Blue services
Improving decision-making about the use of an innovative policy instrument in water quality management

Master thesis of R.B.A. de Groot
Gronmij Nederland bv,
Delft University of Technology
Faculty of Systems Engineering, Policy Analysis & Management
Delft, March 2008
Blue services

Improving decision-making about the use of an innovative policy instrument in water quality management

Delft University of Technology
Faculty of Systems Engineering, Policy Analysis & Management

Delft, March 2008
Roland de Groot
Student number: 1101986

Thesis committee:
- Professor – Prof.dr.ir. Wil A.H. Thissen; section Policy Analysis TU Delft
- First supervisor – Dr.ir. Leon M. Hermans; section Policy Analysis TU Delft
- Second supervisor – Dr. Aad Correljé; section Economics of Infrastructure TU Delft
- External supervisor – Ir. Erwin F.L.M. de Bruin; Grontmij afdeling Waterbeheer
Preface

This Master thesis is the result of my gradation project as part of the Master Systems Engineering, Policy Analysis and Management at the Technical University Delft. Over the last seven months, I have been travelling to Houten almost every day for executing my thesis project under supervision of Grontmij a Dutch consultancy and engineering group. I examined in this thesis how the decision making of water boards regarding blue services, an instrument in water quality management, can be improved.

This paper is interesting for those who are involved in water quality management. I direct those who are interested in measures applicable as blue services to chapter 2. Elements of literature, regarding payment for environmental services are examined in chapter 3. Chapter 4 discusses implementation criteria and success factors for assessing the usability of blue services. Chapter 5 discusses the way in which the case study research, performed in this research, was carried out. The analysis of this case study research is discussed in chapter 6. Finally, chapter 7 discusses the conclusions, recommendation and reflections of this research project. This last chapter in particular is interesting for water boards who consider applying blue services in water quality management.

I would like to thank everyone that I have interviewed and met during my research. The contributions of them are gratefully acknowledged.
I thank my thesis committee: professor Thissen, Leon Hermans and Aad Correljé for their valuable contributions and careful readings.
I am grateful that I was able to conduct my research at engineering company Grontmij. This enabled me to use specific knowledge about water quality management. This way I found acceptance of various water board to conduct my case study research. I thank Erwin de Bruin for his supervision, comments and suggestions throughout my research. Besides, I would like to thank my colleagues at Grontmij, in particular Erik and Bas.
Finally, I thank my parents, my girlfriend Tineke, my sisters Marjolein and Suzanne, and my friends and roommates for their support throughout my thesis project.

Delft, March 2008

Roland de Groot
Index:

PREFACE ........................................................................................................................................................................ IV
SUMMARY ........................................................................................................................................................................ VII
1 INTRODUCTION ............................................................................................................................................................. 1
   1.1 BACKGROUND ........................................................................................................................................................... 1
      1.1.1 Blue services as new instrument .................................................................................................................... 2
      1.1.2 Grontmij ............................................................................................................................................................ 3
   1.2 BLUE SERVICES ......................................................................................................................................................... 3
      1.2.1 History ............................................................................................................................................................... 3
      1.2.2 Characteristics ................................................................................................................................................... 4
      1.2.3 Criteria ............................................................................................................................................................. 5
   1.3 RESEARCH OBJECTIVE ........................................................................................................................................... 7
   1.4 RESEARCH QUESTION ............................................................................................................................................. 8
   1.5 METHODOLOGY .......................................................................................................................................................... 9
2 IDENTIFYING WATER QUALITY ISSUES AND RELATED BLUE SERVICES ........................................ 10
   2.1 INTRODUCTION TO WATER QUALITY ISSUES AND RELATED BLUE SERVICES ........................................ 10
   2.2 WATER ISSUES ......................................................................................................................................................... 11
   2.3 WATER TYPES ......................................................................................................................................................... 12
   2.4 ECOLOGICAL OBJECTIVES .................................................................................................................................... 13
   2.5 MEASURES IN RURAL AREAS ................................................................................................................................ 15
   2.6 CONSTRAINTS FOR BLUE SERVICES ....................................................................................................................... 16
      2.6.1 Not critical for functioning water system ......................................................................................................... 16
      2.6.2 Within the borders of legislation ...................................................................................................................... 17
   2.7 MEASURES APPLICABLE AS BLUE SERVICES ....................................................................................................... 19
3 PAYMENT FOR ENVIRONMENTAL SERVICES .................................................................................. 20
   3.1 INTRODUCTION TO PAYMENT FOR ENVIRONMENTAL SERVICES .................................................................... 20
   3.2 VALUING ECOSYSTEMS ........................................................................................................................................ 22
      3.2.1 Ecological valuation ........................................................................................................................................ 23
      3.2.2 Socio-Cultural Value ....................................................................................................................................... 23
      3.2.3 Economic valuation ....................................................................................................................................... 23
   3.3 DESIGNING A PAYMENT SCHEME ........................................................................................................................ 26
   3.4 DESIGN PRINCIPLES ............................................................................................................................................ 28
      3.4.1 Implementation ................................................................................................................................................ 29
   3.5 ECOSYSTEM VALUATION IN POLICY ANALYSIS ............................................................................................... 31
4 IMPLEMENTATION CRITERIA AND SUCCESS FACTORS ............................................................ 34
   4.1 INTRODUCTION TO IMPLEMENTATION CRITERIA AND SUCCESS FACTORS ........................................... 34
      4.1.1 Determination of criteria and success factors .................................................................................................. 34
   4.2 EFFICIENCY ............................................................................................................................................................ 36
      4.2.1 Amount of payment ......................................................................................................................................... 36
      4.2.2 Transaction costs for water managers ............................................................................................................. 37
      4.2.3 Trust in farmer ............................................................................................................................................... 38
      4.2.4 Effectiveness ............................................................................................................................................... 39
      4.2.5 Continuity .................................................................................................................................................. 40
   4.3 ACCEPTANCE OF SUPPLYING FARMERS ............................................................................................................. 40
      4.3.1 Trust in water manager vs. investment costs ................................................................................................. 40
      4.3.2 Amount of payment vs. effects on farm management .................................................................................... 41
   4.4 CONSTRAINTS .................................................................................................................................................... 43
5 CASE STUDY RESEARCH .................................................................46

5.1 INTRODUCTION TO THE CASE STUDY RESEARCH ..................46
5.2 SELECTION OF CASES ..............................................................47
5.3 VALIDITY .................................................................48
5.4 DATA GATHERING .................................................................48
5.5 DESCRIPTION OF CASES..........................................................49
  5.5.1 Case: Nature friendly banks in Oude Rijn area .......................49
  5.5.2 Case: Active strip management Brabant ...............................51
  5.5.3 Case: Nature friendly banks in Midden Delfland ....................55
  5.5.4 Case: Black Tern, pearl of the Krimpenerwaard ......................57

6 ANALYSIS .......................................................................61

6.1 INTRODUCTION TO THE ANALYSIS .......................................61
6.2 ANALYSIS OF MOTIVATIONS OF WATER BOARDS .................62
  6.2.1 Effectiveness ....................................................................62
  6.2.2 Total costs .......................................................................63
  6.2.3 Continuity .......................................................................64
  6.2.4 Conclusions and recommendations regarding motivations of water boards .................................................................65
6.3 ANALYSIS OF ACCEPTANCE OF SUPPLYING FARMERS ............68
  6.3.1 Investment costs ..................................................................68
  6.3.2 Trust in water manager .......................................................70
  6.3.3 Effects on farm management ................................................72
  6.3.4 Amount of payment ............................................................75
  6.3.5 Conclusion and recommendations regarding acceptance ...........78
6.4 CONSTRAINTS .....................................................................80

7 CONCLUSIONS, RECOMMENDATIONS AND REFLECTION ..........82

7.1 INTRODUCTION ..................................................................82
7.2 CONCLUSIONS ....................................................................82
  7.2.1 Research findings ..............................................................83
  7.2.2 Steps to improve decision making ........................................84
7.3 RECOMMENDATIONS FOR WATER BOARDS IN GENERAL ........87
7.4 ADVISE FOR WATER BOARDS EXAMINED IN CASE STUDY RESEARCH .................................................................88
7.5 REFLECTION .....................................................................90
  7.5.1 Reflection on used literature ................................................90
  7.5.2 Reflection on findings ........................................................91
  7.5.3 Reflection on research methodology ......................................92
7.6 RECOMMENDATIONS FOR FURTHER RESEARCH .................94

TABLES & FIGURES ..................................................................96
REFERENCES .......................................................................97
GLOSSARY .........................................................................105
ENGLISH-DUTCH VOCABULARY ....................................................106
APPENDICES ......................................................................107
Summary

Introduction
In the Netherlands, water quality management cannot always rely on traditional policy instruments to achieve the realization of measures, because traditional instruments are often difficult to enforce or expensive. Moreover, involvement of stakeholders is considered as a necessity for a sustainable development of water management (EU, 2000b). Therefore, applying innovative instruments in water management is required. Such an innovative instrument is using blue services. This policy instrument is defined as the supply of public services, which is over and above the statutory minimum, to realize societal objectives in the area of water management, and for which cost based compensation can be given. Blue services are environmental services, which are provided by land users and these services probably occur only in case compensation is given. For Dutch water boards, applying blue services is an innovative way of water management. Although expectations regarding efficiency are often mentioned, executing measures by means of farmers do require the delegation of responsibilities to others. Over the last six years, a great effort has been made among Dutch water boards to move blue services from theory to practice. However, during this process, it appeared that the possibilities of blue services are not clear to the Dutch water boards.

Therefore, this research is done in order to identify how the decision making of water boards regarding blue services as instrument for water quality management, can be improved. This was carried out by addressing the following research question: How can decision making of water boards about blue services be improved?

Measures applicable as blue services
Not all the measures, which can be implemented in rural areas to improve the water quality, are applicable as blue service. Two constraints are identified by discussing these measures with experts of water boards:

1. Measures implemented by blue services need to be not critical for the functioning of the water system. Measures, which have considerably effects (e.g. safety) on the functioning of water systems, are considered to be not suitable to be executed by land users. Water boards prefer to execute these measures themselves.

2. Blue services need to be within the borders of legislation. In particular, blue services have to be designated within the borders of state aid legislation of the European Union

These constraints narrow the possibilities of measures which can be taken in rural areas. Twenty-three measures are identified which possibly can be executed by using blue services as instrument.
These measures are categorised in four groups:

1. **construction measures combined with management** e.g. nature friendly banks, spawning grounds for fish;
2. **management measures in and around the watercourse or bank** e.g. dredging with attention to ecology, fencing of plot, mowing with attention to ecology;
3. **management measures on land** e.g. buffer strips;
4. **chemical measures** e.g. reduce the use of copper, optimizing fertilization management.

**Literature**

The compensation system for blue services relates to the concept of *payment for environmental services*. Measures indicated above, aim to sustain or improve the natural state of the environment. In this natural state, the ecosystem itself provides environmental services like maintenance of productive ecosystems, pollution control or spawning facilities. However, despite their value, these environmental services can be lost. This loss occurs because normally there is a lack of compensation land users receive for the service their land generates for others. Therefore, they have no economic reason to consider providing this service in making decisions about land use. For example, why should farmers dredge in such a way that the ecosystem is only slightly disturbed when they can do it much quicker by using conventional techniques?

To integrate the negative externalities land users provide, by not supplying environmental services into their agricultural management, it is necessary that the provision of these services is made attractive. The theory of *Payments for Environmental Services* (PES) has the logic that compensating land users for the environmental services a given land provides, makes them more likely to choose that type of land use rather than another (Pagiola et al., 2004). In other words, these payments schemes internalise externalities by creating market mechanisms to exchange services for payments (Smith et al., 2006).

The main principle relies upon the fact that those who provide environmental services should be compensated for doing so and those who receive the services should pay for their provision (Pagiola & Platais, 2002). In this respect, two conditions should be met in order to be efficient. First, the compensation of the landowner should be at least equal to the opportunity cost of the promoted land use. Second, the amount of the payment for the water manager should be lower than the economic value of the environmental externality (for example, the abatement cost of improving water quality) (Kosoy et al., 2007).

These two conditions are presented in Summary figure 1. The connecting arrow represents the value of what is paid as compensation.
Efficiency expectations

The use of blue services is driven by efficiency expectations. Land users usually receive no compensation for the service their land generates to others. Therefore, they have no economic reason to consider this service in deciding about their land use. This results in the loss of this service. To avoid the loss of service, often regulations dictate particular patterns of land use or remedial measures that repair the effect. However, regulations can be difficult to enforce and remedial measures are often expensive (Pagiola and Platais, 2002a). The reason for this is that the costs and benefits of achieving any given environmental objective are rarely constant across all situations. Market-based instruments such as Payment for environmental services (=blue services) take advantage of this difference, by concentrating efforts where costs are lower and benefits higher (Pagiola et al 2004). A voluntary approach would provide a polluter (=farmer) greater flexibility in meeting environmental quality goals and hence allow those goals to be met at lower cost (Alberini and Segerson, 2002). As mentioned by the Dutch Ministry of Agriculture, Nature management and Food Quality, the involvement of landowners and land users for the realization of water objectives, will decrease the costs for the responsible water managing authority, while different opportunities of land functions can be combined (LNV, 2002).

However, based on literature (Kiersch et al., 2005) and interviewing various water boards, it was expected that the comparison of policy alternatives is not only based on the total value related to the measure which is implemented. Probably, the instrument used to execute measures, determines the outcomes of interests of stakeholders as well.

By means of examining literature and interviewing water boards, a framework was constructed that illustrates the relations between the main criteria and underlying factors, which determine the choice for using blue services as policy instrument. This framework was used to structure the exploration of blue services in practice. This exploration was done by means of case study research.
Case study research

The goal of this case study research was to gain insight about existing blue services. This was done by checking the main success factors as presented in framework mentioned above.

Four projects have been explored: 1) Nature friendly banks in Oude Rijn area, 2) Active strip management Brabant 3) Protection of Black Terns in Krimpenerwaard and 4) Nature friendly banks in Midden Delfland.

The case study research addressed the following research questions:

1. Why do water boards consider the application of blue services as an instrument for improving water quality?
2. Why are land users willing to accept a blue service contract?

Results

The results of the case study research showed that the efficiency prospect was not always a dominant argument for water boards to participate. Additional motivations of water boards to establish a blue service are:

*To strengthen relations:* water boards understand the value of cooperation with both land users as well as other governmental organizations. The opportunity of building a good relation with farmers and other governmental organizations is an additional motivation to start a blue service.

By implementing a blue service, water boards could ensure:

a. Increase of good will; in other projects water boards depend on the same actors, so joining a blue service can increase the support for other projects.

b. An example of cooperation; it could influence the attitude of public and land users. Positive experiences about working together in establishing a sound water system can increase the willingness to participate in other cooperation projects.

*To improve awareness:* another participation motivation of water boards is creating awareness. This awareness motivation can be divided in two types.

a. Enhancing the value of water among public; blue services are a kind of public participation. By involving agriculturalists in implementing measures the value of water can more easily be exposed.

b. Increase awareness among farmers about water management; involving farmers makes them more aware of the consequences of their agricultural activities on water quality and ecology.

Consequences of blue services are difficult to determine in advance because these consequences are influenced by the acceptance of farmers. Therefore, it is hard to estimate efficiency of blue services accurately.
Because the acceptance of supplying farmers has a large influence on the motivations outcomes of water boards (see Summary figure 2), the considerations of supplying farmers were analysed.

It was concluded that the willingness among farmers to accept a blue service agreement is driven by eight driving forces (see Summary figure 3). These factors are:

- **Trust**: farmers trust water boards based on history, involvement of intermediary parties and inaccurate assumptions.
- **Investment costs**: equipment, loss of (useable) farmland and required efforts.
- **Amount of payment**: compensation height for activities.
- **Correspondence between interests of supplier and proposed measures**: the interests of the supplier are in line with the proposed measure of the blue service; e.g. adoration of nature by farmers or biological agriculture.
- **Attractiveness of alternative measures**: water boards can implement other measures to realize their water objectives. These alternatives can be less favourable for farmers once they are implemented.
- **Compatibility of blue service activities with regular activities**: activities of measures fit in the regular activities of land user; e.g. mowing of banks can easily being combined with regular mow activities and biological farmers can easily join an agreement in which fertilization is forbidden, whereas they already did not fertilize.
- **Opportunity costs**: by implementing measures, net profits from on-farm activities are sometimes foregone. E.g. considering the implementation of a buffer strip instead of sowing grain depends on the possible profits of grain.
- **Clearness of agreement**: in case the agreement is not entirely clear, lots of exceptions and conditions are included in the contract; the willingness to accept will decrease.
Water boards can take away some negative effects to increase the acceptance and at the same time this can even decrease the required compensation height. Besides, water boards can increase the effect of driving forces, which have a positive effect on the acceptance. These steering options can be used either to change the agreement of the blue service (e.g. compensate in advance to reduce the investment costs), or they can be applied to influence the implementation process of a blue service agreement (e.g. clarify (financial) situation towards suppliers to increase trust).

**Conclusions**

The main research question of this research project was *How can decision making of water boards about blue service be improved?*

Improving the decision-making regarding blue services can be done by performing a sequence of six steps. These steps are:

- **Step 1:** Identify possible measures
- **Step 2:** Reflect on the intended motivations of the blue service agreement
- **Step 3:** Assess the acceptance of farmers
- **Step 4:** Determine steering options
- **Step 5:** Examine legislation constraints
- **Step 6:** Decide upon the applicability of blue services

This sequence of steps can be used by water boards that consider the use of blue services in water quality management. It will improve the decision making whereas by performing the steps water boards can make a more informed decision. The steps are elaborated below.

**Sequence of steps to improve decision-making regarding blue services:**

**Step 1: Identify possible measures**

This step involves the determination of measures, which are suitable to be executed by means of a blue service agreement. Water boards should consider at least two aspects.

- Although water boards can decide otherwise, measures which have considerably effects (e.g. safety) on the function of water systems are considered to be less suitable for use in term of blue services.
• The activities done by the farmer as part of a blue service agreement should exceed legislations, in other words over and above statutory minimum. This is necessary, because it is not allowed to pay supplying farmers for activities when legislations oblige them to provide these services.

Step 2: **Reflect on the intended motivations of the blue service agreement**
Consider the different motivations that affect the choice for using blue services as a policy. Perceive blue services not only from an economic perspective; consider efficiency motivation as well as other possibilities of blue services. Blue services can also:
- strengthen the relation with farmers and other governmental organisations
- increase the awareness about water management among public and land users

Step 3: **Assess the acceptance of farmers**
To what degree the motivations goals are realized is determined to a large extend by the acceptance of the farmers. Water boards can check eight driving forces that influence this acceptance, to estimate the willingness to accept a blue service among future suppliers in advance. This implicates that water boards should have at least a draft of the blue service agreement. Driving forces can have either a positive or a negative effect on the acceptance. By executing this step water boards gain more insight in driving forces that either have a strong or limited effect on the acceptance.
Step 4: **Determine steering options**

Water boards can influence driving forces, by using steering options. This way they can affect the willingness of (future) supplying farmers to participate. In designing a blue service agreement, water boards should aim to enlarge the positive effects of driving forces on the acceptance and to limit the negative effects of driving forces on the acceptance.

Step 5: **Examine legislation constraints**

This step involves checking whether the steering options are in line with legislation constraints. Water boards should examine whether the design of the blue service agreement is in line with legislation aspects, such as European state aid legislation. If not, it is necessary to adjust the design of the blue service agreement.

To assess the acceptance of the adapted blue service agreement by future supplying farmers, return to step three.

Step 6: **Decide upon the applicability of blue services**

Finally assess, based on the previous steps, whether implementing blue services can be successful. Determine which required actions should be implemented to ensure the continuation if a blue service is implemented. Moreover, apply various participation scenarios. This can facilitate the determination of consequences in terms of costs and effectiveness of the blue service.

**Recommendations**

In case water boards consider the use of blue services as an instrument to achieve the implementation of measures, the following is recommended:

1. Perceive blue services not only from an economic perspective; consider efficiency motivation as well as other possibilities of blue services. Blue services can also strengthen the relation with farmers and other governmental organisations, or increase the awareness about water management among public and land users.

2. Assess the willingness to accept the blue service among farmers by determining their perspective about the eight underlying factors presented in the sequence of steps to improve decision making about blue services. If any doubt exists, execute a motivation survey.

3. Consider the following steering options to influence the driving forces.
<table>
<thead>
<tr>
<th>Driving forces</th>
<th>Steering possibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correspondence between suppliers' interests and proposed measures</td>
<td>Consider which regular activities are done in designing a blue service</td>
</tr>
<tr>
<td>Attractiveness of alternative measures</td>
<td>Communication of alternatives to farmers</td>
</tr>
<tr>
<td></td>
<td>Use of pilots</td>
</tr>
<tr>
<td>Compatibility of blue service activities with regular activities</td>
<td>Compatibility is taken into account in designing the agreement</td>
</tr>
<tr>
<td></td>
<td>Determine whether possible nuisance of the blue service agreement can be controlled by regular activities</td>
</tr>
<tr>
<td>Opportunity costs</td>
<td>Payment relates to opportunity costs, e.g. based on cereal prices</td>
</tr>
<tr>
<td>Clearness of agreement</td>
<td>Appointing an area manager;</td>
</tr>
<tr>
<td></td>
<td>Designing an unambiguous contract</td>
</tr>
<tr>
<td></td>
<td>Communicate carefully to avoid negative rumours about the contract</td>
</tr>
<tr>
<td>Trust</td>
<td>Be informed about other policy plans, try to influence these plans</td>
</tr>
<tr>
<td></td>
<td>Clarify (financial) situation towards suppliers</td>
</tr>
<tr>
<td></td>
<td>Explore the reputation of intermediary parties among suppliers, before involving them actively</td>
</tr>
<tr>
<td></td>
<td>Ensure intensive interaction with the intermediary parties involved</td>
</tr>
<tr>
<td>Amount of payment</td>
<td>Raise payment (within borders of state aid legislation)</td>
</tr>
<tr>
<td>Investment costs</td>
<td>Compensate in advance</td>
</tr>
</tbody>
</table>

4. Often, a pilot precedes the final blue service agreement. Consider the possible consequences of pilots before implementing them. Pilots can cause negative precedents. To avoid this from happening, it is required that at least important conditions of the pilot, such as compensation heights, are in line with European legislation.

5. Ensure the continuation of blue services by determining which required actions are necessary to be implemented.

6. Applying various participation scenarios facilitates the determination of consequences in terms of costs and effectiveness.

7. Finally, apply the sequence of steps to improve decision-making regarding blue services.
1 Introduction

1.1 Background

In 1988, a European seminar about water policy concluded that legislation of the European Union had to focus more on the ecological quality of water (EU, 2000a). Twelve years after this meeting, the European parliament accepted the Water Framework Directive (WFD) of the European Union, which had to be incorporated in all European countries, including accession countries. The objective of the WFD is to establish a good condition of the water systems in terms of water quality by the year 2015. This objective can be further subdivided in a) the protection of aquatic ecosystems, b) improving the quality of aquatic environment, c) stimulate sustainable water use and d) mitigation the impact of floods and droughts (Huisman, 2004). The following figure indicates the steps needed to be taken to reach this good condition.

![Timeline European Water Framework Directive](image)

Figure 1.1 Timeline European Water Framework Directive

In the Netherlands, the WFD does not implicate the rise of new plan structures. The objectives and measures determined by provinces, water boards and municipalities are the building blocks of the river basin management plan. In this river basin management plan, existing plans are integrated by summarizing and copying them. Whereas the river basin management plans do not have their own objectives and measures, (because it is related to different plans of the national government, provinces, water board and municipalities), it is necessary that these plans meet the requirements that are related to the WFD and are defined by the European Commission (Wittenhorst and Mak, 2005).

While the WFD focuses on water quality, water legislation concerning water quantity aspects is developed in the same period. Issues like climate change, sea level rising and land subsidence, together with the severe water quantity nuisances by which the Netherlands was confronted in the
nineties, led to a need for a more adaptive attitude instead of a continuous fight against water. The committee water management 21st century expressed this change of attitude by the determination of certain principles to which water systems should be organized in the future. Water systems should be reliable, sustainable and manageable. Furthermore, water should be seen as an ally instead of an enemy. Moreover, various existing legislation offers have to chance to combine new water policies. A third principle is that water problems should not be shifted to neighbours downstream or to future generations. The fourth principle is the three-stage strategy of (1) retaining water in the soil and ditches before (2) buffering the water in the drainage canals, retention ponds and lakes. And only if that storage is more or less filled the surplus water can be (3) drained (Van de Ven, 2007). Consequently, space should be allocated to water. Substantial areas are required for surface water, dikes, dunes and constructions. The latter is hard to accomplish since the last 50 years more and more space has been retracted from the water system (Commissie Waterbeheer 21e eeuw, 2000).

1.1.1 Blue services as new instrument

Both aspects of water management (quality and quantity), requires the determination of measures to realize a sustainable water management system. Although different approaches towards sustainability exist (Rijsberman and Van de Ven, 2000), involvement of stakeholders is considered to be a necessity for a sustainable development (EU, 2000b). This is defined by the Brundtland Commission as: “a development that fulfils the needs of the present generations, without compromising the ability of the future generations to fulfil their needs” (WCED, 1987). Therefore, relying on existing instruments to achieve the realization of measures, which lack stakeholder involvement, is not possible. On the contrary, using new instruments, which expresses the public participation in both designing and implementing of plans is necessary. An innovative instrument is mentioned in the Structuurschema Groene Ruimte 2. This document, formulated by the Dutch Ministry of Agriculture, Nature management and Food Quality, elaborates the concepts of the Fifth National Policy Document on Spatial Planning for rural areas. It defines blue services as a promising new instrument for the realization of measures. Whereby blue services are described as water services, a type of a green service. (LNV, 2002) The concept of green services can be defined as activities or control mechanisms aimed at the realisation of the developing social demands. At the same time, the entrepreneur should be rewarded for this. Blue services are green services related to water and therefore blue services are a realization of a water management objective performed for others based on a contract (Van Bommel et al., 2002). The use of blue services is driven by efficiency prospects. Usually land users receive no compensation for the service their land generates for others. Therefore, they have no economic reason to consider this service in making decisions about land use, which results in the loss of this service. To avoid the loss of this service, usually regulations to dictate particular patterns of land use or remedial measures that repair the effect, are responses. However, regulations can be difficult to enforce and remedial measures are often expensive (Pagiola and Platais, 2002). Applying blue services is an approach whereby land users are paid for environmental services
they generate. By involving landowners and land users for the realization of water objectives, costs for the responsible water managing authority decreases, while different opportunities of land functions can be combined (LNV, 2002). The efficiency prospects of this promising instrument are reason to perform this research.

1.1.2 Grontmij

It is important to realize that water managers evaluate blue services as an alternative for conventionally used instruments. However, ideas about which measures are realized by using various instruments are not entirely considered by water managers themselves. They often assign engineering companies to formulate management plans. The innovative character and the various possibilities of blue services make it difficult for water managers to determine whether a blue service will be a successful instrument or not. It is therefore in the interest of Grontmij, the engineering group where this research will be carried out, to be more involved in the field of blue services. This way they could be assigned by water managers to determine the possibilities of blue services for a specific area.

Grontmij NV, erected in 1915, is a stock market listed organisation focussing on advice, design, engineering, management and turnkey realization of projects. Grontmij participates in the market sectors of building, infrastructure, environment, water, energy and industry and has offices in the Netherland, Belgium, Germany, Denmark, Sweden, the United Kingdom, Ireland and Poland. With over 7000 employees and a turnover of more than 500 million euro’s, it is one of the largest engineering consulting companies of Northwest Europe. When Grontmij acquires expertise on blue services, they can offer a wider range of measures to handle water quality and quantity issues, which can be incorporated in their products. The prospect is that blue services will improve the quality of Grontmij’s efforts, which will result in a higher demand for their products, a better position to their competitors, and eventually this could increase their profit.

1.2 Blue services

1.2.1 History

The idea of blue services is innovative and this characteristic was reason for the association of water boards, the Dutch Agriculture and Horticulture organisation (In Dutch: LTO) and the Ministry of Agriculture, Nature management and Food Quality, to specify this idea further. They started a research to make the concept of blue services comprehensible. The goal of this research was to identify the intended objectives of blue services, the boundary conditions and the economic contract theories which are relevant to connect supply and demand. In 2002, the results were presented in the report “Blauwe diensten”. Although, the conclusion was drawn that the realisation of blue services was feasible, this feasibility had to be tested by following some recommendations. One of the recommendations was to study the social desirability from a more political perspective. Furthermore, it was recommended to specify the various payment systems
and to start pilots in order to explore the possibilities of blue services areas. Finally, a recommendation was made in order to test to what extend European legislation would affect the organization of blue services (Van Bommel et al., 2002). From then on, various water boards started projects to discover what the possibilities of blue services were on water managing tasks like water quantity, water quality and protection (Kraak et al., 2007). Whereas the concept of blue services was not properly defined, and many uncertainties still existed, a broad range of projects was (mis)labelled as blue services by the water boards. Before the aspects will be discussed, which determine the definition of blue services, it is useful to consider first the main characteristics of blue services.

1.2.2 Characteristics

Blue services are services supplied by landowners and land users. These services are first of all water related and thus realize water objectives (In Dutch: Wateropgaven). Although, the demand side as well as the supply side determines the success of blue services, the perspective should be demand driven. This way the realisation of blue services is purposeful and expectations of potential suppliers in specific area are avoided (Kraak et al., 2007).

To establish a water management product like a blue service, it should be over and above the statutory minimum (In Dutch: bovenwettelijk). This means that the work should exceed the legal obligations of the service supplier. This is necessary because the supplier can not be rewarded for a blue service in case he or she is obliged to provide this ‘service’ by legislation. These obligations are determined in the so-called Good Agricultural Practice (In Dutch: Goede Landbouw Praktijk). Landowners and land user should meet these obligations without being rewarded. Blue services are organized voluntarily, which means that the supplier can decide whether he or she wants to participate. Therefore, water boards can not enforce a blue service (Kraak et al., 2007).

Often the contracts of blue services are organized by means of private law agreements. Because the content of the agreement often depends on the specific situation, public law is therefore less applicable. The payment and duration of the agreement is in private law agreements determined in mutual consultation. Although the legal rights and the equality before the law is better ensured for public law agreements, this means inflexibility of the agreement as the negotiation space between supplying and demanding parties is restricted (Kraak et al., 2007).

Most blue services are land tied, which means that the suppliers of blue services use their own land to realize the specific water objective. However sometimes it would be more efficient if landowners deliver a service on land from the water board that borders on their land, for example to maintain and manage embankments. In that case, the term objective tied is used (Kraak et al., 2007).
The compensation system for blue services is related to the concept of payment for environmental services. The basis of any water-related payment for environmental service scheme is the assumption that a change in or preservation of a specific land and water use in the upstream part of the watershed will be beneficial to downstream water users in terms of water availability or quality (Kiersch et al., 2005). Hereby are the main principles that those who provide environmental services should be compensated for doing so and that those who receive the services should pay for their provision (Pagiola and Platais, 2002). There are two conditions which need to be fulfilled in order to be efficient. First, compensation of the landowner should be at least equal to the opportunity cost of the promoted land use. Secondly the amount of the payment for the water manager should be lower than the economic value of the environmental externality (for example, the abatement cost of improving water quality) (Kosoy et al., 2007).

![Figure 1.2 Payment scheme for environmental services (Adapted from Pagiola, 2002)](image)

The two conditions mentioned above, are presented in Figure 1.2. The connecting arrow represents the value of what is paid as compensation. Since there are no explicit markets for blue services, indirect means of assessing values must be used. Different techniques like avoided cost, replacement cost, factor income, travel cost, hedonic pricing can be used to establish the necessary willingness to pay (WTP) and the willingness to accept for the availability or loss of the blue service (De Groot et al., 2002). For now, there is no need to describe these techniques in detail, but during the research, attention will be given to theories about the valuation and payment of ecological services.

### 1.2.3 Criteria

The objectives of water management are divided into three main groups: water quantity, water quality and flood protection. In order to realize these objectives, measures need to be taken. Although the direct effects of measures on quantity or quality can be predicted by using quantitative models, the success of the specific measure is also determined by the assessment of the used instruments in the light of implementation criteria. By comparing different measures, water boards identify the possibilities of the instruments they can use (Van Schaik, 2007).
To clarify the difference between water objectives, measures and instruments the following figure shows their relations. Different measures can contribute to water objectives. For example, the objective can be ‘to reduce phosphate by fifty percent’. One of the measures can be to retain the surplus of water of agricultural land in a trench at the border of the field. Several instruments can support the realization of this measure. A possible conventional instrument is to buy the land of the landowner. Another instrument can be a blue service wherefore the landowner is rewarded. Not only measures are compared with each other, different types of instruments are compared with each other as well.

![Figure 1.3 Relations between water objective, measures and instruments](image)

As said before, blue services are an alternative for conventionally used instruments. Evaluation is therefore relevant. In policy analysis, different analysis methods can be distinguished to guide decision makers in choosing the most appropriate alternative. An important distinction is the difference between monetary and non-monetary evaluation. A monetary evaluation is characterised by an attempt to measure all effects in monetary units, whereas a non-monetary evaluation utilises a wide variety of measurements units to assess the effects. Cost-benefit analysis and cost effectiveness analysis are well known examples of a monetary evaluation. Multi criteria methods belong to the family of non-monetary evaluation methods (Munda et al., 1994).

In water management the consideration of alternatives is not a single issue of evaluating the economic aspects of the different options. Social benefits and technical possibilities have to be considered as well. If these aspects could be expressed in the same units it would be a straightforward process of choosing the unambiguous best solution. However, when dealing with public’s water resources, this is not the case (Loucks and Van Beek, 2005). The consequences of the various alternatives on different criteria have to be trade off against one another. Finding a
balance among all conflicting performance criteria characterizes water management decision making. It is important that the outcome of this decision-making is an informed and effective decision (Loucks and Van Beek 2005).

Multi criteria methods can be used as a decision making tool, to make such an informed and effective decision. These methods are a flexible way of dealing with qualitative multidimensional criteria (Munda et al., 1994). However, work carried out under the rubric of multi criteria decision-making, often bases its claims to legitimacy on a framework in which limitations on objectivity are left aside. Therefore, multi criteria analyses are usually applicable as a decision aid instead of a decision-making tool, whereby its purpose is to help us make our way in the presence of ambiguity, uncertainty and complexity (Roy, 1990). A similar distinction about the role of multi criteria methods is whereby the first is to provide information on trade-offs by displaying how option perform on the various criteria. And the second is to help users articulate and apply their values to the problem rationally and consistently and to document the process (Hobbs et al., 1992). Criteria, on which decisions are based, are for example costs, effectiveness, local support, legal aspects etc. (Kraak et al., 2007).

1.3 Research objective

Until recently, various definitions of blue services existed. To synchronise the development of blue services as water managing instrument the association of water boards set up a letter wherein they formulated the following definition of blue services: The supply of public services, which is over and above the statutory minimum, to realize societal objectives in the area of water management, therefore cost based compensation should be given. In the same letter, the association pointed out that the approval of the catalogue green blue services (list of measures and accompanying payments approved by the European Union, see paragraph 2.6.2) and the discussion about the ‘tweewegenleer’ has restricted the possibilities of using blue services as water management instrument. Whereas in the new water law areas can be assigned as storage areas, for which a tolerate obligation (in Dutch: gedoogplicht) is applied, water storage services should be considered as an obligation instead of a service based on voluntary. Therefore, the possibilities of using blue services to manage water quantity aspects are limited. On the contrary, water board can use blue services to improve the water quality. Hereby it is important to keep in mind the ‘polluter pays’ principle (Van der Kluit, 2006).

This forthcoming research uses the definition of the association of water boards. Therefore this research will focus on the possibilities of using blue services as instrument for water quality management. Focussing on water quality implicates the involvement of water boards, whereas water boards are responsible for water quality management in their territory (Huisman, 2004). Grontmij is helping water boards by using its regional and specialized knowledge, with developing activities necessary for the implementation of the European Water framework.
directive. For example, activities they perform are: characterisation of river basins; determine of reference conditions; formulating of practical guides; set up and evaluate monitoring programmes; formulating of river basin visions and communication with interest groups. When Grontmij acquires expertise on blue services, they can assist water boards even better by making decisions about measures and instruments to improve water quality in rural areas.

Therefore, the goal of this research is to identify for Grontmij how decision making of water boards about blue services as instrument for water quality management, can be improved.

1.4 Research question

To reach the objective presented in the previous paragraph, the following main research question will be addressed:

*How can decision making of water boards about blue services be improved?*

The following sub questions will collectively answer this main question:

1.1 What are water quality issues in rural areas?
1.2 What are promising measures to improve water quality in rural areas, in terms of ecological and chemical effectiveness?
1.3 Which of these measures are applicable as blue services?

2. What elements of literature about payment for environmental services are applicable to blue service agreements?

3. What relevant criteria and success factors for implementing blue services as instrument to influence the quality of surface water, are identified by studying relevant literature and interviewing stakeholders?

4.1 Why do water boards consider the application of blue services as an instrument for improving water quality?
4.2 Why are land users willing to accept a blue service contract?

5. What are the main differences and similarities between existing blue services?

6. What can be concluded from the comparison of existing blue services?
1.5 Methodology

The following steps will be executed during the research project. These steps are represented in the research framework presented below (Figure 1.4):

1. The first stage of the research project will focus on what water quality issues in rural areas are and how these issues are determined. Furthermore, at this stage of the research, effective water quality measures will be identified which improve the ecological and chemical condition in rural areas and which can be executed by using the instrument of blue services. Methods used during this first stage are: literature research; interviewing experts of Grontmij; interviewing water boards and interviewing potential providers.

2. In the second phase, the evaluation of water quality measures and instruments will be discussed, based on the input from phase one. Discussing theories about payment for environmental service will provide understanding of the background of blue services. Evaluating measures and instruments is not a single issue of evaluation the economic aspects of the different options. Social benefits and technical possibilities have to be considered as well. Based on relevant literature and interviews, phase two will result in a framework which shows the relevant relations between criteria and success factors with regard to the choice for blue services. Methods used during this second stage are: literature research; interviewing water boards.

3. The third phase provides understanding of the use of blue services to improve water quality. This is done by exploring different projects that apply blue service agreements to improve water quality. The analysis of these projects will be structured by means of the framework, constructed in the previous phase. This phase will be the main part of the forthcoming research. In this phase a comparative case study research will be executed.

4. In the fourth phase a comparison of the results of the case study research is given. The conclusions of the research project are drawn in this phase.

5. Finally, in the last stage of the research project, recommendations will be given on how the results should be used. A reflection on this research will be discussed as well.

![Figure 1.4 Research framework](image-url)
2 Identifying water quality issues and related blue services

2.1 Introduction to water quality issues and related blue services

Policy analysis processes generally involve a same set of logical steps (Walker, 2000). The first question of this research corresponds to the first step in policy analysis, which is the identification of the problem. Thus, identify the discrepancy between existing and a desired situation. To solve this problem a policy needs to be formulated by the policymaker. If certain objectives of the policymaker are met, the problem is solved. In other words, the discrepancy is taken away. The second step in policy analyses involves the identification of these objectives. After this, it is to decide on which criteria evaluate alternative policies. This is followed by the selection, analysis and comparison of policies. Finally, the chosen policy is implemented and the results are monitored and evaluated.

Whereas the objective of this research is to identify the possibilities of a policy (blue services), the logical steps performed in a policy analysis study are partly executed in this research as well. In paragraph 2.2 the main issues in rural areas, concerning water quality, are discussed. Paragraph 2.3 explains the role of so-called water types in relation to water quality objectives. After this, the determination of ecological objectives is discussed in paragraph 2.4. In paragraph 2.5 measures are identified, which can be applied in rural areas to improve the water quality. This list is narrowed to measures, which can be executed by using the instrument of blue services. In paragraph 2.6 these constraints are discussed and this chapter ends by presenting potential measures that can be taken in rural areas and which can be provided by land users, in other words; by means of blue services.

This chapter addresses the following research questions:

Question 1.1: What are water quality issues in rural areas?
Question 1.2: What are promising measures to improve water quality in rural areas, in terms of ecological and chemical effectiveness?
Question 1.3: Which of these measures are applicable as blue services?
2.2 Water issues

In terms of water quality, the amount of nutrients is the main problem in rural areas. Nutrients as nitrogen (N) and phosphate (P) in the water system result in an increase of algae and aquatic plants growth. High amounts of algae and plants in the water will induce large fluctuations in the oxygen balance. Consequently, big differences in the oxygen balance during the day and night can give problems for animals especially fishes. Furthermore, it causes troubled water, it may cause smelly- or tasty substances and potential poisons and finally, it influences the subsurface light climate (Van de Ven, 2007).

In rural areas, these nutrients thus have a major effect on ecological condition of water bodies. Hereby, increasing nutrient concentrations result in a decreased ecological condition. Although it takes quite a while before it comes to an unwanted ecological condition, the reverse is even harder to establish. When nutrient concentrations decrease in surface water, the ecological condition remains poor. Recovery of the ecosystem eventually occurs at very low nutrient concentrations (see Figure 2.1).

In the past, farmers fertilized their soils heavily. Consequently, more nutrients have been supplied to the soil, than crops could extracted from that soil. There was no balanced fertilization management so to say. This resulted in a decrease of the ecological conditions in Dutch water systems, which is shown by the red line in Figure 2.1 (Adapted from Boheemen, 2004). In addition to changing fertilization legislation to affect the concentration of nutrients (green line), supplementary measures can be taken to enhance the recovery. These can be construction, management and maintenance measures (Boheemen, 2004). Currently, water boards formulate these additional measures as part of their River basin management plans (see previous chapter).

![Figure 2.1 Effects of increasing and decreasing concentration of nutrients](image)

The non-quantitative policy objective of the Water Framework Directive is to establish a good condition of the water systems in terms of water quality. This goal can be divided into the fulfilment of chemical and ecological objectives. Chemical objectives are obtained by eliminating a list of 33 priority hazardous substances. Therefore, pollution through discharge, emission or loss must be ceased or phased out (EU, 2000c). European legislation has determined these chemical
objectives and these are applicable to all water systems throughout Europe. On the contrary, ecological objectives are determined nationally and regionally so that local circumstances can be considered as well. As discussed above, especially the ecological objectives are relevant in relation to blue services provided by land users in rural areas. Particularly for the determination of these ecological objectives, the concept of “water bodies” has been introduced as key units to which a number of the Directive’s requirements are related. A water body is defined as a discrete and significant element of surface water such as a lake, a reservoir, a stream, river or canal, part of a stream, river or canal, transitional water or a stretch of coastal water to which the environmental objectives of the WFD must apply (EU, 2000d). This way, the implementation of the Water Framework Directive is structured. Moreover, the compliance of its quality objectives is checked in this way.

2.3 Water types

Thus, defining quality objectives for water systems is done by means of water bodies. Water bodies can be subdivided into three categories:

a. **Natural waters** are waters that are not regulated by man, have a natural flow regime and are not morphologically altered by man (Steenstra, 2002).

b. **Heavily modified water bodies**, is a body of surface water which, as a result of physical alteration by human activity, is substantially changed in character (EU, 2000e).

c. **An artificial water body** means a body of surface water created by human activity (EU, 2000e).

These three groups of water bodies can be further subdivided into categories: rivers, lakes, transitional waters and coastal waters (EU, 2000e). A **river** is a body of inland water flowing mostly on the surface of the land but which may flow underground for parts of it course; a **lake** is a body of standing inland surface water; **transitional waters** are bodies of surface water in the vicinity of river mouths which are partly saline in character as a result of their proximity to coastal waters but which are substantially influenced by freshwater flows; and finally **coastal waters** are surface waters which are considered as water surfaces into the sea at a maximal distance of one nautical mil away from the landward side.

In the Netherlands, the four categories are further subdivided, based upon descriptors like geological soil, slope, shape etc. This way 42 natural water types and 13 heavily modified/artificial water types have been distinguished (Elbersen, 2003). For example the descriptions of rivers; e.g. water type R15 refers to a rapid flowing river on pebble containing soil. In the Netherlands, heavily modified and artificial waters are practically the same; this becomes clear in Figure 2.2 illustrating the classification of water types.
2.4 Ecological objectives

As was mentioned in section 2.2, the realisation of chemical objectives is obliged for all water types. How ecological objectives are determined is discussed below. Therefore, the term ‘objectives’ refers in this section to ecological objectives.

To determine the desired status for a specific water body, reference conditions are used. The WFD prescribes that the objectives of the directive should be based on reference conditions related to water types. A reference condition is a state in the present or in the past corresponding to very low pressure, without the effects of major industrialisation, urbanisation and intensification of agriculture, and with only very minor modification of the physical-chemical conditions, hydro morphology and biology (Van der Molen et al., 2005b). It depends on whether it is a natural water body or an artificial/modified water body, how these reference conditions are used. For natural water bodies the reference conditions are directly translated to ecological objectives. Three types of indicators are determined, which give information about the ecological condition. These are: biological, hydro morphological and physics-chemically indicators as is presented in Table 2.1. By evaluating the ecological condition, the biology is leading. In other words, the hydro morphological and physical-chemical elements are deduced from the biology (Van der Molen and Pot, 2007).

Table 2.1 Ecological condition indicators

<table>
<thead>
<tr>
<th>Biological</th>
<th>Hydro morphological</th>
<th>General physical – chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composition and abundance of the water flora (# and %)</td>
<td>Hydrological regime (m s(^{-1}) and m(^3) s(^{-1}))</td>
<td>Thermal circumstances (° Celsius)</td>
</tr>
<tr>
<td>Composition and abundance of the macro fauna (# and %)</td>
<td>Morphology (classes)</td>
<td>Oxygen concentration (%)</td>
</tr>
<tr>
<td>Composition, abundance and age distribution of fish (# and %)</td>
<td>River continuity (classes)</td>
<td>Salinity (mg Cl/l)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acidification (pH)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nutrients (mg P/l and mg N/l)</td>
</tr>
</tbody>
</table>
The different indicators that give information about the ecological condition are framed into so-called measuring-sticks. These measuring-sticks are defined as an evaluation of a water type per quality element. For example, a biological stick is the species composition of macrophytes. Measuring sticks contain besides the reference conditions, four types of states (see Figure 2.3a). Hereby, the standard is the Good Ecological Status (GES), which can be described as: the values of the biological quality elements show insignificant disturbance as a result of human activity but differ from the reference condition only slightly (Van der Molen and Pot, 2007).

In the Netherlands however, little natural water bodies exist; the hydrology of the Netherlands has changed during centuries of human interference. It is therefore unrealistic to base determination of ecological objectives on the country’s original meandering streams, braided rivers and great marshes bordering the dunes (Van der Molen, 2005a). For heavily modified water bodies or artificial water bodies an alternative solution is offered to water managers of the WFD by defining the highest achievable ecological status (Maximum Ecological Potential) and the ecological status they actually strive after (Good Ecological Potential). For heavily modified water bodies or artificial water bodies the same indicators are applied, however the measuring sticks are scaled differently (see Figure 2.3b).

The Maximum Ecological Potential (MEP) of these water bodies is derived from measuring sticks used in most similar natural water types. Formulating the Good Ecological Potential (GEP) is done officially by following the so-called ‘royal method’. This method prescribes that the original undisturbed situation serves as starting point. Effects of irreversible physical alterations have to be subtracted as they reduce the ecological potential. After this, potential mitigated measures to improve ecological quality are counted up. This eventually determines the Maximum Ecological Potential (MEP). Only a slight deviation from this will be the Good Ecological Potential (GEP). If the current ecological status of a water body is less than the GEP, measures have to be taken. If these are judged too expensive, phased achievement or the adoption of a less stringent objective
will be an option in general (Pot et al., 2005). This top down approach of defining ecological objectives is represented by the left side of Figure 2.4.

However, it is almost impossible to determine the MEP/GEP by this procedure, because everything has to be expressed in types and quantities. A more pragmatic method is developed in response to this shortcoming. This method was developed in Prague and is therefore sometimes called the ‘Praguematic’ method. It is a bottom-up approach whereby the current situation is taken as starting point, instead of the original undisturbed situation. Hereby, ecological objectives are determined based on all possible measures that can be taken in the water system. Measures, bad for nature or exorbitantly unfavourable for social-economic functions, are not included. Furthermore, measures that have an insignificant ecological effect are left out as well (Pot et al., 2005). This is represented by the right side of Figure 2.4.

### 2.5 Measures in rural areas

To explore and consider the effect of measures on the water quality elements, tools were developed to support this. Together with water boards, the Ministry of Transport, Public Works and Water Management developed the so-called WFD explorer tool. Various engineering companies have developed their own tools which are adapted to the preferences of their customers. Nonetheless, the methodology of these different tools is similar, whereas the relationship between the measures and the effects on the water quality elements is determined by expert judgements of various ecological specialists. The relation between measure and effect on the ecological parameter is dependent on the type of water body. For example the construction of front embankments (in Dutch: vooroevers) as measure to influence covering by embankment plants, has more effect on large deep canals (water type M7) than it has on large shallow canals (water type M6). Furthermore, whether a certain measure can be used depends on the water type of the water body. Still the effect direction of the causal relation between the measure and the ecological parameter is in more than 99% the same (Maessen, 2007).
Not all the measures can be applied as blue services. An important characteristic of blue services is the involvement of land users in rural areas. Measures applicable to urban areas can therefore be excluded. To identify which measures are relevant in rural areas, various documents were used that all focus on water managing measures in rural areas (Clevering et al., 2006a, 2006b; Boheemen et al., 2004; WUR, 2007; Schaap et al., 2006; and Hoving, 2007). Together with the assistance of Grontmij’s experts, the list was narrowed to measures, which can be applied in rural areas. Measures which can be applied in rural areas are for example:

- Construction measures in watercourses e.g. fish migrations facilities
- Construction measures on shore areas e.g. nature friendly embankments
- Construction measures on land e.g. broadening of watercourses
- Management measures e.g. dredging, level control and maintenance with attention to ecology
- Measures which are related to the emission of chemical substances e.g. use of special fertilizing equipment, avoid the farmyard runoff.

The complete overview of measures, which can be taken in rural areas, is found in the appendix.

### 2.6 Constraints for blue services

A number of experts of different water boards reviewed the initial list of measures that could be taken in rural areas (Van Schaik, Hovingh, Doorn, Meijboom, and Meijerink, 2007). They were asked to decide which of these measures were suitable to be realized by means of a blue service. In case the experts were negative about the possibilities of a certain measure, they were asked to ground that decision in order to identify the underlying criteria and constraints. In this phase of the research, elaborating on the conditions for blue services is required because this will narrow the list of measures identified in paragraph 2.5. The following constraints were identified by discussing the list with the experts of water boards: namely *not critical for functioning water system* and *within the borders of legislation*. In the subsections below, these constraints will be elaborated.

#### 2.6.1 Not critical for functioning water system

Measures, which have considerably effects (e.g. safety) on the functioning of water systems, are considered not suitable to be executed by land users. Main watercourses are courses which are critical for the functioning of a large water system. For that reason, the water boards prefer to do the management and maintenance of these watercourses themselves. Measures like *constructing sand trap* and *fish migration facilities* are most of the time implemented in main watercourses and therefore have the risk of influencing the functioning of the water system. The risk of mistakes
made during the construction or maintenance are considered to be too high to allow land users executing these measures.

The same logic counts when discussing level control measures. Water boards consider level control to be crucial for the water system as it affects a large number of stakeholders. Therefore, the decision about the level can only be executed effectively by a governmental organisation who takes into account the different interests of the various actors involved. In addition, measures related to level control, as weir management can have considerable effects in case of mismanagement. It even can affect the safety of the inhabitants. Therefore, measures related to level control and measures which are only applied in main watercourses, are excluded from the initial list of measures.

2.6.2 Within the borders of legislation

The constraint that blue services needs to be organized within the borders of legislation can be divided into three categories.

Over and above the statutory minimum

An activity provided by a land user can only be considered as a blue service if this activity exceeds the legislation. European and national legislation determine that land users are not allowed to receive payments for activities when legislation obliges them to provide this service (Kraak et al., 2007). The concept of good agricultural practice (In Dutch: Goede Landbouw Praktijk) is relevant in this. Good agricultural practice stands for the norms by which agriculture has to be organized, determined by legislation. For good agricultural practice no compensation can be given. For activities in favour of the environment, which exceed these legislative norms, and therefore are over and above the statutory minimum can be considered as green services for which a payment can be given (RLG, 2002).

The same is applicable to regulations formulated by water boards like ‘de legger’ and ‘de keur’. The so-called ‘legger’ is a file in which the dimensions of a specific watercourse are documented. In what way maintenance should be executed is part of the ‘keur’; a document that prescribes what can and what cannot be done in and around watercourse. Both the ‘legger’ and the ‘keur’ are consequently part of the statutory minimum.

Within national legislation (tweewegenleer)

The second aspect that determines the legal space of blue services is the so-called ‘tweewegenleer’. This doctrine responds to the question whether a government can use private law capacities to accomplish public law objectives, when based on these public law objectives she was given public law capacities. The ‘tweewegenleer’ determines that one cannot realize policy objectives by using private law capacities, if the same result can be achieved by making use of public law capacities. Although jurisdiction is unavailable for blue services the expectation is that the ‘tweewegenleer’ will not cause any problems, as the agreements are voluntarily based (De Putter, 2007). As stated before, water quantity differs from water quality management, partly
because of the new water law. This law namely, contains several articles wherein water managers can oblige landowners and land users to tolerate some water measures related to water quantities (Waterwet, 30818). This means that these public law capacities can and should be used in order to realize policy objectives. Private law capacities will be seen as unlawful state aid (Groothuijsen, 2007). With respect to water quality, these obligations for land owners are not formulated and therefore the ‘tweewegenleer’ will probably not hamper the design of blue services to improve water quality.

**No unlawful state aid**

Whereas the agreement between the supplier and the water board is voluntarily, the supplier is able to refuse a contract, in case the compensation is not attractive enough. When the compensation is only based on the erosion of income and the cost price of construction and maintenance, there will probably be no incentive for the supplier to participate. Thus, when the supplier voluntarily agrees upon the provision of a blue service, it should somehow be beneficial to the supplier. Therefore is the compensation most likely to be designated as state aid. To avoid that this is illegal, it must be ensured that the compensation of land users for providing blue services, is designated within borders of state aid legislation of the European Union. One speaks of unlawful state aid, based upon the state aid rules of the European Union (Art 87 to 89), when ‘any aid granted by a Member State or through State resources in any form whatsoever, which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods shall, insofar as it affects trade between Member States, be incompatible with the common market.’ (Reckon, 2007).

What exactly the implications of this state aid legislation are in relation to blue services is not directly clear to water boards. Because the financing of a blue service requires a registration procedure at the European Commission, water boards often hesitate. To overcome this issue, the inter-provincial consultation (In Dutch: Inter Provinciaal Overleg) has bundled initiatives of blue and green services in a catalogue which is approved by the European Commission. The approved list of measures and accompanying payments give governmental organisations notion of the possibilities of state aid. Therefore, the catalogue is an instrument that offers governments the ingredients to develop their own services and arrangements. By presenting the list of possible blue services, the catalogue prevents the wheel of becoming reinvented. Although the inter-provincial consultation is in charge of the catalogue and will updated it annually, the possibilities for using the catalogue especially for blue services, is limited until now. In the appendix it is indicate which of the measures to improve water quality are mentioned in the catalogue. Updating the catalogue will be necessary as experiences and new registration of services can change the cluster description and payment regulations (Van Moorsel, 2006). At this moment, the inter-provincial consultation is primarily focussed on trying to get product familiarity among users of the catalogue (Boonen, 2007).
Besides the compensation height, the duration of the contract is a subject to European legislation as well. The duration of a blue services must be at least five and maximal seven years. Furthermore, the support cannot be accumulated with support that originates from other local, regional, national or European arrangements, which subsidise the same costs (Europese Commissie, 2006).

**Consequences**

The above implicates that five measures were excluded: two chemical measures that appeared to be obligatory for the farmer; one regular maintenance measure and two construction measures. The latter were excluded because once it is decided to execute these construction measures they will become statutory standard and are determined in legislation (in Dutch: keur en de legger). No additional management activities are required for the maintenance of these measures that could be considered as blue service.

Although some measures are not over above the statutory minimum, like dredging and unfertilized buffer strips, they have not been excluded. These measures can be executed in a way that it becomes over and above the statutory minimum and that payment can be given. For example, dredging can be done by using a dredging pump instead of trench digger and buffer strips which are broadened by an additional meter are both over and above the statutory minimum.

### 2.7 Measures applicable as blue services

Now the constraints are known, it is possible to narrow the list of measures to a list of measures which could be taken in rural areas. In such a manner an overview is formed of measures, which possibly can be executed by using blue services as instrument. This way, twenty-three measures were identified that land users in rural areas can perform and for which the water boards should give compensation. The list of these twenty-three measures is found in the appendix.

These measures are categorised in four groups:

1. **construction measures combined with management** e.g. nature friendly banks, spawning grounds for fish;
2. **management measures in and around the watercourse or bank** e.g. dredging with attention to ecology, fencing of plot, mowing with attention to ecology;
3. **management measures on land** e.g. buffer strips;
4. **chemical measures** e.g. reduce the use of copper, optimizing fertilization management.
3 Payment for Environmental Services

3.1 Introduction to payment for environmental services

Measures indicated in the previous chapter aim to sustain or improve the natural state of the environment. In this natural state, the ecosystem provides environmental services like purification and spawning facilities. However, despite their value, these environmental services can be lost, if there is a lack of compensation land users receive for the service their land generates for others. Therefore, they have no economic reason to consider this service in making decisions about land use, what results in the loss of this service. For example, why should farmers dredge in such a way that the ecosystem is only slightly disturbed when they can do it much quicker by using conventional techniques? To avoid the loss of these kinds of services, usually regulations to dictate particular patterns of land use or remedial measures that repair the effect are responses. However, regulations can be difficult to enforce and remedial measures are often expensive (Pagiola and Platais, 2002). To integrate the negative externalities land users provide, by not supplying environmental services into their agricultural management, it is necessary that the provision of these services is made attractive. The theory of Payments for Environmental Services (PES) has the logic that compensating land users for the environmental services a given land provides, makes them more likely to choose that type of land use rather than another (Pagiola et al., 2004). In other words, these payments schemes internalise externalities by creating market mechanisms to exchange services for payments (Smith et al., 2006).

Blue services are environmental services which are provided by land users and that probably only occur in case compensation is given. Considerations regarding Payment for Environmental Services are therefore expected to be relevant in the discussion about blue services.

Most of the literature about PES programs consists of experiences on water services in developing countries such as in Latin America (see, e.g., Kiersch et al., 2005; Kosoy et al. 2007; Pagiola and Platais 2002; Pagiola et al., 2004). In this literature, the basic assumption of water-related payment for environmental service schemes claim that a change or preservation of a specific land and water use in the upstream part of the watershed will be beneficial to downstream water users in terms of water availability or quality (Kiersch et al., 2005). Although in the
Netherlands the term downstream is sometimes less applicable, the basics of compensation in PES as represented in Figure 3.1(Adapted from Pagiola et al., 2002) will be the same as in blue services whereby a beneficiary party compensates the providers of the environmental service.

<table>
<thead>
<tr>
<th>Governance structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beneficiary → Beneficiary → Beneficiary</td>
</tr>
</tbody>
</table>

**Figure 3.1 The flow of compensation from beneficiaries to land users**

Smith et al. (2006), provide an overview of the various components that must be brought together during the development of a payment scheme. Two of these elements, which are the identification and valuing of services and the designing of the payment scheme, are in this chapter applied on blue services. Whereas the identification of what possible measures are to support service provision, is done in the previous chapter, this chapter will start with the valuation of ecosystem services. Valuation is important because it could be used to make an informed decision. The integrated framework of De Groot et al. is hereby used. Next, the willingness to accept and the willingness to pay; both important conditions in voluntary environmental agreements are discussed in paragraph 3.3. In paragraph 3.4, considerations about in environmental principles are mentioned. In the last paragraph of this chapter environmental valuation is related to policy analysis, hereby are arguments given, which demonstrate that not only the decision about measures can affect the outcomes of interest, but also decision about which policy instrument is used.

This chapter addresses the following research question:

**Question 2:** What elements of literature about payment for environmental services are applicable to blue service agreements?
3.2 Valuing ecosystems

Decisions in water management considering blue services must be supported by a sound analysis of the value of the service that is provided. Hereby, it is important to consider the value of the environmental service from an integral perspective whereby besides economic values, socio-cultural and ecological values are taken into account. This is important because water valuation could be used to inform decision makers and stakeholders, to facilitate dialogue and learning, to help stakeholder to express their interest in negotiation and in summary to enable transparent accountable and equitable decision-making (Hermans and Hellegers, 2005).

To enable an integrated assessment and valuation of ecosystem functions, goods and services, De Groot et al., (2002) provide an integrated framework. To understand the ecological complexity De Groot et al. distinguish four ecosystem functions, whereby ecosystem functions can be defined as ‘the capacity of natural processes and components to provide goods and service that satisfy human needs, directly or indirectly’. The four functions are regulative, habitat, production and information functions and these functions provides goods and services like pollution control, detoxification, filtering of dust particles etc.

The valuation of these goods and services can roughly be divided into three categories: ecological, socio-cultural and economic value (De Groot et al., 2002). A similar distinction is made in the integrated water assessment method which is discussed by the Ministry of Transport, Public Works and Water Management. This directory states that interferences in the water system can influence the environment, the economy and the society (Brouwer et al., 2003).
The following subsections discuss the three valuations (ecological, socio-cultural and economic). The ecological and the socio-cultural valuation are discussed briefly. Contrary, the economic valuation is extensively elaborated.

### 3.2.1 Ecological valuation

The value of an ecosystem is given on the one hand by the related ecosystem processes and components which determine the capacity of ecosystems to provide goods and services, and on the other hand by the limits of sustainable use, which are determined by ecological criteria (De Groot et al., 2002). The same approach can be found in the way the objectives of the WFD are determined. Hereby is the capacity of ecosystems identified by the determination of the water type and the ecological criteria are determined by measuring sticks, what has been discussed is the previous chapter.

The directory of the Ministry of Transport, Public Works and Water Management distinguishes three types of indicators which can be used to value the ecology. These are quality indicators like the presence of flora and fauna, pollution indicators which are the opposite of quality indicators and represent substances and objects that are unwanted in water systems, and finally, process indicators to describe the processes that are going on in a certain water system (Brouwer et al., 2003). In the WFD methodology a similar distinction of in indicators can be found, except process indicators. The latter is left out whereas the performance of water managers is based upon the evaluation of the actual state of the water quality. Quality indicators are for example the presences of rheophile fish. Indicators like copper, nitrogen, phosphate and zinc determine the quantity of pollution of the water system.

### 3.2.2 Socio-Cultural Value

In addition to ecological criteria, social values and perceptions play an important role in determining the importance of natural ecosystems and their functions to human society (De Groot et al., 2002). It is a typology to describe why people considering ecosystems valuable, beautiful, good, important, right, justifiable etc. (Brouwer et al., 2003). From a socio-cultural perspective the influences on the existence and the living together of people is considered. Although the aspect of socio-cultural value is part of the valuation of ecosystems, it is not considered to be essential to take into account in this research. Significant changes of socio-cultural values like individualization, anesthetisation or lifestyle development, are not likely to occur when measures to improve water quality are executed by land users.

### 3.2.3 Economic valuation

In a market-place, products tend to be visible, its characteristics are generally well known, and it has a market price. The individual, on the basis of the available information, weighs up quantity, quality and price on offer. However, environmental goods and services often have no market price tag and a considerable amount of uncertainty can surround their true value and significance.
(Turner et al., 1994). For most water measures there are no market prices available to value the effects. Therefore, considering their technical and institutional nature, they can not been separated into exclusive entities; water measures as product can not easily be traded on a market, whereby someone has the exclusive dealing right. Most measures are only effective on specific areas whereby the supplying parties are limited, although the effects of the measure will not be restricted to that specific area.

Nevertheless, in water management policymakers have to evaluate policies that often involve non-market goods and services. This evaluating involves making trade-offs whereby money is often the most important criteria. To understand these trade-offs it is important that external policy effects, projects, measures and human activity are valued. Therefore, it is necessary to impute a value to un-priced goods or services to enable comparisons. The discipline of economics has developed techniques whereby such values can be imputed (Turner et al., 1994). Before these techniques are discussed, it is useful to mention the aspect of economic value with respect to environmental systems.

**Total economic value**

Hereby the concept of total economic value is relevant as it is an attempt of valuing the environment. The concept of total economic value distinguishes user values and non user values (See Figure 3.3). Use values arise from the actual use of water/environment by consumers it or its services. This can be divided into direct use value whereby resources are used directly e.g. hydropower, native possibilities and indirect use whereby goods and service are used indirectly via another good and/or service e.g. water purification (Ruijgrok et al., 2004) (Smith et al., 2006). Non-use values are values place the mere existence of a resource and its physical or cultural characteristics. Non-use values are benefits received from know in that a good exists, even though the individual may not ever directly experience it (Agudelo, 2001).

**Option use value** is described by Agudelo as the fact that some individual who do not wish to use the water resource now is willing to pay or forgo current benefits to preserve the resource for future generation or for some future use (Agudelo, 2001). Turner et al., even distinguishes a separate value for the descendants of the current valuer. This bequest value is the willingness to pay to preserve the environment for the benefit of one’s descendants (Turner et al., 1994). This could be either a use value or a non-use value.

**Existence value:** which is the value people derive from the knowledge that something exists even if they never plan to use it. Thus, people place value on the existence of blue whale or pandas, even if they have never seen one and probably never will, as demonstrated by the sense of loss people would feel if they ever became extinct (Smith et al., 2006).
Techniques
The use of blue services is an alternative instrument. The same measures can be realized by legislation or by purchasing the soil or by using public law instruments. By comparing the use of instruments, efficiency is important. Therefore, water managers need to acquire information about costs and benefits of implementing measures by using different instruments. There are different techniques and approaches of such monetary valuation. These can be classified in a number of different typologies. De Groot et al. (2002) determine four basic types. The first, direct market valuations are the exchange value that ecosystems services have in trade. Second, indirect market valuation when there are no explicit markets for services. Third, the contingent valuation by posing hypothetical scenarios that involves the description of alternatives in a social survey questionnaire. Finally, group valuations whereby the value of a service derives from an open public debate.

Turner et al., (1994) defines six general methods of monetary valuation of environmental services, which can be grouped into two basic approaches; those which value a commodity via a demand curve and those which do not. With relation to this research, some of these techniques are more applicable than others. Therefore, only the contingent valuation method is discussed in this section. In the appendix an overview is given of other monetary valuation techniques, whereby the categorisation of Turner et al. is conducted.

Contingent Valuation Method
This method asks individuals directly what they are willing to pay (WTP) for a benefit and or what their willingness to accept (WTA) is in case of compensation for a hypothetically environmental damage, through a survey or questionnaire. Because of this, the Contingent Valuation Method (CVM) is often referred to as an expressed preference method. The survey is formed by three parts: a) a detailed description of the specific good, the payment system and the hypothetical circumstances in which the respondent would operate, b) a number of questions which describe differing situations to measure the respondents willingness to pay and c) a number of questions related to personal characteristics such as current use of good, income, age, profession etc. After the data is collected, analysts can calculate the average WTP/WTA of respondents and multiply this by the total number of people who enjoy the environmental sit or
asset in question to obtain an estate of the total value which people have for that asset. So based upon a hypothetical market, their demand function for a certain environmental good or services is manifested (Chee, 2004).

Although the method is straightforward, some limitations need to be discussed. First, willingness to pay is often understated because the hypothetical nature of CVM scenarios makes individuals’ responses poor for estimating true values (Turner et al., 1994). Furthermore, the description and framing of what is to be valued is critical to the reliability of the method (Chee, 2004). Besides, the information a survey provides as well as the order in which questions are asked substantially influences the willingness to pay. And prior knowledge, preconceived opinions and level of understanding in respondents affects the results of CVM. Finally, CVM lacks incentives to induce individuals to put as much time and effort into thinking about the value of a good or service and the price they are prepared to pay for it compared to actual markets. There is no penalty of ‘getting it wrong’, unlike in actual markets where people learn from their spending mistakes (Chee, 2004). This aspect was confirmed by a study performed by Kosoy et al. (2007).

This study used a contingent valuation method to estimate opportunity costs, whereby three proxy variables were used: a) net profits from on-farm activities that would be foregone; b) providers’ willingness to accept a “fair price” for PES; and c) the expected rent that would be obtained if the land were rented out. The result of that study showed that the compensation payment was lower than the estimated opportunity costs. They explained these finding on several ways:

- providers participate voluntarily, so opportunity costs are indeed compensated, otherwise they would simply decline to do so. On farm profits can therefore overestimate the opportunity costs e.g. in reality area is not very suitable for agricultural production
- providers benefit direct of indirect economically due to the provided services
- farmers overestimate systematically their profits as a bargain strategy

The concepts of willingness to pay (WTP) and willingness to accept (WTA) will be elaborated in the next paragraph.

### 3.3 Designing a payment scheme

However, valuations do not determine the prices paid by beneficiaries of watershed services to service providers. As in any transaction between contracting parties, prices paid for watershed services under payment schemes are the subject of negotiations guided by the interests and preferences of the beneficiaries and service providers (Smith et al., 2006). Therefore, valuation can serve as a starting point for negotiations. By these negotiations, the main principles are that those who provide environmental services should be compensated for doing so and that those who receive the services should pay for their provision (Pagiola and Platais, 2002). However, the
height of this price is thus an outcome of a negotiation process. Hereby, two conditions should be fulfilled in order to create an efficient payment scheme. First, the compensation of the landowner should be at least equal to the opportunity costs of the promoted land use. Second, the amount of the payment for the water manager should be lower than the economic value of the environmental externality (for example, the abatement cost of improving water quality) (Kosoy et al., 2007).

![Figure 3.4 Payment scheme for environmental services (Adapted from Pagiola, 2002)](image)

Figure 3.4 presents the two conditions. The connecting arrow represents the value of what is paid as compensation. Hereby are the concepts of willingness to pay (WTP) and willingness to accept (WTA) are relevant. Although mentioned briefly in subsection of contingent valuation method, the concepts are now elaborated. WTP is the amount of money an individual would pay willingly to obtain a desired good, service or state of the world, rather than go without. WTA is the amount of money that would induce the individual willingly to give up the good, service or state of the world (Randall, 2002). WTA is therefore a monetary value of how much people are willing to accept in the way of compensation to put up with the loss (Pearce and Turner, 1990). Considering for example the service of pollution control, the two formats determine what people are willing to pay for pollution control, or what they are willing to accept as compensation in case pollution control is left out.

When comparing the two concepts, it is noticed that WTA very often exceeds WTP. This can by explained by the psychological theory of cognitive dissonance, which refers to the individuals feel the cost of a loss (WTA format) more intensely than the benefit of a gain (WTP format) (Pearce and Turner, 1990). Individuals will be far less familiar with the notion of receiving compensation for losing something than they will be with the notion of paying for something, a concept we all meet every day. This is likely to cause for greater uncertainty and variability in answers to WTA questions than occurs with WTP questions (Turner et al., 1994).

Although the WTP and WTA formats are usually applied to valuate how much is paid for the availability or loss of a service, the two distinguished formats are useful when they are applied to the supplying and demanding parties. The willingness to pay of the water boards, as the demand side, together with the willingness to accept compensation of the land user as supplier, will form the bandwidth of the gap which has to be overcome in order to establish a service. Methods to determine the willingness to pay are discussed in paragraph 3.2.3. The willingness to accept
however will be based upon a cost benefit perspective from the perspective of the supplier. Thus the land user will consider attractiveness of the payments he or she receives for the provided service. In principle, a payment scheme deal is only possible, where the willingness to pay (WTP) is higher than the minimum payment needed by the providers (WTA). If this overlap does not exist or can be reached and a gap remains, then buyers and sellers of services will not be able to agree a price that is acceptable to both parties (Smith et al., 2006). This is visualised by Figure 3.5.

![Figure 3.5 Willingness to pay and willingness to accept](image)

### 3.4 Design principles

In environmental policy making different basic principles are more or less applied. Water boards apply often the so-called Polluter Pays Principle (PPP) in their decision-making. However, this principle is contrary to the idea of Payment for Environmental Services, which is based on the Beneficiary Pays Principle (BPP). This paragraph discusses both principles and implementation issues as this enhances the discussion about blue services as kind of Payment for Environmental Services.

This Polluter Pays Principle (PPP) dates back to 1972 were it was adopted by the Organisation for Economic Co-operation and Development (OECD). However, the principle is not unambiguous (Pearce and Turner, 1990) The standard PPP interpretation means that the polluter should pay for controlling its effluent down to an acceptable load (determined by legislation), but the polluter does not have to pay for the environmental damage caused by the acceptable effluent load. An extended interpretation of the PPP is that polluters should compensate the damage as well as the control cost of the residual pollution. Thus not only paying for controlling effluent to an acceptable load, but even further by paying for the damage caused by the residual pollution (Turner et al., 1994). PPP is ambiguous, as it does not make this additional measure obligatory.
This ambiguity came up during a discussing with the association of water board (De Vries, 2007). As the Ministry of Agriculture, Nature management and Food Quality determine fertilizer policy in the Netherlands, the water boards depend to a large extent on their decisions. Unfortunately nutrients affect the water quality (see paragraph 2.2) to a large extent. Striking is that policy on fertilizer will not change before 2009. As Figure 3.6 shows, an alternative way of ensuring less emission of fertilizer is to pay or subsidize the polluters to internalize these negative externalities into the decision of the polluter. The government, as beneficiary party, will pay this way for the environmental service that land users provide by executing measures. In environmental policies, applying this is called the beneficiary pays principle whereby government incentives and voluntary action rather than increased mandatory standards try to achieve environmental goals (Hatfield-Dodds, 2006). The idea of the beneficiary pays principle implies that the parties, which benefit from an environmental service, will pay the upstream users for controlling their effluent. Beneficiaries can be governmental organisations like water boards, but also private companies like drinking water companies. However, the association of water boards prefers applying the PPP on measures related to fertilizer. Thus, the association applies the extended interpretation of PPP. Nevertheless, individual water boards themselves determine if they want to commit to the polluter pays principle or not.

![Figure 3.6 Ways of decreasing the emission of nutrients](image)

The reason why there is no clear compliancy with either one of these principles can be illustrated by the metaphor of health insurance, which sometimes is mentioned. Hereby can the fertilization issue compared with someone who suffers from overweight and who is offered a fitness-training program. Some would say, it is his own fault and under the cloak of the polluter pays principle he should bear the costs of the fitness-training program.

Contrary to the PPP, some would argue that the government should bear the costs of this fitness training program, whereas the cost of expensive cardiovascular surgery is avoided. The effects of the fitness-training program benefit therefore the government.

### 3.4.1 Implementation

Both principles have implementation issues that should be considered. Applying polluter pays principle by increasing mandatory levels would probably ensure high environmental standards. Furthermore, the costs to government would be relatively modest, as land owners or land users
would bear the bulk of the burden (Hatfield-Dodds, 2006). The cost will be based upon the temporarily incentives taken to encourage voluntary action in realizing environmental quality standards. However implementing the polluter pays principle is sometimes blocked. The PPP is often considered as unfair because interests of downstream users are narrowly compared to the interests of upstream users, instead of integrating these interests. Activities by upstream users do not only harm the social needs (like clean water) of downstream users; in practice, they often serve the social needs of downstream users for example by the provision of food. The negative externalities of land cultivation like the pollution of water, goes together with the provision of a good that serves vital interests. This is often overlooked. This unfairness of the PPP prevents water boards to implement stricter regulation (Van Schaik, 2007). So mandatory standards intended by those who want to apply the PPP strictly, are often not realized.

Figure 3.7 Polluter pays approach (Adapted from Hatfield-Dodds, 2006)

As a result, it is possible that water quality objectives will not by reached, as the mandatory standard will be too low. Rewards and encouragement for voluntary action will still be necessary. In Figure 3.7 the implementation issue of polluter pays principle is illustrated.

The beneficiary pays principle on the other hand can have implementation issues as well. Implementation of this approach is hereby often blocked by fiscal constraints, or perceptions of poor public ‘value for money’ among central economic agencies and key politicians. (Hatfield-Dodds, 2006). Besides, private beneficiary parties that pay can have a changing perception about value for money as well. This way changing perceptions and interest can end environmental service contracts over time. In spite of the environmental objectives, which may not be met, it induces risks for the provider of the environmental service. Providers are not willing to participate when they bear the risk of investments, which cannot be financed over time.

It is also possible that the funding provide is not sufficient to satisfy the objectives for environmental quality (Hatfield-Dodds, 2006). In other words, it will be too costly to reach quality objectives entirely by rewards and encouragement for voluntary action. Both implementation issues of the beneficiary pays principle are illustrated in Figure 3.8.
As a result, it is possible that water quality objectives will not be reached, because the rewards and encouragement for voluntary action are not sufficient. The section above implicates that by applying the beneficiary pays principle in environmental policies, the continuity of executing activities can be an issue, because finance problems can occur. In designing a payment for environmental service agreements, this should be bear in mind.

### 3.5 Ecosystem valuation in policy analysis

The last step of the integrated assessment framework of De Groot et al. (2002) involves the decision-making process to determine policy options and management measures (see Figure 3.2). This step will serve as input for the ecosystem structure and processes and thereby a circular pattern is constructed. The policy options and measures, such as payment for environmental services respectively the construction of a natural friendly embankment, will hereby influence the ecosystem structure and process and eventually the total value of the goods and services of the ecosystem.

In the introduction of chapter 2 the steps which can be found in policy analyses, presented by Walker (2000) were mentioned. Some of these steps are similar to the elements presented in the framework of De Groot et al.; which are the steps of selecting, analyze and comparing of alternatives. The step of selecting alternatives is based upon how the ecosystem structure and processes can be influenced. In the step of analyze alternatives whereby the consequences that are likely to occur are determined, in case the alternative is actually implemented, can be found in the framework of De Groot et al. by looking at what kind of goods and services are provided and how these are valued. The step of comparing alternatives is done based upon the total value of the environmental service.

However, the comparison of policy alternatives is not only based on the total value. When alternative policy options and management measures are compared with each other, other criteria than ecological, socio-cultural and economic criteria become important. Kiersch et al., (2005) showed that in Latin America other factors than economic reasoning provided important
motivations for providers and users of the environmental service to enter into the scheme. Kiersch et al., identified important driving forces which led to the establishment of PES schemes and which explain why PES schemes can be popular with providers and users, even if the payment not always compensates providers full for the direct opportunity costs for the land use. Factors which were identified and which could be applicable to Dutch blue services are: Providers may:
- see a benefit in adopting environmentally friendly land use methods voluntarily and for a compensation now, rather than being forced by rising public pressure in a few years’ time without compensation
- see the payments as an additional source of income for activities they would carry out anyway.
Users may:
- improving their ‘green’ / ‘blue’ image.
- have other relationships with the providers which foster the PES schemes.

The factors presented by Kiersch et al., which provide motivations for providers and users of environmental services to participate can neither be valued by economic values, nor by ecological or socio-cultural values. Still, they influence the outcomes of interests to policymakers and other stakeholders. It is remarkable that these factors do not relate to the measure which is implemented (e.g. dredging with attention to ecology), but to the instrument which is used to execute the measure (see Figure 1.3, chapter 1). Thus, these factors are not outcomes of the total value of the ecosystem goods and services, but are effects caused by the implementation of the measure by means of a policy instrument. It is therefore assumed that the integrated assessment framework of De Groot et al. is just a part of the total system which, together with other policy characteristics related to the use of policy instruments, determines the outcomes of interest of stakeholders and therefore the comparison of the policy alternatives. In Figure 3.9 this is shown.

![Figure 3.9 Effects on outcomes of interests in environmental policies](image-url)
Although Figure 3.9 is a simplistic presentation of how outcomes of interests in environmental policies are affected and how these outcomes determines the policy making process, it is useful in understanding environmental policy decisions. It shows that the environmental policy decisions made in a policy making process, not only affect the objectives relevant to the ecosystem goods and services, but also to other objectives which can be reached by applying certain instruments.

In the next chapter, the way in which the choice for policy instruments, like blue service, is affected will be discussed. Hereby, a wider focus is applied that not only considers the effects of the measure to improve the water quality, but also factors related to the implementation.
4 Implementation criteria and success factors

4.1 Introduction to implementation criteria and success factors

For the provision of how well a plan or management policy performs, in other words, how it affects the system, qualifications are necessary. Qualifications indicating how well these plans serve the interests of the involved stakeholders are called performance criteria (Loucks and Van Beek, 2005). Part of these performance criteria directly relates to the water system like the ecological condition indicators as shown in Table 2.1 and therefore relates to the measures that improve the water quality. However, there are also performance criteria to measure the effects on a broader system, whereby the effects of the instrument are taken into account as well. The previous chapter already discussed that the outcomes of interest are not entirely based upon the value of an environmental system. In addition to the water quality criteria, which relate directly to the measure, this chapter will discuss criteria, which are important in measuring the effects of instruments by which measures are realized. Therefore, this chapter addresses the following research question:

**Question 3:** What relevant criteria and success factors for implementing blue services as instrument to influence the quality of surface water, are identified by studying relevant literature and interviewing stakeholders?

4.1.1 Determination of criteria and success factors

The identification process of performance criteria can be done by asking ‘how’ a specified broad fundamental objective can be achieved. Often this leads to more than one answer. For example by questioning how the objective ‘improving ecology’ can be met, this will result in various answers like; ‘improving water flora composition’ or, ‘improving macro fauna abundance’ etc. The next step is asking how for example ‘improving water flora composition’ can be realized. And so on. Each ‘how’ question can have multiple answers, which will lead to a tree of branches, each branch representing a different and more specific performance criterion (Loucks and Van Beek,
During the literature study about Payment for Environmental Services performed in the previous chapter, the ‘how’ question was asked indirectly by the determination of how payment systems should be designed. Besides literature study and different interviews, I attended a meeting of the Community of Practice Blue Services that was organised for a large number of water boards. In this meeting, various water boards expressed their considerations about blue services as possible instrument in the execution of various measures. These considerations were expressed by asking how measures should be implemented. Sometimes it is difficult for policy makers to express why some alternative will not work. This was also shown in the meeting of the Community of Practice. To identifying these more fundamental objectives the question of ‘why?’ can be addressed. For example, ‘why is the use of blue services a promising instrument?’ a fundamental objective is found ‘it will be cost efficient’. Hereby the criterion of efficiency is identified as a performance criterion that measures the success of plan or management policy.

I applied the technique of asking ‘how’ and ‘why’ in various meetings and discussions I had with water boards, agricultural nature associations, farmers and water quality experts (Hovingh, Van Schaik, CoP, Den Hartog, Meijboom, Doorn, Schrauwen, Meijerink). This way, performance criteria have been identified.

It was found that water boards consider two elements important in their decision about policy instrument. The first is efficiency; by means of which costs is the environmental goal reached. Efficiency is considered as the most important element; the measures, which need to be taken to increase the water quality in order to meet the objective by the year 2015, are expensive, thus water boards try to reduce the costs of the measures. The second element relates to the need for joint solutions to implement a sustainable water system, hereby public participation is considered important. Therefore, all parties concerned in planning, designing, construction, and maintenance should be involved (Ruigh, 2007). It is expected that by joint solutions better results in terms of higher effectiveness and lower costs will be achieved than by a unilateral approach.

Applying these two elements to the instrument of blue services, two criteria can be distinguished. These criteria are efficiency and acceptance of the supplier. Since the agreement about a blue service contract is a voluntary contract between a demanding and a supplying party, willingness to accept and willingness to pay are important aspects as was discussed in paragraph 3.3. In paragraph 1.1.1 the efficiency prospects of blue services have already been discussed. Therefore, efficiency refers to a more efficient result compared with the use of other instruments and is related to the idea of willingness to pay. Water boards consider efficiency therefore as an important criterion. The second criterion, the acceptance of the supplier, which relates to the element of public participation, relates to the willingness to accept. Acceptance of the supplier is the second important criterion.
A number of factors influence these two main criteria: effectiveness, continuity, transaction costs, trust, height of payment, effects on farm administration, and suppliers’ investments. This chapter will discuss these factors based on the examination of relevant literature and on insights gained from various meetings and discussions I had with water boards, agricultural nature associations, farmers and water quality experts.

4.2 Efficiency

Blue services promise to be more efficient than traditional approaches. Traditional approaches like regulations can be difficult to enforce and remedial measures are often expensive (Pagiola and Platais, 2002). The reason for this is that the costs and benefits of achieving any given environmental objective are rarely constant across all situations. Market-based instruments such as Payment for environmental services (=blue services) take advantage of this difference, by concentrating efforts on situations where costs are lower and benefits higher (Pagiola et al 2005). A voluntary approach would provide a polluter (=farmer) with greater flexibility in meeting environmental quality goals and hence allow those goals to be met at lower cost (Alberini and Segerson, 2002). As mentioned by the Dutch Ministry of Agriculture, Nature management and Food Quality, the involvement of landowners and land users for the realization of water objectives, will decrease the costs for the responsible water managing authority, as different opportunities of land functions can be combined (LNV, 2002).

To what extent water quality objectives are met by means of which costs, determines the efficiency of measures that are executed. Thus, costs and effectiveness are both factors that need to be considered. First, the costs are determined by the price paid to implement or produce the measure and second, by the organization costs involved. The latter is often referred to as transaction costs. Although on first sight it might be assumed that the effectiveness of a measure is entirely dependent on the measure itself, the type of policy instrument used can also affect it.

4.2.1 Amount of payment

As was discussed in paragraph 3.3 the prices paid for water related services under payment schemes are the subject of negotiations guided by the interests and preferences of the beneficiaries and service providers (Smith et al., 2006). A starting point from the perspective of the supplier can be to consider the productions costs because these costs, determine to a large extent the price eventually paid. Production costs can be divided into: construction costs, maintenance costs and costs related to loss of income.

Construction measures are often combined with maintenance of these constructions, while for example the construction of breeding places is a once only activity, the efficiency arguments that the land user should construct these breeding places are hard to found. A combination with maintenance is to be expected. According to the catalogue green blue services, the compensation
of the specific constructions costs, should be based upon the planning cost and the actual cost of implementing the construction. Contrary, the compensation for maintenance costs should be based not only on material cost and activity costs but also on the possible benefits and transactions costs for the land user (Van Moorsel et al., 2006). The loss of income can be divided into the erosion of revenues and decrease of property value. The first occurs in case the original production function of the soil is decreased or temporarily broken down. For example, the realization of buffer strips along the watercourse where no crops can be cultivated. A decrease of property value occurs when the measure is mend to be infinitive and that succession is obliged, e.g. the completion of nature friendly banks. It is obvious that the property will loose value this way. Both the erosion of revenues as the decrease of property value, involves the making of contracts and therefore should transaction costs for the provider be included into the calculation of these costs.

4.2.2 Transaction costs for water managers

Blue services are the supply of a water service, wherefore compensation is given. As mentioned before, this involves an economic transaction from the beneficiary party to the land user. The efficiency prospects mentioned in chapter 1 were reason to execute this research to identify the possibilities of blue services. Measuring this efficiency requires not only to focus on the production costs of the service, but also on the cost involved in coordinating the economic transaction. In other words, the full costs of agri-environmental schemes based on management agreements include the direct payments and also the organisations costs incurred by both parties (Falconer and Saunders, 2002). The latter is called transaction costs (Groenewegen, 2004). As defined by Williamson: transaction costs are the economic equivalent of friction in physical systems (Williamson, 1985). It is therefore relevant to focus on transaction cost. In blue services, transactions costs depend on the costs to start up (search, negotiation, contracting) and on the costs to run a blue service (administration, monitoring) (Wunder, 2005).

Accounting for transaction costs can: improve preliminary comparison and screening across alternative policy instruments; enhance effective design and implementation of policy to achieve particular objectives; evaluate current policies in order to improve their effectiveness; and assess the budgetary impacts of policies over their life cycle. (McCann et al., 2005)

In case of presence of many suppliers the ‘perfect competition’ will exclude opportunistic behaviour, that is to say that parties purposefully providing false information and try to make abuse of situations. This type of behaviour will not occur because if one supplier cheats a buyer, he can only do so once because the buyer can turn immediately to a competitor (Groenewegen, 2004) However in case of blue services, the number of suppliers is often limited and therefore ‘perfect competition’ does not exist. Opportunistic behaviour can therefore occur. This is dangerous whereas in an uncertain and complex environment the contract between the supplier
and the beneficiary party cannot specify every detail. Consequently, the contract will have open ends. This situation would not be problematic when parties could simply wait for the future to develop and adjust the contract more or less continuously when new facts come in. However due to opportunistic behaviour, this will not happen (Groenewegen, 2004). Actors are characterised by self-interest seeking with guile (Williamson, 1985).

Opportunisms needs not be a permanent part of his nature, but can depend on the circumstances: actors will display it sometimes. Actors have to find out what kind of behaviour they can expect and how they can safeguard themselves against opportunism. Both the search costs and the cost of safeguarding, in other words transaction costs, add to the cost of making the contract and thus determine together with the production cost the efficiency of the policy (Groenewegen, 2004).

In order to measure if providers execute blue services properly and in line with the contract, they agreed with the water manager that information is required. Monitoring is therefore important as it determines the effectiveness of the project (Pagiola et al., 2004). The cost of these monitoring, whereby data and information will be gathered can be high. In that case it lowers the economic efficiency of the blue service. Therefore, there is a need for low cost monitoring techniques, whereby the use of modelling tools and using existing and already operational instruments can be part of the solution (Hermans and Hellegers, 2005).

However, the measurement of transaction costs poses formidable difficulties (McCann et al., 2005). Although McCann et al. (2005) has developed a framework to enhance the ability of incorporating transactions in research models and policy analyses, and to measure transaction costs in a consistent and meaningful way, still the proposed methods are time consuming. Therefore, the forthcoming case study research will consider transaction costs, although these costs will not be measured in detail. In order to keep transaction costs low the cost involving the coordination of the economic transaction should be low. In the forthcoming case study research the ways in which these costs are reduced without losing the consideration of opportunistic behaviour will be discussed.

4.2.3 Trust in farmer

The transaction costs for the water manager depends on whether water managers trust the supplying farmers, as will be explained in this paragraph. Trust concerns an expectation about the intention of another actor. That intention concerns the expectation that the other actor will respect the interests of the ‘trusting’ actor. Trust, therefore includes:

- Stable perception of an actor about the intentions of another actor. Trust is the perception of an actor and not an action or choice by an actor.
- The expectation of an actor that another actor will abstain from opportunistic behaviour when an opportunity for that emerges. So it will take the interest of the other actor into account.
First, trust will reduce transaction costs. Not only will it reduce the risk involved in transactions and cooperation since it enhances predictability. Trust can also operate as an alternative to contracts or as a supplement (Koppenjan and Klijn, 2004). If the water board expects that the supplying farmer will provide the service, and thereby trust the supplying party, costly contracts can be avoided.

Moreover, trust can stimulate learning and exchange of knowledge (Koppenjan and Klijn, 2004). Not all the outcomes can be predicted, as for example there are uncertainties about the best method is to maintain nature friendly banks. During the provision of e.g. maintenance service, the suppliers will gather knowledge about the optimal method. For water boards and other suppliers, it is efficient when they share learning experiences with each other. A contract can organize the exchange of this knowledge, but this will often be too expensive. Trust between cooperating actors will improve knowledge exchange and enhance learning. Consequently, trust can increase the effectiveness of measures that are executed.

In literature, the following factors are mentioned to influence the emergence and growth of trust:
- More interaction and social contacts will improve the creation of trust;
- Reputation of other actors based upon past experiences;
- Expectation of future benefits (Koppenjan and Klijn, 2004).

4.2.4 Effectiveness

One of the reasons to choose for blue services is the efficiency prospects. That means that blue services will cost less in terms of production and transaction costs to improve the water quality. Besides efficiency gain, effectiveness can also be a reason of using blue services, which contribute to the efficiency as well. The expectation can be that blue services contribute to a higher level of water quality than other instruments do, as land users have more information about the state of the environment in which the measure is executed. In other words, blue services are more effective than traditional instruments. For example, land users can evaluate the ecological state of watercourses every day and based upon that they can decide what time is best to executed the annual dredging. Hereby, the ecological condition indicators mentioned in Table 2.1 (see paragraph 2.4) determine the water quality.

One can imagine that it is hard to measure effectiveness, because a correct methodology needs a control group whereby the same measures are executed but using instruments different from blue services. In a paper about voluntary agreements in environmental policy performed by Jiménez, this kind of extensive research was performed. It was concluded that voluntary agreements had significant effects, however more incremental than radical (Jiménez, 2007).
4.2.5 Continuity

As discussed in paragraph 2.1, it can take quite a while before the ecological condition of water is increased, despite the fact that concentrations of nutrients decreased (Boheemen, 2004). Therefore, the effectiveness of measures benefits from a continuous provision of these services. Moreover, if continuity of the provision of blue services is secured for a longer period, transaction costs are likely to reduce. In sum, continuity of the blue services will increase the effectiveness and will reduce the total costs.

4.3 Acceptance of supplying farmers

Whereas a voluntary agreement can only be established if there is a demand and a supply, both aspects are important. The demand is driven by efficiency prospect from the perspective of the water managers. The service is only supplied if the agreement is accepted by the supplier. Besides efficiency, the acceptance of the supplier is therefore a second important criterion.

Exploring documentation (Hoekstra and Boland, 2001) that discusses the support of farmers in executing water related measures, and by interviewing agricultural nature associations (Den Hartog, 2007; Brak, 2007), various arguments were found which influence this support from the perspective of the supplier. It is assumed that these arguments or criteria relevant to the acceptance of the supplier to participate in a blue service agreement can be structured into two couples of criteria. These are; trust in water manager in relation with investment costs, and amount of payment in relation with effects on farm management. Paragraph 4.3.1 will discuss the first relation and paragraph 4.3.2 the second.

4.3.1 Trust in water manager vs. investment costs

There are factors that result in hesitation among farmers to execute measures although they may want to participate. The reasons for this are issues related to trust and investment costs. For example, sometimes farmers consider governments as unreliable with regard to subsidies like SAN (Stimuleringregeling Agrarisch Natuurbeheer) en MEP (Milieukwaliteit Elektriciteitsproductie) (Clevering et al., 2006). When policies and legislation are likely to change, farmers have difficulties to manage their farm administration. They rely for example on continuity of financial aid for services they provide. In an interview with a cattle breeder, who realized 1300 meter of nature friendly banks, this importance of security was emphasised. He was only willing to invest if the revenues were secured (Den Hartog, 2007).

In other words, if there is a substantial amount of trust, actors are more likely to make investments despite the risks and uncertainties involved. When they have a stable perception about the intentions of water boards, in other words when they expect that the water boards will compensate for the provided service for a certain period, farmers are more likely to buy expensive dredging equipment for a nature friendly way of dredging.
Ways to increase trust have already been described in the subsection about trust: more interaction and social contacts; reputation of other actors based upon past experiences; and expectation of future benefits (Koppenjan and Klijn, 2004). In designing blue services contracts it is important to realise that today’s experiences will influence future possibilities. The last factor mentioned in paragraph 4.2.3, *expectation of future benefits*, can be established for instance by providing a long-term contract. However, it is assumed that trust relates to investment costs. When investment costs are low, changing government policies are concerned less negative as they have limited influence on the farm administration of farmers. Hereby are investment costs determined by material, loss of farmland and subsequently the loss of revenues (Van Moorsel et al., 2006). Figure 4.1 presents the relation between trust and investment.

![Figure 4.1 Relation between trust and investment costs](image)

In case a measure is situated in the red area on the bottom right in Figure 4.1 one can aim to reduce the investment cost and/or increase trust. The first can be done for example by purchasing expensive material together with other suppliers, in order to reduce the investment per supplier.

A similar relation is assumed by Pagiola et al. (2004) ‘the importance of secure tenure is likely to be particularly important in cases where PES programs (=blue services) require long-term investments’.

### 4.3.2 Amount of payment vs. effects on farm management

In a study performed by Hoekstra (2003), experiences of fifteen farmers were mentioned whereby the criterion of ‘easy to adapt in agriculture organisation’ was often put forward. The question is whether this is a real criterion or even further, what is meant by ‘easy to adapt’? When certain
measures are not compatible with the current activities of the farmer, for example the construction and maintenance of constructed wetlands (In Dutch: helofytenfilter), one could say that this is hard to adapt in the agriculture activities and the willingness to participate is less. Measures can also have a positive effect on the farm management; the realization of buffering strips can facilitate the dredging activities of the farmer, while the watercourses are more accessible. Another possible effect is that it connects with changing agriculture in the Netherlands whereby farmers broaden their activities to ensure a sustainable farm administration, or that farmers consider themselves to be acknowledged (Meijboom, 2007). This is similar to the argument that providers see the payments as an additional source of income for activities they would carry out anyway as was provided by Kierch et al. (2005), mentioned earlier in paragraph 3.5. Thus, effects on farm management are positive when blue service measures are in line with the achievement of farmers’ objectives.

Research of Wilson and Hart (2000) concluded on the basis of responses given by approximately 800 participants in ten European countries, that economic considerations have been the primary driving force for farmers to participate in voluntary agri-environmental schemes (financial reasons and secure source of income), followed by reasons that the services fitted in well with existing farm management plans. Reasons for non-participation mirror motivations for participants, and reemphasise the important of goodness of fit with farm management plans. Financial reasons also rank highly; compensation was considered as too low for entry to be feasible (Wilson and Hart, 2000).

Alberini and Segerson (2002) mention in their research on voluntary programs to improve environmental quality, that the more stringent the abatement obligations, the less likely it is that a polluter would voluntarily participate, or the higher is the financial payment that would be necessary to induce participation.

Therefore, the assumption is made that there is a relation between the amount of payment and the effect on farm management. This relation is shown by Figure 4.2. When services have negative effects on the farm administration this does not automatically implicates that the acceptance of the farmer is low; when the payments are beneficial to the farmer, he or she will provide the service by executing the measure. On the other hand, when measures result in positive effects, the height of the payment might be reduced.
Figure 4.2 Relation between payment height and effects on farm management

As mentioned earlier in paragraph 4.2.1, the amount of payment can take into account the organisation costs for the farmers to start up or run a blue service. Transaction costs to start up a blue service (e.g. attending of meetings or negotiations about the agreement) and the costs to run a service (e.g. filling in application forms or other administration) will affect the price of a blue service. Trust in the water boards can lower the required transaction costs as it enhances predictability, which was explained earlier in paragraph 4.2.3.

4.4 Constraints

In this paragraph the constraints toward blue services, which were discussed in paragraph 2.6, are summarized. The constraints are determined on the one hand whether measures have considerably effects (e.g. safety) on the functioning of water systems, as these measures are considered not suitable to be executed by land users.

On the other hand, blue services have to be designed within the borders of legislations. To avoid that compensation is designated as state aid, it must be ensured that the compensation of land users for the provision of blue services is designated within borders of state aid legislation of the European Union. This implicates that blue services:

- Exceed legislative norms, and therefore are over and above the statutory minimum;
- Compensation is comparable with the catalogue green blue services or similar norms;
- The duration of a contract must be at least five and maximal seven years;
- The support cannot be accumulated with support that originates from other local, regional, national or European arrangements, which subsidise the same costs (Europese Commissie, 2006).
4.5 Framework to structure case study research

Throughout the discussion of the factors in the previous section, various interactions were mentioned briefly. The two main criteria, *efficiency* and *acceptance of the supplier*, are influenced by underlying factors, as explained in paragraph 4.1. Whereas through these factors the score of the two main criteria and efficiency can be indicated, these factors are called success factors. However, not all of these success factors have a hierarchical relationship with each other. An example is trust. Trust influences, in relation with investment costs, the acceptance of the supplier. Besides, it affects the transaction costs of the water manager as well, which will contribute to the total costs and on the effectiveness. Eventually trust can affect the efficiency of the measure.

Findings of this chapter are summarized in Figure 4.3. This figure presents a framework which visualizes the relations between the identified criteria and success factors. The choice for blue services as policy instrument forms the centre of this system diagram. Whereby this decision is limited by the constraints that were identified in paragraph 2.6: *legislation* and *critical for functioning water system*. Since the agreement about a blue service contract is a voluntary contract between a demanding and a supplying party, willingness to accept and willingness to pay are important aspects as was discussed in paragraph 3.3. Thus, besides the constraints, the choice for blue services is affected by the performance of the two main criteria efficiency and acceptance. The left side of the main box in Figure 4.3 shows the success factors from the perspective of the water manager as demanding party. On the right, attention is given to the factors relevant for the supplying party to participate.

There are various steering variables, which influence the success factors. These steering variables are presented in green and can affect the success factors: effectiveness, transaction costs, continuity, payment amount, trusts and the investment costs for the supplier.

The function of framework presented in Figure 4.3 is to structure the next phase of this research. This next phase will explore different existing projects that apply blue services to improve water quality. Using the framework will structure the analysis of the forthcoming case study research.

Chapter 5 will pay attention to how this case study research will be carried out.
Figure 4.3 Framework to structure case study research; relations between criteria and success factors (TC = transaction costs)
5 Case study research

5.1 Introduction to the case study research

The first phase of this research concluded that the outcomes of interest for policymakers in water management are not only dependent on the type of measure used, but also on the type of policy instrument used.

However, current literature about environmental policies focuses mainly on the economic aspect of an ecosystem; the valuation of their functions, goods and services (see, e.g., Turner et al., 1994; Agudelo, 2001 and De Groot et al., 2002). It is assumed in this literature that decision making processes to determine policy options and management measures depend solely on the sum of the ecological, the socio-cultural and economic value. It is less understood that the outcomes of interests in a decision making process, also depend on the implications of the used policy instrument. For example implications with regard to who will implement the measures.

A promising policy instrument that water boards can apply is blue services. By means of literature research and interviews, I determined criteria, factors and constraints that influence the choice for using this instrument. This was structured in the framework presented in the previous chapter.

To improve the decision making about blue services, which is the overall goal of this research project, case study research will be carried out. The goal of this case study research is to gain insight about existing blue services, which is done by checking the main success factors as presented in framework Figure 4.3. Lessons learned form the case study research will contribute to a better understanding of blue service and consequently this will improve the answer to the main research question of how decision making about blue service can be improved.

I decided to execute the case study research in such a way that it was exploratory of nature. The constructed framework of chapter 4 was used to structure the interviews. This chapter continues by paying attention to the selection of the cases, which will be done in section 5.2. In section 5.3, I will discuss the validity of this research. Section 5.4 will focus on the methods used to gather data. The description of the four explored cases will be found in section 5.5.
5.2 Selection of cases

For the selection of cases, I used the information I acquired during the first stage of my research. By asking water boards specifically about current projects in which water related services were compensated, I was able to identify potential cases. Subsequently, I used the following criteria and conditions in the selection process:

- **Type of measure**: There are four groups of measures that could be applied as blue service (see chapter 2.6). I preferred the different cases to cover all of these groups. Unfortunately, the group ‘chemical measures’ could not be found.

- **Availability of information**: The gathering of data had to be possible within the time span of this research; approximately eight weeks for gathering of data.

- **Project stage**: Blue services projects can be found in different phases: design, in progress, finished and evaluation phase. I aimed for covering all the various phases by means of the selected cases.

- **Location**: This project focuses on the Dutch situation, so only cases in the Netherlands are applied.

Considering the above mentioned conditions, I selected four cases; Active strip management Brabant, Black Tern in the Krimpenerwaard, Nature friendly banks in Midden Delfland and Nature friendly banks and open water Oude Rijn. Table 5.1 gives an impression of the selection procedure. Focusing on four cases instead of one will increase the external validity of the results of this research.

<table>
<thead>
<tr>
<th>Case</th>
<th>Initiators</th>
<th>Type of measure</th>
<th>Availability of information</th>
<th>Project stage</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature friendly banks in Oude Rijn area</td>
<td>Hoogheemraadschap De Stichtse Rijnlanden</td>
<td>Construction measure combined with management</td>
<td>*</td>
<td>Design</td>
<td>Design</td>
</tr>
<tr>
<td>Nature friendly banks Midden Delfland</td>
<td>Hoogheemraadschap van Delfland</td>
<td>Management measure in and around the watercourse or bank</td>
<td>++</td>
<td>In progress, Evaluation, Design</td>
<td>In progress, Evaluation, Design</td>
</tr>
<tr>
<td>Black Tern, pearl of the Krimpenerwaard</td>
<td>Hoogheemraadschap Schieland en Krimpenerwaard</td>
<td>Management measure in and around the watercourse or bank</td>
<td>*</td>
<td>Finished, In progress, Design</td>
<td>Finished, In progress, Design</td>
</tr>
</tbody>
</table>
5.3 Validity

Case study research has a bad reputation while a lot depends on the skill of the researcher, it is an extensive kind of research form and often there is not enough foundation for generalization (Yin, 2003). To avoid this discussion I made an effort in increasing the validity of the research method. Therefore I applied data triangulation, established a sound documentation of information and I made a procedure to execute the interviews.

Data triangulation:

To increase the validity of my data, I tried to apply the method of triangulation. By using three types of data sources (interviewing involved actors, reading documents and field observation), the accuracy of the acquired information has most likely enhanced.

Documentation:

The acquired information from interviews has been elaborated and the minutes are bundled in the appendix. This is available upon request with the author. All other kinds of information and data are documented to make sure that it can be retrieved.

Interviews were done by applying the following procedure:

- Start with desk research
- Formulating interview questions
- Interview (use of tape recorder)
- Elaboration of interviews
- Sending minutes to interviewees for approval
- If necessary adaptations to minutes

5.4 Data gathering

Gathering data was done by means of interviewing involved actors, reading documents and field observations.

1. Interviewing involved actors:
   - Suppliers of blue service (farmers)
   - Consumers of blue service (project groups, water boards)
   - Intermediary organizations
   - Experts
   - Other actors with steering power (e.g. Dutch Ministry of Agriculture, Nature management and Food Quality)

2. Reading documents:
   - Water plans
   - Contracts
3. Field observations:
- Visiting participating farmers
- Inspecting implemented measures

5.5 Description of cases

In this section, I will briefly describe the four projects. Findings of the cases are mentioned as well in this section. A more extensive description of the cases is presented in the appendix.

5.5.1 Case: Nature friendly banks in Oude Rijn area

Project
This case study is an examination of a blue service, which probably will be implemented in the Oude Rijn area. In contrast with the other case studies, in this case there have not been activities executed by farmers yet. Therefore, this case study is based upon a blue service plan, instead of an actual blue service.

Water board ‘Hoogheemraadschap de Stichtse Rijnlanden’, from this moment on called HDSR, needs to accomplish a quantitative storage objective as was determined by the national water policy agreement (In Dutch: Nationaal Bestuursakkoord Water). While the capacity of the drainage-channels is insufficient; the surplus of precipitation in the polders can not be discharged properly. Consequently, pumping stations are often stopped and this has caused water nuisance in polder areas. Therefore HDSR needs to realize a water storage objective of 3.1 million cubic metres, in the Oude Rijn area, for both the polders as well as the drainage-channels (In Dutch: boezem). Besides qualitative objectives, quantitative objectives defined by the water framework directive need to be realized in the Oude Rijn area. HDSR wants to realize both objectives from an integral perspective; storage related measures are combined with water quality measures as much a possible (Bosman, 2006).

Three measure packages were defined in 2006, which could all realize the water storage objective of 3.1 million cubic metres or lower the storage objective. The following packages were determined. They can be related to the three stage strategy of water management (see chapter 1):
1. Retaining: small-scale measure which contributed to the quality of the landscape and the ecology of the area
2. Buffering: realizing the quantitative objective on some large-scale locations, by water storage on land and combining with nature
3. Draining: exploiting the capacity of the drainage channels as much as possible by enlarging it and by increasing the capacity of pumping stations, this way the water storage objective of 3.1 million cubic metres will be reduced.

One of the measures that will be taken to retain the water will be the broadening of watercourses. The intention is to broaden the watercourses at the end of the plots. At the same time, this broadening creates opportunities to execute measure that improve the water quality. Part of the retaining measure package is therefore to establishing more open water in combination with the construction of nature friendly banks. Whereby open water is a sole event of excavating the soil, nature friendly banks require management and control activities. Farmers that border to the proposed watercourses can voluntarily participate and receive compensation for the broadening and for the management activities.

**Measure**

There are two ways of constructing nature friendly banks; by means of a terrace bank or by a gentle slope. Both types can be combined to enhance the diversity of the hydro morphology. A terrace bank will be constructed 10-30 cm below the water level in the summer. Nature friendly banks will have a slope of a least 1:4. During the first three years, the banks should be mowed once or twice a year, depending on the type soil, to attenuate the bank. After this period, mowing is executed once every two years (Aequator, 2007).

![Figure 5.1 Gentle slope bank and Terrace bank](image-url)
Institutional setting
Below, in Table 5.2 the interests, goals and means to steer of the most important actors involved are summarized.

### Table 5.2 Involved actors and their interests, goals and means to steer

<table>
<thead>
<tr>
<th>Actors</th>
<th>Interests</th>
<th>Goals</th>
<th>Means to steer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water board De Stichtse Rijnlanden</td>
<td>• Realizing water objectives determined in National Water Policy and Water Framework Directive (Aequator, 2007)</td>
<td>• Water storage of 3.1 million cubic metre</td>
<td>• Financial contribution</td>
</tr>
<tr>
<td></td>
<td>• Multiple possibilities in executing measures to improve the water system (Van Schaik)</td>
<td>• Improve ecological condition</td>
<td>• Designing stimulation agreement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Enhance recreation</td>
<td>• Determination in legislation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reduce the emission of harmful substances</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Exploring the possibilities of blue services as supplement</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>to existing policy instruments (Van Schaik)</td>
<td></td>
</tr>
<tr>
<td>Province of Utrecht (and South-Holland)</td>
<td>• Uniform green blue service system</td>
<td>• Exploring the possibilities of green blue service</td>
<td>• Financial contribution</td>
</tr>
<tr>
<td></td>
<td>• Working together in realizing a robust ecological connection in lower part of the Netherlands</td>
<td>• Realizing Green Backbone</td>
<td>• Coordination of plans</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Designing green blue services</td>
</tr>
<tr>
<td>Agricultural nature association ‘Lange Ruige Weide’</td>
<td>• Avoiding water storage on land as much as possible, by cooperation with the water board</td>
<td>• Support of many farmers as possible for the realization of Nature Friendly Banks</td>
<td>• Achieve publicity</td>
</tr>
<tr>
<td></td>
<td>• Realization of footpath</td>
<td></td>
<td>• Organize education campaigns;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Organize enrolment meetings;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Consult farmers by kitchen table meetings;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Execute the supervision.</td>
</tr>
</tbody>
</table>

### 5.5.2 Case: Active strip management Brabant

**Project**
In 2002, the project active strip management Brabant (in Dutch: Actief Randenbeheer Brabant) has started. Until 2006, farmers were actively involved in achieving an improved water quality in Brabant. The project was a pilot to examine in what way awareness and active strip management could be integrated in agricultural management. This strip management would reduce the emission of nutrients and pesticides in to the surface water, as participating farmers had to realize a buffer strip at the side of their plots on which they were not allowed to use fertilization and pesticides. Although active strip management is beneficial for nature, it causes an erosion of revenues for farmers, because of unproductive land. These losses for the farmers were compensated by the project group.
The project was an initiative of ZLTO, the four water boards in Brabant (Aa en Maas, Brabantse Delta, Rivierenland and De Dommel), Drinkwater company RIWA Maas, the province of Noord Brabant and the Agricultural Innovation Agency (LIB). Participation was voluntarily organized and approximately 700 farmers participated. Rapidly the objective of 1250 km was realized and the enrolment stopped, because the budget was not sufficient to anticipate on this willingness to participate. During five years the farmers together managed around 1250 km of buffer strips (Randenbeheerbrabant, 2008).

After this first project, from this moment on called ARB1, the project group proposed a national arrangement to continue this project. However, while the development of rural areas is organized decentralized by means of provinces, this appeared to be impossible. However, the success of ARB1 was reason for the four water boards, ZLTO and the province of Noord Brabant to continue the project in Brabant. At the end of 2006 a new recruitment campaign started and the participating farmers of this second project, ARB2, have been performing management activities since March 2007.

Whereas the willingness to participate during ARB1 was beyond expectations, the objective of ARB2 was increased to 2700 kilometres. Unfortunately, the number of participants at this moment is approximately 350 farmers, covering approximately 700 kilometres. It is needless to say that this is very disappointing for the project group (Schrauwen, 2007).

This case study examines the ARB project and more specific the reasons that could explain the decrease of participation among farmers.

**Measure**

The measure of implementing the buffer strips is executed by farmers. The project distinguishes two types of land; grass land and plough lands. The specifications of the agreements are dependent on the type of land. For both grass and plough lands, the breadth of buffer strip is 4 metre and for both types the use of fertilizer and plant protection products is forbidden.
The emission of manure caused by grazing activities, which is allowed on grassland, is hereby considered as insignificant. As the grassland is not fertilized, the grass on the buffer strip is dry. Furthermore, it is not allowed to sow the buffer strip in case of grass land. Farmers are obliged to mow this type of land at least once a year, either by using cattle or by machines.

For plough land sowing is only allowed after it is approved by the water board. Plough lands have to be mowed at least two times annually to attenuate the soil, during the first three years of the contract. After three years, farmers are allowed to mow the buffer strip maximum once a year. Farmers are obliged for both types of land to remove the mow products away from the buffer strip. For talus mowing products this has to be done within seven days.

**Institutional setting**
Below, in Table 5.3 the interests, goals and means to steer of the most important actors involved are summarized.
Table 5.3 Involved actors and their interests, goals and means to steer

<table>
<thead>
<tr>
<th>Actors</th>
<th>Interests</th>
<th>Goals</th>
<th>Means to steer</th>
</tr>
</thead>
<tbody>
<tr>
<td>The province of Noord-Brabant</td>
<td>• Agriculture should be competitive and sustainable on the long run (Programma Landelijk Gebied, 2006) &lt;br&gt;• WFD obligations</td>
<td>• Increasing the number of agricultural organisations with sustainable production systems (Programma Landelijk Gebied, 2006) &lt;br&gt;• Water quality improvement</td>
<td>• Financial contribution &lt;br&gt;• Communication about ILG budget with national government</td>
</tr>
<tr>
<td>Water board Brabantse Delta</td>
<td>• Water quality as main task &lt;br&gt;• Lowering management costs</td>
<td>• Water quality improvement &lt;br&gt;• More efficient water management system</td>
<td>• Project responsible &lt;br&gt;• Consultation of the ministry of ANF, province of NB to harmonize projects &lt;br&gt;• Recruitment of participants &lt;br&gt;• Adjust dredging techniques; drop mowing products on plot instead on the buffer strip</td>
</tr>
<tr>
<td>Water board Aa en Maas</td>
<td>• Water quality as main task &lt;br&gt;• Communication possibilities to public and farmers</td>
<td>• Water quality &lt;br&gt;• Participating in a project in which all the water boards of Brabant participate &lt;br&gt;• Awareness by farmer &lt;br&gt;• Example project of cooperation</td>
<td>• Communication with participants &lt;br&gt;• Financial contribution</td>
</tr>
<tr>
<td>Water board De Dommel</td>
<td>• Communication to public &lt;br&gt;• Water quality as main task</td>
<td>• Participating in a project in which all the water boards of Brabant participate &lt;br&gt;• Water quality, although this was not decisive</td>
<td>• Communication with participants &lt;br&gt;• Financial contribution</td>
</tr>
<tr>
<td>Water board Rivierenland</td>
<td>• Water quality as main task</td>
<td>• Reduce the (indirect) emission of nutrients and plant protection products to surface water</td>
<td>• Communication with participants &lt;br&gt;• Financial contribution</td>
</tr>
<tr>
<td>Zuidelijke Landen Tuinbouworganisatie Projecten</td>
<td>• Helping farmers in their knowledge and skill development and improving their market and social position (ZLTO, 2008).</td>
<td>• A successful project that is beneficial for water boards, province and farmers, whereby the central idea is social learning (Schrauwen, 2007).</td>
<td>• Project leader &lt;br&gt;• Execution of motivation research among participant and ex participants &lt;br&gt;• Examine the effect on water quality by model studies &lt;br&gt;• Examine the effects of agro biodiversity</td>
</tr>
<tr>
<td>Zuidelijke Landen Tuinbouworganisatie Belangenbehartiging</td>
<td>• Look after the interest of their members (Elshof, 2007)</td>
<td>• A voluntary agreement that is attractive to the farmer in Noord Brabant, in which the participants won’t have to worry about the (financial) risks. (Elshof, 2007)</td>
<td>• Political pressure to Ministry of ANF and the province of Noord Brabant &lt;br&gt;• Recruitment of participants (Elshof, 2007)</td>
</tr>
</tbody>
</table>
5.5.3 Case: Nature friendly banks in Midden Delfland Project

By 2004 in the area of Midden Delfland 50 kilometres nature friendly banks had been realized within the scope of a reconstruction policy. Dienst Landelijk Gebied, a department of the ministry of Agriculture, Nature management and Food Quality purchased land to contribute to the ecological main structure (in Dutch: ecologische hoofdstructuur) in the Netherlands. A chain of nature friendly banks in Midden Delfland creates an environment for flora and fauna and therefore contributes to the ecological main structure (Groeneveld, 2004).

Besides this ecological objective, nature friendly banks bring an end to the bank erosion (in Dutch: oeverafkalving).

The property of the banks along main watercourses was appointed to the water board ‘Hoogheemraadschap van Delfland’. Although one could say that farmers should keep their cattle away from the banks, which is owned by the water board, the poor preservation of fencing over the years made this unrealistic in practice. Besides, farmers considered the loss of their farmland, which was not voluntarily based but on the reconstruction law, as if the government had stolen their land. Therefore, some of the farmers showed recalcitrant behaviour in fencing of their plot (Poot, 2007). While clear management agreements about these nature friendly banks did not exist, many of the nature friendly banks deteriorated. Both the water board as the farmers realized in 2004 that the current situation at that time did not lead to nature friendly banks; cattle calved down the banks and maintenance at the ditch done by the water board harmed the development of the banks (Poot, 2007).

A substantial part of the 50 kilometres of nature friendly banks is realized by 67 farmers, the water board considered these farmers as an important actor for the management of the banks. While the farmers are not obliged to manage the banks, the water board used the instrument of blue services to establish their cooperation. Some of the 67 farmers receive only a compensation for maintenance of the fence. The rest is managed by the water board. A group of 12 farmers is compensated for the fencing and mowing activities of in total.

This latter group executes these activities at two watercourses whereby the nature friendly banks are especially important, while these watercourses are important water bodies in the WFD. In 2006 agreements were made with bordering farmers along the watercourses Slinksloot and Zweth to manage the nature friendly banks, see Figure 1.3. It is as an agreement with 12 farmers who
together manage 4 kilometres banks. This agreement is a pilot for three years (2006, 2007, and 2008). Afterwards both the farmer and the water board are allowed to choose for a different management approach.

Delfield has the goal to expand the management task of nature friendly banks from 4 to 20 kilometres by 2010. Experiences of the pilot of the Slinksloot and the Zweth will be evaluated in order to formulate a new policy (Schaafsma, 2007).

This case study examines the project to expand the management of nature friendly banks by farmers.

**Measure**

For the development of a sound nature friendly bank the farmers have to do certain activities. According to the contract this is:

- Acquire, place and maintenance of fence
- Mowing of moist area, once a year varying the locations
- Mowing of dry embankment, twice a year
- Mowing products must be removed within three weeks

Furthermore:

- Pesticides are not allowed on the banks
- It is not allowed to manure the banks

**Institutional setting**

Below, in Table 5.4 the interests, goals and means to steer of the most important actors involved are summarized.
Table 5.4 Involved actors and their interests, goals and means to steer

<table>
<thead>
<tr>
<th>Actors</th>
<th>Interests</th>
<th>Goals</th>
<th>Means to steer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water board 'Hoogheemraadschap van Delfland'</td>
<td>• Property owner of nature friendly banks</td>
<td>• Efficient management plan of nature friendly banks</td>
<td>• Financial support</td>
</tr>
<tr>
<td></td>
<td>• Future WFD objectives</td>
<td>• Expanding management of banks to 20 km by 2010</td>
<td>• Recruitment of participants</td>
</tr>
<tr>
<td></td>
<td>• Farmers are important actors in executing future water management</td>
<td>• Exploring possibilities of blue services</td>
<td>• Use of alternative management plans</td>
</tr>
<tr>
<td></td>
<td>measures</td>
<td>• Realizing support and familiarity among public and participating actors</td>
<td>• Recruiting a project manager</td>
</tr>
<tr>
<td></td>
<td>• Blue services could be cost efficient compared to other instruments to</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>implement measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural nature association Vockestaert</td>
<td>• Maintaining the polder landscape in Midden Delfland and its characteristic elements</td>
<td>• Execution of management activities of nature friendly banks by farmers</td>
<td>• Participating in working groups</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Representation of farmers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Intermediary party</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Recruiting of farmers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Supervision of farmers</td>
</tr>
<tr>
<td>LTO noord department Delflands Groen</td>
<td>• Maintaining the polder landscape in Midden Delfland and its characteristic elements</td>
<td>• Execution of management activities of nature friendly banks by farmers</td>
<td>• Participating in working groups</td>
</tr>
<tr>
<td></td>
<td>• Look after the interests of farmers in Midden Delfland</td>
<td></td>
<td>• Representation of farmers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Recruiting of farmers</td>
</tr>
</tbody>
</table>

5.5.4 Case: Black Tern, pearl of the Krimpenerwaard

Project

Maintenance of watercourses in the area of the Krimpenerwaard is over 90% the responsibility of land owners and land users. To fulfil the objectives of the Water Framework Directive, the water board Hoogheemraadschap van Schieland en de Krimpenerwaard (HHSK) desired the participation of land owners and land users (Oosters, 2006). Therefore, in February 2004 the Krimpenerwaard water project (In Dutch: Samen naar goed water in de Krimpenerwaard) has started. Within this project, five municipalities, the water board and various organisations cooperate to establish open water which is suitable as living environment for water flora and fauna in the area the Krimpenerwaard. It is expected that cooperation and coordination will lead to more efficiency in the realization of objectives related to the water system. The area the Krimpenerwaard is part of the province of Zuid-Holland and is situated in the triangle Schoonhoven, Gouda and Krimpen aan den IJssel. The Krimpenerwaard is part of the so-called Green Hart of Holland and is bordered by River Lek, River Hollandsche IJssel and River
Vlist. The Krimpenerwaard is composed by a number of polders with an average ground level of 150 cm below N.A.P. The size of Krimpenerwaard is approximately 13,500 hectares. The soil consists mainly of peat, with a small strip of clay along River Lek. The urban areas consists besides Krimpen aan den IJssel and Schoonhoven out of a number of small residential clusters. The landscape of the Krimpenerwaard is dominated by typically small and straight parcels and in between (wide) ditches. See Figure 5.4. The parcels are used for grassland and dairy farming is hereby the most important form of agriculture. In the South West corner of the Krimpenerwaard recreation areas are located. Some of these recreation areas are forests. The agricultural parcels are partly transformed into nature areas (Oosters, 2006). In the appendix a map of the Krimpenerwaard can be found.

![Typically small and straight parcels of the Krimpenerwaard](image)

**Figure 5.4 Typically small and straight parcels of the Krimpenerwaard**

The goal of the Krimpenerwaard water project is clean water with a high quality for all users in the Krimpenerwaard. This implicates water that is clear and clean, that is suitable for cattle to drink, which provides a suitable environment for flora and fauna and that can be used to enjoy people (HHSK, 2008). Different measures were defined, as part of this broad project to realize the sub goal of enabling a healthy viable population of characteristic flora and fauna species for peat ditches in Krimpenerwaard. One of the measures is the protection of the Black Tern; a characteristic bird species in the Krimpenerwaard. See Figure 5.5. To develop a healthy viable population, it is required to adapt the agriculture management. Farmers in the Krimpenerwaard can provide such a service.
Figure 5.5 Black Tern feeds young

Measure
To develop of a healthy viable population Black Terns in the Krimpenerwaard it is important to protect the breeding season. It is therefore necessary to conduct an adapted agrarian management strategy. This adapted management exists of:

- Placing small rafts in the watercourse
- No mowing of grass and the bank on both sides of the colony concerning a counterfoil of 100-200 meters from the centre of the colony, with a width of maximum three metres during the period from start agreement (April) until September 1st
- No grazing of this counterfoil, by means of fencing of the plot

This way, a safe location for the Black Tern is realized. On the embankment and strip, grass and weed will grow and therefore a relatively safe watercourse is realized. The high grass on both sides will protect the nest. The fence will hinder the cattle of disturbing the brooding Black Terns. Furthermore, diverse vegetation increases the available insects that serve as food for the youngs (Krimpenerwaard water project, 2006).

Institutional setting
Below, in Table 5.5 the interests, goals and means to steer of the most important actors involved are summarized.

<table>
<thead>
<tr>
<th>Actor</th>
<th>Interests</th>
<th>Goals</th>
<th>Means to steer</th>
</tr>
</thead>
</table>
| Water board ‘Hoogheemraad Schieland en de Krimpenerwaard’ | - Improving ecology  
- Enhancing the value of water among the public  
- Dependent on support of actors for other projects | - Protection of the Black Tern to increase or at least maintain the population  
- Exposing successes of Krimpenerwaard water project  
- Support the project | - Financial aid |
<table>
<thead>
<tr>
<th><strong>Landscape management South Holland</strong></th>
<th><strong>Agricultural Nature foundation Weidehof Krimpenerwaard</strong></th>
<th><strong>Project group 'Krimpenerwaard water project'</strong></th>
<th><strong>Foundation 'Het Zuid-Hollands Landschap'</strong></th>
<th><strong>Farmers</strong></th>
<th><strong>Nature and Bird working group 'de Krimpenerwaard'</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Active cooperation with stakeholders in preservation nature and landscape in South Holland</td>
<td>- Maintain and increase nature in the Krimpenerwaard whereby management is to a large extent executed by farmers</td>
<td>- More variety in living water system</td>
<td>- Purchasing and establishing major nature reserve is still in progress. Without protection contributions of farmers, the period until realization of the reserve is too long for maintaining Black Terns in the area.</td>
<td>- Interested in nature</td>
<td>- Maintain and increase wild flora and fauna in the Krimpenerwaard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Increase water quality and quality of ecology</td>
<td></td>
<td>- Enjoying the presence of the Black Tern</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Project subsidy
- Communication
- Informing
- Control

- Project subsidy
- Communication
- Informing
- Control

- Project subsidy
- Communication
- Informing
- Control

- Project subsidy
- Communication
- Informing
- Control

- Project subsidy
- Communication
- Informing
- Control

- Project subsidy
- Communication
- Informing
- Control

- Project subsidy
- Communication
- Informing
- Control

- Project subsidy
- Communication
- Informing
- Control

- Project subsidy
- Communication
- Informing
- Control

- Project subsidy
- Communication
- Informing
- Control
6 Analysis

6.1 Introduction to the analysis
The next step in this research is the analysis of the explored cases. Analyzing the gathered information of the four projects shows us what kind of differences and similarities there are between existing blue services.

The analysis will be done by checking the success factors as presented in the framework for case study exploration, see paragraph 4.5. The results of the case study research will be used to examine these factors in order to draw conclusions with regard to the criteria, which influence the choice for blue services.

The structure of this chapter is in congruence with the framework presented in chapter four. First, the motivations of water boards to consider the application of blue services will be analysed in paragraph 6.2. Paragraph 6.3 will pay attention to the willingness among land users to accept a blue service agreement. Finally, in paragraph 6.4 the constraints with regard to legislation will be analysed. This chapter addresses the following research questions:

| Question 4.1: | Why do water boards consider the application of blue services as an instrument for improving water quality? |
| Question 4.2: | Why are land users willing to accept a blue service contract? |
| Question 5:   | What are the main differences and similarities between existing blue services? |
6.2 Analysis of motivations of water boards

One of the main reasons to perform this research was the efficiency prospect of blue services. The first phase of this research concluded that water boards perceive efficiency, which is estimated by means of effectiveness and costs, is the most important argument to consider applying blue services as part of their water management system. It was expected that blue services will cost less in terms of production and transaction costs to improve the water quality. Furthermore, it was expected that blue services contribute to a higher level of water quality than other instruments do, whereas land users have more information about the state of the environment in which the measure is executed. Moreover, continuity of the blue service is important whereas it will increase the effectiveness and will reduce the total costs. These expectations have been examined in the case study research. This paragraph pays attention to main aspects of the left side of the framework to structure case study research (Figure 4.3).

6.2.1 Effectiveness

Effectiveness of a blue service is determined by the ability to achieve water quality objectives. As mentioned in Table 2.1 (see paragraph 2.1), the status of surface water can be determined by ecological condition indicators (biological, hydro morphological and general physical – chemical). The four cases examined all had effectiveness expectations based on these ecological condition indicators. However, the case study research showed that water boards have difficulties in estimating effectiveness. This will be discussed below. Table 6.1 presents the results of the four cases.

<table>
<thead>
<tr>
<th>Case</th>
<th>Effectiveness expectation</th>
<th>Estimation issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature friendly banks in Oude Rijn area</td>
<td>Considered as the best way to realize water quantity, water quality and ecology objectives, compared with alternative plans (buffering and draining).</td>
<td>Effectiveness determined by willingness to participate.</td>
</tr>
</tbody>
</table>
Active strip management Brabant  | Less nutrients (nitrogen and phosphates) and pesticides to surface water. Improved biodiversity.  | Effectiveness of the buffers strips in practice is still unknown because accurate monitoring program to measure effects on water quality appeared to be too expensive. Effectiveness determined by willingness to participate.  
Nature friendly banks Midden Delfland  | Realization of ecological mosaic pattern instead of uniform management increases the survival possibilities of flora and fauna species.  | Difficult to quantify these effects by means of ecological condition indicators. Effectiveness determined by willingness to participate.  
Black Tern, pearl of the Krimpenerwaard  | Formulating the Black Tern protection as a blue service increases most likely the population of Black Terns in the Krimpenerwaard due to improved steering possibilities and increased familiarity.  | Various factors (predators, incidental traffic nuisance etc.) influence the success of the project as well which makes it impossible to find directly significant improvements.  

It appeared that effectiveness is either being determined ex ante or ex post.

- Estimation in advance is used for assessing new projects and is done by relying on expert judgements and water management models. E.g. within the project ‘nature friendly banks in Oude Rijn area’, the effects of various policy plans on water quality and ecology have been estimated in 2006 (Bosman, 2006).
- Estimating the effectiveness afterwards helps water boards to evaluate certain projects. Outcomes of these evaluations can be used to adapt their future policies or to assess the effectiveness of projects in case these are continued. In theory, this kind of effectiveness determination could be applied in the cases ‘Active strip management Brabant’, ‘Nature friendly banks Midden Delfland’, and ‘Black Tern, pearl of the Krimpenerwaard’, whereas these projects all are a kind of continuation of earlier projects or pilots.

Although in most cases, there are good reasons to expect that by means of a blue service a better water quality is realized, it appeared that in none of the projects water boards could draw firm conclusions about the effectiveness. Two explanations were found.

- First, effects on ecological condition indicators are often dependent on specific local circumstances and various factors. Consequently, accurate determination of effectiveness is expensive and time consuming.
- Second, the participation of suppliers affects the effectiveness. E.g. the proposed mosaic pattern in Midden Delfland is only established when many farmers participate.

6.2.2 Total costs

Paragraph 4.2.2 discussed that the total costs of a blue service for water boards are determined by the amount of payment and the transaction costs (start up and running costs). The costs of a blue
services should be compared with alternative policy plans in order to make an informed decision. The determination of costs can also be done ex ante or ex post.

The exploration of the case study research showed that although the amount of payment can easily be determined, the determination of transaction or organisation costs is often difficult. For example, the costs of all kinds of negations and administration with regard to a blue service are often not determined, whereas these costs are hard to quantify.

Moreover, the case study results showed that the participation of suppliers influences the total costs. Hereby are issues of scale important. For example, what are the costs whereby everyone participates except a few? Are other (expensive) measures required, if there is a lack of participation? In particular, in the projects ‘Nature friendly banks in Oude Rijn area’ and ‘Nature friendly banks Midden Delfland’ such difficulties came across during the case study research.

Table 6.2 gives an overview of the costs and related estimation issues that were pointed out during the case study research.

<table>
<thead>
<tr>
<th>Case</th>
<th>Costs</th>
<th>Estimation issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature friendly banks in Oude Rijn area</td>
<td>Costs of construction and management are considerably higher than costs of other plans.</td>
<td>Organisation costs (supervision, organisational costs) are not estimated yet as this depend on willingness to participation.</td>
</tr>
<tr>
<td>Active strip management Brabant</td>
<td>Total budget of approximately 10 million euros until 2013.</td>
<td>• The actual expenses depend on the willingness to participate among farmers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Organisation costs are hard to determine but considerable (negotiations between four different water boards, province, and ZLTO; contracting between water boards and farmers; administration Dienst Regelingen; monitoring by water boards etc.)</td>
</tr>
<tr>
<td>Nature friendly banks Midden Delfland</td>
<td>-</td>
<td>• Costs of management alternatives such as management by contractor via water or by land are not clear.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Difficulties in estimating the costs in situations whereby everyone participates except a few.</td>
</tr>
<tr>
<td>Black Tern, pearl of the Krimpenerwaard</td>
<td>Sufficient annual project budget of 2500 euros, (includes supervision)</td>
<td>-</td>
</tr>
</tbody>
</table>

### 6.2.3 Continuity

In paragraph 4.2.5, it was expected that long-term contracts would increase the continuity of the measure. This way the effectiveness could be improved and total cost could be reduced.
Therefore, the case study research deliberately focused at the continuity on the long term. Table 6.3 presents the outcomes of the four examined projects with regard to this aspect.

### Table 6.3 Overview of continuation

<table>
<thead>
<tr>
<th>Case</th>
<th>Time period contract</th>
<th>Comments</th>
<th>Intentions</th>
<th>Actions related to intentions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature friendly banks in Oude Rijn area</td>
<td>Twelve years</td>
<td>Contract is revised after six years</td>
<td>Arrangement till 2027</td>
<td>Estimating different cost scenarios</td>
</tr>
<tr>
<td>Active strip management Brabant</td>
<td>Six years</td>
<td></td>
<td>Continuation after 2013</td>
<td>None</td>
</tr>
<tr>
<td>Nature friendly banks Midden Delfland</td>
<td>Three years</td>
<td>Pilot</td>
<td>Formulating a blue service for continuation of bank management by farmers</td>
<td>Use of pilot outcomes</td>
</tr>
<tr>
<td>Black Tern, pearl of the Krimpenerwaard</td>
<td>Six years</td>
<td>Previously it has been an one year contract</td>
<td>Continuation as long as Krimpenerwaard water project runs, no exact finish date</td>
<td>After Krimpenerwaard water project, continuation uncertain</td>
</tr>
</tbody>
</table>

The outcomes of the case study research show that although the water boards often have the intention to continue the specific blue service, actions are missing. This is mainly caused by the inability of water boards to formulate policies beyond their administration period. Unfortunately, this lack of continuation commitment could affect the relation with farmers. Water boards should be aware of how this continuation intention is perceived by farmers.

### 6.2.4 Conclusions and recommendations regarding motivations of water boards

#### Conclusions

It is remarkable that with regard to blue services the willingness to participate, influences both costs and effectiveness to a large extent. Although often other policy instruments require participation for a smooth realization as well, the implementation of these measures can eventually be enforced. However, water boards cannot enforce blue services, as they depend on the willingness among farmers to accept the arrangement.

Considering this causality between willingness to participate and cost and effectiveness (see Figure 6.1), and considering the fact that participation can not be estimated in advance makes it difficult for water boards to determine the efficiency of blue services.
This was confirmed in the cases whereby the efficiency prospect was not always a dominant argument for water boards to participate. Although one might expect that efficiency is the main argument for a water board to start up a blue service, it appeared that there are additional aspects that motivates water boards to set up a blue service arrangement. These additional motivations can be categorized in three groups: strengthening of relations, increasing awareness and exploration.

1. Strengthen relations
Water boards understand the value of cooperation with both land users as well as other governmental organizations. The opportunity of building a good relation with farmers and other governmental organizations is an additional motivation to start a blue service. By implementing a blue service, water boards could ensure:
   c. Increase of good will; in other projects water boards depend on the same actors, so joining a blue service can increase the support for other projects.
   d. An example of cooperation; it could influence the attitude of public and land users. Positive experiences about working together in establishing a sound water system can increase the willingness to participate in other cooperation projects.

2. Improve awareness
   Another participation motivation of water boards is creating awareness. This awareness motivation can be divided in two types.
   c. Enhancing the value of water among public; blue services are a kind of public participation. By involving farmers in implementing measures the value of water can more easily being exposed.
   d. Increase awareness among farmers about water management; involving farmers makes them more aware of the consequences of their agricultural activities on water quality and ecology.

3. Exploration motivation
   It appeared that for water boards at this moment of writing, blue service in itself is an argument to participate. Water boards would like to acquire knowledge about payment for water related services and to comprehend the market forces that influence this policy instrument. By executing pilots they explore the possibilities of using blue services as an additional instrument to achieve a
more sustainable water management system. Therefore, this exploration motivation is driven by expectations about efficiency, relation improvements or awareness. Once the possibilities of blue services are known this motivation will disappear.

Table 6.4 shows what additional motivations were found in the exploration of the four cases.

Table 6.4 Additional motivations

<table>
<thead>
<tr>
<th>Case</th>
<th>Strengthening of relations</th>
<th>Improve awareness</th>
<th>Exploration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature friendly banks in Oude Rijn area</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Active strip management Brabant</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Nature friendly banks Midden Delfland</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Black Tern, pearl of the Krimpenerwaard</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

After analysing the outcomes of the four blue service project, it is necessary to revise the left side of the framework presented in chapter 4. It appeared that not only efficiency motivates water boards to set up a blue service agreement, but also the opportunities to strengthen relations and to improve the awareness. Crucial is acceptance of the supplier of the blue service. Evidently this will affect to what extent relations can be improved or relations can be strengthened. Moreover, the acceptance of the agreement by the supplier will affect the effectiveness and the total costs of the blue service. This is visualized in Figure 6.2.

Figure 6.2 Motivations influenced by acceptance of supplier
Recommendations
The question remains whether water boards could overcome the difficulties of estimating efficiency. With regard to this question, water boards are recommended to do the following:

- First, water boards can apply different participation scenarios. A scenario is not a prediction or a specific forecast per se; rather, it is a plausible description of what occur. Plausibility is what distinguishes scenarios from mere fantasy (Enserink, 2004). By applying different participation scenarios, water boards are enabled to estimate the total costs (amount of payment and organization costs) corresponding to a specific participation number; e.g. the total costs of a participation rate scenarios of 5, 20, 50 and 100 percent.
- Second, water boards are recommended to focus more on the considerations of supplying farmers. When water boards gain insight in what way the acceptance of a blue service agreement determined by farmers, they can aim to increase the acceptance. The next paragraph will discuss the factors that affect the willingness of farmer to accept a blue service.

6.3 Analysis of acceptance of supplying farmers

The previous paragraph discussed the large influence of the acceptance of supplying farmers on the motivation outcomes of water boards. Therefore, analysing the considerations of supplying farmers is useful. This paragraph pays attention to the factors mentioned in Figure 4.3, which affect the acceptance of the supplier. This is situated on the right side of the framework for case study research exploration.

6.3.1 Investment costs
In chapter four, it was discussed that farmers have difficulties to manage their farm administration, when policies and legislation concerning blue services are likely to change. They rely for example on the continuation of financial aid for services they provide. Investments are only done if revenues can be guaranteed. Two of the examined cases show some investment costs. However, it was not always an argument for farmers to avoid participation. Table 6.5 gives an overview of the investment costs in relation to participation that were pointed out during the case study research.
Table 6.5 Overview of investment costs in relation to participation

<table>
<thead>
<tr>
<th>Case</th>
<th>Investment costs</th>
<th>Argument to avoid participation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature friendly banks in Oude Rijn area</td>
<td>- Loss of farm land</td>
<td>- No; decrease of property value is compensated by once only payment</td>
</tr>
<tr>
<td>Active strip management Brabant</td>
<td>- Possible purchase of mow equipment</td>
<td>- No; Mow equipment is lend out by neighbouring farmers</td>
</tr>
<tr>
<td></td>
<td>- Attenuation of the soil</td>
<td>- No; Fertilizing and ploughing the soil enhance the soil is allowed once the contract is expired</td>
</tr>
<tr>
<td></td>
<td>- Designing annual agricultural management plan</td>
<td>- Yes; Uncertain financial resources</td>
</tr>
<tr>
<td>Nature friendly banks Midden Delfland</td>
<td>None</td>
<td>--</td>
</tr>
<tr>
<td>Black Tern, pearl of the Krimpenerwaard</td>
<td>None</td>
<td>--</td>
</tr>
</tbody>
</table>

Based on the explorations done in the cases study research, the required investments done by the farmers are divided into the following investment groups:

- **Equipment**: possible investments in terms of equipment were insignificant, e.g. mow equipment belonged often already to the possessions of farmers or it was lend out by neighbouring farmers.
- **Loss of (useable) farmland**: this was not an argument to avoid participation because the decline of property was compensated and attenuation of the soil was restored by fertilization and ploughing the soil.
- **Required efforts**: uncertainty about the financial resources was in the active strip management project reason for farmers to cancel their participation. In other words, they did not trust the intentions of the water board sufficiently to design their annual agricultural management plan in which buffer strips were included.

**Conclusions and recommendations with regard to investment costs**

In paragraph 4.3.1 a relation between investment costs and trusts was put forward. From the three investment types mentioned above, only the latter investment, *required efforts*, shows a relation with trust. Nevertheless, during the examination of the four projects trust was often put forward as an important consideration for farmers. Although this was not related to investment costs, it influenced the willingness to participate. This will be analysed in the next paragraph.

By compensating in advance, investment costs became no longer an argument for farmers to avoid participation. This occurred in the project ‘Nature friendly banks Oude Rijn area’ in which the loss of farmland was compensated by a once only payment of the water board. In the Black Tern project something similar happened; farmers did not have to buy (invest) the floating rafts themselves.
6.3.2 Trust in water manager

According to the explorations of the case study research, trust is based upon three aspects: trusting intermediary parties, trust based on inaccurate assumptions and trust based on history. Table 6.6 indicates whether these trust aspects occurred, based on a certain situation, within the four projects. The three aspects of trust are elaborated below.

**Table 6.6 Overview of occurred trust**

<table>
<thead>
<tr>
<th>Case</th>
<th>Situation</th>
<th>Trust</th>
</tr>
</thead>
</table>
| **Nature friendly banks in Oude Rijn area** | ▪ Agricultural nature associations will be involved in recruiting participants and supervision; uncertain is whether they are able to represent the farmers accurately  
▪ Agricultural nature associations can use social pressure to convince farmers  
▪ Farmers fear that the province of Zuid-Holland could affect the realization of the project, while the project might be affected by another project (Green backbone) | ▪ Trusting intermediary parties  
▪ Trusting intermediary parties  
▪ Trust based on inaccurate assumptions |
| **Active strip management Brabant** | ▪ Dienst Regelingen rejects contracts, without communicating with water boards. Subsequently, farmers blame the water boards  
▪ Ministry of agriculture, nature management and food quality implemented obliged buffer strips; conflicted with active buffer strip management project because compensation is no longer possible | ▪ Trusting intermediary parties  
▪ Trust based on inaccurate assumptions |
| **Nature friendly banks Midden Delfland** | ▪ Agricultural nature association will probably be involved in recruiting participants and supervision; farmers are not enthusiastic about this  
▪ Acquisition of banks was done by Dienst Landelijk Gebied; water board Delfland is blamed for stealing  
▪ Negotiations about pilot were perceived as unfair by farmers; a lack of dialogue | ▪ Trusting intermediary parties  
▪ Trust based on inaccurate assumptions  
▪ Trust based on history |
| **Black Tern, pearl of the Krimpenerwaard** | ▪ Agricultural nature organisation is involved as intermediary party with relation to the contract; farmer are satisfied about this | ▪ Trusting intermediary parties |

**Trusting intermediary parties**

Intermediary parties (agricultural nature associations, administrative parties etc.) are often involved in some phase of the blue services. They can be consulted in the design phase, can have a recruitment function, can be responsible for the administration and can be involved in supervising the activities. This can be beneficial or negative for the blue service project, depending on the trust farmers have in these intermediary parties. The following occurred in the explored projects:
1. It is expected by the agricultural nature association in the Oude Rijn area that farmers will trust the agricultural nature association as intermediary party. The association uses tries to convince the farmers to join the agreement.

2. In the active strip management project the registration was done by an intermediary party (Dienst Regelingen). However, farmers have had negative experiences with this department. Based on previous situations they did not expect that this intermediary party would respect the interests of the farmers. In other words, farmers did not trust this intermediary party. This hampered the willingness among farmers to participate.

3. The same phenomenon was pointed out by examining the case of Midden Delfland. The water board Delfland has the intention to delegate the supervision to the agricultural nature association of Midden Delfland. However, during interviews farmers ventilated their concerns about this intention of Delfland, as they consider the association as incapable.

4. In the Black Tern project, the contrary was mentioned. The activities done by the intermediary organization were perceived as positive by farmers. The water board (HHSK) relied on the existing relation between the farmers and the agricultural nature association.

Anyway, if water boards involve intermediary parties in the blue service arrangement, they need to keep in mind the position of the farmers towards these intermediary parties. If there are doubts farmers could be interviewed to determine their possible concerns. Water boards should be aware that they gather limited information with respect to this point, when they only talk to intermediary parties.

**Trust based on history**

Trust is also based upon the past experiences with water boards. These past experiences can be split up in experiences directly related to the project and other former experiences between the farmers and the water boards. For example, the history of the project in Midden Delfland affected the trust of farmers, because the water board threatened the farmers that it was a matter of all or none.

Unfortunately, trust based on other experiences can not properly being analysed based on the case study research.

**Trust based on inaccurate assumptions**

As defined by Koppenjan and Klijn trust concerns an expectation about the intention of another actor. That intention concerns the expectations that the other actor will respect the interests of the ‘trusting’ actor (Koppenjan & Klijn, 2004). However, it appeared that sometimes farmers do not trust the intentions of water boards anymore, even though water boards try to respect the interests of the trusting actors, the farmers. Reason for this distrust was caused by policies of other governmental organisations for example the Dutch Ministry of Agriculture, Nature management.
and Food Quality. Unfortunately, sometimes farmers do not distinguish governmental organizations from each other in determining their trust towards water boards. Consequently, water boards are held responsible for acts of other organisational organisations. This influences the relation between water boards and farmers.

Conclusions and recommendations with regard to trust
Based on the case study research it can be concluded that trust is one of the considerations that farmers take into account in determining their willingness to participate. Farmers trust water boards based on history, involvement of intermediary parties and inaccurate assumptions.

In paragraph 4.2.3 factors were mentioned to influence the emergence and growth of trust:
- More interaction and social contacts will improve the creation of trust;
- Reputation of other actors based upon past experiences;
- Expectation of future benefits

From the case study research, recommendations are derived that are in line with these factors. With regard to blue services, water boards are recommended to apply the following steering options in order to influence trust:

- Be informed about other policy plans and if necessary, try to influence them
- Clarify (financial) situation towards suppliers
- Explore the reputation of intermediary parties among suppliers, before involving them actively
- Ensure intensive interaction with involved intermediary parties

6.3.3 Effects on farm management
Chapter 4 discussed the relation between amount of payment and the effects on farm management. It was pointed out that if blue services are in line with the achievement of the objectives of farmers, farmers are more likely to accept the blue service agreement. Moreover, a relation between effects on farm management and payment was expected. In other words in case a blue service lead to negative effects on farm management, the willingness to accept the contract will decline, unless higher compensation is realized.

Different factors were found during the exploration of the cases that could influence the farm management and thereby the realization of farmers’ objectives. These factors are categorized in five groups:

1. Correspondence between interests of supplier and proposed measures;
It was found that the willingness of farmers to participate is sometimes determined by the congruence between the interests of the supplier and the proposed measure of the blue service. The following two examples will illustrate this category.
- In the project ‘active strip management Brabant’ it was pointed out by a biological farmer that the proposed measure of the blue service was in line with his idealistic intentions as biological farmer; the measure obliged participants of not using pesticides.
- In the project ‘Black Tern, pearl of the Krimpenerwaard’, some farmers enjoy the presence of the bird at their farm. By executing measures to protect the Black Tern, these farmers could realize these goals.

2. **Attractiveness of alternative measures:**
   Another factor that influences the willingness of farmers to accept a blue service agreement is the attractiveness of the alternative. When water board cannot realize certain water (quality) objectives by using a blue service, they have to do this some other way. These alternatives can be very disadvantageous for the farmers.
   - In the project, ‘Nature friendly banks Midden Delfland’ contractors could execute the management of the banks as well. However, farmers perceive this alternative as less favourable whereas contractors cause a lot of nuisance.
   - The same kind of motivation was pointed out in the project ‘Nature friendly banks Oude Rijn area’. By cooperating with the proposed blue service agreement, farmers could avoid that water storage areas need to be realized on their plots.

3. **Compatibility of blue service activities with regular activities:**
   A third factor with regard to farm management, concerned whether proposed measures fit in the regular activities of land users. The following examples will illustrate this category.
   - In the project, ‘Nature friendly banks Midden Delfland’, mowing of banks is easily being combined with regular mow activities and is therefore ‘compatible’ with regular activities. However, nature friendly banks causes weed nuisance and this is not compatible, whereas the farmers is forced to execute additional activities in order to control the weed pressure.
   - In the project ‘active strip management Brabant’ it was pointed out that the buffer strip had some advantages for the farmers, because buffers strips provide a nice access road to plot or watercourse and they provide a good location for sprinkler equipment.

4. **Opportunity costs**
   A fourth factor that was found is *opportunity costs*. By implementing measures, net profits from on-farm activities are sometimes foregone. Farmers take into account these opportunity costs in their decision with regard to participation.
   - In the project ‘Active strip management Brabant’, the increasing cereal prices have been reason for some farmers to decide not to continue participation after the first period. The increasing cereal prices made it for farmers less attractive to participate, because more profit can be made by sowing grain instead of implementing a buffer strip.
   - In the project ‘Black Tern, pearl of the Krimpenerwaard’ it was pointed out that it was tempting to let cows graze the fresh green grass, whereas farmers like to feed their cattle with
the best products. However, the blue service agreement forbade farmers to mow the strip along the watercourse for five months.

5. **Clearness of agreement**

Finally, the exploration of the cases shows that the clearness of the agreement is another important factor, which influences the acceptance. When the agreement is not entirely clear, for example because lots of exceptions and conditions are included in the contract, the willingness to accept will fall because this distracts farmers in executing their agricultural practices. This category can be illustrated by the following example.

- In the project ‘Active strip management Brabant’ some farmers stopped providing the blue service because they misinterpreted the contract. Conditions about mowing and function change were not entirely clear to them.

Table 6.7 indicates which types of effects were found for each project.

**Table 6.7 Factors that influence farm management**

<table>
<thead>
<tr>
<th>Case</th>
<th>Factors relevant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature friendly banks in Oude Rijn area</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>Active strip management Brabant</td>
<td>1, 3, 4, 5</td>
</tr>
<tr>
<td>Nature friendly banks Midden Delfland</td>
<td>2, 3</td>
</tr>
<tr>
<td>Black Tern, pearl of the Krimpenerwaard</td>
<td>1</td>
</tr>
</tbody>
</table>

Although it is expected that a high compensation can compensate some negative score on the five other effects, whether they are mutual correlated is less interesting. What is interesting is the elaboration of effects on farm management, which influence the acceptance among farmers to accept a blue service.

**Conclusions and recommendations with regard to the effects on farm management**

Now that the effects on farm management are elaborated and grouped into five categories, water boards can consider their options to influence these factors, which all affect the willingness of farmers to accept a blue service agreement.

Water boards are recommended to consider their steering options to influence each factor in order to increase the acceptance of the agreement. Water boards have different kinds of steering options for each factor. These are discussed below.

**Correspondence between interests of supplier and proposed measures**

- In designing a blue service agreement, water boards could join existing initiatives.
- Consider idealistic intentions of potential suppliers and determine whether a blue service agreement could improve the execution of existing activities.
Attractiveness of alternative measures

- By communicating the less attractive alternatives to farmers, water boards could convince farmers to participate. This can be done by starting a pilot.

Compatibility of blue service activities with regular activities

- In designing a blue service agreement, water boards should consider the regular activities of farmers. Farmers are more likely to accept a blue service agreement in case the activities are compatible with their regular activities. For example, mowing nature friendly banks is much more in line with regular activities than managing a constructed wet land (In Dutch: helofytenfilter).
- Determine whether possible nuisance of the blue service agreement can be controlled by regular activities.

Opportunity costs

To overcome the problem of opportunity costs, water boards can:

- Relate the payment to opportunity costs. For example by designing an agreement with flexible compensation heights related to changing cereal prices.

Clarity of agreement

To increase the clarity of the agreement water boards can:

- Appoint an area manager, who will improve the communication with the supplying farmers. An area manager can take away misunderstandings.
- Aim to design an unambiguous contract, because exceptions, additional pilots and vague conditions will diffuse the perception of potential farmers towards blue service.
- In addition to the previous, negative rumours will decrease the willingness of farmers to participate. Communicate carefully, which means at the right time and by the right people, in order to avoid negative rumours.

6.3.4 Amount of payment

Paragraph 4.3.2 mentioned the importance of financial reasons for both participation as non-participation. This paragraph discusses the compensation that is given to the farmers for supplying the services. For each case, the following aspect will be discussed:

- Overview of production costs, type of activities and amount of payment
- A realistic example to gain insight in the total amount of payment for the blue service
- Perception of farmers towards the amount of payment
Project Protection of the Black Tern in the Krimpenerwaard:

Table 6.8 Payment overview Project Black Tern in the Krimpenerwaard

<table>
<thead>
<tr>
<th>Production costs</th>
<th>Type of activities</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management of rafts (placing, removing and storage)</td>
<td>Maintenance costs</td>
<td>Annual € 45.00</td>
</tr>
<tr>
<td>Fencing plot</td>
<td>Maintenance costs</td>
<td>Annual € 0.44 per running metre</td>
</tr>
<tr>
<td>- No grazing of strip along watercourse</td>
<td>Loss of income (erosion of revenues)</td>
<td>Annual € 0.12 per square metre</td>
</tr>
</tbody>
</table>

Realistic example
A farmer has a colony of Black Tern. He manages 250 metres along the watercourse. Consequently, this year he received € 245. -.

Perception towards compensation
Participation farmers consider the compensation as an evidence of appreciation rather than additional income.

Project Nature friendly banks Midden Delfland:

Table 6.9 Payment overview Project Nature friendly banks Midden Delfland

<table>
<thead>
<tr>
<th>Type of activities</th>
<th>Production costs</th>
<th>Payment amount and frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase of fence and fencing plot</td>
<td>Construction costs</td>
<td>Once only € 5.00 per running metre</td>
</tr>
<tr>
<td>Maintenance fence</td>
<td>Maintenance costs</td>
<td>Annual € 3.25 per running metre or € 3.75 per running metre (depending on length of bank)</td>
</tr>
<tr>
<td>Mowing nature friendly banks</td>
<td>Maintenance costs</td>
<td>Annual € 4.75 per running metre or € 5.75 per running metre (depending on length of bank)</td>
</tr>
</tbody>
</table>

Realistic example
A farmer manages 500 metres nature friendly banks. The first year he receives € 7275. The coming years he receives annually € 4775.
Perception towards compensation
The compensation is eight to ten times higher than the standard amount of payment for this kind of services. During the case study research it was noticed that the participating farmers are somehow aware of that, because they perceive this payment as lucrative.

Project Nature friendly banks Oude Rijn area:

<table>
<thead>
<tr>
<th>Type of activities</th>
<th>Production costs</th>
<th>Payment amount and frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease of property value</td>
<td>Construction costs</td>
<td>Once only € 3.24 per square metre</td>
</tr>
<tr>
<td>nature friendly bank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decrease of property value</td>
<td>Construction costs</td>
<td>Once only € 3.44 per square metre</td>
</tr>
<tr>
<td>open water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excavation of soil</td>
<td>Construction costs</td>
<td>Once only € 0.50 per cubic metre</td>
</tr>
<tr>
<td>Profiling the bank</td>
<td>Construction costs</td>
<td>Once only € 0.94 per running metre</td>
</tr>
<tr>
<td>Treatment of surplus of soil</td>
<td>Construction costs</td>
<td>Once only € 0.52 per cubic metre</td>
</tr>
<tr>
<td>Removing surplus of soil</td>
<td>Construction costs</td>
<td>Once only € 1.85 per cubic metre</td>
</tr>
<tr>
<td>Fencing of plot</td>
<td>Construction costs</td>
<td>Once only € 2.91 per running metre</td>
</tr>
<tr>
<td>Applying a permission</td>
<td>Construction costs</td>
<td>Based on actual costs</td>
</tr>
<tr>
<td>Drinking spot for cattle</td>
<td>Construction costs</td>
<td>Once only € 500.00</td>
</tr>
<tr>
<td>Mowing of bank</td>
<td>Maintenance costs</td>
<td>Annual € 0.20 per running metre</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or € 0.22 per running metre</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Depending on width of strip</td>
</tr>
<tr>
<td>Maintenance fence</td>
<td>Maintenance costs</td>
<td>Annual € 0.17 per running metre</td>
</tr>
<tr>
<td>Removing mowing products</td>
<td>Maintenance costs</td>
<td>Annual € 0.05 per square metre</td>
</tr>
<tr>
<td>Maintenance wire fencing</td>
<td>Maintenance costs</td>
<td>Annual € 0.30 per running metre</td>
</tr>
</tbody>
</table>

Realistic example
A farmer constructs 100 metre of nature friendly bank and open water, width of 3 metre and an excavation depth of 0.30 metre for nature friendly bank and 0.70 metre for open water. For the construction, he receives approximately € 4370. The coming years he receives annually € 70.

Perception towards compensation
Since this project is not implemented yet, it was difficult to determine the perception of farmers towards the compensation. Striking is that the construction compensation involves many different components. This complicates the contract. The water board could avoid this by taking the construction components out of the blue service agreement. This way the contract will be much easier. It is obvious that the water board still needs to compensate the farmers for the decrease of property value.
**Project Active strip management Brabant:**

### Table 6.11 Payment overview Project Active strip management Brabant

<table>
<thead>
<tr>
<th>Production costs</th>
<th>Type of activities</th>
<th>Payment amount and frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plough land</td>
<td>Loss of income, Maintenance costs</td>
<td>Annual € 0.60 per running metre</td>
</tr>
<tr>
<td>No fertilization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and use of pesticides</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removing of mow products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grass land</td>
<td>Loss of income, Maintenance costs</td>
<td>Annual € 0.30 per running metre</td>
</tr>
<tr>
<td>No fertilization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and use of pesticides</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removing of mow products</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Realistic example**

A farmer has a buffer strip of 400 metres on plough land. Consequently, he receives annually €240.

**Perception towards compensation**

In the ARB1 project, the width of the buffer strip was considerably smaller than the width of the ARB2 project. At first sight, it seems that the compensation was increased in proportion to the broadening of the strip. However, from interviews it appeared that farmers consider the compensation of the ARB2 project as less than the ARB1 project. Still, it seems that the financial reward is an important motivation for farmers to participate.

**Conclusions with regard to the amount of payment**

From the analysis above it can be concluded that payment is not always an important motivation to participate. Due to a lack of observations, it is not possible to draw conclusions about the relation between payment height and effects on farm management whereas the measures of the four projects differ from each other.

**6.3.5 Conclusion and recommendations regarding acceptance**

In sum, the willingness among farmers to accept a blue service is driven by various factors: factors with regard to farm management, trust, investment costs and compensation height. In total, eight driving forces of farmers have been found by analysing the case study results (see paragraphs 6.2 and 6.3), which affect the willingness to accept a blue service. Therefore, the right side of the framework discussed in chapter four, needs to be revised (see Figure 6.3):
Water boards can take away some negative effects to increase the acceptance or even to lower the required compensation height. Besides, water boards can increase the effect of driving forces, which have a positive effect on the acceptance. These steering options can be used either to change the agreement of the blue service (e.g. compensate in advance to reduce the investment costs), or they can be applied to influence the implementation process of a blue service agreement (e.g. clarify (financial) situation towards suppliers to increase trust). By examining the four projects, the following steering possibilities were identified, which relate to the driving forces. See Table 6.12.

Table 6.12 Steering possibilities to influence driving forces

<table>
<thead>
<tr>
<th>Driving forces</th>
<th>Steering possibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Correspondence between suppliers' interests</td>
<td>• Consider which regular activities are done in designing a blue service</td>
</tr>
<tr>
<td>2. Attractiveness of alternative measures</td>
<td>• Communication of alternatives to farmers</td>
</tr>
<tr>
<td>3. Compatibility of blue service activities with</td>
<td>• Compatibility is taken into account in designing the agreement</td>
</tr>
<tr>
<td>4. Opportunity costs</td>
<td>• Determine whether possible nuisance of the blue service agreement can be controlled</td>
</tr>
<tr>
<td>5. Clearness of agreement</td>
<td>• Payment relates to opportunity costs, e.g. based on cereal prices</td>
</tr>
<tr>
<td>6. Trust</td>
<td>• Appointing an area manager;</td>
</tr>
<tr>
<td>7. Amount of payment</td>
<td>• Not specified</td>
</tr>
<tr>
<td>8. Investment costs</td>
<td>• Raise payment (within borders of state aid legislation)</td>
</tr>
<tr>
<td></td>
<td>• Compensate in advance</td>
</tr>
</tbody>
</table>
One of the constraints of blue services is that contracts need to be designated within the borders of state aid legislation of the European Union ( Europese Commissie (2006). This means that water boards have to avoid that the compensation for the blue services is considered an unlawful state aid. This can be done by verifying the blue services with the green blue catalogue of the inter-provincial consultation.

To verify that the compensation of the blue services is in line with the European state aid legislation, the analysis took the following aspects into account:

- The way in which the compensation height was determined
- The time period of the contract is between 5 and 7 years
- Accumulation of blue service compensation with other support for same measures

### Table 6.13 State aid legislation issues

<table>
<thead>
<tr>
<th>Case</th>
<th>Determination of compensation</th>
<th>Time period contract</th>
<th>Accumulation issues</th>
<th>State aid problems likely to occur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature friendly banks in Oude Rijn area</td>
<td>Based on the norm directories defined by the ministry of agriculture, nature management and food quality</td>
<td>Twelve years, revised after six years</td>
<td>Yes, but other subsidy contracts expire on time</td>
<td>No</td>
</tr>
<tr>
<td>Active strip management Brabant</td>
<td>Based on the Gasunie norm</td>
<td>Six years</td>
<td>Some, department of ministry of agriculture, nature and food quality (Dienst Regelingen) rejected part of contracts</td>
<td>No</td>
</tr>
<tr>
<td>Nature friendly banks Midden Delfland</td>
<td>Negotiation with farmers</td>
<td>Three years</td>
<td>No</td>
<td>Yes, 8 to 10 times the catalogue compensation</td>
</tr>
<tr>
<td>Black Tern, pearl of the Krimpenerwaard</td>
<td>Copied from a similar project elsewhere in the Netherlands</td>
<td>Six years</td>
<td>No, not yet occured</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 6.13 presents the outcomes of this examination. The colours indicate whether the aspects occurred to be an issue with regard to European state aid legislation (green = in line, orange =
questionable and red = not in line). The fourth column indicates whether state aid problems are likely to occur still.

Only the Midden Delfland project compensates the farmers in such a way that problems concerning state aid are likely to occur. Although this project is still a pilot, the current compensation can be problematic for the future because it can create a precedent. The willingness among farmers to participate is likely to decrease when the payment is lowered after the pilot. Thus, water board Delfland faces a difficult situation; lowering the compensation will affect the willingness to participate, but continuing the compensation will lead to problems concerning unlawful state aid.
7 Conclusions, recommendations and reflection

7.1 Introduction

After analysing the results of the explored cases it is now possible to a) draw conclusions, b) give recommendations for further research and to water boards and finally c) reflect on my research. Paragraph 7.2 will present the conclusions of my research. The sequence of steps presented in this paragraph is especially interesting. Water boards that consider the use of blue services in water quality management can use these steps, as it will improve the decision-making. Paragraph 7.3, presents general recommendations for water boards. More specific recommendations for the water boards examined during my case study research, are discussed in paragraph 7.4. I will reflect on my research in paragraph 7.5. Eventually, I will finish this chapter by giving recommendations for future research in paragraph 7.6.

This chapter addresses the following research question:

Moreover, this chapter addresses the main research question of this research project:

<table>
<thead>
<tr>
<th>Question 6:</th>
<th>What can be concluded from the comparison of existing blue services?</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Research Question:</th>
<th>How can decision making of water boards about blue services be improved?</th>
</tr>
</thead>
</table>

7.2 Conclusions

After identifying water quality issues and related blue services, I examined literature concerning payment for environmental services. Examination of this literature was relevant, as blue services are environmental services, which are provided by land users and probably only occur when compensation is given. As mentioned earlier, the theory of Payments for Environmental Services
(PES) has the logic that compensating land users for the environmental services a given land provides, makes them more likely to choose that land use rather than another (Pagiola et al., 2004). In other words, these payments schemes internalise externalities by creating market mechanisms to exchange services for payments (Smith et al., 2006). Valuation is an important aspect of payment for environmental services as it could be used to make an informed decision. This can be done by applying the framework of De Groot et al. for an integrated assessment and valuation of ecosystem functions, goods and services. By using this framework the total value of ecosystems is determined based on ecological, socio-cultural and economic criteria (De Groot, et al., 2002)

However, based on literature (Kiersch et al., 2005) it was to be expected that the comparison of policy alternatives is not only based on the total value related to the measure which is implemented. The instrument used to execute the measure determines the outcome of interests of stakeholders as well. Thus, the integrated assessment framework of De Groot et al. is therefore just a part of the total system which, together with other policy characteristics related to the use of policy instruments, determines the outcomes of interests of stakeholders.

By means of interviewing water boards and literature research a framework was constructed. It visualizes the relations between the main criteria and underlying factors, which determine the choice for using blue services as policy instrument (see Figure 4.3). This framework has been used to structure the analysis of the case study research. In this paragraph conclusions will be drawn and the main research question will be answered.

**7.2.1 Research findings**

After analysing the outcomes of four blue service projects, the following five main conclusions can be drawn:

1. The economic prospect of efficiency is not the only motivation for water boards to participate or to set up a blue service agreement.

2. Additional motivations of water boards to establish a blue service are:
   a. By cooperation through blue services, the relation between land users or other governmental organisations is improved
   b. Blue services create awareness about the value of water and the importance of water management among public and farmers

3. Consequences of blue services are difficult to determine in advance whereas these consequences are influenced by the participation of farmers. Therefore, it is hard to estimate efficiency accurately.
4. The willingness among farmers to accept a blue service agreement is determined by eight driving forces. These factors are:

- **Trust**: farmers trust water boards based on history, involvement of intermediary parties and inaccurate assumptions.
- **Investment costs**: equipment, loss of (useable) farmland and required efforts.
- **Amount of payment**: compensation height for activities.
- **Correspondence between interests of supplier and proposed measures**: the interests of the supplier are in line with the proposed measure of the blue service; e.g. adoration of nature by farmers or biological agriculture.
- **Attractiveness of alternative measures**: water boards can implement other measures to realize their water objectives. These alternatives can be less favourable for farmers once they are implemented.
- **Compatibility of blue service activities with regular activities**: activities of measures fit in the regular activities of land user; e.g. mowing of banks can easily being combined with regular mow activities and biological farmers can easily join an agreement in which fertilization is forbidden, whereas they already did not fertilize.
- **Opportunity costs**: by implementing measures, net profits from on-farm activities are sometimes foregone. E.g. considering the implementation of a buffer strip instead of sowing grain depends on the possible profits of grain.
- **Clearness of agreement**: in case the agreement is not entirely clear, lots of exceptions and conditions are included in the contract; the willingness to accept will fall.

5. Water boards have various steering possibilities to influence these factors and thereby they can affect the willingness of suppliers to accept a blue service agreement.

### 7.2.2 Steps to improve decision making

The main research question of this research project was *How can decision making of water boards about blue service be improved?* The sub questions, which have been answered in the previous chapters, collectively answer this main question. This paragraph will involve the last stage of answering the main research question and will draw conclusions about the way in which decision making, of water boards about blue services can be improved.

Improving the decision-making regarding blue services can be done by performing a sequence of six steps. These steps are:

- **Step 1**: Identify possible measures
- **Step 2**: Reflect on the intended motivations of the blue service agreement
- **Step 3**: Assess the acceptance of farmers
- **Step 4**: Determine steering options
- **Step 5**: Examine legislation constraints
- **Step 6**: Decide upon the applicability of blue services
This sequence of steps can be used by water boards who consider the use of blue services in water quality management. It will improve the decision making because by performing these steps water boards can make a more informed decision. The steps will be elaborated below.

**Sequence of steps to improve decision-making regarding blue services:**

**Step 1: Identify possible measures**

This step involves the determination of measures, which are suitable to be executed by means of a blue service agreement. Water boards should consider at least two aspects.

- Although water boards can decide otherwise, measures which have considerably effects (e.g. safety) on the function of water systems are considered to be less suitable for them.
- The activities done by the farmer, as part of a blue service agreement, should exceed legislations, in other words over and above statutory minimum. This is necessary, because it is not allowed to pay supplying farmers for activities when legislations oblige them to provide these services.

**Step 2: Reflect on the intended motivations of the blue service agreement**

Consider the different motivations that affect the choice for using blue services as a policy. Perceive blue services not only from an economic perspective; consider efficiency motivation as well as other possibilities of blue services. Blue services can also:

- strengthen the relation with farmers and other governmental organisations
- increase the awareness about water management among public and land users

**Step 3: Assess the acceptance of farmers**

To what degree the motivations goals are realized is determined to a large extent by the acceptance of the farmers. Water boards can check eight driving forces that influence this acceptance, in order to estimate the willingness to accept a blue service among future suppliers in advance. This implicates that water boards should have at least a draft of the blue service
agreement. Driving forces can have either a positive or a negative effect on the acceptance. By executing this step water boards gain more insight in driving forces that either have a strong or limited effect on the acceptance.

Step 4: **Determine steering options**
Water boards can influence driving forces, by using steering options. This way they can affect the willingness of (future) supplying farmers to participate. In designing a blue service agreement, water boards should aim to enlarge the positive effects of driving forces on the acceptance and to limit the negative effects of driving forces on the acceptance.

Step 5: **Examine legislation constraints**
This step involves checking whether the steering options are in line with legislation constraints. Water boards should examine whether the design of the blue service agreement is in line with legislation aspects, such as European state aid legislation. If not, it is necessary to adjust the design of the blue service agreement.

To assess the acceptance of the adapted blue service agreement by future supplying farmers, return to step three.

Step 6: **Decide upon the applicability of blue services**
Finally assess, based on the previous steps, whether implementing blue services can be successful. Determine which required actions should be implemented to ensure the continuation if a blue services is implemented. Moreover, apply various participation scenarios. This can facilitate the determination of consequences in terms of costs and effectiveness of the blue service.
7.3 Recommendations for water boards in general

This section presents the recommendations that water boards should pursue in order to improve the decision making process around blue services. In case water boards consider the use of blue services as an instrument to achieve the implementation of measures, the following is recommended:

1. Perceive blue services not only from an economic perspective; consider efficiency motivation as well as other possibilities of blue services. Blue services can also strengthen the relation with farmers and other governmental organisations, or increase the awareness about water management among public and land users.

2. Assess the willingness to accept the blue service among farmers by determining their perspective about the eight underlying factors presented in the sequence of steps to improve decision making about blue services. If any doubt exists, execute a motivation survey.

3. Consider the following steering options to influence the driving forces.

<table>
<thead>
<tr>
<th>Driving forces</th>
<th>Steering possibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correspondence between suppliers' interests and proposed measures</td>
<td>Consider which regular activities are done in designing a blue service</td>
</tr>
<tr>
<td>Attractiveness of alternative measures</td>
<td>Communication of alternatives to farmers</td>
</tr>
<tr>
<td></td>
<td>Use of pilots</td>
</tr>
<tr>
<td>Compatibility of blue service activities with regular activities</td>
<td>Compatibility is taken into account in designing the agreement</td>
</tr>
<tr>
<td></td>
<td>Determine whether possible nuisance of the blue service agreement can be controlled by regular activities</td>
</tr>
<tr>
<td>Opportunity costs</td>
<td>Payment relates to opportunity costs, e.g. based on cereal prices</td>
</tr>
<tr>
<td>Clearness of agreement</td>
<td>Appointing an area manager;</td>
</tr>
<tr>
<td></td>
<td>Designing an unambiguous contract</td>
</tr>
<tr>
<td></td>
<td>Communicate carefully to avoid negative rumours about the contract</td>
</tr>
<tr>
<td>Trust</td>
<td>Be informed about other policy plans, try to influence these plans</td>
</tr>
<tr>
<td></td>
<td>Clarify (financial) situation towards suppliers</td>
</tr>
<tr>
<td></td>
<td>Explore the reputation of intermediary parties among suppliers, before involving them actively</td>
</tr>
<tr>
<td></td>
<td>Ensure intensive interaction with the intermediary parties involved</td>
</tr>
<tr>
<td>Amount of payment</td>
<td>Raise payment (within borders of state aid legislation)</td>
</tr>
<tr>
<td>Investment costs</td>
<td>Compensate in advance</td>
</tr>
</tbody>
</table>
4. Often, a pilot precedes the final blue service agreement. Consider the possible consequences of pilots before implementing them. Pilots can cause negative precedents. To avoid this from happening, it is required that at least important conditions of the pilot, such as compensation heights, are in line with European legislation.

5. Ensure the continuation of blue services by determining which required actions are necessary to be implemented.

6. Applying various participation scenarios facilitates the determination of consequences in terms of costs and effectiveness.

7. Finally, apply the sequence of steps to improve decision-making regarding blue services.

7.4 Advise for water boards examined in case study research

The objective of this research was to identify how decision making of water boards about blue services as instrument for water quality management, could be improved. The answer to this main question is based upon the success and failures of the four cases, which have been explored during case study research. The water boards that are involved in these four projects can therefore consider some of the recommendations mentioned above as ‘a day after the fair’. However, by analysing the four projects from an integrated perspective some insights were gained. These insights will be used to recommend the involved water boards to enhance their future decision-making about their blue services projects.

**Oude Rijn - recommendations for water board Hoogheemraadschap De Stichtse Rijnlanden**
The project nature friendly banks in Oude Rijn area is in the design phase. Therefore, all the recommendations of section 7.3 are applicable. The following is recommended:

- Communicate with great care, to avoid negative rumours about blue service agreement.
- Join existing initiatives (e.g. footpath).
- Determine the position of farmers towards agricultural nature associations.
- Consider to construct the nature friendly banks yourself. This will significantly improve the clearness of the contract.

**Brabant - recommendations for project group Active strip management**

- Be informed about other policy plans and try to influence these plans by communicating the active strip management project.
- Discuss the continuity of the project on the long term. Consider the finance opportunities and threats on time.
Appoint (an) area manager(s) to improve the communication about the project. There are misunderstandings that hamper the willingness to participate, which could be avoided by intensifying the direct communication with supplying farmers.

Try to centralize decision making about additional contract conditions. Additional conditions about processing mowing products differ among the water boards. This diffuses the view of (potential) suppliers in Brabant.

In addition to the latter; keep it simple. The more pilots are include in the project, the more negative rumours are about to occur.

Improve the communication between water boards, Dienst Regelingen and farmers. Farmers ground their trust in water boards often by inaccurate assumptions e.g. negative experiences with Dienst Regelingen.

**Midden Delfland - recommendations for water board Hoogheemraadschap van Delfland**

The following is recommended to water board Hoogheemraadschap van Delfland:

- Estimate costs of alternative plans, which can be applied as cost reference
- The enormous compensation payments and the three year time span of the contract is not in line with European legislation concerning state aid
- Apply future participation scenarios, whereby the participation is assumed to be a certain amount, this way it will be a lot easier to determine the consequences in terms of costs and effectiveness
- Keep in mind that the results of the pilot are less useful because in the pilot high compensation was given
- Perform a survey to examine the considerations with regard to the willingness to participate among farmers
- Do not rely on expectations of agricultural nature association Vockestaert in determining the support for Vockestaert among farmers. Despite the fact that a lot of the farmers in Midden Delfland enrolled to Vockestaert, involvement has probably adverse effects on the project
- Appoint an area manager to improve the communication about the project. There are misunderstandings that hamper the willingness to participate, which could be avoided by intensifying the direct communication with supplying farmers.

**Black Tern - recommendations for water board Hoogheemraadschap van Schieland en de Krimpenerwaard**

The intention of water board HSK to suggest a contract with a time span of six year could affect the acceptance of the contract among the participating farmers. I would recommend HSK to focus on the factor *opportunity costs* and *clearness of the contract* because an obligation of six years could affect the possibilities of farmers. An unambiguous contract and counselling by means of an area manager will most likely take away possible objections towards extending the contracts. Counselling, by means of an area manager, can also increase the effectiveness of the measure, because in the current situation, the execution of activities done by the farmers can be improved.


7.5 Reflection

7.5.1 Reflection on used literature

Now that the conclusions of my research are formulated, I apply a retrospective view at some of the examined literature. This way I can check whether my findings are recognized in literature.

Kosoy et al. concluded in comparing three cases of payments for water-related environmental services in Central America, that the amounts of payments are below the estimated opportunity cost. Kosoy et al. discussed that this apparently challenged the economic foundation of PES schemes, since suppliers of services should demand at least the value of the foregone economic benefits as compensation. One of the explanations was that providers of the services perceive the payment as a support to implement socially desirable activities. In Central America local social and cultural features, such as religious or social habits, environmental awareness and education programs, may induce the services. Even thought, it may be economically inefficient from the individual point of view (Kosoy et al., 2007). I found a similar explanation by the driving force ‘correspondence of suppliers’ interests and proposed measures’. Furthermore, I found additional driving forces that explain why economic efficiency is not the only consideration of suppliers.

Kiersch et al. mentioned driving forces which lead to the establishment of water-related PES schemes (Kiersch et al., 2005). Below, I will indicate whether these forces have been confirmed in this research.

According to Kiersch et al. providers may:

- See a benefit in adopting environmentally friendly land use methods voluntarily and for a compensation now, rather than being forced by rising public pressure in a few years’ time without compensation. – Driving force found in this research: Attractiveness of alternative measure
- Perceive a latent threat that if they do not cooperate, their land may be incorporated into adjacent protected areas. – Driving force found in this research: Attraction of alternative measure
- Perceive the granting of PES benefits as informal recognition of their property to the land in the absence of formal titles. – Driving force found in this research: Framework does not confirm this force, as it is not applicable in the Netherlands and most of the developed world.
- See the payments as an additional source of income for activities they would carry out anyway. – Driving force found in this research: Compatibility with regular activities

Users may:

- See the PES scheme as an opportune mechanism to solve conflicts with upstream communities. – Motivation found in this research: Relation improvement

90
- Expect benefits in terms of improving their ‘green’ image for supporting environmental activities, beyond the hydrological benefits, particularly private companies. – Motivation found in this research: Not applicable here, refers to private companies and industries, not to water boards
- Have other relationships with the providers, which foster the PES schemes. – Motivation found in this research: Relation improvement

Concluding, some driving forces were not found because of difference in applicability. Nonetheless, explanations about acceptance and participation motivations are compatible with the results of my research. The conclusions of my research presented in the sequence of steps are even more extensive.

7.5.2 Reflection on findings
Economic or non-economic aspects
One important recommendation stated in paragraph 7.3 was that water boards should perceive blue services not only from an economic perspective; in addition to efficiency, blue services can
• strengthen the relations with farmers and other organisations;
• increase the awareness about water management among public and land users.
Moreover, it was shown in this report that the willingness to accept blue services among farmers depends on eight factors.

The question is whether the identification of eight driving forces and additional motivations justify the statement that non-economic aspects are relevant in the discussion regarding blue services. First, the additional motivations will be discussed and subsequently the driving forces will be reflected.

The two additional motivations both can increase the efficiency of water boards, if a more integrated perspective perceives efficiency. For example, strengthening the relations with farmers or other organisations can decrease the transaction costs of future projects. Increase the awareness might cause general pollution abatement, as public and farmers both are more aware of the value of water. Thus, by applying a wider scope towards blue services, more efficiency gains are noticed. Therefore, one might state that economic reasons drive the additional motivations as well. However, these additional motivations are more related to strategic efficiency instead of operational efficiency. Therefore, they are even harder to quantify than the operational efficiency. This implicates that the distinction between the three motivations, found is this research project, is still valuable.

Reflecting on the driving forces, which determine the acceptance, the conclusion is that majority of these forces is related to economic considerations. Except for the driving force ‘correspondence interests – measures’, they all are in some way linked to financial costs or
benefits for the supplying farmer. However, supplying farmers base their acceptance on the total spectrum of driving forces. This means that positive driving forces can compensate negative driving forces, which can result in willingness to accept blue services. The distinction between these eight driving forces found in this research project, clarifies what kind of economic considerations influence the acceptance.

**Issues of scale**
The case study research focussed on four projects, varying in scale of participants, budget and geographical size. Although it is difficult to draw firm conclusions, about the influence of scale on the success of the projects, from such a limited number of projects, some reflections can be made.

Although expanding a blue service will probably increase the effectiveness on water quality, because more supplier participate, it can be difficult to design a suitable agreement. It is difficult to design a contract, which is applicable on all the suppliers without including all kinds of conditions and definitions. Including conditions or definitions is required to ensure an accurate execution of measures, however it can affect the clearness of the contract. For example this was pointed out by the project active strip management Brabant. In this project mow conditions varied between the four water boards involved. Moreover, expanding the agreement often implicates the involvement of more intermediary parties. Depending on the kind of relation between the suppliers and the intermediary party, this can either harm or increase the success of the project. Important is whether the suppliers trust the intermediary parties involved.

**7.5.3 Reflection on research methodology**
This paragraph reflects on the used methodology. This is done by addressing some questions.

_Could data triangulation be applied properly?_
I made an effort in applying the method of triangulation to increase the validity of my data. This data triangulation was done by using three types of data sources (interviewing involved actors, reading documents and field observations). Unfortunately, in the project ‘nature friendly banks in the Oude Rijn area’ it was not possible to apply this approach; the blue service had not been communicated to the farmers yet. I decided not to interview these potential participants. After all, if I had informed them about green-blue services in their area, this could have affect their willingness to participate. Consequently, the data triangulation approach was not entirely carried out correct in this case.

_Would exploring more projects have increased the validity of the results?_
Exploring more projects can increase the validity, as in that case the results are based on findings of more cases. On the contrary, the strength of exploring only four projects is that a diversity of positions and views of the subject in depth could be considered. Thus, there was a tension between the number of projects and the dept of explorations. To overcome this problem, I used
the selection criteria to select the cases, (see paragraph 5.2), which increased the validity. Unfortunately, the group ‘chemical measures’ could not be found at the selection phase of the cases and it therefore was not examined. The validity of my research could have been increased in case this type of measure was considered as well.

Are there any causes to be biased?
My choice for the four projects was biased by the fact that only information of ‘successful’ or implemented projects was available. Blue service projects, which have never even been implemented, because farmers were not wiling to participate are not examined in this research. It is obvious that it is difficult to gather data concerning these ‘failed’ projects. However, the driving forces of these farmers could have enhanced the conclusions of this research.

Did water managers endorse the research conclusions?
During the final phase of this research project, the findings of this research were presented to the water boards and project partners of the examined cases. The water managers of the four projects were invited to attend a seminar, which was held at Grontmij Houten. Goal of this seminar was to give the invited water managers the opportunity to learn from each other’s projects and to discuss the results of the research project. Moreover, the participants of the seminar had the opportunity to point out additional steering options they can use to influence the driving forces of farmers. Whereas the water managers confirmed and recognised the findings of the research project, no considerable additional steering options or driving forces were pointed out. Nonetheless, the participants of the seminar considered both the results as the discussion as rather valuable. The seminar contributed to their perception about blue services in water quality management. Therefore, the participants all wanted to receive a copy of the final thesis report. However, despite the support of the water managers toward the research conclusions, the sequence of steps have not yet been applied by water boards in practice. Because decision making about blue services requires months or years, the conclusions of the research (in particular the sequence of steps) could not been validated within this research project.
7.6 Recommendations for further research

The goal of this research was to identify the possibilities of using blue services as an instrument for water quality management by Dutch water boards. However, some interesting aspects have not been examined yet, as they were outside the scope of this research project. For enhancing the understanding of blue services even further, some recommendations for further research are given below.

- **Explore the applicability of 'chemical measures' as blue services**
  Measures applicable as blue service were categorised in four groups, see paragraph 2.7. Unfortunately, the group ‘chemical measures’ could not be found and therefore it was not examined. It is interesting to explore if there are additional driving forces that influence the acceptance of these measures. Moreover, it is interesting to examine why water boards have not implemented this kind of blue service.

- **Examine private to private agreements**
  The examined blue services concern agreements between water boards and farmers. In other words; public to private. Agreements that were not examined in this research are private to private agreements, for example between drinking water companies and farmers. It is assumed that state aid legislation will not be an issue for this kind of agreements. However, cost efficiency is probably more crucial for private companies than for water boards. An examination of how this cost efficiency is determined by private companies can probably improve the efficiency estimation of water boards.

- **Assess the appropriateness of methods to estimate the effects of driving forces**
  Assessing the willingness to accept blue services among farmers by determine their perspective about the eight underlying driving forces will improve the decision making of water boards. However, there are various methods to estimate the effects of these driving forces. For example, water boards can apply a quick and dirty approach or an extensive motivation survey can be carried out. Further research should focus on the appropriateness of these kinds of methods.

- **Examine how engineering companies can improve their methodology of determining effects on water quality**
  In spite of the influence of participation on the effectiveness, it appeared that assessing the effectiveness of blue services in advance is very difficult. This because various factors determine the success of the project. An estimation of the relation between measure and effect is often based on expert judgements. To adapt these judgements to actual experiences, Alterra has developed a knowledge system ‘KIS’ in which measurements, model results and process descriptions of measures are documented (Leenders and Kwakernaak, 2006). The main idea of this system is that
estimation rules can be improved continuously. Unfortunately, at this moment, this system is still in progress. Further research should examine how engineering companies can adopt this system to improve their methodology of determining effects on water quality.

- *Examine how water boards can exchange their gained experiences with each other*

In the Netherlands there are 27 different water boards. Because each water board has its own water quality objective, they are all facing the difficulties of decision making about blue service agreements. Currently the catalogue green blue services prevents the wheel of becoming reinvented by each water board. However, the catalogue focuses only on the legal aspects of blue services such as compensation heights. One can imagine that each time the same driving forces are relevant in the process of implementing certain measures, by means of a blue service agreement. By exchanging experiences about blue services among water boards, it prevents that the wheel is reinvented with regard to driving forces and steering options. This way, water boards can learn from each other and gain insight about possible steering options, which can be used to influence driving forces, relevant for a specific measure. Therefore, it is recommended to perform further research on how this exchange of knowledge and experiences can be done best.
Tables & Figures

Figure 1.1 Timeline European Water Framework Directive .......................................................... 1
Figure 1.2 Payment scheme for environmental services (Adapted from Pagiola, 2002) ....................... 5
Figure 1.3 Relations between water objective, measures and instruments ........................................ 6
Figure 1.4 Research framework .................................................................................................. 9
Figure 2.1 Effects of increasing and decreasing concentration of nutrients ....................................... 11
Figure 2.2 Tree structure categorisations (Adapted from Steenstra, 2002) ........................................ 13
Figure 2.3 a b Measuring sticks (Van der Molen and Pot, 2007) ..................................................... 14
Figure 2.4 From Royal method towards Pragmatic method (Pot et al., 2005) ...................................... 15
Figure 3.1 The flow of compensation from beneficiaries to land users ............................................ 21
Figure 3.2 Framework for integrated assessment and valuation of ecosystem functions, goods and services (De Groot et al., 2002) ................................................................. 22
Figure 3.3 Total Economic Value of ecosystems (Turner et al., 1994) .............................................. 25
Figure 3.4 Payment scheme for environmental services (Adapted from Pagiola, 2002) ....................... 27
Figure 3.5 Willingness to pay and willingness to accept .............................................................. 28
Figure 3.6 Ways of decreasing the emission of nutrients .............................................................. 29
Figure 3.7 Polluter pays approach (Adapted from Hatfield-Dodds, 2006) ......................................... 30
Figure 3.8 Beneficiary pays approach (Adapted from Hatfield-Dodds, 2006) ................................. 31
Figure 3.9 Effects on outcomes of interests in environmental policies ......................................... 32
Figure 4.1 Relation between trust and investment costs ............................................................. 41
Figure 4.2 Relation between payment height and effects on farm management ............................. 43
Figure 4.3 Framework to structure case study research; relations between criteria and success factors (TC= transaction costs) .................................................................................. 45
Figure 5.1 Gentle slope bank and Terrace bank ........................................................................... 50
Figure 5.2 Buffer strips on plough land and grass land ................................................................. 53
Figure 5.3 Slinksloot and Zweth in Midden Delfland ...................................................................... 56
Figure 5.4 Typically small and straight parcels of the Krimpenerwaard .......................................... 58
Figure 5.5 Black Tern feeds young ............................................................................................. 59
Figure 6.1 Causality between willingness to accept, effectiveness and costs ............................... 66
Figure 6.2 Motivations influenced by acceptance of supplier ....................................................... 67
Figure 6.3 Driving forces influence acceptance of supplier ........................................................ 79

Table 2.1 Ecological condition indicators .................................................................................... 13
Table 5.1 Impression of selection procedure .............................................................................. 47
Table 5.2 Involved actors and their interests, goals and means to steer ........................................ 51
Table 5.3 Involved actors and their interests, goals and means to steer ........................................ 54
Table 5.4 Involved actors and their interests, goals and means to steer ........................................ 57
Table 5.5 Involved actors and their interests, goals and means to steer ........................................ 59
Table 6.1 Effectiveness expectations and estimation issues ......................................................... 62
Table 6.2 Overview of the costs and related estimation issues ...................................................... 64
Table 6.3 Overview of continuation ............................................................................................ 65
Table 6.4 Additional motivations .................................................................................................. 67
Table 6.5 Overview of investment costs in relation to participation .............................................. 69
Table 6.6 Overview of occurred trust .......................................................................................... 70
Table 6.7 Factors that influence farm management ....................................................................... 74
Table 6.8 Payment overview Project Black Tern in the Krimpenerwaard ....................................... 76
Table 6.9 Payment overview Project Nature friendly banks Midden Delfland .................................. 76
Table 6.10 Payment overview Project Nature friendly banks Oude Rijn area ............................... 77
Table 6.11 Payment overview Project Active strip management Brabant ....................................... 78
Table 6.12 Overview of the costs and related estimation issues ...................................................... 79
Table 6.13 State aid legislation issues ......................................................................................... 80
References


<table>
<thead>
<tr>
<th>Name</th>
<th>Organisation</th>
<th>Method</th>
<th>Location</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melissa de Looff</td>
<td>Adviseur, Grontmij Waddinxveen</td>
<td>interview</td>
<td>Houten</td>
<td>7-aug</td>
</tr>
<tr>
<td>Lisette Boonen</td>
<td>Adviseur landelijk gebied, Grontmij Eindhoven</td>
<td>interview</td>
<td>Eindhoven</td>
<td>9-aug</td>
</tr>
<tr>
<td>Bjartur Swart</td>
<td>Senior Adviseur, Grontmij Drachten</td>
<td>mail</td>
<td>Nvt</td>
<td>8-aug</td>
</tr>
<tr>
<td>Mark Verberkt</td>
<td>Adviseur, Grontmij Waddinxveen</td>
<td>telephone</td>
<td>Nvt</td>
<td>14-aug</td>
</tr>
<tr>
<td>Erik Oomen</td>
<td>Waterschap Aa en Maas</td>
<td>interview</td>
<td>Den Bosch</td>
<td>15-aug</td>
</tr>
<tr>
<td>Marco van Schaik</td>
<td>Hoogheemraadschap De Stichtse Rijnlanden</td>
<td>interview</td>
<td>Houten</td>
<td>16-aug</td>
</tr>
<tr>
<td>Pierre de Vries</td>
<td>Senior beleidsmedewerker Unie van Waterschappen</td>
<td>interview</td>
<td>Den Haag</td>
<td>29-aug</td>
</tr>
<tr>
<td>Peter de Putter</td>
<td>Jurist Sterk Consulting</td>
<td>interview</td>
<td>Leiden</td>
<td>6-sept</td>
</tr>
<tr>
<td>Mario Maessen</td>
<td>Adviseur Oppervlakte water, Grontmij Houten</td>
<td>interview</td>
<td>Houten</td>
<td>18-sept</td>
</tr>
<tr>
<td>CoP Blauwe diensten</td>
<td></td>
<td>meeting</td>
<td>Utrecht</td>
<td>25-sept</td>
</tr>
<tr>
<td>Cindy Brak</td>
<td>Agrarische Natuurvereniging Waterland</td>
<td>telephone</td>
<td>Nvt</td>
<td>10-okt</td>
</tr>
<tr>
<td>Henk den Hartog</td>
<td>Agrarische Natuurvereniging Vecht Vallei</td>
<td>interview</td>
<td>Abcoude</td>
<td>10-okt</td>
</tr>
<tr>
<td>Wessel Doorn</td>
<td>Waterschap Vallei en Eem</td>
<td>interview</td>
<td>Leusden</td>
<td>22-okt</td>
</tr>
<tr>
<td>Erwin Meijboom</td>
<td>Hoogheemraadschap van Delfland</td>
<td>interview</td>
<td>Delft</td>
<td>23-okt</td>
</tr>
<tr>
<td>Joan Meijerink</td>
<td>Waterschap Zuiderzeeland</td>
<td>interview</td>
<td>Lelystad</td>
<td>25-okt</td>
</tr>
</tbody>
</table>
### Personal communication (Case study research)

<table>
<thead>
<tr>
<th>Name</th>
<th>Organisation</th>
<th>Date</th>
<th>Minutes available in callable appendix</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Zwarte Stern, parel van de Krmpenerwaard</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erik Hovingh</td>
<td>Hoogheemraadschap van Schieland en de Krmpenerwaard</td>
<td>5 oktober 2007</td>
<td></td>
</tr>
<tr>
<td>Maurice Kruk</td>
<td>Landschapsbeheer Zuid-Holland</td>
<td>23 november 2007</td>
<td>X</td>
</tr>
<tr>
<td>Liesbeth van den Heuvel</td>
<td>Agrarische natuurvereniging Weidehof Krmpenerwaard</td>
<td>27 november 2007</td>
<td>X</td>
</tr>
<tr>
<td>Familie De Jong</td>
<td>Deelnemer Zwarte Stern project</td>
<td>13 december 2007</td>
<td>X</td>
</tr>
<tr>
<td>R.J.S. (Rudi) Terlouw</td>
<td>Stichting Het Zuid-Hollands Landschap</td>
<td>19 december 2007</td>
<td>X</td>
</tr>
<tr>
<td>Erik Hovingh</td>
<td>Hoogheemraadschap van Schieland en de Krmpenerwaard</td>
<td>20 december 2007</td>
<td>X</td>
</tr>
<tr>
<td>E. Schattenberg</td>
<td>Contact persoon Natuur en vogelwerkgroep Krmpenerwaard</td>
<td>4 januari 2008</td>
<td>Telefonisch</td>
</tr>
<tr>
<td><strong>Actief Randenbeheer Brabant</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R.J.G.M. (Rob) Schrauwen</td>
<td>ZLTO</td>
<td>17 oktober 2007</td>
<td>X</td>
</tr>
<tr>
<td>T. (Ton) van der Putten, &amp; G.J. (Gerie) Mensink</td>
<td>Waterschap Rivierenland</td>
<td>7 november 2007</td>
<td>X</td>
</tr>
<tr>
<td>C.M.C. (Casper) Lambregts</td>
<td>Waterschap Brabantse Delta</td>
<td>21 november 2007</td>
<td>X</td>
</tr>
<tr>
<td>R. (Raymond) van Mol,</td>
<td>Waterschap Aa en Maas</td>
<td>23 november 2007</td>
<td>X</td>
</tr>
<tr>
<td>Van Bergen</td>
<td>Deelnemer ARB1</td>
<td>11 december 2007</td>
<td>Telefonisch</td>
</tr>
<tr>
<td>H. (Henk) Vugts</td>
<td>Waterschap De Dommel</td>
<td>11 december 2007</td>
<td>X</td>
</tr>
<tr>
<td>A.J.M. (Adrie) Geerts,</td>
<td>Provincie Noord Brabant</td>
<td>18 december 2007</td>
<td>X</td>
</tr>
<tr>
<td>M.T.J. (Marcel) van Drunen</td>
<td>Waterschap Aa en Maas, Deelnemer ARB1</td>
<td>19 december 2007</td>
<td>X</td>
</tr>
<tr>
<td>T. (Ton) van Schaijk,</td>
<td>Deelnemer ARB1 en ARB2</td>
<td>19 december 2007</td>
<td>X</td>
</tr>
<tr>
<td>F.A.E.M. (Frank) van Deurzen,</td>
<td>Deelnemer ARB1 en ARB2</td>
<td>19 december 2007</td>
<td>X</td>
</tr>
<tr>
<td><strong>Natuurvriendelijke oevers en open water Oude Rijn gebied</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marco van Schaik</td>
<td>Hoogheemraadschap De Stichtse Rijnlanden</td>
<td>1 oktober 2007</td>
<td></td>
</tr>
<tr>
<td>Linde Verbeek</td>
<td>Aequator</td>
<td>1 november 2007</td>
<td></td>
</tr>
<tr>
<td>Gert van der Hoeven</td>
<td>Agrarische natuurvereniging Lange Ruige Weide</td>
<td>30 november 2007</td>
<td>X</td>
</tr>
<tr>
<td>Wim Dijkman</td>
<td>Provincie Utrecht</td>
<td>21 december 2007</td>
<td>X, email, telefonisch</td>
</tr>
<tr>
<td>Naam</td>
<td>Organisatie</td>
<td>Datum</td>
<td>Opmerking</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------</td>
<td>--------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Rienk Schaafsma</td>
<td>Waaloord advies</td>
<td>24 september 2007</td>
<td></td>
</tr>
<tr>
<td>Erwin Meijboom</td>
<td>Hoogheemraadschap van Delfland</td>
<td>23 oktober 2007</td>
<td></td>
</tr>
<tr>
<td>Stefan Poot</td>
<td>Hoogheemraadschap van Delfland</td>
<td>3 december 2007</td>
<td>X, telefonisch</td>
</tr>
<tr>
<td>Hans Buisman</td>
<td>Hoogheemraadschap van Delfland</td>
<td>6 december 2007</td>
<td>X</td>
</tr>
<tr>
<td>Gerard van Winden</td>
<td>LTO Noord Delflands Groen</td>
<td>11 december 2007</td>
<td>X</td>
</tr>
<tr>
<td>Vier agrariërs Midden Delfland</td>
<td></td>
<td>12 december 2007</td>
<td>X</td>
</tr>
<tr>
<td>Soet Huijbregts</td>
<td>Hoogheemraadschap van Delfland</td>
<td>13 december 2007</td>
<td>X</td>
</tr>
</tbody>
</table>
Glossary

ANF Ministry of Agriculture, Nature management and Food Quality
ANV Agrarische Natuur Vereniging
ARB1 Actief Randenbeheer Brabant project 2002-2006
ARB2 Actief Randenbeheer Brabant project 2006-2013
BPP Beneficiary Pays Principle
CVM Contingent Valuation Method
DLG Dienst Landelijk gebied
DR Dienst Regelingen
GEP Good Ecological Potential
HDSR Hoogheemraadschap de Stichtse Rijnlanden
HHSK Hoogheemraadschap Schieland en de Krimpenerwaard
MEP Maximum Ecological Potential
N Nitrogen
OECD Organisation for Economic Co-operation and Development
P Phosphate
PES Payment for Environmental Services
PPP Polluter Pays Principle
SAN Stimuleringregeling Agrarisch Natuurbeheer
TC Transaction Costs
WFD Water Framework Directive
WTA Willingness to accept
WTP Willingness to pay
ZLTO Zuidelijke Land- en Tuinbouw Organisatie
# English-Dutch vocabulary

<table>
<thead>
<tr>
<th>English</th>
<th>Dutch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active strip management Brabant</td>
<td>Actief Randenbeheer Brabant</td>
</tr>
<tr>
<td>Agricultural discharge policy</td>
<td>Lozingenbesluit open teelt en veehouderij</td>
</tr>
<tr>
<td>Axis of water</td>
<td>De Natte As</td>
</tr>
<tr>
<td>Bank erosion</td>
<td>Oeverafkalving</td>
</tr>
<tr>
<td>Black Tern</td>
<td>Zwarte Stern</td>
</tr>
<tr>
<td>Constructed wet lands</td>
<td>Helofytenfilter</td>
</tr>
<tr>
<td>Drainage-channels</td>
<td>Boezem</td>
</tr>
<tr>
<td>Dutch Agriculture and Horticulture organisation</td>
<td>Land en Tuinbouw organisatie</td>
</tr>
<tr>
<td>Ecological main structure</td>
<td>Ecologische hoofdstructuur</td>
</tr>
<tr>
<td>Front embankments</td>
<td>Vooroevers</td>
</tr>
<tr>
<td>Good Agricultural Practice</td>
<td>Goede Landbouw Praktijk</td>
</tr>
<tr>
<td>Inter-provincial consultation</td>
<td>Inter Provinciaal Overleg</td>
</tr>
<tr>
<td>Investment budget Agricultural Area</td>
<td>Investeringsbudget Landelijk Gebied</td>
</tr>
<tr>
<td>Krimpenerwaard water project</td>
<td>Samen naar goed water in de Krimpenerwaard</td>
</tr>
<tr>
<td>Mowing contracts</td>
<td>Maaibestekken</td>
</tr>
<tr>
<td>National water policy agreement</td>
<td>Nationaal Bestuursakkoord Water</td>
</tr>
<tr>
<td>Nature friendly bank</td>
<td>Natuurvriendelijke oever</td>
</tr>
<tr>
<td>Nitrogen action program</td>
<td>Nitraat Actie Programma</td>
</tr>
<tr>
<td>Over and above the statutory minimum</td>
<td>Bovenwettelijk</td>
</tr>
<tr>
<td>Pollard willows</td>
<td>Knotwilgen</td>
</tr>
<tr>
<td>Tolerate obligation</td>
<td>Gedoogplicht</td>
</tr>
<tr>
<td>Water objectives</td>
<td>Wateropgaven</td>
</tr>
</tbody>
</table>
Appendices