterdam port, stakeholders either directly determined the choices (like the MER commission) or formed a coalition that had a very limited amount of communication possibilities to the choices in the valuation processes. This means that the influence indirect stakeholders have on the process was at least transparent.

7.4.4 Interest Group Politics

Some stakeholders of the valuation processes were involved in interest group politics. As a result, this allowed them to communicate their ideas and goals to the choices in these valuation processes. Both the level of engagement and influence on choices in the valuation process differed between the three case studies. In the cost-benefit analysis on gas extraction, for example, interest group politics played a major role in the choices throughout the valuation process. On the other hand, in the study on land reclamation for the port expansion, interest group politics played a less prominent role while in the other study on the port expansion it in fact played no role at all.

In the analysis on gas extraction, one particular coalition engaged in interest group politics with three other coalitions (see sections 5.4.2 and 5.6.3). The key to this interest group politics lay in two stakeholders: the Netherlands Petroleum Company (NAM) and Greenpeace, who was the principal of this valuation study. It was explained how this relationship could be traced back to other incidents like the Brent Spar and Shell's (one of the two shareholders of the NAM) role in Nigeria. Greenpeace and NAM are thus regularly engaged in interest group politics in relation to their diverging positions and interests towards economics and the environment. As a result, it is likely that the choices in the study were influenced in one way or another by this interest group politics relationship in order to increase Greenpeace's power over NAM so that gas extraction in the Wadden Sea would be banned. Obvious examples are the choices of the phenomenon being studied, which was defined by Greenpeace to increase power over NAM in the first place; the definition of the project alternative, which was defined as a complete collapse of the ecosystem in the case of gas extractions, thereby increasing its cost; and the drawing of geographical boundaries that produced a larger geographical area than the use of boundaries produced by other institutes, thereby also increasing the cost of gas extractions and thus the power of Greenpeace over NAM.

In one of the studies related to the Rotterdam port, the cost-benefit analysis on land reclamation, an important interest group politics relationship was formed between one of the contracting parties, CPB, and the Rotterdam Municipality Port Management (RMPM). This relationship was characterized by disagreements on several assumptions of the economic valuation process, including noise limitations and future economic growth. It is likely that this interest group politics relationship influenced some of the choices in the valuation process, in particular two choices in which these assumptions were relevant: the determination of the project alternative and choices in the sensitivity analysis (see section 6.6.3).

Once more the question arises whether different choices are made when there is less interest group politics, as was the case in the studies related to the Rotterdam port. It can be argued that a higher participation of stakeholders in interest group politics, like in the case on gas extraction, leads to different choices. An example is the choice on how to value the existence value of nature: while Greenpeace and its partners decided to apply an unconventional method to at least be able to derive some sort of figure that would increase the cost of gas extractions and hence their power over NAM, PMR and its partners, who were not involved in such similar power struggles decided not to use unconventional methods.

Perhaps a more important observation in this section is that it is the way in which stakeholders communicate their preferences to the choices that matters. While in the case studies related to the Rotterdam port, many stakeholders with different goals and interests related to the project were in fact integrated in the analysis by joining committees, in the cost-benefit analysis on gas extraction this wasn't the case. They nevertheless had an important influence through engaging in interest group politics, but their influence was indirect and hence less transparent. In the cases related to the Rotterdam port, it can be argued that as the interests and goals of stakeholders had been directly integrated in the valuation process, it thereby made the analysis and thus the balancing of stakeholder interests more transparent.

Chapter 8 Conclusions for Valuation Processes in Dutch Water Management

8.1 Introduction

This dissertation has analyzed the process of economic valuation of ecosystems in Dutch water management. The goal was to formulate conclusions and recommendations on how to improve valuation processes by limiting inconsistencies in their outcomes.

Balanced decisions in integrated water management require transparent processes: a process in which it is clear to all stakeholders which choices and assumptions are made and why. It was explained that, despite a growth in popularity of valuation studies, overviews of publications show that a repetition of studies on the same subject is not uncommon, but that the outcomes of these studies may be completely different. At the basis of these inconsistencies in outcomes lies the fact that economic valuation has a variety of methodological tools that are at the disposal of different practitioners with different interests. At the same time, little agreement exists on these methodologies, and as a consequence different methodological constructions are used resulting in diverging outcomes. Despite these inconsistencies, economic valuation studies have an important added value in environmental management, including water management. It is the only method that allows for the quantification of environmental effects in monetary terms, and as such plays an important role in highlighting the values of ecosystems, in countering arguments on ecosystem conversion and in balancing environmental effects with other costs and benefits. However, there is a possibility that persistent inconsistencies in outcomes of valuation studies may undermine the usefulness of valuation studies to integrated water management in the long run. Decision-makers may become increasingly skeptical to valuation studies if they tend to reflect the subjective preferences of only one

stakeholder, while balanced decisions in integrated water management often need to involve the preferences of numerous stakeholders.

In order to explain inconsistencies in valuation outcomes, an institutional theory perspective on economic valuation processes was taken. The key to this perspective is that choices in valuation processes and their outcomes are influenced by the context in which they are made. The two sub-questions analyzed therefore were: (1) Which choices are made in economic valuation processes and how? and (2) Which factors can be distinguished in the context of choices in economic valuation processes? Both questions were answered from a theoretical and an empirical perspective, focussing on the field of water management in the Netherlands. The sub-questions guided the answers to the main research question of this thesis: *How are choices in economic valuation processes in water management influenced by the context in which they are made?* Conclusions on this question will be drawn in this chapter, preceded by a discussion of each of the two sub-questions that will take place in the following two sections. The chapter will finish with a discussion in which a reflection is given on the major strengths and weaknesses of this research, including the analytical model, and recommendations are formulated for theory and the practical application of economic valuation in water management.

8.2 Choices in the Economic Valuation Process

This section will answer the first sub-question of this dissertation: *Which choices are made in economic valuation processes and how?*

The perspective introduced in this thesis was that economic valuation of ecosystems is a process, which consists of a series of actions within which actors make choices (see Chapter 2). This implies that in order to understand the economic valuation process, it is necessary to understand the choices that are made within this process. An important first step therefore is to analyze which choices were made. In Chapter 3, several authors were distinguished that provided important contributions to explaining the types of choices involved in the valuation process, including Hanley and Spash (1993), Barbier et al. (1997), and Eijgenraam (2002). The theoretical contributions of these different authors were complemented by participant observation of two economic valuation processes with an NGO and a Dutch government department in Chapter 4. The result was a clear identification of choices:

1. **Pre-assessment choices**
 - a) defining the phenomenon to be studied
 - b) defining the project alternative
 - c) defining the parties affected
 - d) defining the geographical boundaries
 - e) identification of impacts
 - f) identification of impacts to be valued

2. **Assessment choices**
 - a) quantification of impacts into monetary units
 - b) discounting
 - c) sensitivity analysis

The next step was to analyze whether these choices could also be found in the three case studies of economic valuation processes in Dutch water management, which were carried out in Chapters 5 and 6. For each of the three case studies, the pre-assessment and assessment choices made were analyzed. The analysis showed that the choices identified in the analytical model were appropriate.

8.3 The Context of the Choices

In this section, the second sub-question of this dissertation will be answered: *Which factors can be distinguished in the context of choices in economic valuation processes?*

The use of an institutional theory perspective on the economic valuation process implies that the question of how stakeholders make choices in this process is important and that this can be understood by analyzing the institutional context in which these choices are made. Economic valuation of ecosystems is based on a stakeholder perspective known as the neoclassical theory of consumer behavior. In this perspective, theories are developed that explain why people make certain choices under scarcity, if the motivation of the economic actor (*homo oeconomicus*) is self-interest. An important limitation to this approach, however, is that a boundary is drawn around the stakeholder and as a result the influence of social and ecological contexts on its choices are ignored. Since this thesis wants to obtain a broader understanding of actor choices in the economic valuation process, whereby the context in which these choices are made play a key role, neoclassical economic theory can therefore not be applied. Instead, other theories were sought that explicitly relate actor behavior to its context. One such theory is institutional theory.

The institutional theory perspective applied in this dissertation identified elements in the context of economic valuation processes that influence the choices stakeholders make within this process. For this reason, the first set of influences that was defined was the set of actors in the economic valuation process and their relationships. Actors were distinguished as direct and indirect stakeholders in the process that sustain various relationships with each other. It was explained that direct stakeholders are actors that are involved in the economic valuation process itself and thus are in a position to directly influence choices in the economic valuation processes. The most obvious direct stakeholders are the principal and contracting party. Indirect stakeholders, on the other hand, are not directly involved in the valuation process, but must nevertheless be recognized as important influences on choices of the valuation process. They may influence choices through pressure and lobbying, and include for example nature organizations, political parties, and the industry.

Both direct and indirect stakeholders influence choices in valuation processes through the relationships they sustain. The nature of these relationships is based on stakeholder goals and ideologies - coalitions are likely to form between stakeholders with converging functional and ideological goals, while stakeholders more easily engage in interest group politics when these goals diverge. Functional goals relate to the specific goals of the organization, or to the goal of the economic valuation process, while ideologies relate to perspectives towards nature and water. Theories on power and strategic behavior were introduced, based on Callon (1998), Knight (1992) and Bacharach and Lawler (1980), which the following perspective: rational agents with competing functional goals and ideologies make choices in economic valuation processes to gain a strategic advantage over other agents involved in the conflict of interests. This strategic advantage is directly related to a quest for power, in which valuation processes may be applied as tools that increase power.

This theoretical perspective on actors and actor behavior was applied to three case studies. The distinction between direct and indirect stakeholders was a useful tool for a broad identification of important stakeholders in the case studies. In all cases, a principal, contracting party (or parties), steering committee, and interviewed and consulted persons were distinguished as direct stakeholders of the valuation processes. The three cases differed however with respect to the role of one of the direct stakeholders. Whereas the cost-benefit analysis on gas extraction in the Wadden Sea had a peer review group who reviewed the study after it had been completed, the two cost-benefit analyses related to the Rotterdam port expansion had an

advisory board, whose members guarded both processes throughout the time it took to carry out the cost-benefit analysis in addition to peer-reviewing the studies when they were finished. As for the indirect stakeholders, several groups could be distinguished, including ministers, non-governmental organizations, companies, politicians, and commissions.

In the identification of relationships between these stakeholders, the theoretical perspective also served the purpose of identifying key relationships that may influence the choices made in each valuation process. By distinguishing coalitions and interest group politics, the network of complex relationships that existed in the three case studies could be unraveled into two relatively straightforward categories. In all three case studies, coalitions and interest group politics relationships could be identified that influenced specific choices made in the valuation processes.

A *send* set of influences on choices in valuation processes consisted of the context within which stakeholders and their relationships are embedded. A literature review of institutional theory was carried out to distinguish the types of institutions that may influence stakeholder behavior. The main theory applied was institutional theory according to North, who distinguished formal and informal institutions: formal institutions relate to rules and regulations, while informal institutions concern norms and values. It was explained how stakeholders make choices in the economic valuation process within this context of different formal and informal institutions, which determines how these choices are made. This perspective was then applied to important government documents that focussed on institutions in integrated water management in practice. The following set of formal and informal institutions were identified for the economic valuation process in Dutch water management:

- policy paradigms
- scientific paradigms
- rules and regulations

In the informal institutional context, policy paradigms were explained as "institutionalization of environmental problems", "ecological modernization", "integrated water management" and "water as a scarce resource". Discussions of scientific paradigms related to the increased popularity of economic valuation and the dominance of neoclassical and ecological economic paradigms. The last characteristic in the institutional

context that was identified were rules and regulations for economic instruments, the economic valuation process and the environment.

The theoretical perspective on the institutional context that was developed proved satisfactory for the case study analysis. It was a useful guide in analyzing the very complex set of institutions in all three case studies. In fact, the set of institutions identified in the analytical model could be filled in for each of the case studies and allowed a selection of key factors in the context of stakeholders that were likely to have influenced the choices of these stakeholders.

The *third* influence on choices in the economic valuation process was identified as the set of characteristics of the economic instrument of which the economic valuation process is part. The economic instrument can be a multi-criteria analysis or a cost-benefit analysis, in which economic valuation is applied to quantify environmental effects. The following characteristics of the economic instrument were identified:

- use type
- goal
- time constraints
- budget constraints

The identification of these key characteristics was based mainly on participant observation in two economic valuation processes for NGO and the Dutch government department.

In all three case studies, the economic instrument was a social cost-benefit analysis, where the use type was project evaluation. The goals on the other hand, differed: while the goal of one of the cases on the Rotterdam port was an identification of decisions, the goal of the other case of the Rotterdam port was a justification of decisions. In the case study on gas extraction in the Wadden Sea, the goal was to influence political decisions. The analysis of time and budget constraints showed that in two of the three cases time and budget constraints played a major role.

In general, the distinction of the different characteristics of the economic instrument in the analytical model proved useful. It allowed a clear dissection of different characteristics of the economic instrument that may not be apparent as influences on choices at a first glance. However, the distinction of "use type" proved to be irrelevant to the analysis. Although it was likely to have played a role in some of the choices, no significant relationships could be found.

8.4 Main Conclusions

Several conclusions can be drawn in relation to the main research question: How are choices in economic valuation processes in water management influenced by the context in which they are made?

The analysis in this dissertation showed that several factors in the context of valuation processes influenced choices made within these processes. The *first* conclusion of this dissertation therefore reads as follows:

Choices within a valuation process are influenced in particular by four elements in its context: (a) the prevalence or absence of guidelines; (b) the goal for which the valuation study is carried out; (c) participation of certain stakeholders within the process and the effectiveness of the communication of their ideas, and; (d) the time and budget constraints imposed on the valuation process.

The *second* conclusion relates to the role of the institutional theory perspective that was applied in this dissertation. This research has shown that institutional theory contributes to understanding the inconsistencies in choices between valuation processes, by focussing on the context in which these choices were made. Therefore, the second conclusion can be formulated as follows:

Through applying an institutional theory perspective, this dissertation contributes to the understanding of choices in valuation processes and explains the inconsistencies in their outcomes.

Some of the choices made in the valuation processes in the three cases were influenced by the context such as subjective perspectives and goals of stakeholders and limited time and budget constraints. Integrated water management, however, requires an integrated balancing of different stakeholder interests. When economic valuation, as part of cost-benefit analysis, does not convey the different stakeholder interests but instead the interests of a few dominant or more powerful ones, economic valuation does not contribute to policy making in a positive way. Conversely, only when transparency in choices of valuation processes are pursued will economic valuation contribute to integrated water management. Therefore, the *third* conclusion is:

Pursuing transparency within valuation processes as part of decision making tools such as cost-benefit analysis is necessary if these processes are to contribute to balancing stakeholder interests in water management. A transparent valuation process is characterized by a situation in which it is clear who has made the choices and for what reasons.

Chapter 7 explained how the organization of certain stakeholders in committees steered choices in valuation processes (see section 7.4). In particular the absence of certain stakeholders in committees and hence their inability to communicate their ideas to the choices of the valuation process resulted in non-transparent choices. A committee, whether it is called a steering committee, an advisory board or a peer review group, should consist of a representative set of stakeholders whose opinions on the choices of the valuation process are taken seriously. If not, the establishment of committees are mere pretexts for principals and contracting parties to secure a non-deserved level of 'objectivity'. When it is unclear which role such stakeholders, either within committees or directly, play in a valuation process, the choices of this process become non-transparent. Once more, in the case of integrated water management, where the integrated balancing of stakeholder interests is required, such economic valuation processes do not contribute to balanced decisions or policy-making in a positive way. Therefore, the *fourth* conclusion is:

Transparency in valuation processes is enhanced by the participation of all relevant stakeholders and the effective communication of their interests.

In one of the cases, guidelines had been established in the formal institutional context to guide some of the choices in the valuation process. These guidelines contributed to a more structured and transparent valuation process - some of the choices could be substantiated based on these guidelines. The guidelines provided support, for example, as to how the project alternative should be defined and where to draw the geographical boundaries. It was also explained, however, that only a limited amount of such choices were subject to guidelines, allowing the other choices to be non-transparent. Again, when economic valuation is applied in integrated water management where different stakeholder interests need to be balanced, there is a need for transparent choices by stakeholders in the valuation process. Hence, in pursuit of limiting the inconsistencies of valuation outcomes, the *fifth* conclusion can be stated as follows:

Transparency is improved through the development of guidelines for valuation processes.

Lastly, it was shown in the case study analysis (see sections 5.6.2 and 6.6.2) that time and budget constraints seriously affect the choices made in a valuation process. In those cases where little time and limited budget was available, choices were made to fulfill the requirements of finishing the study within the given constraints as opposed to applying the most appropriate choices. In the case of integrated water management, economic valuation requires sufficient time and budget so that the choices in the valuation process reflect the values of different stakeholders. The *sixth* and last conclusion, therefore, reads as follows:

Sufficient time and budget result in a more transparent valuation process in which inconsistencies of choices and their outcomes are limited. This increases the usefulness of valuation processes to water management decisions.

8.5 Discussion

Now that the main conclusions have been drawn, it is important to focus on several additional aspects. First, this section will outline some of the strengths and weaknesses of this research and their consequences for the findings. Next, the contribution of this research to theory will be discussed. The section will end with the formulation of recommendations for the practical application of the economic valuation process in integrated water management.

8.5.1 Strengths and Limitations

A *strength* of this research that was important for its findings is the continuous interaction between theory and practice. Throughout the research, theory was applied to practice and insights from practice were applied to theory. This continuous feedback allowed the development of an analytical model that was directly applicable to the case studies, thereby limiting the shortcomings of this model as discussed in sections 8.2 and 8.3.

With regard to the weaknesses of this research, a *first limitation* is related to the methodological approach of this thesis. It was difficult in the case study analysis to eliminate the subjective perspective on the case studies, something that relates to most qualitative analyses. This implies that the analysis and results were based on the perspective of the researcher. This subjectivity, however, has been limited as much as possible in the following

ways. First, the analysis followed the lines of an analytical model based on institutional theory. It was therefore the theory that guided the analytical model and the cases in the first place. Second, many different stakeholders of the valuation processes were interviewed, which often gave a broader perspective on the cases. The interviews were typed out and sent to the interviewed for verification. Third, the chapters have been proofread by experts that were not stakeholders of the cost-benefit analyses. Hence, although subjectivity can never be completely eliminated in most qualitative research, a variety of measures were taken to limit this as much as possible.

Although this research answered its main research question of how choices in valuation processes are influenced by the context in which they are made, a *second limitation* is that it generally could not answer whether a different context necessarily results in different choices. The reason for this limitation is that all three case studies deal with three different economic valuation processes carried out in three different contexts. Only if the three case studies would have had one single economic valuation process, carried out in three different contexts such aspects could have been scientifically tested. Such case studies, however, do not exist in water management in the Netherlands, and the time within which this research needed to be carried out did not allow for other empirical analyses like simulations that may provide answers to such additional research questions. Therefore, this research explains how the context influences choices in economic valuation processes, and thus that such processes and their outcomes must be interpreted in relation to their context, but does not claim that a different context necessarily leads to different choices.

A *third limitation* is related to the generalization of the analytical model. In this thesis, the model was applied to three case studies in water management, and it can be argued that this model is applicable to economic valuation processes in Dutch water management in general. The model can be used to search for contextual influences and choices and their relationships, and in this respect is not limited to specific economic valuation processes. Certain parts of the model are, however, less applicable to economic valuation processes in water management outside the Netherlands and outside the field of water management. This limitation lies particularly in the characterization of the formal and informal institutional context, which is field- and country specific. Therefore, although the general framework of the model is generally applicable, the characterization of the formal and informal institutional context must be adjusted to fit the specific field or country.

8.5.2 Theoretical Contribution

Now that the strengths and weaknesses have been discussed, it is interesting to look at how the different insights of this research can contribute to both theory and practice. The base for the main theoretical contribution of this research consists of the first two conclusions drawn in section 8.4. These conclusions stated that (1) the context of the economic valuation process influences the choices made within this process, and; (2) that institutional theory has contributed to building an understanding of these choices and the inconsistencies in their outcomes. Stakeholders often apply economic valuation as part of their strategic behavior to pursue personal goals and ideologies, with as a main goal obtaining more power. Rules and regulations may exist that guide specific choices in valuation studies. Or certain scientific and policy paradigms may be prevalent that have influenced the choices in such studies. From a theoretical perspective, it is important to understand this behavior and these elements in the institutional context in which stakeholders operate in order to understand the outcomes of the economic valuation process. Consequently, the theoretical contribution of this thesis is that it has contributed to an explanation of how the inconsistencies in economic valuation outcomes are not only attributable to the application of diverging methodologies, as has been researched up until now, but also to factors in the context in which these studies have been carried out. Scientific research focussing on the *process* of economic valuation studies, including actors and their institutional context, will be needed in addition to methodological development to further improve valuation processes and limit the inconsistencies in their outcomes.

8.5.3 Practical Recommendations

The remaining conclusions are the key to the contribution of this research to practical application of economic valuation in water management, which will be formulated as practical recommendations. These recommendations are made for all actors that undertake economic valuation processes in water management, including government departments, non-governmental organizations and companies.

The third conclusion states that when valuation processes are applied as part of decision making processes in water management, transparency in these processes must be pursued. Integrated water management calls for the balancing of stakeholder needs and interests, therefore this must also be conveyed in the tools applied by decision makers to aid them in making

such decisions. Therefore, an important recommendation of this research is that efforts must be directed at increasing transparency in economic valuation studies. More specific recommendations for such a transparent process can be derived from conclusions four, five and six.

The fourth and fifth conclusions drawn in this chapter relate to the *guidance* of economic valuation processes: guidelines as well as guidance by a representative group of stakeholders, whether directly or through their organization in committees. In terms of *guidelines*, the OEEI report, a guideline for social cost-benefit analysis in the Netherlands, covers some of the choices in the economic valuation process, as was explained in Chapters 6 and 7. For those choices not covered by these guidelines, however, it is recommended that some sort of framework is developed and/or agreements are reached to cover the choices. This can be an extension of the OEEI guidelines that specifically focuses on the economic valuation process in large infrastructural projects, or a separate framework for the valuation process. Such a practical framework could, for example, cover the following types of elements, not yet covered by OEEI:

1. how to select the parties that are affected (those that benefit and those that lose);
2. where to draw the geographical boundaries of the study;
3. which valuation methods are most suitable to value what type of environmental impacts;
4. which discount rate should be applied specifically for projects affecting the environment, whether public financed government projects or other, and over what time period the impacts should be discounted;
5. the type of factors that should be tested in a sensitivity analysis.

It is clear that such a framework cannot and should not represent a strict framework that specifically indicates rules or regulations for dealing with these elements. However, a practical framework could be created that guides actors carrying out valuation studies on the type of options available to them and how they can make their choices. Along the same line, specific guidance should also be given to the broader process of valuation, such as:

1. which stakeholders should participate and how
2. which committees should be established with which stakeholders and what role should these committees play
3. how much time and budget should be allocated to a study

The result is a guidance document, which actors who are involved in water management issues (and other environmental management issues) can

resort to if they want to carry out a transparent valuation process. Such actors are then also forced to substantiate any choices that deviate from these guidelines. Following such guidelines furthermore ensures the readers of these studies that the outcome of the process is based on a relatively transparent process.

In terms of improved guidance by *stakeholders*, several aspects are important. First, representatives of all relevant stakeholder groups should be organized to supervise the process of economic valuation, like in the cost-benefit analyses related to the Rotterdam port. Second, relevant experts should be included in the valuation process to peer review and judge the choices made in the valuation process when it is finished. Third, it is important that stakeholders have an important say in and influence on choices in the valuation process. Committees should not be created as a pretext, allowing the principal and contracting parties to pretend that there is an increased transparency in their studies while in actual fact the committees are listed for appearances. Instead, regular meetings should be held with a steering committee to allow all stakeholders to give their input to the process, while the advice of a peer review committee should be either processed in the study or not for substantiated reasons.

In stakeholder participation processes a balance must be found between public participation and independence of the study. Independence through public participation can be pursued, however, through incorporating all stakeholders in the process; those opposing as well as those supporting the project for which the valuation study is carried out. One way to incorporate stakeholders has already been discussed in the previous paragraphs – steering committees should be established that meet regularly with the principal and contracting parties, consisting of representatives of all major stakeholders. Another possibility is to hold discussion meetings or workshops during the economic valuation process in which major assumptions and choices are debated among representatives of all major stakeholders. Other recommendations related to stakeholder participation are given by Spash (2001), who discusses Deliberative Monetary Valuation (DMV) – the use of formal deliberation concerning environmental impacts to express monetary values. DMV can be used for policy purposes, as an input to cost-benefit analyses. Stakeholder participation also directly relates to other recommendations and strategies made in water management, the most important one being the EU Water Framework Directive. This Directive promotes the active participation of all interested parties in the development of River Basin Management Plans (see Article 14). Integration

of stakeholders in economic valuation processes therefore connects well with a general trend towards stakeholder participation in the implementation of the Directive in EU member countries.

Guidance of the economic valuation process by *Environmental Impact Statements* (or MERs) is also necessary. In this respect, the recommendations connect well with the recommendations given in the OEEI guidelines report (Eijgenraam et al., 2000). This report explicitly calls for a direct linkage between MER reports and cost-benefit analyses, where both studies should be performed simultaneously. Both would need to have the same starting points, and there should be a constant exchange of information.

The sixth and last conclusion in this chapter is related to the *time and budget* constraints. It is important that a transparent economic valuation process requires sufficient time and budget. Obviously, time and money are not always available. This does not mean that in these cases, economic valuation processes should not be carried out. On the contrary – economic valuation processes often need to be carried out under strong time and budget pressures. In these cases, the studies should not pretend to be a comprehensive economic valuation study and choices affected by such pressures should be explicitly mentioned. Unfortunately, no elaborate economic valuation study has yet been carried out in water management (or environmental management in general) in the Netherlands. It is therefore necessary to carry out at least one such study in the Netherlands, so that it may provide further guidance to future economic valuation processes. Such a study could also serve as a guideline for economic valuation processes.

Lastly, it is recognized that non-transparency can never be fully eliminated, no matter what the nature and extent of guidance, stakeholder participation, time period and budget. This further supports the observation that economic valuation and similar processes are only one input in water management decision making processes - an observation that was also underlined in the introduction to this research. Choices in valuation processes are embedded in an institutional context that represents, specific values and interests. Other values and interests will need to be taken into account at other places in decision making processes, conveyed through other processes and tools.

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Appendix 1 Cross-Case Analysis

Table A-1 Key Influences on the Choices in the Economic Valuation Process of Gas Extraction in the Wadden Sea

Choices	Formal & Informal Institutional Context	Characteristics Economic Instrument	Stakeholders Context
Section 5.5	Sections 5.2 & 5.6.1	Sections 5.3 & 5.6.2	Sections 5.4 & 5.6.3
1 Phenomenon being studied	<ul style="list-style-type: none"> ✓Policy paradigms ✓Scientific paradigms: increased popularity economic valuation ✓Rules and regulations: environment 	<ul style="list-style-type: none"> ✓Goal 	<ul style="list-style-type: none"> ✓Principal ✓Coalition principal/contracting party ✓Coalitions indirect stakeholders ✓Interest group politics
2 Project-alternative	<ul style="list-style-type: none"> ✓Absence rules and regulations economic instrument 	<ul style="list-style-type: none"> ✓Goal 	<ul style="list-style-type: none"> ✓Principal ✓Coalition principal/contracting party ✓Coalitions indirect stakeholders ✓Interest group politics
3 The parties affected	<ul style="list-style-type: none"> ✓Absence rules and regulations economic valuation 	<ul style="list-style-type: none"> ✓Goal ✓Use type 	<ul style="list-style-type: none"> ✓Principal ✓Coalition principal/contracting party ✓Coalitions indirect stakeholders ✓Interest group politics
4 Geographical boundaries	<ul style="list-style-type: none"> ✓Absence rules and regulations economic valuation 	<ul style="list-style-type: none"> ✓Goal 	<ul style="list-style-type: none"> ✓Principal ✓Contracting party ✓Coalition principal/contracting party ✓Coalitions indirect stakeholders ✓Interest group politics
5 Identification of impacts	<ul style="list-style-type: none"> ✓Scientific paradigms: dominance certain economic paradigm ✓Absence rules and regulations economic instrument 	<ul style="list-style-type: none"> ✓Goal ✓Use type 	<ul style="list-style-type: none"> ✓Contracting party ✓Coalition principal/contracting party ✓Coalitions indirect stakeholders ✓Interest group politics

Valuation of Water

(Continued)

6	Identification of impacts to be valued	<ul style="list-style-type: none"> ✓Absence rules and regulations economic instrument ✓Scientific paradigms: dominance certain economic paradigm 	<ul style="list-style-type: none"> ✓Goal 	<ul style="list-style-type: none"> ✓Contracting party ✓Coalition principal/contracting party ✓Coalitions indirect stakeholders ✓Interest group politics
7	Quantification of impacts into monetary units	<ul style="list-style-type: none"> ✓Absence rules and regulations economic valuation ✓Scientific paradigms: dominance certain economic paradigm 	<ul style="list-style-type: none"> ✓Goal ✓Time constraints 	<ul style="list-style-type: none"> ✓Contracting party ✓Coalition principal/contracting party ✓Coalitions indirect stakeholders ✓Interest group politics
8	Discounting	<ul style="list-style-type: none"> ✓Absence rules and regulations economic valuation 	<ul style="list-style-type: none"> ✓Goal 	<ul style="list-style-type: none"> ✓Contracting party ✓Coalition principal/contracting party ✓Coalitions indirect stakeholders ✓Interest group politics
9	Sensitivity analysis	<ul style="list-style-type: none"> ✓Absence rules and regulations economic valuation 	<ul style="list-style-type: none"> ✓Goal 	<ul style="list-style-type: none"> ✓Contracting party ✓Coalition principal/contracting party ✓Coalition indirect stakeholders ✓Interest group politics

Table A-2 Key Influences on the Choices in the Economic Valuation Process of Land Reclamation

Choices	Formal & Informal Institutional Context	Characteristics Economic Instrument	Stakeholders Context
Section 6.5	Section 6.2 & 6.6.1	Sections 6.3.1 & 6.6.2	Sections 6.4 & 6.6.3
1 Phenomenon being studied	✓Policy paradigms		✓Principal
2 Project-alternative	✓Rules economic instrument	✓Goal	✓(Coalition) Contracting parties ✓Steering committee ✓Advisory board ✓Interest group politics ✓Coalition indirect stakeholders ✓Coalition principal and contracting parties
3 The parties affected	✓Absence rules & regulations economic valuation	✓Goal ✓Use type	✓(Coalition) Contracting parties ✓Steering committee ✓Advisory board ✓Coalition principal and contracting parties
4 Geographical boundaries	✓Absence rules & regulations economic valuation	✓Goal	✓(Coalition) Contracting parties ✓Steering committee ✓Advisory board ✓Coalition principal and contracting parties
5 Identification of impacts	✓Rules economic instrument ✓Rules environment	✓Goal ✓Use type	✓(Coalition) Contracting parties ✓Steering committee ✓Advisory board ✓MER commission ✓Coalition principal and contracting parties
6 Identification of impacts to be valued	✓Rules economic instrument ✓Rules environment		✓(Coalition) Contracting parties ✓Steering committee ✓Advisory board ✓Coalition principal and contracting parties
7 Quantification of impacts into monetary units	✓Absence rules & regulations economic valuation ✓Rules environment		✓(Coalition) Contracting parties ✓Steering committee ✓Advisory board ✓Coalition principal and contracting parties
8 Discounting	✓Absence rules & regulations economic valuation		✓(Coalition) Contracting parties ✓Steering committee ✓Advisory board ✓Coalition principal and contracting parties

Valuation of Water

(Continued)

9	Sensitivity analysis	✓Absence rules & regulations economic valuation	✓(Coalition) Contracting parties ✓Steering committee ✓Advisory board ✓Coalition indirect stakeholders ✓Coalition principal and contracting parties ✓Interest group politics
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Table A-3 Key Influences on the Choices in the Economic Valuation Process of the Development of 750 Hectares Nature and Recreation Area

Choices	Formal & Informal Institutional Context	Characteristics Economic Instrument	Stakeholders Context
Section 6.5	Section 6.2 & 6.6.1	Sections 6.3.2 & 6.6.2	Sections 6.4 & 6.6.3
1 Phenomenon being studied	<ul style="list-style-type: none"> ✓Policy paradigms: institutionalization environmental problems, dominance rational arguments ✓Scientific paradigms: increased popularity economic valuation 	<ul style="list-style-type: none"> ✓Goal 	<ul style="list-style-type: none"> ✓Principal ✓Coalition principal project and delegated principal CBA ✓Coalition indirect stakeholders
2 Project-alternative	<ul style="list-style-type: none"> ✓Rules economic instrument 	<ul style="list-style-type: none"> ✓Goal 	<ul style="list-style-type: none"> ✓(Coalition) Contracting parties ✓Steering committee ✓Advisory board ✓Coalition principal & contracting party
3 The parties affected	<ul style="list-style-type: none"> ✓Absence rules & regulations economic valuation 	<ul style="list-style-type: none"> ✓Use type ✓Goal 	<ul style="list-style-type: none"> ✓(Coalition) Contracting parties ✓Steering committee ✓Advisory board ✓Coalition principal & contracting party
4 Geographical boundaries	<ul style="list-style-type: none"> ✓Absence rules & regulations economic valuation 	<ul style="list-style-type: none"> ✓Goal 	<ul style="list-style-type: none"> ✓(Coalition) Contracting parties ✓Steering committee ✓Advisory board ✓Coalition principal & contracting party
5 Identification of impacts	<ul style="list-style-type: none"> ✓Rules economic instrument 	<ul style="list-style-type: none"> ✓Use type ✓Goal 	<ul style="list-style-type: none"> ✓(Coalition) Contracting parties ✓Steering committee ✓Advisory board ✓MER commission ✓Coalition principal & contracting party
6 Identification of impacts to be valued	<ul style="list-style-type: none"> ✓Rules economic instrument 	<ul style="list-style-type: none"> ✓Time constraints ✓Budget constraints 	<ul style="list-style-type: none"> ✓(Coalition) Contracting parties ✓Steering committee ✓Advisory board ✓Coalition principal & contracting party
7 Quantification of impacts into monetary units	<ul style="list-style-type: none"> ✓Absence rules & regulations economic valuation 		<ul style="list-style-type: none"> ✓(Coalition) Contracting parties ✓Steering committee ✓Advisory board ✓Coalition principal & contracting party

Valuation of Water

(Continued)

8	Discounting	✓Absence rules & regulations economic valuation	✓(Coalition) Contracting parties ✓Steering committee ✓Advisory board ✓Coalition principal & contracting party
9	Sensitivity analysis	✓Absence rules & regulations economic valuation	✓(Coalition) Contracting parties ✓Steering committee ✓Advisory board ✓Coalition principal & contracting party

Appendix 2 Abbreviations

CPB	Centraal Planbureau
CV	Contingent Valuation
EE	Ecological Economics
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
ERE	Environment and Resource Economics
GNP	Gross National Product
HP	Hedonic Pricing
IEE	Inventory Economic Effects
IVM	Instituut voor Milieuvraagstukken
LNV	Ministerie van Landbouw Natuurbeheer en Visserij
MER	Milieu Effecten Rapportage
MinEZ	Ministerie van Economische Zaken
MinV&W	Ministerie van Verkeer en Waterstaat
NAM	Nederlandse Aardolie Maatschappij
NEI	Nederlands Economisch Instituut
NGO	Non-Governmental Organization
NIE	New Institutional Economics
NNP	Net National Product
NOAA	National Oceanic and Atmospheric Administration
NPV	Net Present Value
NRDA	Natural Resource Damage Assessment
NWO	Nederlandse Organisatie voor Wetenschappelijk Onderzoek
OECD	Organization for Economic Cooperation and Development
OEEI	Onderzoeksprogramma Economische Effecten Infrastructuur
OIE	Old Institutional Economics
ONR	Organisatie Niet-Rijkspartijen
PKB	Planologische Kernbeslissing
PM	Pro-Memory
PMR	Project Mainport Development Rotterdam
PPP	Polluter Pays Principle
PZH	Provincie Zuid-Holland

Valuation of Water

RIVM	Rijksinstituut voor Volksgezondheid en Milieu
RMPM	Rotterdam Municipal Port Management
SOC	Social Opportunity Cost of Capital
SSE	Steady State Economy
STPR	Social Time Preference Rate
TC	Travel Cost
UNEP	United Nations Environment Programme
VERM	Verkenning Ruimtetekort Mainport Rotterdam
VROM	Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieu
VWS	Ministerie van Volksgezondheid, Welzijn en Sport
WCD	World Commission on Dams
WCED	World Commission on Environment and Development
WTA	Willingness to Pay
WTP	Willingness to Accept

Appendix 3 List of Interviewed People for the Case Study Analysis

1. Cost-Benefit Analyses on Gas Extraction

- José Joordens, AidEnvironment
- Liesbeth Bijvoet, AIDEnvironment
- Marc Davidson, CE
- Wim Groenendijk, NAM
- Jan Bijlsma, Greenpeace
- Martijn Lodewijkx, Greenpeace

2. Two Cost-Benefit Analyses Related to the Rotterdam Port Development

- Carel Eijgenraam, CPB
- Jan Anne Annema, RIVM
- Sjaak Boeckhout, NEI
- Bas van Holst, PMR
- Siebout Nooteboom, DHV
- Hans Slootweg, Provincie Zuid-Holland
- Ronald Houterman, Provincie Zuid-Holland
- Arno Stekelenburg, Zuid-Hollandse Milieufederatie
- Albert Doe, Gemeentelijk Havenbedrijf Rotterdam
- Hans Opschoor, Institute of Social Studies

Dutch Summary (Nederlandse Samenvatting)

In dit proefschrift wordt het proces van economische waardering van ecosystemen in Nederlands waterbeheer onderzocht. Het onderzoek gaat er vanuit dat economische waardering een belangrijke bijdrage kan leveren aan besluitvormingsprocessen in waterbeheer. Het analyseert hoe verschillende belanghebbenden het waarderingsproces gebruiken en hoe de context van dit proces invloed heeft op de uitkomst. Het doel van dit proefschrift is om tot conclusies en aanbevelingen te komen voor de structuur van waarderingsprocessen in waterbeheer. De aanbevelingen zijn er op gericht om inconsistenties in de uitkomsten te beperken.

Economische waardering van ecosystemen plaatst een monetaire waarde op de effecten van ingrepen in de natuur. Waarderingsprocessen kunnen een bijzonder belangrijke rol spelen bij het benadrukken van de economische waarde van een ecosysteem bovenop de ecologische en sociaal-culturele waarden. Verder kunnen deze processen ook bijdragen tot het formuleren van economische argumenten voor duurzaam beheer van ecosystemen. Ondanks de belangrijke rol van waarderingsstudies is gebleken dat inconsistenties in de uitkomsten van deze studies een gegeven zijn. De reden voor deze inconsistenties is te vinden in de grote variëteit in methodologieën die gebruikers al naar gelang hun eigen voorkeur kunnen toepassen. Het is mogelijk dat deze inconsistenties de bruikbaarheid van waarderingsprocessen in Nederlands waterbeheer ondermijnen. Waterbeheer in Nederland wordt gekenmerkt door "integraal waterbeheer" waarin de afweging van alle relevante belangen wordt nagestreefd. Op lange termijn bestaat het risico dat besluitvormers steeds sceptischer worden over de meerwaarde van waarderingsstudies wanneer deze bestaan uit subjectieve keuzes van methodologieën gemaakt door één belanghebbende, terwijl hun besluiten de interesses van alle belanghebbenden moeten weergeven. In een poging om de inconsistenties te beperken wordt in dit onderzoek geanalyseerd hoe verschillende belanghebbenden economische waarderingsstudies in waterbeheer toepassen. Hierbij ligt de nadruk op het *proces* van economische waardering waarbij strategische keuzes worden gemaakt door actoren met verschillende belangen in de uitkomst van de

waarderingstudie. Het doel is om de volgende hoofdonderzoeksvraag te beantwoorden:

Hoe worden de keuzes in economische waarderingprocessen in waterbeheer beïnvloed door de context waarin deze keuzes worden gemaakt?

Voor het beantwoorden van deze vraag wordt een analytisch perspectief gebruikt dat is gebaseerd op institutionele theorie waarin de context van formele en informele instituties het gedrag van de actoren bepaalt. Dit perspectief bekijkt het waarderingproces binnen de volgende context: (1) actoren en hun onderlinge relaties; (2) formele en informele instituties, zoals regels, richtlijnen, beleids- en wetenschappelijke paradigma's; en (3) specifieke karakteristieken van het economisch instrument, zoals het doel en de beperkingen in tijd en budget. Deze elementen bepalen de keuzes die in een waarderingproces worden gemaakt en kunnen de inconsistenties in hun uitkomsten verklaren.

Het analytisch perspectief wordt toegepast op drie case studies. Deze cases bestaan uit kosten-batenanalyses in Nederlands waterbeheer waarvan het economische waarderingproces een onderdeel is. Zowel de keuzes die gemaakt worden in deze waarderingprocessen, als de context waarin ze worden toegepast worden geanalyseerd. De nadruk ligt op mogelijke relaties tussen deze elementen.

De conclusies van dit onderzoek zijn als volgt:

1. Keuzes binnen een waarderingproces worden vooral beïnvloed door vier elementen in haar context: (a) het wel of niet aanwezig zijn van richtlijnen; (b) het doel waarvoor het onderzoek wordt uitgevoerd; (c) de deelname van bepaalde belanghebbenden in het proces en de wijze waarop hun ideeën kenbaar worden gemaakt; en (d) de tijd- en budgetbeperkingen die worden opgelegd aan het proces.
2. De toepassing van het perspectief van institutionele theorie in dit onderzoek draagt bij tot het inzicht in keuzes die in waarderingprocessen worden gemaakt en verklaart de inconsistenties in hun uitkomsten.
3. Het nastreven van transparantie in waarderingprocessen, wanneer deze onderdeel zijn van besluitvormingsinstrumenten zoals kosten-batenanalyse, draagt bij tot een evenwichtige afweging van belanghebbenden in besluitvorming in waterbeheer. Een transparant

- waarderingsproces wordt gekenmerkt door een situatie waarin het duidelijk is wie de keuzes hebben gemaakt en waarom.
4. Transparantie in waarderingsprocessen wordt bevorderd door deelname van alle relevante belanghebbenden en de effectieve inbreng van hun interesses.
 5. Transparantie wordt verder verbeterd door de ontwikkeling van richtlijnen voor waarderingsprocessen.
 6. Voldoende tijd en budget resulteren in een transparanter waarderingsproces waarin inconsistenties van keuzes en hun uitkomsten beperkt worden. Dit bevordert de bruikbaarheid van waarderingsprocessen bij de besluitvorming in waterbeheer.

De bijdrage van dit onderzoek aan zowel de theorie als de praktijk wordt behandeld aan de hand van deze zes conclusies. De theoretische bijdrage is met name te vinden in een beter inzicht in waarderingsprocessen en in de inconsistenties in hun uitkomsten. Verder belicht dit onderzoek het belang van transparantie bij de praktische toepassing van waarderingsprocessen in waterbeheer. Deze transparantie wordt nagestreefd door meer gestructureerde *begeleiding* van waarderingsprocessen door alle relevante belanghebbenden, het ontwikkelen van richtlijnen en de directe aansluiting van waarderingsprocessen op Milieu Effecten Rapportages (MER). Verder wordt de aanbeveling gedaan dat *publieke participatie processen* een groter deel moeten uitmaken van waarderingsprocessen. Dit leidt niet alleen tot betere participatie van belanghebbenden maar ook tot effectievere inbreng van hun belangen. Tenslotte wordt aanbevolen dat voldoende *tijd en budget* beschikbaar wordt gesteld aan tenminste één uitgebreide waarderingsstudie in Nederland om daarop volgende waarderingsprocessen te sturen.

Acknowledgements

The research for this dissertation would not have been possible without the full financial contribution of the Rijkswaterstaat Zeeland and I would like to express my gratitude to this organization for their support.

This dissertation is the result of inspiration and input from numerous people, and I would like to thank all those who have contributed, both intentionally and unintentionally. A key to a successful dissertation is a good supervisor and I consider myself lucky to have had two of these. Jan Jaap, I greatly benefited from your economics expertise and your practical approach to scientific research. Our numerous conversations have always motivated me and I am very thankful for your support. Henk, your contribution based on your experiences in water management as well as your vision have been invaluable to this dissertation, but your input has been much broader than this. You have inspired me to think and act on numerous issues, made sure I never lost touch with practical realities and taught me to be critical. I enjoyed our many trips abroad together for ICOLD and thank you and Mieke for your support and the good times.

I have spent three-and-a-half years at ESM and all people there have contributed to this dissertation in one way or another - I am very grateful for that. In particular, I would like to thank Aad - you have been my most critical reader. I have always appreciated the enormous amount of time you have invested in this dissertation and thank you for that. Nicole, your support in many different ways has meant a lot to me. I enjoyed our long talks and walks, discussing our major challenges and how to overcome them, and most importantly sharing our successes. Trude, thanks for all your support and hard work particularly over the past couple of months - you have been great. Ingvild, thank you for your amazing work on the cover design of this thesis; I am still impressed with your seemingly limitless creativity! Sander, you have been a great roommate and I enjoyed our many discussions. Lastly, I would like to thank Frank for his interest and support particularly at the beginning of my dissertation - our discussions have played a crucial role in the direction this dissertation has taken.

Numerous people outside ESM have also greatly contributed to this dissertation. Hein Engel, Dik Tromp and Madeline Winnubst - thank you for your interest and support throughout this research. Hein, I particularly want to thank you for your valued comments at several stages of this dissertation, many of which have inspired me to think beyond what I had written. I would also like to thank the members of the promotion committee - Toine Smits, Wim Hafkamp and Job Dronkers - for reading, commenting and especially accepting the draft of this dissertation. I am grateful to Siebout Nooteboom for his comments on the Maasvlakte II case study, and all the people I interviewed for the case studies for their cooperation and interest. I would like to thank Iris Borger for helping me polish my English in this dissertation. My stay at IIASA for three months has also played an important role in this research, particularly in the final stage. I would like to thank the people there, especially Harrij van Velthuisen, Jan Sendzimir and my "partners in distress" and friends Reinier, Christian, Anna, Tova and Angeles. I also thank my colleagues at WWF-International, especially Tom McShane, for giving me all the space and support I needed to finalize this dissertation.

My family and friends have been an immense support throughout this dissertation and I thank you all for this. Martijn, Josine, Greet, Jan, Eefje, Adria, Bouwien, Frank, Renske, Michiel, Lo, Renee, Elsbeth, Lies - I am grateful for your continued interest in and support for my dissertation over the past years and for bearing with me. My parents, Chris and Marianne: your unconditional support, your interest in and patience with my numerous ambitions has been incredible and has meant a lot to me in the course of this dissertation. I thank you for this. Lastly, I thank Johan - you motivated me both to start and successfully finish this dissertation, for some odd reason believed in me along the way, while at the same time reminding me there is so much more to life than this. I thank you for that and can't believe my luck.

Curriculum Vitae

Kirsten Diane Schuijt grew up in the Netherlands, Denmark and Germany and obtained her International Baccalaureate from the Frankfurt International School in 1993. She studied International Economic Studies at the University of Maastricht in the Netherlands and graduated with a Masters of Science degree in 1998. During her studies she spent half a year in Kenya doing her internship with the Royal Netherlands Embassy in Nairobi. She studied the economic values of the Yala Swamp Wetland near Lake Victoria, which resulted in a Master Thesis. Following her graduation, she spent one year in Malawi, where she studied the economic values of the Lake Chilwa Wetland for Danida and taught Economics at the Chancellor College in Zomba. She returned to the Netherlands in 1999 to do her Ph.D. with the Erasmus Center for Sustainable Development and Management (ESM) at the Erasmus University in Rotterdam. Her publications and presentations at conferences mainly focused on the application of economic valuation of ecosystems in water management. In 2002 she participated in the Young Scientists Summer Program at the International Institute for Applied Systems Analysis (IIASA) in Austria, where she published a study on the economic values of African wetlands. She left ESM in December 2002 to work with WWF-International (World Wide Fund for Nature) in Gland, Switzerland, as a DGIS Associate Expert. She works as a Resource Economist with WWF's Forests Program.