The other side in sight

The social and economic value of ferry services in the Netherlands in 2009

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Preface

In front of you is the end product of an internship of six month at the LVP (National ferry services Platform). The research is conducted as graduation-research at finalizing my master specialization Urban, Port and Transport Economics within the MSc Economics & Business at Erasmus University in Rotterdam.

The realization of this research did of course not go automatically. Hence, I want to thank a few persons in particular, starting with my supervisor at the university: dr. Bart Kuipers. When I was searching for a topic for my master thesis in April 2009, I got in touch with the LVP via you, where I could start by September. Besides this, you had confidence in a good end product from the start and your critical view and good supervision kept me motivated. Thank you for the pleasant cooperation!

Next, I want to thank my supervisors at the LVP. First of all Ben Brouwer and Pieter de Boer for giving advice and comment concerning the content during the research. This enabled me to continue when things did not work out as planned during the research. I want to thank Lijdia de Groot for the organizational supervision at CBRB, one of the pillars of the LVP, and the place where I spend my internship. In this way I quickly became familiar with the organization.
Thanks also to Rob Joosten and Johan Hania for giving comment concerning the content in the final phase of the research.

Furthermore, I want to thank all colleagues at CBRB for a fantastic period. Graduating has been a nice time in a pleasant environment for me, both *on* as *off* the office floor.

Last but not least I want to thank my family and friends. Especially my parents: your support when things did not worked out as planned has unmistakable contributed to this thesis. Thanks for being a listening ear at the moments it was needed!

Hendrik-Frans den Hartogh

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Executive summary

Background

In 2004 the report *'Hoe ver is de overkant?'* (Oostinjen, 2004) showed that the ferry services in the Netherlands fulfilled an indispensable social and economic role, but that those ferry services were too often in the danger zone from a financial point of view. The outcomes of this report (Oostinjen, 2004) together with an amendment of Member of Parliament Van der Staaij (SGP), resulted in ten million euro's from the national budget for the ferry services over freshwater in 2006.

In this research is the current (financial) position of the ferry services over fresh water mapped, to 'update' the aforementioned report. In addition, given the ongoing focus on the environment, attention is paid to the impact of the ferry services on the environment.

Social and economic value

There are currently 243 ferry services exploited in the Netherlands. With respect to the previous research, the number of ferry services has increased by almost 24%. 93 of these ferry service are services over freshwater which sail throughout the entire year. The aforementioned ferry services transfer over 32 million persons a year.

It is proved that the absence of ferry services will lead to barrier functioning. Users are then obliged to alter their behavior by changing their need, type of transport and/or location. When a user still chooses to make the trip, most of the time extra costs are involved, dependent on the chosen alternative. By determining the monetary amount with which a user wants to be compensated for 'taking away' the ferry service, the *willingness-to-accept* (WTA), the social value of the ferry services could be quantified. It is then showed that the total WTA of the ferry services over freshwater totals up to 275,4 million euros. This is an increase of 13% with respect to 2004.

Besides this, the extra kilometres – related to alternative routes – lead to higher environmental stress as they cause a higher emission of air pollutants and greenhouse gases. These external costs are mapped by using prevention costs and shadow prices of this extra pollution. The total external cost of the 333 million extra kilometres – 329 million for the normal ferries and 4 million for the Public Transport ferries – total up to 5,6 million euros. Moreover, the extra kilometres cause 103 extra road accidents a year. These numbers are substantial higher than in 2004, when the total external costs were 3,6 million euros and 76 extra road accidents were caused.

The ferry services over freshwater transfer 32 million persons a year and have a direct turnover of 27 million euros. Besides this, the ferry services generate employment for 612 fte's. With respect to 2004, the direct turnover has increased, while the number of fte's has decreased. From the analysis of the financial position of the ferry services over fresh water becomes clear that the efficiency of the ferries has increased. Right down the line, the ferry services have thus increased their margin on average. Where the total exploitation deficit was 18 million euros in the previous research (Oostinjen, 2004), the current deficit has decreased to 6 million euros. This image could be distorted, however, as not *all* ferry services over freshwater are represented in the current research. The exploitation deficit of the normal ferries is mainly caused by the municipal car- and pedestrian-bicycle ferries. This is also confirmed by the average margin per person and the performance per fte of the municipal ferries, which is lower than that of the private ferries. A possible explanation is the execution of a 24-hour time schedule, where proportionally more fte are required. The lower return per person indicates,

however, that there is room for improvement on the revenue side. This is an indication that there are possibilities to increase the efficiency of the municipal ferry services, for example by privatizing them, as the market seems to operate more efficient.

Ferry services and the environment

Ferry services are also involved in improvements with respect to the environment. Given the intensified attention for the (living) environment, an active attitude of the ferry services is required. The emission of the ferry services is determined by using emission factors from inland navigation. It becomes clear that emission of detrimental gases (i.a. CO_2 and SO_2) of the ferry services corresponds with 2-4% of the emissions of inland navigation. Furthermore, the hydrofoil and the catamaran are *relatively* most polluting with respect to other ferry types. This pollution is, however, still much lower than that of road transport.

From the current research it becomes clear that only one third of the ferry services is engaged in sustainability from one's own accord. Given the percentage which tries to be sustainable, it can be concluded that the ferry service sector is on the right track with respect to sustainability. Nevertheless, it requires still necessary efforts before the sector has a 'sustainable' character.

The importance of ferry services

From the current research it becomes clear that the social value of the ferry services is substantial; also the economic value is significant. Furthermore, ferry services play an important role with respect to the environment: the extra environmental costs as a consequence of the extra kilometres when ferry services are absent, are substantial. Ferry services thus prevent unnecessary kilometres and hence, have to be present in the mindset of (car)users. By making use of information campaigns, government and/or provinces could make users conscious of ferry services as a real option within the route choice. With the expected pressure on the Dutch roads in mind, and with it increasing congestion and waiting times, the use of a ferry service could be quicker and more profitable then was thought in the first instance. Different parties already brought various projects and ideas forward to cope with the congestion problem. What is remarkable, however, is that none of the mentioned projects think of the ferry services sector as a possible option for reducing congestion. Because of this, it appears that ferry services are also absent in the mindset of policy makers. Ferry services are a neglected way of increasing the robustness of the Dutch road network in the medium term.

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1. Introduction

1.1 Background

Within Europe, the Netherlands are known for its transit function to and from the *Hinterland*, with mainport Rotterdam as the most important port. This 'transit-function' is made possible through the different transport modes, mainly over water. But from this point of view, one major point of importance is overlooked: the mobility *within* the Netherlands itself.

This mobility is made possible by the interconnection of different infrastructure networks over land and water. Much has been written on the road infrastructure of the Netherlands, but as the report '*Hoe ver is de overkant?'(*Oostinjen, 2004) outlined, the importance of mobility over water by ferry services is most of the time underestimated. The aforementioned report tried to determine the social- and economic importance of the ferry services within the Netherlands. The outcome of this report was that the social importance of ferry services is high, but that structural, sustainable policy measures are needed to maintain this position, given the weak financial base of ferry services over freshwater. The outcomes of the report *'Hoe ver is de overkant?' (2004)*, together with an amendment of Member of Parliament Van der Staaij, resulted in ten million euro's from the national budget for the ferry services over freshwater in 2006.
This thesis tries to 'update' the aforementioned report, by examining the current state of the ferry services.

1.2 Social relevance

In today's world, major streams of goods and persons go back and forward between continents, nations and cities as a result of our consumption society, 24 hours a day. This is mainly made possible by the transport sector. Transport by road, rail, air and water are some transport modes that can be mentioned. Most of these transport modes use petrol or other gasoline products in order to get from A to B. The use of these gasolines have undoubtedly effects on our environment. Global warming and pollution are some negative effects that can be mentioned. But not only by using gasoline the transportation of goods and people has negative influences; other negative effects on the environment that can be mentioned are traffic jams and noise pollution.

The focus of this thesis is on the ferry sector over freshwater. Important aspects related to these services are the extra miles and pollution caused by commuters and other (freight) traffic when specific ferry services stop to exist. This thesis tries to map these consequences and comes up with structural and sustainable policies to cope with these problems.

1.3 Problem statement

Mobility within the Netherlands is made possible by a variety of transport modes, as already mentioned in the introduction. This research focuses exclusively on the ferry services over freshwater in the Netherlands. As this research tries to give an update of the research done in 2004, some important questions are: What is the *current* state of the ferry sector in terms of social and economic

importance? Where is the ferry sector heading? In other words: *Is the ferry services sector sailing in the right direction?*

In order to answer these questions, the following research question is formulated:

"What is the current social and economical importance of the ferry services in the Netherlands?"

This problem statement will be discussed in more detail by means of the following questions:

1) What is a ferry service?
2) What is the composition of the ferry services sector in the Netherlands?
3) How can the concepts of social and economic importance be quantified and qualified?
4) What is the current social importance of the ferry services sector?
5) What is the current economic importance of the ferry services sector?
6) What is the environmental impact of the ferry services sector?
7) What vision can be formulated for the medium and long term with respect to the ferry services sector?

1.4 Goals

This thesis concentrates on the ferry services sector in the Netherlands. Because of the important role ferry services play for the Netherlands (Oostinjen*, 2004)*, it is important to know the current social and economic importance of this sector. Moreover, with the ongoing focus on sustainable transportation and the impacts of transportation on nature and society, it is important where the ferry services sector is heading from this viewpoint. *Is the ferry services sector sailing in the right direction?* Based on the outcomes of the sub questions – with the future of the ferry services in mind – conclusions and recommendations are given for the short and medium term.

1.5 Approach

The research for this thesis is divided into four parts. First, by making use of academic and other literature a theoretical framework has been constructed. By means of this the ferry services sector in the Netherlands has been mapped. The report '*Hoe ver is de overkant"* was an important source in this respect, but a critical assessment of the report will be conducted. Within the theoretical framework different methods which can be used to 'measure' social and economical importance have been discussed. Furthermore, this part provides a focus for the relevant ferry services which have been researched in this thesis and presents a research method aimed at the upgrade of the 2004 report. The choice for the research method to be applied has come about in consultation with the work group, formed for the supervision of the project.

Subsequently, similarly with the research performed in 2004, the social and economical importance of the ferry services sector have been quantified and qualified by means of surveys on the supply- and user-side of the ferry services. Next to this, the 'footprint' of the ferry services on the environment will be discussed.

Finally, besides the drawn conclusions, also recommendations are made and a future vision for short and medium period is formulated.

1.6 Structure

The structure of this report is as follows. Chapter 1 describes the background, problem statement and goals of this research. From this chapter it becomes clear which course is taken to answer the problem statement. Chapter 2 presents a clear definition of the term 'ferry service' from an economic point of view; subsequently, the composition of the ferry services sector is discussed in chapter 3 to get a clear image of the scale of the sector.

The theoretical framework is discussed in chapter 4. In this chapter is described in which way the social and economic value of the ferry service has been operationalized in this research. Some social and environmental effects of transport were discussed for this end.
Chapters 5 and 6 describe the social and economical value of the ferry services. First, the used method comes up for discussion; user-questionnaires are the basis for the determination of the social value, while for the economic value, supplier-questionnaires were used. Next, by means of the results of these questionnaires, the social and economic value has been mapped. In doing this, a distinction has been made between 'normal' , Public Transport-, and 'free' ferry services.

Chapter 7 describes the 'footprint' of the ferry services on the environment. First, the method for determining the emissions of the ferry services is discussed. Next, the total emission of detrimental gases by the ferry services is mapped.
Conclusions and recommendations are given in chapter 8, as well as recommendations for further research.

2. Definition

2.1 Introduction

Before one can start to map the social and economic importance of the ferry services in the Netherlands, it is important to have a clear image of the definitions which have been used in this research. Furthermore, it is of interest in what way the ferry services are to be classified. The definitions 'ferry service' and 'ferry' will be clarified successively, after which the various ways to categorize ferry services are briefly discussed.

2.2 Ferry service and ferry

When one consults the dictionary, the following two definitions are found:

> *"A ferry service is a scheduled service of a ferryboat, connection by boat between two shores." (www.vandale.nl)*

and

> *"A ferry is a scheduled connection by boat between two locations located nearby." (www.vandale.nl)*

However, from an economic point of view, a 'ferry service' is not the connection of two locations by a ferry, but the actual service: transferring people and/or goods. In this way, every individual – with or without goods – who uses a ferry service *consumes* a ferry service. Every ferry service is thus a market of demand and supply on itself. The ferry services together form the ferry service sector.

Now the definitions are clear, the following paragraph will briefly discuss the different types of ferries.

2.3 Types of ferry services

There are several ways to categorize ferry services. One way is to look at the motorial output. One speaks than about rapid and slow ferries. Rapid ferries are able to reach a speed of 50-55km per hour, while slow ferries reach at most 6-12km per hour. Examples of rapid ferries are ferry services which use a hydrofoil or catamaran.

Besides the motorial output, one can use other criteria to categorize ferry services (Oostinjen, 2004):

- The type of ferry service: pedestrian ferry service (only for pedestrians), pedestrian-bicycle ferry service (for pedestrians and people by bike) or car-ferry service (for everyone up to cars, most of the time also freight traffic).
- The main function of the ferry service. The main function of a ferry service can be determined by examining the dominant travel motive of the users. Possible travel motives are for example: commuter, business and commercial traffic, students and tourists. Ferry services

which have a predominant commuter function, do have a greater capacity most of the time and a higher transfer frequency during rush hours.

- The sailing period: ferry services which sail during the whole year or only in specific periods.
- The time schedule: ferry services which sail according a 24-hour time schedule or according a time schedule which consists of several periods during the day.

3. Composition of the ferry service sector

3.1 Introduction

Paragraph 2.3 clarified that several methods can be used to categorize the ferry service sector. In this section, some of these methods will be used to map the supply side of the ferry service sector in the Netherlands. Before doing this, the history of the ferry services in the Netherlands will briefly be discussed.

3.2 Ferry services in the Netherlands: past and present

The Netherlands are closely related to water. Because of this relation, the ferry services have played an important role in Dutch history. The ferry services are of course not a specific Dutch phenomenon: all over the world ferry services were present when people established in a certain area. Where water formed a barrier between villages and cities, ferry services played an important role. In the Roman era were already transfer places registered along rivers. The Dutch word 'pont' find here its origin: it is derived from the Latin word 'pons', what means bridge.

What is remarkable in the history of the ferry services in the Netherlands, is the fact that the first notations of ferries date only back to the late middle ages (1250-1500). The first ferries made use of the flow of the river to sail between the two riverbanks. Due to increased traffic flows over the river, this type of ferry was fitted with an engine over time, to increase the transfer speed. During the second half of the twentieth century, the car began to dominate the street picture. Because of this development, a number of ferry services were replaced by bridges and tunnels or simply disappeared.

Another development during the twentieth century – which continues until this day – is the protection of interests with respect to the ferry services, started in 1963 with the establishment of the association of owners and exploiters of ferry services [V.E.E.O.N].
Increased exploitation costs within the ferry service sector were the reason that ferry services could not survive without governmental support. That these problems continue until this day becomes clear from the establishment of the national ferry services platform [LVP] in November 2006. The objective of the LVP is to 'protect the collective interests of the ferry services in all relevant area's' (LVP, 2006).

One of the target area's are the investment and exploitation problems of the ferry services sector. Apart from these problems, ferry services can play an important role in reducing traffic jams. Although the traffic jams have reduced due to the credit crunch, one can expect that the growth in the Dutch road network is minimal. Increasing congestion, together with longer waiting times, could increase the attractiveness of ferry services in the route choice of individuals.

3.3 Composition of the ferry service sector

There are currently 243 ferry services exploited in the Netherlands. With respect to the previous research (Oostinjen, 2004) the number of ferry services has increased with almost 24%. Especially the

number of small motorferries and self service ferries has increased. Subdivided to the type of ferry, there are 42 (17%) pedestrian ferries, 139 (57%) pedestrian-bicycle ferries and 62 (26%) car- ferries.

When one looks at the number of ferries over freshwater and over saltwater, 15 ferries over saltwater can be distinguished; the remaining ferries are obviously freshwater ferries. Just like the previous research the ferries over saltwater are excluded from the research. Only the ferry service Vlissingen-Breskens is included, as this ferry service qualifies as public transport ferry. As such, this ferry is placed in this category. There is also a number of ferries over freshwater which qualify as public transport ferry ('PT-ferry'). These ferries are:

- Amsterdam Centraal Station - Velsen Zuid (Fast Flying Ferry)
- Rotterdam – Dordrecht (Waterbus)
- Dordrecht – Zwijndrecht – Papendrecht – Sliedrecht (Waterbus)
- Vlissingen – Breskens (Veolia Fast Ferries)
- Hoek van Holland- Maasvlakte (RET)

What is remarkable is the fact that the ferry service Almere Haven – Huizen is abolished with respect to the previous research. This ferry service was exploited by Aqualiner, which exploits now the ferry service Rotterdam – Heijplaat, a ferry which did not exist in the previous research. It is typical that the ferry Almere Haven – Huizen was abolished after governmental support was ceased in 2006, because the ferry was not profitable. The ferry Hoek van Holland – Maasvlakte is exploited since 2008.

3.3.1. Ownership structure

The ferry services in the Netherlands have different ownership structures. A distinction can be made between privately-, provincially-, municipality- and state-owned ferries. When a ferry service is privately exploited, it is not automatically privately-owned.

Within this research, a privately-owned ferry is a ferry service where both the ownership and the exploitation are in private hands. The ownership of a municipal ferry is at the municipality; nevertheless, the ferry service can be privately exploited. This also holds for provincially- and state-owned ferries: despite the fact that these ferries are provincially- or state-owned, the exploitation can be in municipal or private hands.

4. Theoretical framework

4.1 Introduction

Mapping the social and economic importance of the ferry services sector starts with operationalising these terms. Within the economic science there are several ways to this. To have a good comparison with the previous research, the same method for operationalising these terms is chosen. Within this section will be started with operationalising the term 'social value'. Subsequently, the quantification and qualification of the social and economic importance is discussed, after which conclusions will be given.

4.2 Social value

The term 'importance' is most of the time connected with the benefit (value) of a good or service. Strictly speaking, the importance or value of a good or service is nothing else then saying that the good or service is able to satisfy a need. As a result of this, there are as many values as needs, which can be classified in social-, economic-, ethic-, esthetic- and political values. All these definitions have in common that they are based on human preferences and needs. Determining these values and expressing them in the right value is not an easy thing to do (Slangen, 2000).

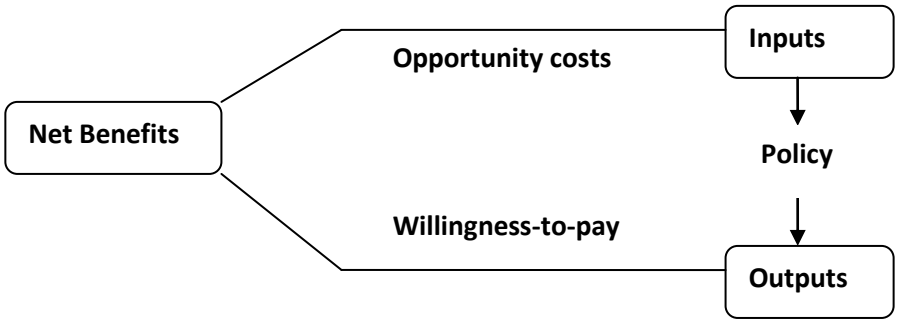
Since the 70's many research has been carried out on the socio-economic value of the nature, environment and landscape (Ruijgrok, 2004). The common denominator of these studies is determining the economic value of goods and services which cannot be expressed in a market price at first. One tries thus to determine the *social value* which cannot directly be expressed in a financial value. In economic thought, the social value is described as the total economic value for society, connected with a specific good or service. The ferry services in the Netherlands have a social value because they serve the (transport) needs of individuals. This total economic value can be subdivided in (direct) market and (indirect) non-market values. Where market values can be determined via the market-based mechanism, non-market values cannot – as the term suggests (Slangen, 2000).

4.3 Quantification

There are several methods for quantifying social value(s). What is important in selecting a method for quantifying this value is the ability to list *all* advantages and disadvantages of a social project/policy. A common used method is the Cost-Benefit Analysis (CBA). A CBA is able to map all advantages and disadvantages – including indirect and intangible aspects – and gives policymakers an instrument to justify why (market)intervention is necessary. However, from an economic point of view market intervention would not be necessary, if markets would operate efficiently. The allocation of resources would then be efficient anyhow. But in case of market failure government has to intervene (Boardman et al., 2006).

A CBA can prove in such cases why it is more efficient to intervene then to do not. This is *only* the case when there is a Pareto-improvement: at least one person is better off without harming other persons. The net benefits of such a policy are then positive. This is illustrated in figure 2.1.

Figure 4.1: Net Benefits of policies



Source: own elaboration

In the figure above the opportunity costs are the resources needed for a certain policy, the 'inputs'. As these resources could also be used elsewhere, the opportunity costs represent the value of the resources when used in the next-best alternative. The Willingness-to-pay (WTP) represents the benefits of a certain policy measures and indicates how much an individual is prepared to pay to be indifferent between the *status quo* and the situation where the policy measure is introduced. The WTP is used when a certain policy measure leads to an increase in the quality of a good or service. If a certain policy measure takes a good or service away from an individual, the person wants to be compensated. The Willingness-to-accept (WTA) represents a person's compensation in such cases.

The CBA is most times used when the behavior of individuals is observable. In case the behavior of individuals is not directly observable or hard to observe, as is the case with the users of ferry services, another method is most of the times used: Contingent Valuation. This method is used as an input into the traditional CBA.

4.3.1 Valuation of non-valuable goods

Generally speaking, economists find it easier to determine the valuation of goods and services by individuals by means of their behavior in (economic) markets (Boardman et al., 2006). For goods and services which are not traded as such on economic markets this is not possible, as the preferences and valuation of individuals are not directly observable. Therefore different direct and indirect methods have to be used in order to make statements on the valuation of these goods. Common methods are the Contingent Valuation-, Hedonic Pricing-, Travel Cost- and Averting Behavior approach.

The Contingent Valuation (CV) approach is a *direct* method to determine the costs and benefits of non-valuable goods, such as a change in welfare. This is done by using questionnaires. An example of an *indirect* method is the Hedonic Pricing approach. This method is most of the time used to value quality-indicators with respect to the environment, whereby market goods are studied which are closely related with non-valuable goods. The Travel Cost approach is also an indirect method to map relations between changes in the natural environment on the one hand and the changes in specific areas on the other hand. The last method I want to mention is the Averting Behavior method. With

this method, one tries to estimate the benefits of a certain change in the natural environment *indirectly* by means of observed changes in the behavior of individuals (Nas, 1996).
The indirect methods are thus particularly usable when specific effects on the natural environment or the influences of changes in the natural environment on the behavior of individuals are examined. As such, these methods are not usable to map the social and economic importance of the ferry services. The CV-approach however, is usable, because this method analyzes non-valuable goods in general. Besides this feature, it is also important to have a good comparison with the previous research (Oostinjen, 2004), where the CV-approach was also used to map the importance of the ferry services.

4.3.2 Contingent Valuation

As already said, the CV-approach uses questionnaires to valuate non-valuable goods. These questionnaires could be taken by letter as well as by means of interviews. What is characteristic for the CV-method is the creation of a hypothetical market. In this market, the non-market good is present or absent. By means of questionnaires is tried to determine the willingness to pay for the specific good. This valuation is *contingent*, or context-dependent. The information relates after all *only* to the hypothetical market context, and can only be interpreted from this context (Willems et al., 2001).

Next, by using questionnaires the willingness to pay is determined, expressed in the 'willingness-to-pay' (WTP) or 'willingness-to-accept' (WTA) of the respondent (see paragraph 4.3). The WTP and/or WTA represent the economic value of the non-market good when traded on markets. By doing this, the social value (importance) is quantified

Several steps have to be taken for this method. The four relevant steps for determining the social value of the ferry services are outlined below (Hanley & Spash, 1993):

1) *Creating a hypothetical market.* Because there is no market for the (non-valuable) good in a 'normal' market situation, this market has to be created. In this hypothetical market, the law of demand and supply applies to value the good.
2) *Obtaining the WTP/WTA*
   The WTP and WTA can be determined by means of questionnaires. These questionnaires could be taken *face-to-face*, by phone of by letter. The different methods all have their own advantages and disadvantages. *Face-to-face* interviews could be very detailed, but are also costly to execute; written questionnaires on the other hand are fairly easy to collect, but have the chance of a lower response rate.
3) *Calculating the mean WTA.*
   One can choose to calculate the mean *or* median WTP and/or WTA. When one chooses a median WTA/WTP, outliers do not influence this output. With a mean WTA/WTP, outliers do influence this output.
4) *Merging data*
   In this phase it is important to determine the relevant population on which a change in (the supply of) the good has influence, and take a sample of this. Subsequently, the mean WTP or WTA of the sample is used to determine the WTP or WTA of the total population.

Before using the CV-approach, some marginal comments have to be made. Because a hypothetical market is created, respondents could have difficulty in overlooking the different alternatives. This could lead to systematic deviations in the given WTP/WTA of the respondent. Respondents could give a lower WTA when they underestimate the importance of a good, for example, or give a much higher WTP when the financing is not their responsibility. In this research, the hypothetical market is a market where ferry services are absent. This is a recognizable situation, as the situation is comparable with a period in which a ferry service temporarily does not sail. As such, the chance of systematic errors is reduced/intercepted.

Besides a systematic deviation in the given WTP/WTA as a result of a hypothetical market situation, systematic deviations could also occur as a result of the welfare level of the respondent (Boardman et al., 2006). The WTP/WTA tends to be higher as the welfare level rises, and vice versa. This has to be taken into account when interpreting the research results.

A last systematic deviation in the given WTP/WTA which could play a role in this research, could occur as a result of strategic behaviour of the respondents or the method of interviewing (Nas, 1996). When respondents feel like they are responsible for the (possible) change in the supply of a good, they could give an extremely low or high WTP/WTA. These respondents could be identified in the sample as their WTP/WTA deviates in such a way from the mean WTP/WTA, that these values qualify as 'unrealistic' (Hoevenagel, 1994). The method of interviewing can influence the outcomes of a research when respondents feel they are 'steered' towards a certain (socially-desirable) direction. In this research is therefore carefully paid attention to the presentation of questions in the questionnaires to reduce/intercept the aforementioned strategic deviations.

4.4 Qualification

Besides a clear quantification of the social importance, it is also important to take some qualitative aspects along the research. Said differently: what are the effects of the ferry services on society? The effects of traffic – in this case ferry services – could be defined in several ways. Niekerk (2000) defines an effect as: *'a change of state with respect to the initial situation, as a result of executing or neglecting a certain action'.* This change of state originates from the initiator, in this case the ferry services; the consequences/effects of this change of state could be addressed in different ways.

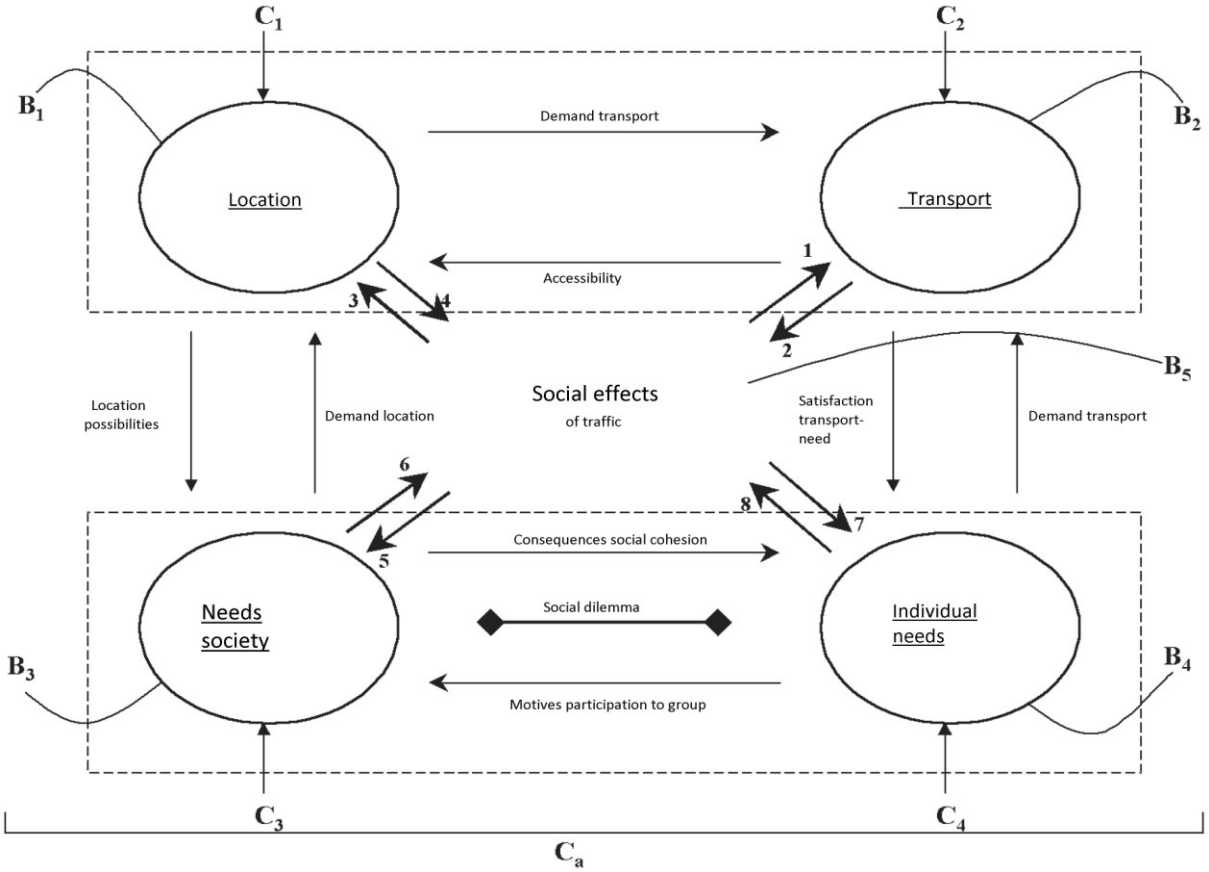
What is important in mapping the effects of the change of state is the way of categorizing. Classification to time (short vs. long term), space (macro, meso, micro) or receptor (society, environment, individuals) are some examples that can be mentioned (Boon, 2004). Given the period of time and the available data, only the social effects and environmental effects on macro level are examined in this research – in line with the previous research (Oostinjen, 2004).

4.4.1 Social effects

Social effects are one category of effects which can occur as a consequence of the absence of ferry services. Whether individuals are affected by these effects depends on the sensitivity of these individuals. These individuals are part of different groups, which can be categorized to geographic-, social-economic-, or social characteristics. Differences concerning the exposure to social effects can

occur between these groups. When these differences do not correspond with the subjective standards and values (as the principal of equity), social inequality occurs (Boon, 2004). This depends on the (transport)*needs* of individuals, the *location* of the destinations, and the supply and demand of transport means (*transport*). This is illustrated below in the conceptual model of Boon (2004).

Figure 4.2: Conceptual model for social effects of traffic



Source: own elaboration to Boon, 2004.

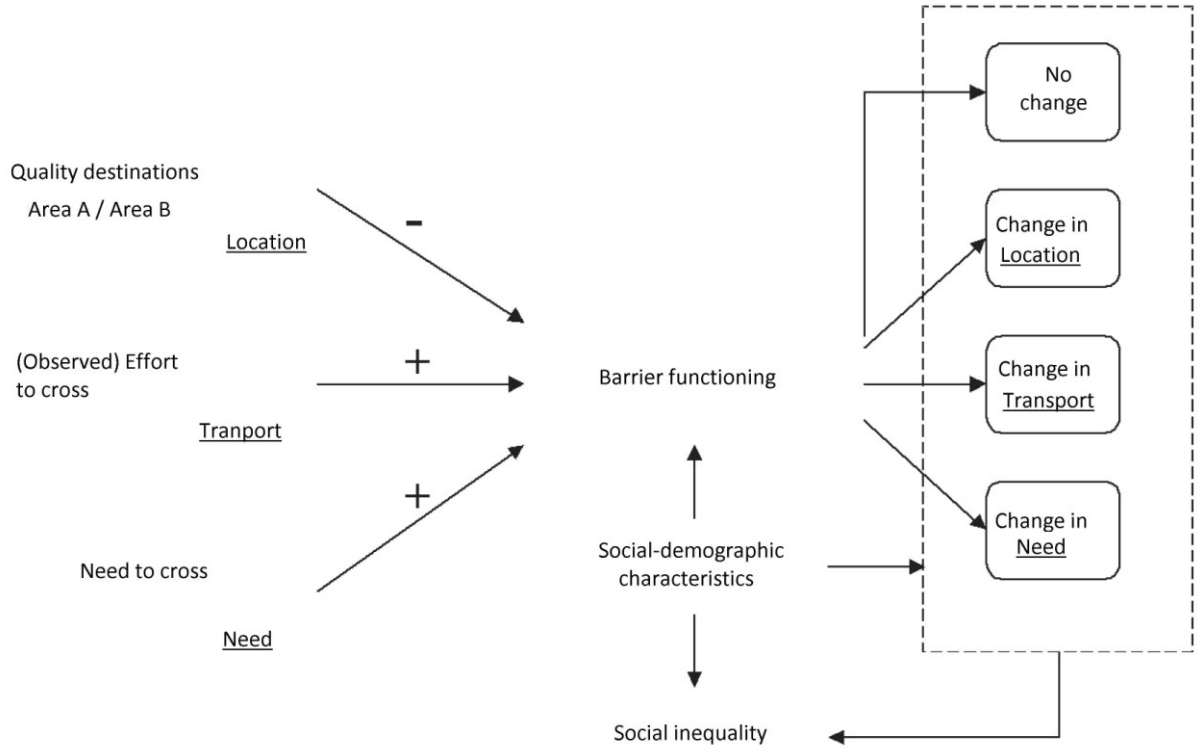
The figure shows that social effects depend on the 'location' (interaction demand and supply of destinations and activities), 'transport' (demand and supply of transport means and infrastructure), 'needs society' and 'individual needs' (demand for transportation and activities so the functioning of the group and/or individuals is stimulated). Besides that, the separate categories have also mutual influence on each other (Boon, 2004).

The B's in the figure represent policies of the government, the C's represent the context (Boon, 2004). In this research, the presence or absence represent a policy of the government with respect to transport (B_2 in the figure). Examples of contextual factors are welfare growth or technological developments. The interaction of the different categories is subsequently determinative for the degree in which the society is affected by the absence of the ferry services in the hypothetical market. Because ferry services transfer individuals from A to B over water, the absence of the ferry services can be seen as barrier functioning, as individuals are obliged to use other routes to get to the other side.

Barrier functioning

In the hypothetical market where ferry services are absent can be spoken of barrier functioning, as the bank connection between location A and B no longer exists. Traffic is obliged to choose another means of transportation, or adjust/give up the 'need' and/or 'location'. Social-demographic characteristics determine also the ability of individuals to adjust their need(s) or choose another means of transportation (car, public transport). As said before, social inequality can occur when these differences do not correspond with subjective standards and values (Boon, 2004). This is illustrated in the figure below.

Figure 4.3: Conceptual model for barrier functioning



Bron: own elaboration to Boon, 2004

The degree of barrier functioning by the absence of ferry services depends on the effort to cross the barrier (+) and the need to cross (+), but the quality of the destinations (-), the income, age and gender of individuals do not have any influence (Boon, 2004). The individuals who do not adjust their location have to make a detour. This causes extra car kilometres, with (extra) noise pollution as a consequence. Moreover, the road safety could deteriorate. These costs are mapped by using prevention costs and shadow prices.

Noise pollution

From different studies is has become clear that noise pollution is one of the most important factors of annoyance (Franssen et al., 2004; Algemene Rekenkamer, 2009). Road traffic is, besides noise from neighbours and flight traffic, the biggest source of noise pollution (Franssen et al., 2004). Furthermore, it applies that noise pollution is experienced at a higher level when the density of the population increases. Besides sleep disturbance, noise pollution can also lead to negative effects on

health, such as a higher blood pressure and heart diseases (Algemene Rekenkamer, 2009). Since it can be said that the detours – as a result of barrier functioning – lead to higher levels of noise pollution, it is important to quantify these costs. The data which CE Delft has published in 2004, based on the WTP of individuals, is used in this research to quantify the costs of noise pollution. These shadow prices are described in the table below.

Table 4.1: Financial valuation external costs of noise pollution (eurocent/km)

Type of vehicle	Urban driving cycle	Extra-urban driving cycle
Passenger car	1,0	0,1
Bus & truck solo	8,6	0,4
Motorcycle	11,6	1,7
Moped	3,5	0,5
Delivery van	1,3	0,2
Truck combination	14,5	0,7

Source: CE, 2004

Road safety

In general, individuals have to travel longer distances to get from A to B in the absence of ferry services. When a driver decides to make a detour, this can increase the chance of road accidents. This chance depends on the road type which is chosen. Highways are for instance safer than provincial roads, which are in turn safer than rural roads (Willems et al., 2001).

To quantify the costs which are connected with road safety, the expected rate of hospitalization per travelled kilometre is used. This is expressed in the number of road accidents per million travelled kilometres, shown in table 4.2.

Table 4.2: Number of road accidents per million travelled kilometres

Road type	Number of road accidents (per million tkm's)
Extra-urban driving cycle	
Highway	0,06
Provincial road	0,08
Regional road (closed for slow traffic)	0,22
Road for all traffic	0,43
Urban driving cycle	
Main road	1,10
Residential street	0,57
Total Dutch road network	**0,31**

Source: SWOV, 2005; Rijkswaterstaat, 2005

4.4.2 Environmental effects

Besides social effects, the hypothetic absence of the ferry services also causes environmental effects. These environmental effects are caused as a result of the previously described barrier functioning.

Users of the ferry services are obliged to choose alternative routes if they want to reach their initial destination. The extra kilometres as a result of the detours cause extra emission of air pollutants (NO_x, SO_2, PM_{10}) and greenhouse gases, causing higher environmental stress. These environmental costs are valued using the external costs of the transport-related air pollution, consisting of pollution costs (i.e. health costs, diminishing biodiversity) and prevention costs. These external costs are illustrated in table 4.3.

Tabel 4.3: External costs transport related emissions (values 2010, in eurocent/km)

Emission → / **Modality ↓**	CO_2	NO_x	SO_2	PM_{10}			**Total** (weighted)
				Urban(metropolis)	Urban	Rural	
Car	0,52	0,30	0,23	1,21	0,39	0,25	1,38
Delivery van	2,46	5,69	0,96	2,75	0,88	0,55	1,85
Truck	0,17	0,17	0,09	8,37	2,69	1,66	11,02
Motorcycle	0,50	0,53	0,019	1,22	0,39	0,24	1,18

Source: CE, 2008

These values deviate significantly from the values used in the previous research (Oostinjen, 2004). The external costs of the emission of CO_2 are lower as a result of new interpretations and calculations. The external costs of NO_x and PM_{10} are substantial higher as a wrong unit was used in the aforementioned research[1].
In the Netherlands only the Randstad qualifies as metropolis; therefore only the data with relation to urban and rural areas are used in the calculation of the external costs.

4.5 Economic value

The economic value is the total economic value for the economy, connected with a good or service. This is done by looking at the supply side of the good or service. Any good or service which is carried out *commercial* is an economic activity. Whether or not there is a strive for profit does not matter for the qualification as economic activity (Norden, 2007). For this reason also free ferry services are taken along in determining the economic value of the ferry services sector. This is done by using the EIS-method.

4.5.1 EIS-method

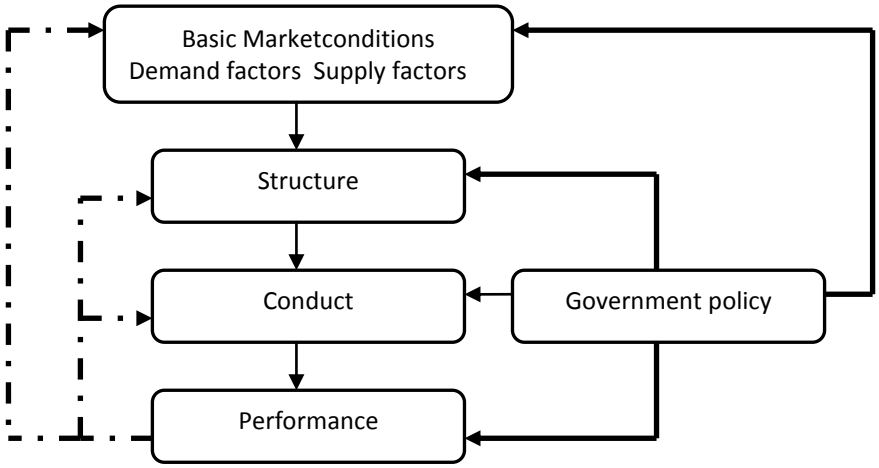
Several methods can be used to determine the economic value of a sector or industry. One can look at the *direct* economic value, the *indirect* economic value, or both. The indirect economic value of the ferry services sector consists of the turnover, added value and employment created in other sectors connected with the ferry services sector. This is not an easy thing to do as *all* subcontractors have to be mapped. A much used method for doing this is the Economic Impact Study (EIS) method. This method is able to take all relevant subcontractors along in determining the economic value of a

[1] In the report *'Hoe ver is de overkant?'*, the emission of CO_2, NO_x and PM_{10} was expressed in euro's per tonne, while this had to be euro's per kilogramme for the emission of NO_x and PM_{10}.

sector. By doing this, the direct and indirect economic value can be determined. In line with the previous research (Oostinjen, 2004), this method will be used to determine the economic value of the ferry service sector. This method will be briefly discussed.

An EIS tries to map the social-economic value of a sector (Peeters & Debisschop, 1995). As said before, different aspects could be included in determining this value. The EIS-method focuses on the turnover, added value and employment which a specific sector generates, both direct and indirect. The theoretical framework of the EIS-method is the *Structure-Conduct-Performance* (SCP) model. This model is illustrated in figure 4.4.

Figure 4.4: The Structure-Conduct-Performance model



Source: own elaboration to Strikwerda, 2002

In this model, different aspects have an influence on the behavior of ventures (*Conduct*). First, the *structure* of the market is analyzed, whereby strengths and weaknesses, current government policy and future expectations are mapped. Next, the effect of an altered government policy on the *conduct* of ventures is assessed (Peeters et al., 1999). The *performance* of ventures after the altered government policy is introduces is examined last. In this way one can examine whether or not the altered policy has the desired impact.

The EIS-model is a useful tool in examining government policy with respect to the ferry services sector. The strength of this method is the bottom-up approach, whereby data is obtained at company level. In line with the previous research, only the direct economic value has been examined for the comparability. This has been done by using supply-questionnaires. The economic value has been based only on the direct turnover from ticket selling and employment of the ferry services. Similar with the previous research, the added value is not included into the research report due to company-sensitive information. The employment is expressed in Full Time Equivalents (fte), where 1,0 fte represents a full time working week of 40 hours. This unit makes it possible to express the employment in full time jobs. A job of 20 hours corresponds thus with 0,5 fte.

4.6 Conclusion

In this section was put forward that from an economic point of view, the social value can be described as the total economic value which is connected with a good or service. The ferry services in the Netherlands have a social value because human needs are satisfied. Subsequently, this social value can be subdivided in (direct) valuable and (indirect) non-valuable values.

The non-valuable values could be quantified by using a specific Cost-Benefit Analysis, the Contingent Valuation approach (CV-approach). Within a CBA all costs and benefits of a project or policy measure are compared. The outputs of a certain project or policy are expressed in the *willingness-to-pay* (WTP) or *willingness-to-accept* (WTA). The WTP indicates how much an individual wants to pay to be indifferent between the *status quo* and the situation in which the policy measure is implemented. When a certain policy excludes a good or service from an individual, this person wants to be compensated; in these cases, the WTA expresses the value of the compensation. The CV-approach makes use of questionnaires to determine the willingness to pay (WTP and WTA). Characteristic for this approach is the creation of a hypothetical market, in which a specific good or service is present or absent. The valuation of the respondents is therefore *contingent* or context-dependent. Nevertheless, one has to take into account possible systematical deviations in the given WTP/WTA. In this research is therefore carefully paid attention to the presentation of questions in the questionnaires to reduce/intercept the aforementioned strategic deviations (see Annexes 1 and 2).

Non-valuable goods could be mapped by analyzing the effects of a certain policy. These effects could be categorized in several ways, such as classification to time (short vs. long term), space (macro, meso, micro) or receptor (society, environment, individuals). The way of categorization determines which effects could be taken along the analysis. Given the period of time and the available data, only the social effects and environmental effects on macro level are examined in this research – in line with the previous research.

Social effects depend among others on the location (correlation supply and demand of destinations and activities), transport (supply and demand of transport modalities and infrastructure) and the needs of the community. The absence of ferry services could thereby be seen as barrier functioning, as the bank connection between location A and B no longer exists. The degree of barrier functioning is thereby dependent on i.a. the difficulty to cross the barrier and the *need* to cross. On the other hand, individual characteristics do *not* play a role. Subsequently, this barrier functioning can lead to two other (social) effects: noise pollution and lower road safety. The reasons for this are the longer distances which users have to travel in the absence of a specific ferry service. These social costs are valued by using respectively shadow prices and the expected rate of hospitalization. Moreover, the detours cause higher environmental stress, as the extra (road) kilometres cause a higher emission of greenhouse gases. These environmental costs are valued using the external costs of the transport-related air pollution, consisting of pollution costs and prevention costs.

In line with the previous research is chosen for the Economic Impact Study (EIS-method) to quantify the economic value. The EIS-method focuses on the turnover, added value and employment which a specific sector generates, both direct and indirect. In this research, however, only the direct economic value of the ferry services sector has been mapped using the turnover and employment which is generated. The turnover has thereby only been based on the direct turnover from ticket selling; the

employment is expressed in Full Time Equivalents (fte), where 1,0 fte represents a full time working week of 40 hours.

5. Social value

5.1 Introduction

In this chapter the social value of the ferry services is discussed. First, the Contingent Valuation (CV) approach is used to quantify this value. Next, some qualitative aspects are discussed. As the users of the ferries over saltwater have no real alternatives, the CV-approach is not usable. As such, only the ferry services over freshwater are included in the analysis. The absence of the ferry services over saltwater will, however, without doubt lead to barrier functioning, as users are unable to satisfy their transport needs. Therefore intuitively can be said that the ferry services over saltwater have a considerable social value. Before mapping the social value of the ferry services over freshwater, the used method is presented.

5.2 Method

The social value of the ferry service sector is determined using the CV-method. User-questionnaires have been send to the same ferry services as in the previous research to have a good comparison. As the number of ferry services has grown compared with the previous research, a growth factor is used for the number of ferry services in the sample. As such, 17 ferry services are approached. These ferry services have each received 200 questionnaires, whereby was asked to collect these questionnaires on four different days during the week. Next to this was asked to collect on a Wednesday and a Saturday anyway, to have a distribution during the week.

In total, 1152 questionnaires have been returned. This is considerably lower than in the previous research. The low response among ferry services and the fact that not all 200 questionnaires per ferry service have been returned explain the low response rate. To have a reliable sample of the ferry-users there is assumed that the user-questionnaires have been taken equally over the week. As such, 71% (5/7*100) of the returned questionnaires would be collected during the week, with remaining questionnaires collected during weekends. To determine whether or not this is true, a Pearson Chi-Square test is carried out[2]. It appears that the questionnaires which were returned do significantly deviate from the assumption. Therefore, the number of questionnaires which are taken during the week and weekend are weighted according the assumption of equal distribution over the week. This is illustrated in table 5.1.

Table 5.1: Weighting factors user-questionnaires

	Number	Weighting factor	Number after correction
Week	780	1,00	780
Weekend	372	0,84	312
Total	1152	-	1092

Source: own elaboration

[2] See Annex 3 for the calculation of the chi-square test.

5.2.1. Quantification

As discussed in paragraph 4.3.2, the Contingent Valuation approach makes it possible to valuate non-valuable goods. The four steps which have to be taken to do this are outlined below.

1) *Creating a hypothetical market*
   The hypothetical market in this research is a market where ferry services are absent. The user is asked in the questionnaire how the trip would be made if the current ferry services is absent. As the users of the ferry services over saltwater have no real alternatives, it is not possible to use the CV-method. As such, only the ferry services over freshwater are examined.
2) *Obtaining the WTP/WTA*
   To retrieve the willingness to pay for the ferry services, written questionnaires are used. There is emphasized that the questionnaire is used to determine the social value of the *whole* ferry services sector and not the specific ferry service they are using at the time the questionnaire is taken. Doing this reduces the chance on 'social desirable' outcomes. As the absence of the ferry services excludes a transport modality, the users want to be compensated. As such, the Willingness-to-Accept (WTA) is asked.
3) *Calculating the mean WTA.*
   After the WTA of the questioned users is determined, these values are summed up and a mean WTA is calculated.
4) *Merging data*
   After the mean WTA is calculated, this value is multiplied with the total number of transfers of the ferry services. As some ferry services are absent in this research, there can statistically nothing be said about these ferry services. To have a comparison with the previous research, some ratios – as the total number of transfers – are based on the previous research (Oostinjen, 2004).

5.2.2 Willingness-to-Accept

As said in the theoretical framework, the Willingness-to-Accept (WTA) is asked because the absence of the ferry services excludes a transport modality and users want to be compensated for this. Because of the barrier functioning, users have to make detours if they want to reach their initial destination. Therefore, the cost of these detours are the norm for calculating the WTA. These costs consist of extra travel costs and the costs of extra travel time:

WTA= Extra travel costs + costs extra travel time

Extra travel costs

The extra travel costs depend on the chosen alternative and the extra kilometres of the detour. This is asked in the user-questionnaire. As the ferry service is not used in the hypothetical situation, the extra travel costs are corrected with the costs a ferry transfer normally would cost. The correction costs are €1,25 for normal ferry services and €1,74 for Public Transport ferry services.

Extra travel costs= ((Costs alternative per km* amount of detour km's)-costs ferry service)

In the user-questionnaire, the user was asked which alternative was chosen in the absence of the ferry service and the extra kilometres this would cost. The respondent was asked which category of extra kilometres corresponded with the average number of extra kilometres. If a respondent did not know exactly the number of extra kilometres, the average of the other categories was taken (11,89 kilometres). These data is shown in table 5.2 and 5.3.

Table 5.2: Number of extra kilometres

Category	Number of km
0-5km	2,5
5-10km	7,5
10-20km	15
>20km	25
Unknown	11,89

Table 5.3 Costs per alternative (€/km)

Alternative	Costs per kilometre
Detour by bike	0,11
Detour by car	0,34
Public Transport	0,18
Not make the trip	-

Source: ANWB, V&W(2009)

Extra travel time

The extra travel time is also depended on the chosen alternative. The valuation of the extra travel time depends however on the travel motive of the user. Four travel motives could be distinguished: commuter traffic, business traffic, commercial transport and other traffic. Scholars, social and recreational traffic are thereby placed in the category 'other traffic'. The time valuation of the different travel motives is given in table 5.4.

Table 5.4: Time valuation by travel motive

Travel motive	Time valuation(€ /hour)
Commuter	7,94
Business	26,67
Commercial	45,95
Other	5,29

Source: SEO, 2006; VITO, 2007

5.3 Analysis

Within the ferry services over freshwater, two categories could be distinguished: 'normal' ferries and Public Transport (PT) ferries. From the method above follows an individual valuation per user for the two categories ferry services. The individual WTA's which follow from the user-questionnaire are summed up, after which the mean WTA for the specific category ferry services is multiplied by the respectively total number of transfers of the category. As indicated before, the total number of transfers for the normal ferry services over freshwater is based on the previous research. Consecutively, the WTA of the normal ferry services and public transport ferry services are discussed.

5.3.1 Social value normal ferry services

In table 5.5 is the social value of the normal ferry services described. It becomes clear that the total social value of the normal ferry services has grown significantly with respect to the year 2004. This is mainly caused by the increased extra travel costs per user.

As said before, the extra travel costs depend on the chosen alternative, the number of extra kilometres and the costs per kilometre which is used in the calculations. What is remarkable in the current research is the considerably higher percentage which chooses the car as an alternative, namely 61% (2004: 47%). The 12% which chooses the bike as an alternative on the other hand, is much lower than in the previous research (2004: 29%). There no clear explanation for these remarkable differences. Besides this, only 1,8% percent of the users indicates to use public transport (2004: 10%).

Table 5.5: Social value normal ferry services 2004 - 2009

Type of costs				
	Year	**Average costs a year per user**	**Average costs per user per transfer**	**Total number of transfers a year (29.975.607)**
Extra travel costs	2009	€ 543,54	€ 2,78	88,3 million euro (€ 88.332.187,46)
	2004	€ 346,58	€ 1,55	46 million euro (€ 46.462.190,85)
Costs extra travel time	2009	€ 1113,88	€ 5,69	170,6 million euro (€ 170.561.203,83)
	2004	€ 1515,79	€ 6,17	185 million euro (€ 184.949.495,19)
Total WTA	2009	€ 1657,42	€ 8,47	**258,9 million euro** (€ 258.893.391,29)
	2004	€ 1862,37	€ 7,72	231 million euro (€ 231.411.686,04)

Source: own elaboration

When one looks at the number of extra kilometres, a user has to travel 13,5 kilometres *extra* on average. In 2004, this was 12 kilometres. For the bike the number of extra kilometres has decreased from nine to eight kilometres; for the car this number has increased from 15 to 17 kilometres. The costs per kilometre have, however, increased for all alternatives with respect to 2004. Especially the costs per kilometre for the use of a car (34 cents) is significantly higher compared to the previous research (2004: 28 cents). The higher valuation of the costs per kilometre with respect to the year 2004, combined with the higher percentage in the sample which uses the car as an alternative, are the most important cause for the increase in the average costs per user. The average costs for extra travel time have however decreased. This is striking as the average time valuation has increased with respect to the year 2004. The average extra travel time per user has however decreased, which explains the decrease in extra travel costs. Because of the lower user-frequency, the average extra costs a year are proportionally lower for both the extra travel costs and the costs of extra travel time.

5.3.2 Social value Public Transport-ferry services

The current sample only represents one Public Transport ferry service. As such, this sample is *not* representative for the PT-ferry services and therefore *no* statistical statements could be made. The WTA of this category will therefore be calculated on the basis of the previous research (Oostinjen, 2004), with the current valuation of the extra costs.

In table 5.6 is the social value of the PT-ferry services described. It follows that the total social value of the PT-ferry services has increased substantially. This is caused by a significant growth in both the extra travel costs and the extra travel time per user.

Table 5.6: Social value PT-ferry services 2004-2009

Type of costs	**Year**	**Average costs a year per user**	**Average costs per user per transfer**	**Total number of transfers a year (2.909.000)**
Extra travel costs	2009	€ 79,12	€ 0,27	785.000 euro (€ 785.430,00)
	2004	€ 17,57	€ 0,06	168.000 euro (€ 168.300,00)
Costs extra travel time	2009	€ 1579,32	€ 5,39	15,7 million euro (€ 15.679.510,00)
	2004	€ 972,34	€ 4,35	12 million euro (€ 12.201.750,00)
Total WTA	2009	€ 1658,44	€ 5,66	**16,5 million euro** (€ 16.464.940,00)
	2004	€ 989,91	€ 4,41	12 million euro (€ 12.370.050,00)

Source: own elaboration

As the characteristics of the users are based on the previous research, the explanation for the growth of the WTA must be sought in the valuation of the extra costs. As discussed in the previous paragraph, the costs per kilometre have increased for all alternatives. Due to this the average extra travel costs are significantly higher. The extra travel costs for the users of PT-ferry services are however much lower than for the users of normal ferry users, similar with the previous research (Oostinjen, 2004). A possible explanation is the higher percentage which makes a detour by bike (51%), with a lower valuation of extra travel costs. Furthermore, the correction costs for the PT-ferry service (€ 1,74) are higher than for the normal ferry services (€ 1,25), leading to lower extra travel costs. Because of the higher valuation of time, the costs of extra travel time have increased.

An overview of the total WTA of the ferry services over freshwater, including the total WTA in the year 2004, is given in table 5.7. Because the number of PT-ferries was not representative for the sample, the total WTA of this category only serves as an indication/comparison.

Table 5.7: Total WTA ferry services 2004 - 2009 (in euro's)

Category	Year	Total WTA
Normal ferries	2009	258,9 million
	2004	231 million
PT-ferries	2009	16,5 million
	2004	12 million
Total	**2009**	**275,4 million**
	2004	243 million

Source: own elaboration

5.3.3 Social costs in the absence of ferry services

As said in the theoretical framework, the barrier functioning due to the absence of ferry services leads to social and environmental costs. These social costs are given in table 5.8[3].

Table 5.8: Social costs in the absence of ferry services (in euro's)

Category	Year	Environmental damage*	Noise pollution	**Total environmental costs**	**Extra traffic accidents**
Normal ferries	2009	5,1 million	€ 502.938,-	5,6 million	102
	2004	3,0 million	€ 690.994,-	3,6 million	75
PT-ferries	2009	€ 51.813,-	€ 5729,-	€ 57.542,-	1
	2004	€ 49.960,-	€ 11.936,-	€ 62.916,-	1
Total	**2009**	5,1 million	€ 508.868,-	**5,6 million**	**103**
	2004	3,0 million	€ 702.930,-	3,6 million	76

* Included are the environmental costs of the emission of CO_2, NO_x, SO_2 and PM_{10}. Valuation 2004 in values 2010.

Source: own elaboration

The social costs in the absence of ferry services differ significantly with the previous research (Oostinjen, 2004). This is caused partially by the higher valuation of the environmental costs with respect to the year 2004. Besides this, the calculation of the environmental costs in 2004 was incorrect. Therefore, the environmental costs in 2004 are valued in the values of the year 2010 to have a more accurate comparison.

The users of normal ferry services which make a detour cause 329 million extra kilometres. This is much higher than in 2004 as a result of a higher percentage users which use the car as an alternative, combined with a higher mean of detour-kilometres. The PT-ferry users cause four million extra kilometres, which is slightly higher than in 2004 due to an increase in the amount of users. The total

[3] See table 4.3 for the external costs of transport related emissions per kilometre.

costs of noise pollution are considerable lower than in 2004 due to al lower valuation of the external costs. The shadow prices of noise pollution (see table 4.1) for the different categories are weighted, after which a mean shadow price per kilometre is calculated. As such, the used shadow price is 0,1526 eurocent. In the previous research this was 0,3231 eurocent, which is significantly higher. The reason for this difference is the decreased valuation per vehicle category with respect to 2004 due to an altered valuation method[4].
The extra traffic accidents are not valued financially to have a comparison with the previous research (Oostinjen, 2004). When this would be done, however, the social costs would be significantly higher.

5.4 Conclusion

The absence of ferry services causes barrier functioning. Users are then obliged to alter their behavior by changing their need, type of transport and/or location. When a user still chooses to make the trip, there are most of the time extra costs involved, dependent on the chosen alternative. By determining the monetary amount with which a user wants to be compensated for 'taking away' the ferry service, the *willingness-to-accept* (WTA), the social value of the ferry services could be quantified.

The WTA is obtained by collecting user-questionnaires at several ferry services. Because the focus of this research is on the ferry services over freshwater, the ferry services over saltwater are not incorporated in determining the social value of the ferry service sector. Moreover, as the users of the ferry services over saltwater have no real alternatives, the method to determine the WTA of these users can not be used. Because these users are to a large extent dependent on the ferry services over saltwater, intuitively, the social value of these ferries is substantial.

Within in the ferry services over freshwater, two categories could be distinguished: the normal ferries and the public transport (PT) ferries. The normal ferries have a social value of 258,9 million euro and transfer 29.975.607 persons a year. The number of transferred persons is hereby based on the previous research, as a number of ferry services is absent in the current sample. Users of normal ferry services have to travel 13,5 extra kilometres on average because of the barrier functioning. This causes 329 million extra kilometres in total. Besides the individual costs which are connected with the extra kilometres, there are also social (external) costs involved. The extra kilometres lead to higher environmental stress, as the extra kilometres cause a higher emission of air pollutants and greenhouse gases (CO_2, NO_x, SO_2, PM_{10}). The total external costs of these emission total up to € 5.089.552. Next to this, the detours could lead to extra noise pollution and a decrease of the road safety. The external costs of noise pollution total up to € 502.938. The extra kilometres cause 102 extra road accidents a year.

The total social value of the PT-ferry services is 16,5 million euro. This category transfers 2.909.000 persons a year. The users of the PT-ferry services have to travel eight extra kilometres on average, which sums up to four million extra kilometres in total. The environmental costs of this total up to € 51.812,51. The total costs of noise pollution total up to € 5729,41. As a consequence of the detours, one extra road accident is caused.

[4] For comparison: the price per kilometre of noise pollution in the extra-urban driving cycle for a passenger car has decreased from 0,2 to 0,1 eurocent, which means a decrease of 50%.

From the analysis is put forward that the social value of the ferry services over freshwater is substantial. Not only by the role the sector plays *itself* for the users (*quantitative* aspects), but also by the prevention of social costs which would occur in the absence of the ferry services (*qualitative* aspects). Moreover, the social value – including the social and environmental aspects – of the ferry services has grown significantly with respect to 2004. The growth of the total WTA of the normal ferry services is mainly caused by the higher percentage users which chooses the car as an alternative to make a detour, in combination with a higher valuation of the price per kilometre. As the percentage PT-ferry services in the sample was *not* representative, no statistical statements could be made based on the current sample. The characteristics of these users are therefore based on the previous research. Hence, the valuation of the social value of the PT-ferry services only serves as an indication/comparison.

6. Economic value

6.1 Introduction

As discussed in the theoretical framework, the economic value of the ferry services will only be based on the direct economic value. Subsequently, this direct economic value is based on the direct employment and turnover of the sector. Because the focus of this research is on the ferry services over freshwater, the ferry services over saltwater are not incorporated in the analysis. This section also starts with describing the used method, after which the analysis – based on statistical indicators – takes place.

6.2 Method

In paragraph 3.3 was outlined that at present there are 243 ferry service in the Netherlands. Because it would be very time consuming to incorporate all ferry services in the research – and in line with the chosen comparability of the previous research (Oostinjen, 2004) – it is decided to take a sample of the population ferry services. In this sample are 102 ferry services incorporated – not being self service ferry services – which sail throughout the entire year. This is an increase of 13% with respect to the previous research, where 90 ferry services were incorporated. The economic value of the ferry service sector is determined using the supplier-questionnaires which were send to the ferry services of the sample. Because of the low response among the ferry services (69%), the missing data is extrapolated using data from the previous research (Oostinjen, 2004) as the response percentage was considerable higher at that time (97%). Thereby are the values of the missing ferry services split up to the type of ferry service and ownership structure, after which they are replaced by the respectively categorical mean. By doing this, a more accurate comparison could be made with the previous research. Because only the direct turnover and employment is taken along in this research – similar with the previous research – , the economic value of ferry service sector is higher when also the *indirect* turnover and employment is taken along.

6.3 Ferry services over freshwater

There are 93 ferry services over freshwater incorporated in the sample. The ferry services which have returned the questionnaire are described in table 6.1. The direct economic value of the ferry services over freshwater after extrapolation is described in table 6.2. The free ferry services are described in table 6.3. Because all the ferry services were represented in this category, no extrapolation was needed. Besides the turnover and direct employment, the number of ferry services per category and the number of transferred persons is also incorporated. Furthermore, the ratios are subdivided to category and type of ferry service. Thereby must be noticed that all the PT-ferry services are pedestrian-bicycle ferries.

Table 6.1: Response ferry services over freshwater, including PT-ferries

		Population	Response	Numer of transferred persons a year	Turnover	FTE
Normal ferries	Car-ferries	50	38	13,5 million (13.564.056)	16,3 million (16.314.386)	242 (242,34)
	Pedestrian-bicycle ferries	27	11	1,3 million (1.314.839)	1 million (1.045.935)	37 (36,5)
PT-ferries		7	7	2,9 million (2.909.000)	4,9 million (4.949.288)	142 (142,17)
Total		**84**	**56**	**17,7 million** (17.737.895)	**21,0 million** (21.049.609)	**421** (421,01)

Source: own elaboration

Table 6.2: Direct economic value ferry services over freshwater 2009

		Population	Numer of transferred persons a year	Turnover	FTE
Normal ferries	Car-ferries	50	18,7 million (18.668.164)	20,7 million 20.732.445)	311 (311,12)
	Pedestrian-bicycle ferries	27	2,2 million (2.185.949)	1,8 million (1.771.325)	75 (74,7)
PT-ferries		7	2,9 million (2.909.000)	4,9 million (4.949.288)	142 (142,17)
Total		**84**	**23,8 million** (23.763.113)	**27,4 million** (27.453.058)	**528** (527,99)

Source: own elaboration (extrapolation missing data)

Table 6.3: Direct economic value free ferry services over freshwater 2009

		Population	Response	Numer of transferred persons a year	Turnover	FTE
Normal ferries	Car-ferries	3	3	1,5 million (1.520.000)	0,00	16 (15,5)
	Pedestrian-bicycle ferries	6	6	7,1 million (7.110.000)	0,00	68 (68,3)
Total		**9**	**9**	**8,6 million** (8.630.000)	**0,00**	**84** (83,8)

Source: own elaboration

6.4 Analysis

Some remarkable things are put forward by the previous tables. First: despite of the absence of a number of ferry services in the sample, the total turnover is only slightly lower than in 2004. This implies that the average turnover per ferry services has increased. Next, the total number of transferred persons by the free ferry services has slightly increased with respects to the previous research (2004: 8,4 million persons). This increase is ascribed to the free car ferries. Within this category, a relatively small number of ferry services transfers a considerable number of persons. The explanation for this must be sought in the fact that a large number of small ferry connections fall within the category normal ferry services.

In the previous research (Oostinjen, 2004), a substantial number of ferry services had an operating deficit. To determine whether this is still the case, the financial position per category ferry services has been examined.

6.4.1 Financial position

The ferry services which have returned the questionnaire transfer together over 26 million persons a year. After extrapolation, this is over 32 million persons. The total turnover is over 21 million euros and the generated employment is 505 fte's. After extrapolation this results in 27,4 million euros and 612 fte's, respectively. In the current research, over 26% of the ferry services over freshwater have an operating deficit, which totals op to € 6.176.744,- euros[5].

Subsequently, the different categories are discussed[6], whereby the technical characteristics and the time schedule of the ferry services are not taken into account. A ferry service which sails according a 24-hour time schedule will, for example, need more fte's to execute such a schedule than a ferry service which has a 'normal' schedule. This translates in higher exploitation costs, and as a result it could be more difficult to implement cost savings. There is, however, looked at the ownership structure of the ferry services, as it became clear from the previous research that there were significant differences between the different ownership structures.

Car-ferries

Within this category there are four different ownership structures: privately-, municipally-, provincially-, and state-owned ferry services. Successively, the comparison of the statistical indicators of these categories with respect to 2004 will be discussed.

The statistical indicators of the private ferry services are described in table 6.4. It follows that – although the exploitation costs have increased – the private ferry services have increased their profit margin on average. The performance per fte has however decreased with respect to 2004. A possible explanation for the increased exploitation costs are inflation and increased fuel prices.

[5] In 2004, the total operating deficit was 18 million euros (€18.639.774,47). However, there is no information about the actual percentage of the ferry services which had an operating deficit. Due to this, only statements could be made on the total operating deficit with respect to the previous research (Oostinjen, 2004).

[6] Note: based on the sample. The total numbers of transferred persons per category can therefore *not* be compared with each other.

Table 6.4: Statistical indicators private car-ferries 2004-2009

Private car-ferries		
Statistical indicator	**2009**	**2004**
Number of fte	68,05	134,2
Transferred persons	**4.873.350**	10.675.900
Transferred persons per fte	71.614	79.552
Return per person transferred	**€ 1,25**	€ 0,88
Exploitation costs per person transferred	**€ 0,98**	€ 0,85

Source: own elaboration

The performance per fte for the provincial ferry services has increased substantially. This follows from table 6.5. Furthermore, both the return and exploitation costs per person have increased with respects to 2004. Inflation and increased fuel prices could also here be an explanation for the increased exploitation costs. The decrease in the exploitation costs for the other ferries which follow, is caused by the fact that these costs were considerably higher in 2004 with respect to the private and provincial ferry services. For the state-owned and municipal ferries, the exploitation costs are similar or higher than the other ferry services. The explanation for this must be sought in cost savings which exceed inflation and increased fuel costs.
The provincial ferry services have thus increased their profit margin by increasing the return per person. Where there was a small operating deficit in the previous research, this category now has a positive operating profit *without* subsidies.

Table 6.5: Statistical indicators provincial car-ferries 2004-2009

Provincial car-ferries		
Statistical indicator	**2009**	**2004**
Number of fte	20,5	59,04
Transferred persons	**1.415.000**	2.120.067
Transferred persons per fte	69.024	35.909
Return per person transferred	**€ 1,18**	€ 0,74
Exploitation costs per person transferred	**€ 1,00**	€ 0,83

Source: own elaboration

There is only one state-owned ferry service present in this research, while this were three in the previous research. The statistical indicators are summed up in table 6.6. The performance per fte has increased substantial. This category has also increased its profit margin by increasing the return per person and reducing the exploitation costs. Where there was a operating deficit in the previous research, there is now made a profit. In the previous research (Oostinjen, 2004) was put forward that the price for the use of a state-owned ferry service was not realistic anymore and action was needed. Besides this, this ferry service is privately exploited. From this point of view, the increase of the profit margin is plausible, as the return per person does not much deviate from that of the private ferry services. The decrease in exploitation costs is explained by the low exploitation costs of the ferry-type which is used for executing the ferry service.

Table 6.6: Statistical indicators state-owned car-ferries 2004-2009

State-owned car-ferries		
Statistical indicator	**2009**	**2004**
Number of fte	3,5	48
Transferred persons	**225.000**	2.206.287
Transferred persons per fte	64.286	45.964
Return per person transferred	**€ 1,24**	€ 0,12
Exploitation costs per person transferred	**€ 0,98**	€ 2,04

Source: own elaboration

The municipal car-ferries are described in table 6.7. The performance per fte has slightly increased. The return per person has also increased; although the municipal ferry services have reduced their exploitation costs, they have the highest exploitation costs compared to the other ownership structures within this category. Moreover, the increase in the performance per fte is lower compared with the other car-ferries. Despite the fact that this category has increased the profit margin on average, a quarter of the municipal ferries has an operating deficit.

Table 6.7: Statistical indicators municipal car-ferries 2004-2009

Municipal car-ferries		
Statistical indicator	**2009**	**2004**
Number of fte	150,29	110,34
Transferred persons	**7.023.452**	4.907.358
Transferred persons per fte	46.733	44.475
Return per person transferred	**€ 1,18**	€ 1,06
Exploitation costs per person transferred	**€ 1,09**	€ 1,47

Source: own elaboration

Pedestrian-bicycle ferries

Within this category, two ownership structures could be distinguished: privately- and municipally-owned ferry services. The statistical indicators of the private and municipal ferry services are respectively described in table 6.8 and 6.9.

Table 6.8: Statistical indicators private pedestrian-bicycle ferries 2004-2009

Private pedestrian-bicycle ferries		
Statistical indicator	**2009**	**2004**
Number of fte	12,5	23,15
Transferred persons	**566.000**	972.300
Transferred persons per fte	45.280	42.000
Return per person transferred	**€ 0,67**	€ 0,96
Exploitation costs per person transferred	**€ 0,80**	€ 1,15

Source: own elaboration

The performance per fte of the private ferry services has increased with respect to the previous research. The return per person has however decreased. As the exploitation costs have also been reduced, the exploitation deficit per person has decreased. When the subsidies are included in calculating the return per person, the return per person is € 1,06.
The municipal pedestrian-bicycle ferries have also increased the performance per fte. Next, the return per person has increased, while the exploitation costs have been reduced. However, this still means an operating deficit of € 0,15 per person. *With* subsidies, the return per person is € 1,10. For both ownership structures in this sample holds that the average operating deficit has thus been reduced. Nevertheless, the majority of the pedestrian-bicycle ferry services is dependent on subsidies.

Table 6.9: Statistical indicators municipal pedestrian-bicycle ferries 2004-2009

Municipal pedestrian-bicycle ferries		
Statistical indicator	**2009**	**2004**
Number of fte	24	33
Transferred persons	**748.839**	939.996
Transferred persons per fte	31.202	28.152
Return per person transferred	**€ 0,89**	€ 0,78
Exploitation costs per person transferred	**€ 1,04**	€ 1,86

Source: own elaboration

Public Transport-ferries

In this category there are seven ferries which are – as mentioned before – all pedestrian-bicycle ferries. As the statistical indicators in table 6.10 indicate, the performance per fte has slightly increased with respect tot 2004. Without subsidies, the return per person for both the private and provincial PT-ferries has increased, while both categories have reduced their exploitation costs. This category has a total operating deficit of 5 million euros when the subsidies are left out of consideration.

Table 6.10: Statistical indicators Public Transport ferries 2004-2009

Public Transport-ferries		
Kengetal	**2009**	**2004**
Number of fte	142,17	150,71
Transferred persons	**2.909.000**	2.805.000
Transferred persons per fte	20.461	18.611
Private return per person tranferred	**€ 1,44**	€ 1,28
Provincial return per person transferred	**€ 2,15**	€ 1,46
Private exploitation costs per person transferred	**€ 2,77**	€ 3,00
Provincial exploitation costs per person transferred	**€ 4,70**	€ 4,77

Source: own elaboration

A possible explanation for the high exploitation costs is the type of ship which is used. With the exception of only one ferry service, all ferry services use catamarans or Swath-ships. The investment- and exploitation costs of these ships are much higher due to the engines used and the longer distances for which they are used. Besides this can be noticed that the PT-connection Hoek van Holland – Maasvlakte is only operational since 2008, and due to the development of the Second Maasvlakte a growth in the number of transferred persons is expected. Because of that, the exploitation costs per person are expected to decrease.

6.5 Extrapolation

As mentioned in paragraph 6.2, comparison with the previous research can only take place when missing data is estimated. The statistical indicators in table 6.2 show that the total number of transferred persons *after extrapolation* does not much deviate from the total number in 2004, when 24 million persons were transferred by the non-free ferries. The turnover has however increased significantly with respect to 2004, which is confirmed by the analysis of the different categories ferry services. After al, the ferry services have increased their margin on average. The total number of fte's has decreased substantially. This decrease is mainly caused by the car-ferries, which employ less fte's then in 2004, while their number has remained the same.
In the table below the statistical indicators of the ferry services for 2004 and 2009 (after extrapolation) are given.

Table 6.11: Direct economic value ferry services over freshwater 2004 - 2009

		Population		**Number of transferred persons a year (in millions)**		**Turnover (x million euro)**		**FTE**	
Non-free ferries		2009	*2004*	2009	*2004*	2009	*2004*	2009	*2004*
Normal ferries	Car-ferries	50	50	18,7	20	20,7	16,4	311	352
	Pedestrian-bicycle ferries	27	17	2,2	1,6	1,8	1,3	75	54
PT-ferries		7	5	2,9	2,8	4,9	3,7	142	151
Free ferries	Car-ferries	3	3	1,5	0,9	0,00	0,00	16	16
	Pedestrian-bicycle ferries	6	**7**	7,1	7,5	0,00	0,00	68	68
Totaal		**93**	82	**32,4**	32,8	**27,4**	21,5	**612**	641

Source: own elaboration

Table 6.11 illustrates that the total number of transferred persons is almost identical to the number in 2004, but that the turnover has increased. The total number of fte's has however decreased, indicating the increased performance per fte once more.

6.6 Conclusion

Despite the fact that not all ferry services are incorporated in the sample, the economical value of the ferry services is substantial. The ferry services over freshwater transfer 32 million persons a year and have a total turnover of 27 million euros. Besides this, the ferry services generate employment for 612 fte's. Because only the direct turnover and employment is included in this research, the economic value of the ferry services sector is higher when also the *indirect* turnover and employment is included.

In 2004 the total exploitation deficit totalled up to 18 million euros. It was then suggested that the exploitation deficit could be reduced by increasing efficiency, thereby reducing exploitation costs and increasing turnover. The current analysis of the financial position of the ferry services over freshwater indicates that they have increased their margin on average. Nevertheless, the total exploitation deficit of these ferry services totals up to 6 million euros, of which the PT-ferries have an exploitation deficit of 5 million euros. The explanation must be sought in the high investment- and exploitation costs of the ship type which is used by the PT-ferries. The exploitation deficit of the normal ferries is mainly caused by the municipal car- and pedestrian-bicycle ferries. This is also confirmed by the average margin per person of the municipal ferries, which is lower than that of the private ferries. Moreover, the increase in the performance per fte for both the car- and pedestrian-bicycle ferries is lower compared to the other ownership structures. On the one hand, this could be an indication that there are possibilities to increase the efficiency of the municipal ferry services, for example by privatizing them, as the market seems to operate more efficient. On the other hand, the execution of a 24-hour time schedule – which implies more fte – is also an explanation for the lower performance per fte (and higher exploitation costs).

7. Ferry services and the environment

7.1 Introduction

As discussed in paragraph 4.4.2, the hypothetical absence of the ferry services causes higher environmental stress. Some aspects which could be mentioned are extra air- and noise pollution. But apart from these aspects, the ferry services themselves do also pollute. Therefore it is important to map the 'footprint' of the ferry services on the environment. Subsequently, the background of the environmental issues and the influence of inland navigation on the environment is discussed in this paragraph. Next, the footprint of the ferry services on the environment is described.

7.2 Background

Over the past decennia the attention for the environment has increased. Worldwide is paid more attention to air pollution, as the emission of the industry- and transport sector is continuing to grow, and structural policy is needed to cope with this problem (TNO, 2007). The increasing emission of detrimental gases are a serious problem for the public health. To dam this emission, maximum-emission values are formulated.

When one looks at table 7.1, it is clear that inland navigation has a substantial contribution to the total emission of the transport sector.

Table 7.1: Air pollution, emissions by all sources (mln kg)*

Periods	**2000**				**2008****			
	CO2	**SO2**	**NOx**	**PM10**	**CO2**	**SO2**	**NOx**	**PM10**
Mobile sources, total	39500	74,5	352	21,91	44200	73,8	318,5	19,88
Road transport	28400	3,1	156,2	10,08	32000	0,3	111,7	8,63
Inland navigation	2100	2,1	30	1,36	2000	1,9	28,2	1,16
Rail traffic	100	0,1	2,1	0,07	100	0,1	1,6	0,05
Air traffic	600	0,2	2,4	0,04	700	0,1	2,9	0,04
See-going navigation	4600	65,5	110,8	7,72	5700	69,8	137,1	8,35

* Caused on or above Dutch territory

** Interim data

Source: CBS, 2009

While inland navigation is an efficient mode of transport, transport by road has significantly reduced its emission, given the increase in transport volumes of both transport modalities. When one analyzes the growth in performance per transported weight for the period 1997-2006, the performance of inland shipping has increased with 3,3%, while transport by road increased with almost 30% (CBS, 2009). The emission per tonne-kilometre has thus decreased for transport by road. The absolute

value has however increased, while this does not hold for inland navigation. The CO_2-emission of inland navigation has namely decreased with almost 5%. Inland navigation thus loses territory when looking at the growth of transport volumes.

One of the reasons for the difference in the growth of emissions of road transport and inland navigation is the thought for years that inland navigation was a relative clean transport modality (Kasifa, 2002). Because of this, there has been almost no policy to reduce the (Greenhouse-) emissions of inland navigation, while this was the case for transport by road. The numbers in table 7.1 confirm this. Although the ferry services are only a small party within inland navigation, it is relevant – given the focus of this research – to have more insight in the emissions of ferry services. This will be discussed in the next paragraph.

7.3 A closer look on ferry services

Ferry services are in fact a bit of a stranger within inland navigation, as they can not be categorized in *one* category. The CBS does for example distinguish between passenger transport and freight transport, but is unclear to what category the ferry services belong. Ferry services transfer after all both persons and vehicles, including freight traffic. The problem of categorization arises thus from the question to which category the 'load' belongs. Hence, another way of determining must be followed to make statements on the emission. This has been done by the following steps:

- ***Classification ferry services to car- and pedestrian-bicycle ferries***

  With the different types of ferries are different techniques – and thus engines – involved. This is of influence on the height of the emissions.

- ***Assigning emissions to the different types of ferry services.***

  Assigning the emissions to the different types of ferries has been done by means of research which is executed by Royal Haskoning in 2004. The aforementioned research maps the emissions of different ship types, which differ in size and load capacity. In consultation with the working group is determined which ship type(s) can be used as benchmark for the different ferry types.

- ***Determining number of kilometres a year***

  To determine the total emission of the ferry services, the number of kilometres a year has been determined. This was done by determining the average distance per transfer for each category ferry services, after which the kilometres a year function as a norm for the whole category. In this way, an indication of the total kilometres a year is obtained for the ferry services.

7.3.1 Classification ferry services

Within the ferry service sector a distinction can be made a distinction between pedestrian ferries, pedestrian-bicycle ferries and car-ferries. Next, a distinction can be made to small, medium and large ferry services. Some car-ferries are large ferries, while most of the pedestrian- and pedestrian-bicycle ferries are small ferries. Table 7.2 describes the classification of the ferry services. Based on the type of ferry used, the ferry services are subsequently categorized in table 7.3.

Table 7.2: Categorial classification ferry services

Category	Pedestrian	Pedestian/bicycle	Car	**Total**
Number	3	37	53	93
Percentage	3,2	39,8	57,0	100

Source: own elaboration

Table 7.3: Classification to type of ferry

Category / **Type of ferry**	Pedestrian	Pedestian/bicycle	Car	**Total**
G-ferry*	0	0	10	10
Cable-ferry**	0	0	23	23
Ferry large***	0	0	8	8
Ferry small	1	14	9	24
Ferry-boat large***	0	8	0	8
Ferry-boat small	2	7	0	9
Electric ferry	0	2	3	5
Hydrofoil, catamaran	0	6	0	6
Total	3	37	53	93

* A G-ferry makes use of the river flow to transfer people

** A cable-ferry makes use of a cable across the river to transfer people

*** A ferry is a *flat* ship, like a pontoon, while a ferry-boat is a normal ship.

Source: own elaboration

7.3.2 Assigning emissions to the different types of ferry services

As the number of transferred persons varies per ferry-transfer, it is not easy to determine the emission per transport 'volume' per transfer. Intuitively, a ferry will have a higher emission of detrimental gases when much (freight) traffic makes use of the ferry service. But due to the absence of concrete data the emission per tonne-kilometre (g/tkm)and passenger-kilometre (g/pkm) can not be determined. The short distance over which most of the ferry services transfer people does also makes it almost impossible to determine the emission per transfer.

Due to the aforementioned aspects is chosen to determine the emission per used quantity of energy of the ferry services. Table 7.4 describes the emission per used quantity of energy in megajoule (MJ) for inland navigation as a whole. This data is used to approximately determine the emissions of the ferry services.

Table 7.4: Emission factor inland navigation (g/MJ)

Emission factors	CO_2	NO_x	PM_{10}	SO_2
	73	1,070	0,049	0,048

Source: CE, 2008

Next, by means of the average number of travelled kilometres (see paragraph 7.3.3), an indication could be given of the total emissions of the ferry services over freshwater. Table 7.5 describes the used quantity of energy per kilometre, based on research by Royal Haskoning (2004) and CE (2008).

Table 7.5: Energy use inland navigation (MJ/km)

Ship type	**Ferry type**	**Energy use**
Spits – Peniche	G-ferry, cable ferry ferry small, ferry-boat small	113
Kempenaar	Ferry large, ferry-boat large	178
Rhine Herne Canal Ship	Hydrofoil, catamaran	395

Source: CE, 2008; Royal Haskoning, 2004

In the table above, per ship type the corresponding ferry type is described. Thereby are electric ferries excluded, as this ferry type does not emit detrimental gases. Furthermore is presumed that G-ferries and cable-ferries are actuated with a small, outdated diesel engine. Therefore, the emission factors of the small ship type 'Spits' are used. This also applies for small ferries and ferry-boats.

For the larger ferry types are the emission factors used of the medium ship type 'Kempenaar'. The hydrofoil and catamaran are actuated by (large) powerful diesel engines. As such, the emission of detrimental gases is much higher. Therefore, the emission factors of the large ship type ''Rhine Herne Canal Ship' are used for determining the emission of these ferry types.

Multiplying the emission factors with the energy use of the separate ferry types produces the emission per kilometre. This data is described in the table below.

Table 7.6: Emission per ferry type (g/km)

Emission factors / **Ferry type**	CO_2	NO_x	PM_{10}	SO_2
G-ferry, cable-ferry	8249	120,91	5,54	5,42
Ferry large	12994	190,46	8,72	8,54
Ferry small	8249	120,91	5,54	5,42
Ferry-boat large	12994	190,46	8,72	8,54
Ferry-boat small	8249	120,91	5,54	5,42
Hydrofoil, catamaran	28835	425,86	19,36	18,96

Source: own elaboration based on tables 7.4 and 7.5

7.3.3 Determining number of kilometers a year

For the determination of the total number of kilometres a year for each category, a number of ferry services within each category has been closer examined. Based on these ferry services, the average transfer-frequency and average distance per transfer has been approximately determined for the specific category.

This has been done by determining the average distance per transfer for each category of ferry services, after which the kilometres a year function as a norm for the whole category. In this way, an indication of the total kilometres a year is obtained for the ferry services. Next, a distinction is made between large and small ferry-boats, because larger ferry-boats tend to travel longer distances. This is not the case for ferries. Furthermore, the G-ferries and cable ferries are merged into one category, based on the characteristics described in the previous paragraph. This data is described in table 7.7.

Table 7.7: Kilometres a year per category ferry services

Ferry type	Transfer frequency (a day)	Average distance travelled (km)	Number	**Total** (km)*
G-ferry, cable-ferry	150	0,4	33	722.700
Ferry large	150	0,5	8	219.000
Ferry small	150	0,5	24	657.000
Ferry-boat large	120	0,8	8	280.320
Ferry-boat small	120	0,6	9	236.520
Hydrofoil, catamaran	30	25	6	1.642.500

* transfer frequency x average distance x number of ferry services x 365 (days a year)

Source: own elaboration

7.3.4 Total emission of the ferry services

The total emission of the ferry services per year can be calculated by multiplying table 7.7 and 7.6. This data is described in table 7.8. It follows that the hydrofoil and catamaran are *relatively* the most polluting ferries with respect to the other ferry types. There are two reasons for this: on the one hand the use of large, powerful diesel engines and on the other hand the longer distances on which the aforementioned ferry types are used. The values of the other ferry types do not differ much from each other. When the data of table 7.8 is compared with the emission of inland navigation, the values correspond with 2-4% of the resp. emissions of inland navigation. Nevertheless, the total pollution of these ferries is still much lower than that of road transport. Although the total emission of the ferry services sector is not high compared to inland navigation, it is of interest to determine the level of 'environmental awareness' within the ferry services sector. This is discussed in the next paragraph.

Tabel 7.8: Air pollution, emission per type of ferry service

Emission factors / Ferry type	CO_2 (mln kg)	NO_x (tonne)	PM_{10} (tonne)	SO_2 (tonne)
G-ferry, cable-ferry	5,96	87,38	4,00	3,92
Ferry large	2,85	41,71	1,91	1,87
Ferry small	5,42	79,44	3,64	3,56
Ferry-boat large	3,64	53,39	2,44	2,39
Ferry-boat small	1,95	28,60	1,31	1,28
Hydrofoil, catamaran	47,36	699,48	31,80	31,14
Totals	67,18	990,00	45,10	44,16

Source: own elaboration

7.3.5 Initiatives within the ferry service sector

By means of the supplier-questionnaire an indication is obtained of the environmental awareness within the ferry services sector. 67% of the ferry services indicate that they are engaged in sustainability of *one's own* accord. However, when one takes a closer look on the initiatives which are implemented within the framework of sustainability, a dichotomy can be made between ferry services which try to be economically sustainable (51,3%) and ferry services which indeed try to be sustainable for the environment (48,7%).

The first category aims mainly on the control of exploitation costs and tries – where possible – to create sustainable cost savings. Furthermore, a number of ferry services indicate that they focus on the 'image' of the ferry service. These initiatives are thus aimed on guaranteeing the 'economical' continuity of the ferry service.
The other category indeed tries to be less harmful for the environment, although this can lead to higher exploitation costs. Initiatives which could be mentioned in this respect are the use of low-sulphur diesel, particular matter filters and other innovative systems which reduce the pollution to air and water. Although these initiative are first of all one's own accord, a number of ferry services indicate that future legislation also plays a role.

17,3% of the other ferry services indicate that they are not engaged in sustainability. Of the other 15,5% it is unknown whether or not sustainability does play a role.

7.4 Conclusion

Ferry services can not stay behind with respect to the environment. An active attitude is required given the intensified attention for the (living) environment. In this chapter, the background of the environmental problems is discussed after which a closer is taken on the emission of the ferry services. It becomes clear that it is not easy to place ferry services in a particular category (freight transport / passenger transport) when assigning emissions, as both categories could apply. Therefore

there is no explicit data with respect to the emissions. Due to the aforementioned reasons, the emissions are assigned on the basis of the type of ferry service. Thereby, per ferry type a corresponding ship type has been taken as a norm for the emissions. Subsequently, the total number of kilometres a year is determined for the different ferry types. After assigning the emissions, it becomes clear that the hydrofoil and the catamaran are *relatively* the most polluting with respect to the other ferry types. There are two reasons for this: on the one hand the use of large, powerful diesel engines and on the other hand the longer distances on which these ferry types are used. The values of the other ferry types do not differ much from each other. When the emissions of the ferry services are compared with those of inland navigation, the values correspond with 2-4% of the emissions of inland navigation. Nevertheless, this is still much lower than road transport.

From the supplier-questionnaires becomes clear that almost 70% of the ferry services indicate that they are engaged with sustainability of one's own accord. However, the interpretation of the term 'sustainability' differs per ferry service. Over half of the ferry services indicated that they were engaged in sustainability, meaning the (economical) continuity of the ferry service. The other ferry services indeed tried to be sustainable for the environment. As such is only one third of the ferry services engaged in sustainability. Given the percentage which tries to be sustainable can be concluded that the ferry service sector is on the right track with respect to sustainability. Nevertheless, it requires still necessary efforts before the whole sector has a 'sustainable' character.

8. Conclusions and recommendations

8.1 Introduction

From the research, conducted in 2004 (Oostinjen, 2004), it became clear that the social and economical value of the ferry service sector was significant, but that there were substantial exploitation deficits. Based on the aforementioned research and an amendment of the Member of Parliament mr. C.G. van der Staaij in the Dutch House of Representatives, the government reserved ten million euro's from the national budget in 2006 for the ferry services over freshwater. The current research aims at giving an actualization of the social and economical value. Hence, the following research question is formulated:

"What is the current social and economical importance of the ferry services in the Netherlands?"

Furthermore, given the ongoing focus on sustainable transportation and the impacts of transportation on nature and society, attention is paid to the 'footprint' of the ferry services on the environment. The research question will be answered in the following paragraphs. A future vision for the short- and medium term will also be given. Finally, recommendations are given for further research.

8.2 Conclusions

8.2.1 Social and economic value

In chapter four is demonstrated that the ferry services in the Netherlands have a social value, because human needs are satisfied. Subsequently, this value is quantified by mapping the *willingness-to-accept* (WTA) of the ferry service users. Because the focus is on the ferry services over fresh water and the used method is not applicable on the ferry services over saltwater, the last mentioned ferry services are not incorporated in the research. Intuitively, the social value of these ferry services is however significant.

The absence of ferry services can lead to barrier functioning. Users are then obliged to adjust their behavior by choosing another means of transportation, or adjust/give up the 'need' and/or 'location'. The individuals who choose to make a detour cause extra vehicle kilometres, with higher environmental stress as a consequence. Moreover, the noise pollution could increase and the road safety could deteriorate. The prevented environmental damage, noise pollution and road accidents represent the indirect social value of the ferry services. Because these aspects affect the society as a whole (see paragraph 4.4), these aspects are *qualitative*. The total social value of the ferry services over freshwater is described in table 8.1. A distinction is made between normal and Public Transport (PT) ferries. Because the number of PT-ferries was not representative for the sample, the total WTA of this category only serves as an indication/comparison.

Table 8.1: Total social value ferry services over freshwater anno 2009 (in euro's*)

Aspect / Category	*Quantitative aspect*	*Qualitative aspects*				**P.M*** **
	Total WTA	Environmental damage**	Noise pollution	**Total environ-mental damage**	**Extra road accidents**	- Cultural value - Recreative value
Normal ferries	258,9 million	5,1 million	€ 502.938,-	5,6 million	102	-
PT-ferries	16,5 million	€ 51.813,-	€ 5729,-	€ 57.542,-	1	-
Total	**275,4 million**	5,1 million	€ 508.868,-	**5,6 million**	**103**	**-**

* Except the number of road accidents.

** Included are the external cost of the emission of CO_2, NO_x, SO_2 and PM_{10}.

*** See also paragraph 4.4

Source: own elaboration

As the table above illustrates, the social value of the ferry services over freshwater is considerable. With respect to 2004 the social value has increased significantly in both the quantitative and qualitative aspects. This data is described in the table below.

Table 8.2: Total social value ferry services over freshwater 2004 - 2009 (in euro's*)

Aspect / Category		*Quantitative aspect*	*Qualitative aspects*			
	Year	**Total WTA**	Environmental damage**	Noise pollution	**Total environ-mental damage**	**Extra road accidents**
Normal ferries	2009	258,9 million	5,1 million	€ 502.938,-	5,6 million	102
	2004	231,0 million	3,0 million	€ 690.994,-	3,6 million	75
PT-ferries	2009	16,5 million	€ 51.813,-	€ 5729,-	€ 57.542,-	1
	2004	12,0 million	€ 49.960,-	€ 11.936,-	€ 62.916,-	1
Total	**2009**	**275,4 milion**	5,1 million	€ 508.868,-	**5,6 million**	**103**
	2004	243,0 million	3,0 million	€ 702.930,-	3,6 million	76

* Except the number of road accidents.

** Included are the external cost of the emission of CO_2, NO_x, SO_2 and PM_{10}. Valuation 2004 in values of 2010.

Source: own elaboration

The ferry services over freshwater thus play an important role for the users (*quantitative* aspects), but also for the society as a whole (*qualitative* aspects). The social costs of the extra road kilometres are almost 6 million euros. It must be noticed, however, that in line with the previous research (Oostinjen, 2004), the extra road accidents are *not* valued financially and thus not incorporated in the

calculation of the total social value. This implies that the actual total social costs are higher than the described value[7]. The ferry services thus have a non-insignificant social value.

The economic value of the ferry services is expressed in the direct turnover and employment which the sector generates. The employment is thereby expressed in the number of full time jobs (fte). The direct turnover of the ferry services over freshwater totals up to 27 million euros, while the sector generates employment for 612 fte's. These values are obtained after extrapolation of the sample. The reason for this extrapolation is the low response rate among the ferry services in the current research. The economic value is also higher when the *indirect* turnover and employment of the sector are incorporated. However, in line with the previous research this has not been done for the comparability. In the table below, the economic value of the ferry services in 2009 and 2004 is described.

Table 8.3: Direct economic value ferry services over freshwater 2004 - 2009

		Population		**Number of transferred persons a year (in millions)**		**Turnover (x million euro)**		**FTE**	
Non-free ferries		2009	*2004*	2009	*2004*	2009	*2004*	2009	*2004*
Normal ferries	Car-ferries	50	50	18,7	20	20,7	16,4	311	352
	Pedestrian-bicycle ferries	27	17	2,2	1,6	1,8	1,3	75	54
PT-ferries		7	5	2,9	2,8	4,9	3,7	142	151
Free ferries	Car-ferries	3	3	1,5	0,9	0,00	0,00	16	16
	Pedestrian-bicycle ferries	6	**7**	7,1	7,5	0,00	0,00	68	68
Totaal		**93**	82	**32,4**	32,8	**27,4**	21,5	**612**	641

Source: own elaboration

From the previous research (Oostinjen, 2004) became clear that a majority of the ferry services had exploitation deficits. The total exploitation deficit in 2004 totalled up to 18 million euro. The most important reasons for this were too low returns per person and an 'overstaffing' of fte's, especially at the governmental ferry services. Thereby must be noticed that when a ferry service sails according to a 24-hour time schedule, there is anyhow talk of overstaffing, as proportionally more fte are required for executing the time schedule. This also leads to a lower (statistical) performance per fte.

[7] When the road accidents would be valued financially, the total costs of the road accident are € 25.696.646,-, assuming a financial value of €249.482,- per road accident (Rijkswaterstaat, 2006). In 2004, this value would have been € 18.960.532,- .

The current analysis of the financial position of the ferry services over freshwater indicates that they have increased their margin on average. Besides this, the average performance per fte has increased. The efficiency has thus increased. Nevertheless, the total exploitation deficit of these ferry services totals up to 6 million euros, of which the PT-ferries have an exploitation deficit of 5 million euros. The explanation must be sought in the high investment- and exploitation costs of the ship type which is used by the PT-ferries. The exploitation deficit of the normal ferries is mainly caused by the municipal car- and pedestrian-bicycle ferries. This is also confirmed by the average margin per person of the municipal ferries, which is lower than that of the private ferries. Moreover, the increase in the performance per fte for both the car- and pedestrian-bicycle ferries is lower compared to the other ownership structures. On the one hand, this could be an indication that there are possibilities to increase the efficiency of the municipal ferry services, for example by privatizing them, as the market seems to operate more efficient. On the other hand, the execution of the previously mentioned 24-hour time schedule can also explain higher exploitation costs. The lower return per person with respect to the private ferry services indicates however that there is room for improvement on the revenue side[8].

8.2.2 Ferry services and the environment

Given the intensified attention for the (living) environment it is important to analyze how 'sustainable' the ferry service sector is and what attitude the exploiters have with respect to sustainability. From the analysis it becomes clear that the values correspond with 2-4% of the resp. emissions of inland navigation. As ferry services can not be placed in a particular category (freight transport / passenger transport) – because both categories could apply – they are, when assigning emissions, a bit of a stranger within inland navigation. Therefore there is no explicit data with respect to the emissions of the ferry services sector. In order to accommodate this problem, the emissions are assigned on the basis of the type of ferry service. It becomes clear that the hydrofoil and the catamaran are relatively the most polluting with respect to the other ferry types. This is mainly caused by the use of large, powerful diesel engines on the one hand and the fact that they are used exclusively on longer distances on the other hand. The values of the other ferry types do not differ much.

From the supplier-questionnaires it becomes clear that almost 70% of the ferry services indicate that they are engaged with sustainability of one's own accord. However, over half of the ferry services meant the (economical) continuity of the ferry service. As such, only one third of the ferry services is

[8] When the exploitation deficit is compared with social value of the different categories ferry services, the results are remarkable. The normal ferry services have a social value of 251 million euros and an exploitation deficit of 1 million euros. De PT-ferry services, however, have a social value of 16 million euros and an exploitation deficit of 5 million euros. Proportionally, the PT-ferry services thus have a considerable higher exploitation deficit than the normal ferries. It must be notices however that the exploitation deficits of both categories are based on data of the sample. The PT-ferry services were all represented in this sample, while a substantial number of normal ferry services was absent. It is thus unknown whether the missing ferry services have an exploitation deficit or not. This can lead to a distorted image of the financial position of the normal ferry services.

engaged in sustainability. Given the percentage which tries to be sustainable, it can be concluded that the ferry service sector is on the right track with respect to sustainability. Nevertheless, it requires still necessary efforts before the whole sector has a 'sustainable' character.

8.3 Recommendations

In the current research one term/concept is prevalent when talking about the ferry service sector: *sustainability*. Not only when talking about the ferries itself, but also the role they play for the society as a whole. The ferry services over fresh water have after all an important role with regard to the environment: the extra environmental costs as a consequence of the extra kilometres when ferry services are absent, are substantial. Ferry services thus prevent unnecessary kilometres and hence, have to be present in the mindset of (car)users. By making use of information campaigns, government and/or provinces could users make conscious of ferry services as a real option within the route choice. Besides this, sustainability has an important place with respect to the expenditures and investments of the sector. Only when these expenses are made in a *sustainable* way, the continuity of the ferry services is guaranteed, now and in the future.

As mentioned before, the environmental costs would be higher in the absence of ferry services, as the number of vehicle kilometres – and with it the emission of detrimental gases – increases as a result of detours. This can also be viewed from another perspective: perhaps that the ferry services could increase the efficiency of the road network, by putting on ferry services *sustainably* at important bottlenecks in this network. The aforementioned efficiency can be specified by means of two concepts: 'robustness' and 'elasticity'. Robustness indicates the degree in which a road network succeeds to transport people from A to B, even when exceptional situations occur, such as a severe traffic accident or a collapsed part of the road. The elasticity indicates to what degree the road network is able to recover after a temporal overload[9]. The congestion problem is after all – despite the economic crunch – still present on the Dutch roads and indicates that this elasticity, especially around the Randstad, is limited. By different parties are already various projects and ideas brought forward to cope with this problem, such as the project 'Spitsmijden' on the national highway A15 by the municipality of Rotterdam, Rijkswaterstaat (Directorate General for Public Works and Water Management) and the Port of Rotterdam Authority, and the vision of the ANWB on a robust road network, conducted by TNO. What is remarkable, however, is that none of the mentioned projects think of the ferry service sector as a possible option for reducing congestion. When this *is* actually done, the ferry service sector could increase the robustness of the Dutch road network in the medium term.

8.4 Recommendations for further research

The number of PT-ferries which was incorporated in the current research was not representative for this category ferry services. Because of this, it is appropriate to do further research to make the described data in this research more complete and strengthen it where possible. In my conviction, the general conclusions of the present research will not change fundamentally.

[9] For the application of these concepts (which are founded by traffic expert Ben immers), see: **B. Kuipers**, "*Naar een robuuste bereikbaarheid met veerkracht*", in: Nieuwsbulletin LVP, Volume 2, Number 6, December 2009, pp. 2vv.

Next, further research could be done on the exploitation deficit of the ferry services. Due to the absence of a substantial number of the normal ferry services within the sample, it is unclear whether or not these missing ferry services have an exploitation deficit. A higher exploitation deficit will lead to a nuancing of the improved financial position of the normal ferry services. Besides this, viewed from the perspective of the social value, proportionally much money goes to the PT-ferries. This could also be examined in more detail in a future research.

In the third place it seems relevant to map the environmental effects of the ferry service sector *itself*. As becomes clear from the current research, it is not easy to place ferry services in a particular category (freight transport / passenger transport). Hence, the data with respect to the emissions of the ferry service sector are based on assumptions. By a closer analysis of the possibilities on which the emissions of detrimental gases by the ferry service sector *can* be determined accurately, specific environmental policy measures can be implemented with regard to this sector.

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Annex 1: User-questionnaire

Gebruikersenquête

Veerdienst: ..... Tijd: .....
Datum: ..... Weersomstandigheden: .....
Dag: ..... Volgnummer: .....

1) Waar komt u nu vandaaan: ..... Postcode .....

2) Wat is uw bestemming: ..... Postcode .....

3) Wat is uw reismotief:

- ☐ Woon-werk
- ☐ School
- ☐ Sociaal (familiebezoek, verenigingen, winkelen)
- ☐ Recreatief
- ☐ Beroepsvervoer (vb. landbouwverkeer)

4) Is de economische crisis van invloed op uw keuze om gebruik te maken van de veerdienst?

- ☐ Ja
- ☐ Nee

Toelichting: .....

.....

5) Hoe vaak maakt u gebruik van het veer:

- ☐ Een keer per dag
- ☐ Meer dan een keer per dag
- ☐ Een paar keer per week
- ☐ Een paar keer per maand
- ☐ Een paar keer per jaar
- ☐ Dit is de eerste keer

6) Op welke tijdstippen maakt u meestal gebruik van de veerdienst?

- ☐ ‘s Ochtends
- ☐ ‘s Middags
- ☐ Namiddag
- ☐ Avond

7) Van welke vervoersmodaliteit maakt u nu gebruik:

☐ Personenauto / Personenbusje
☐ Bestelauto
☐ Vrachtauto
☐ Lijnbus (OV bus)
☐ Motor
☐ Brommer / Scooter
☐ Fiets
☐ Te voet
☐ Rolstoel
☐ Skates
☐ Anders,nl.

8) Maakt u doorgaans gebruik van deze vervoerswijze of alleen incidenteel?

☐ Ja

Nee, normaal maak ik gebruik van:
☐ Personenauto / Personenbusje
☐ Bestelauto
☐ Vrachtauto
☐ Lijnbus (OV bus)
☐ Motor
☐ Brommer / Scooter
☐ Fiets
☐ Te voet
☐ Rolstoel
☐ Skates
☐ Anders,nl. .....

9) Aantal inzittende (in het geval van een groep fietsers: aantal fietsers)

.....

.....

10) Hoe zou u de reis maken wanneer deze veerverbinding niet zou bestaan:

☐ Omrijden over de dichtstbijzijnde brug / tunnel met de fiets
☐ Omrijden over de dichtstbijzijnde brug / tunnel met de auto
☐ Openbaarvervoer
☐ Via een andere veerverbinding
☐ Ik zou de reis niet maken
☐ Anders nl: .....

.....

11) Hoeveel kilometers zou u om moeten rijden indien er geen veerdienst is:

☐ 0-5 km

☐ 5-10 km

☐ 10-20 km

☐ meer dan 20 km

☐ weet niet

12) Kunt u een schatting geven van de tijd die dit u extra zou kosten:..... min

13) Kunt u aangeven wat voor u de belangrijkst vormen van hinder zouden zijn indien de veerdienst er niet zou zijn:

☐ Extra reistijd

☐ Extra reiskosten

☐ Toename van de verkeersonveiligheid

☐ Omzetverlies

☐ Ongemak

☐ Anders nl:.....

.....

14) Kunt u een oordeel geven over enkel aspecten van het veer:

	Zeer positief	Positief	Niet positief, niet negatief	Negatief	Zeer negatief
Frequentie van de Veerverbinding	1	2	3	4	5
Vaartijden van de Veerverbinding	1	2	3	4	5
Tarieven van de Veerverbinding	1	2	3	4	5
Bereikbaarheid van het veer	1	2	3	4	5
Informatievoorziening van het veer (bewegwijzering en vaartijden)	1	2	3	4	5
Voorzieningen aan de wal (vb wachtruimte)	1	2	3	4	5
Voorzieningen aan boord (vb zitplaatsen)	1	2	3	4	5

Bedankt voor uw tijd!

Annex 2: Supplier-questionnaire

Aanbiedersenquête

N.B. Gegevens worden vertrouwelijk behandeld. Omzetcijfer dient alleen ter indicatie van het economisch belang van de veerdiensten als geheel. Dus er worden **géén** individuele cijfers opgenomen in het rapport.

1) Wie is de eigenaar van de veerdienst: .....

.....

2) Wie is de exploitant van de veerdienst: .....

.....

3) Het veer vaart over: ..... (rivier, kanaal, vaart):

Herkomst: .....

.....

Bestemming: .....

.....

(eventueel tussenstop): .....

.....

4) Het veer heeft een bijnaam nl: .....

.....

5) Met wat voor type vaartuig vaart u:

- ☐ Motorveerboot
- ☐ Motorveerpont (vrij varend)
- ☐ Motorveerpont met koplading (vrij varend)
- ☐ Kabelveerpont
- ☐ Kabelveerpont met handkracht
- ☐ Kabelveerpont met zelfbediening
- ☐ Kabelveerpont met electromotor
- ☐ Zeeschip
- ☐ Gierpont met motor
- ☐ Roeiboot
- ☐ Roeiboot met buitenboordmotor
- ☐ Electroveerboot
- ☐ Zonneveerpont
- ☐ Draagvleugelboot
- ☐ Catamaran
- ☐ Anders, nl:……

6) Met hoeveel vaartuigen onderhoud u de veerdienst: .....

.....

7) Wat is het bouwjaar van uw vaartuig(en): .....

.....

8) Voldoet uw schip aan de huidige technische eisen: ja/ nee

9) Onder welke categorie zou u uw veerdienst plaatsen:

☐ Autoveer
☐ Voet-fietsveer
☐ Voetveer

10) Wat is de vaarperiode van uw veerdienst:

☐ Het gehele jaar
☐ Bijna het gehele jaar, uitzonderingen zijn de volgende dagen: .....
.....
☐ Aantal maanden per jaar, van:..... tot:.....
.....

11) Wat zijn de vaartijden van uw veerdienst:

ma-vr: :van..... uur t/m .....
.....uur
zaterdag :van..... uur t/m .....
.....uur
zon en feestdagen: :van..... uur t/m .....
.....uur
(Kunt u een folder met de dienstregeling van uw veerdienst bijsluiten?)

12) Wat is de afvaart frequentie van uw veerdienst (hoe vaak vaart u heen en weer):....
.....keer
per uur/ per dag

13) Hoeveel personen zet u per jaar over (indien u dit niet precies weet kunt u een schatting geven): .....
.....

14) Wat voor soort vervoersbewijzen verkoopt u:

☐ Enkele reis
☐ Retour
☐ Rittenkaart
☐ Abonnement
☐ Geen (gratis veerdienst)

15) Kunt u schatting geven van de verdeling van de reizigers over de vervoersmodaliteiten: (totaal 100%)

....% Personenauto / Personenbusje
....% Bestelauto
....% Vrachtauto
....% Lijnbus (OV bus)
....% Motor
....% Brommer / Scooter
....% Fiets
....% Te voet
....% Rolstoelgebruikers
....% Skaters
....% Anders nl:.....

16) Met welk doel gebruiken personen uw veerdienst (meerdere antwoorden mogelijk):

☐ Woon-werk verkeer
☐ Beroepsverkeer (vb. landbouwverkeer)
☐ Scholieren
☐ Sociaal (familiebezoek, verenigingen, winkelen)
☐ Recreatief

17) Heeft de veerdienst, voor zover u weet, nog een andere functie:

☐ Economische functie (andere bedrijven zijn voor hun omzet afhankelijk van de veerdienst omdat hun klanten bijvoorbeeld aan de andere oever zitten.)
☐ Het veer is onderdeel van een calamiteitenplan
☐ Het veer heeft een cultuurhistorisch waarde
☐ Het veer is onderdeel van een gevaarlijke stoffen route
☐ Anders nl: .....

18) Hoeveel personen zijn er in dienst bij de veerdienst (varend en kantoor personeel):

.....
..... FTE's

(FTE = Full Time Equivalent, aantal personen uitgedrukt in eenheden van 40 uur)

19) Kunt u een schatting geven van uw totale exploitatiekosten (loonkosten, onderhoudskosten, afschrijvingskosten): € .....
..... per jaar

20) Wat is de vervangingwaarde van uw vaartuig en de veerstoep:

Vaartuig: € .....
.....
Veerstoep: € .....
.....

21) Wat is de omzet van de veerdienst per jaar (indien u dit niet precies weet kunt u een schatting geven):

Opbrengst kaartverkoop: € ..... per jaar
Subsidie: € .....
.. per jaar
Overig (fondsen, donaties) € .....
.. per jaar +
Totaal: € .....
.. per jaar

22) In hoeverre ondervindt u gevolgen van de economische crisis?

☐ Positief (meer reizigers/omzet). Indien van toepassing, vraag 23
☐ Negatief (minder reizigers/omzet). Indien van toepassing, vraag 24
☐ Geen verschil. Indien van toepassing, vraag 25

23) Kunt u een schatting geven van het aantal extra reizigers, en een schatting van de extra inkomsten (in %) ?

……
……
Stijging inkomsten: …….%

24) Kunt u een schatting geven van het aantal gedaalde reizigers, en een schatting van de gedaalde inkomsten (in %) ?

……
……
Daling inkomsten: …….%

25) Kunt u aangeven wat voor subsidie u ontvangt:

☐ Suppletie op basis van de behaalde opbrengsten / aantal overgezette reizigers

☐ Afdekking van het exploitatie tekort

☐ Vast subsidiebijdrage op basis van aanbodcriteria (vb. Aantal dienstregelingsuren)

☐ Eenmalige investeringssubsidies in infrastructuur zoals veerstoepen en veerboten

☐ Anders, nl .....
.....

26) Op basis van welke wettelijke regeling ontvangt u subsidie: .....
.....

27) Vanuit welk(e) overheidsorga(a)n(en) ontvangt u subsidie:

☐ Oevergemeente

☐ Provincie

☐ Rijksoverheid, ministerie .....
.....

☐ Anders nl: .....
.....

28) Kunt u de samenstelling van de subsidie aangeven:

€ ..... van .....
.....

€ ..... van .....
.....

€ ..... van .....
.....

€ ..... van .....
.....

29) Valt uw veerdienst onder een van de volgende wetten?

- ☐ Verenwet
- ☐ Wet openbaarvervoer
- ☐ Anders, nl .....
- ☐ Geen

30) Staan er grote investeringen op de planning: ja/ nee

Zo ja, welke: .....

31) Is er financiële ruimte voor het doen van deze investeringen: ja/nee

Nee, want: .....

32) In hoeverre houdt u zich bezig met de duurzaamheid van de veerdienst?

- ☐ In het geheel niet
- ☐ Ja, vanuit eigen beweging. Indien van toepassing, ga naar vraag 33.
- ☐ Ja, vanwege (toekomstige) wet- en regelgeving. Indien van toepassing, ga naar vraag 34.
- ☐ Anders,nl .....

33) Welke initiatieven heeft u doorgevoerd/worden binnen korte tijd doorgevoerd m.b.t. duurzaamheid binnen de veerdienst? Kunt u aangeven wat uw drijfveren zijn voor deze initiatieven?

.....

34) Kunt u aangeven in welke mate dit uw bedrijfsvoering beïnvloedt?

.....

35) Voor verdere informatie:

Contactpersoon: .....

Telefoonnummer: .....

Mobiel telefoonnummer: .....

Internet adres: .....

Annex 3: Chi-Square test

A Pearson Chi-square test is test of independence at which two hypotheses are formulated ,with a significance level (α) of 5%:

α= 0,05
H_0= *There is no correlation, the observed and expected values are equal*
H_1= *There is correlation, the observed and expected values are not equal*

The expected values during weekdays and weekends are respectively 5/7 and 2/7. The observed and expected values are shown in the table below, including the Ch-Square test.

	Observed	**Expected**
Weekdays	780	822,857143
Weekends	372	329,142857
Chi-Square	7,8125	
degrees of freedom (df)	1	
p-value	0,005189	

As the table above shows, the *p*-value is lower than the significance level. The null hypothesis must therefore be rejected: there is a significant deviation between the observed and expected values. Subsequently, the number of questionnaires has to be corrected with a weighting factor. This weighting factor is 0,84.[10]

[10] ((780/5)*2)/372