IMPLEMENTING URBAN WATERWAY TRANSPORT AS A SUSTAINABLE FREIGHT TRANSPORT SOLUTION

A case study for the city of Amsterdam

MSc thesis Complex Systems Engineering and Management

Maarten Jan Roosmale Nepveu

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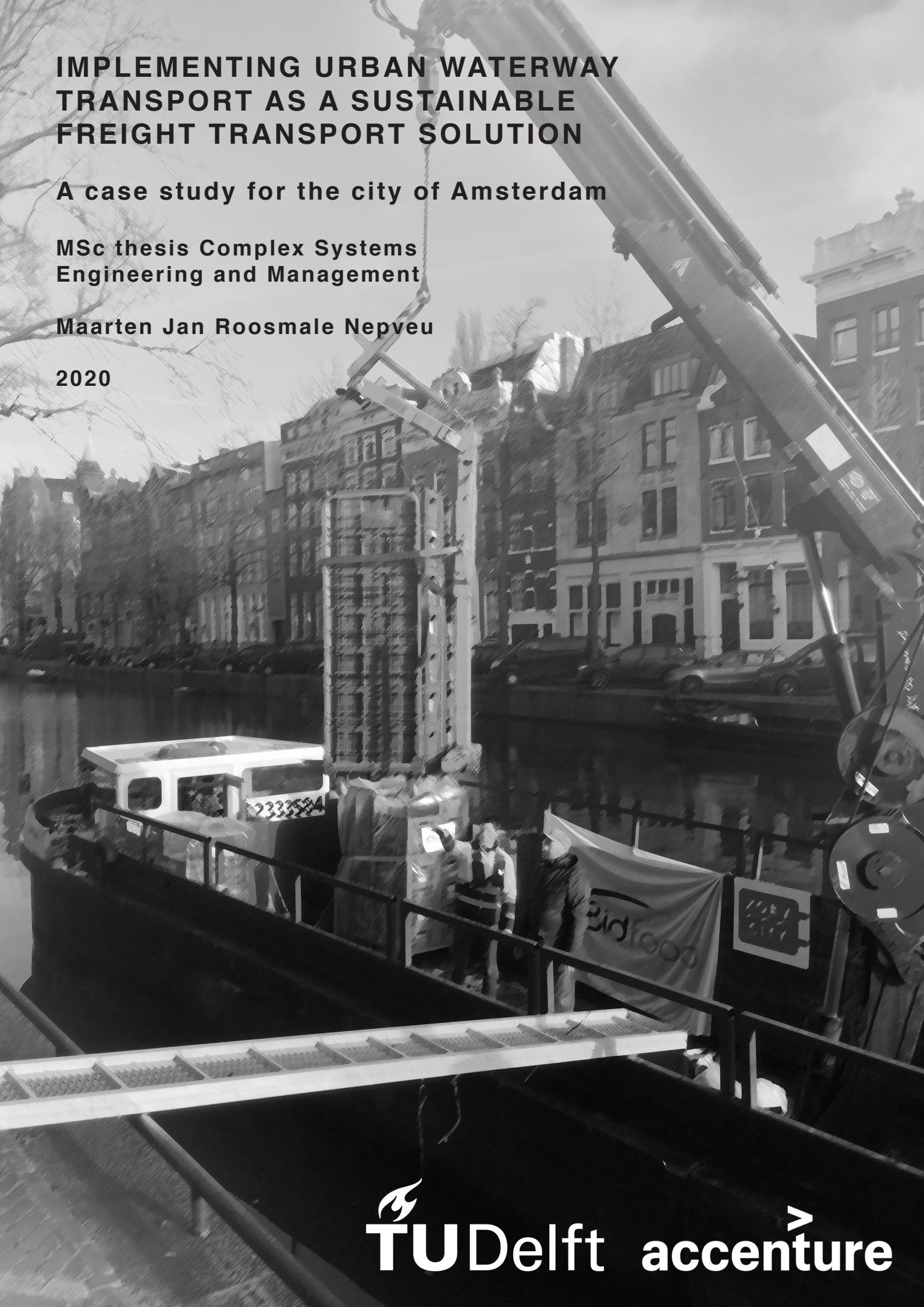

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IMPLEMENTATING URBAN WATERWAY TRANSPORT AS A SUSTAINABLE FREIGHT TRANSPORT SOLUTION: A CASE STUDY FOR THE CITY OF AMSTERDAM

Master thesis submitted to Delft University of Technology in partial fulfilment of the requirements for the degree of

Master of Science
in **Complex Systems Engineering and Management**

by

Maarten Jan Roosmale Nepveu
Student number: 4311558

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First Supervisor:	Dr. J.A. (Jan Anne) Annema Transport & Logistics
Chairperson:	Prof.Dr. G.P. (Bert) van Wee Transport & Logistics
Second Supervisor:	Dr. G. (Geerten) van de Kaa Economics of Technology and Innovation
External Supervisors:	Dr. I. (Iratxe) Gonzalez-Aparicio Dr. S. (Sytze) Dijkstra Accenture

TU Delft

PREFACE

Dear reader,

In front of you lies my thesis project, the final challenge I faced to complete my Complex Systems Engineering and Management Master's degree. My passion for the city of Amsterdam makes that I aim to improve the life of 'Amsterdammers'.

At the age of 13 I took my bike and cycled to the very east of the city to buy myself an old, second hand, outboard motor. My neighbour had asked me if I liked to use the small polyester rowing boat she had. Plenty of hours have been spent on the Amsterdam canals and although I mainly aimed to have a nice time, I also experienced how the increasing amount of people lead to inconveniences along the waterways. Large crowds of tourists, cyclists and freight vehicles all had to share the same limited available space. Assuming that the amount of residents and visitors was likely to further increase, I foresaw that the city would have a hard time to cope with sustainability challenges.

My ambition to tackle these challenges, my specialisation in transport and logistics and my passion for the Amsterdam canals made an ideal mix to explore how urban waterway transport could contribute to the alleviation of existing sustainability problems. Once I heard about the development of autonomous floating vessels that could be used for city logistics, I knew I was coming really close to the subject I wanted to graduate on. Although I believe autonomous floating vessels are the future, I wanted to explore how we could re-appropriate the canals for freight transport purposes as of today. This resulted in two main questions: how can I be part of organising freight transport on the urban waterways and how do I write a scientific master thesis?

I knew that to provide answers on these questions I needed to talk with many people involved with city logistics in Amsterdam. So that is what I did. I went from professors and politicians to cafes and wholesalers to understand what factors determine the successful implementation of waterway transport. I was part of organising one of the first waterway transport pilots to distribute food and beverages, I presented the preliminary results of my research project in Pakhuis de Zwijger and I figured out how to come up with the scientific thesis that I hope you are about to read now.

All this would not have been possible without the help of my supervisors from TU Deft, my colleagues at Accenture, my fellow students, my family, my roommates and my friends. Particularly, I would like to thank Jan Anne, Iratxe and Sytze for their supervision. Despite their busy schedules, they al-

ways found time to help me out. I would also like to thank Bert and Geerten for being part of my graduation committee and taking the time to provide me with helpful feedback.

Furthermore, I would like to thank all the people that listened to me when I was thinking out loud. My parents, Inge and Jan Pieter, and my roommates, Frank, Mathijs, Sytze, and Toon, are probably able to write half my thesis based on everything I told them. I must not forget Marnus, who listened at least as much, but I am especially grateful for the table football games we played during our breaks. Finally, I would like to thank my 'little' brother, Jasper, who often helped me out with LaTeX, even while he was busy enough with graduating on the most complex challenges in physics himself.

Maarten Roosmale Nepveu
Amsterdam, March 2020

EXECUTIVE SUMMARY

All major cities in Europe face common freight transport problems. A reliable transport system fosters economic growth and the quality of life, but freight transport is causing congestion, pollution and traffic accidents. The use of waterways as a means for urban freight transport Urban Freight Transport (UFT) is suggested to overcome these problems and to contribute to a sustainability transition. Both scientists and policy makers recognised that a modal shift could contribute to solving sustainability challenges, but Urban Waterway Transport (UWT) has not been implemented on a significant scale yet. The objective of this study is to assess the potential for implementing UWT by systematically exploring success and failure factors. Additionally, as no theoretical framework explaining the dynamic process of urban waterway transport implementation has been found, it is aimed to fill this scientific gap and to contribute to the the evaluation of innovations by providing an innovative analysis framework. A case study has been conducted for the city of Amsterdam to explore the research question: to what extent it is feasible to implement urban waterway transport as a means for sustainable freight transport in Amsterdam?

To scientifically explore the research question, Transport Innovation Adoption Theory (TIAT) and Transition Management Theory (TMT) are used as theoretical research lenses. It has been argued that the implementation of transport innovations does not merely depend on the outcome of innovation diffusion, but on the outcome of societal and political processes. The Political Economy Framework Political Economy Framework (PEF) from Feitelson and Salomon (2004), has been complemented with the PESTEL Classification Framework to systematically address the feasibility of UWT. Desk-research and expert interviewing have been used to explore the factors determining feasibility and a focus group meeting is organised to envision pathways to overcome failure factors. The activities performed during this meeting followed from Loorbach (2010) who prescribed four governance activities in a Transition Management Cycle (TMC) to guide transitions towards sustainable systems. Triangulation of desk-research, interviews and the focus group meeting is done to validate and converge the research findings.

The extent to which waterway transport can be implemented as a sustainable freight transport solution depends on the condition that the alternative, road transport, becomes less attractive. Many of the canal walls and bridges in Amsterdam are in bad condition and as a result of maintenance projects and a ban on heavy freight vehicles in the centre, road accessibility is considered to decrease. This stimulates a modal shift towards waterway transport, but a lack of transshipment locations, vague transport policy and failing cooperation seem reason for failing implementation.

The research findings indicate that implementation of waterway transport is feasible under the condition that the municipality and private logistic actors collaborate. A focus group developed a shared vision on urban freight transport system in Amsterdam and envisioned a multimodal system including waterway transport. Transshipment between modes must be flexible in terms of time and location and freight transport should be noiseless, reliable, affordable, safe, zero-emission and efficient. Currently, clear policy and efficient transshipment technology are lacking. Both public and private actors recognised the importance of executing pilots to fill existing knowledge gaps regarding the development of transport policy and technology. Waterway transporters are willing to participate in long-term pilots, but require political support in the form of temporarily transshipment permits and subsidies to succeed. Conflicting public interests and a lack of long-term focus seem to hold against the providence of financial and regulatory support.

For practical purposes, this thesis contributes by recommending the Transition Management Approach to foster sustainable waterway transport development. Three practical policy strategies are suggested to foster the potential for implementing urban waterway transport in Amsterdam. 1. Install a multi-disciplinary municipal team to align the interests of different municipal departments. 2. Collect and use the knowledge that is available from domestic concepts, foreign concepts and pilots that have been performed in the past. 3. Request waterway transport for municipal transport services to demonstrate suitability. The research findings and results are solely based on qualitative data-collection methods. The lack of quantitative accountability of the research findings limits the direct added value to policy making as decision-making should preferably not solely be based on qualitative data. It is recommended to quantitatively assess the the effects of policy implementation by modelling the effects of implementation on the urban freight transport system in Amsterdam.

A recognised drawback of the theoretic research lens is imposed by the fact that the lens does not account for priority changes over time. It is uncertain how road accessibility will develop and the notion that successful implementation is highly determined by this development led to the insight that assessing the potential for waterway transport implementation could benefit from a more dynamic approach. Existing frameworks, such as the Multi-Level Perspective (MLP) Framework from Geels (2002), do incorporate a dynamic perspective on innovation implementation, but provide limited insight on how to operationalise feasibility factors. This study theoretically contributes by providing an innovative analysis framework that constitutes a pragmatic, dynamic and multi-level perspective approach to improve understanding on innovation implementation. To support policy makers and scientists in the evaluation of innovations, it is recommended to explore and improve the applicability of the suggested framework by applying the framework to address other cases.

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ACRONYMS

UWT Urban Waterway Transport vi
TMC Transition Management Cycle vi
UFT Urban Freight Transport vi
TIAT Transport Innovation Adoption Theory vi
PEF Political Economy Framework vi
TMT Transition Management Theory vi
MLP Multi-Level Perspective vii
BTM Business Transition Management 13
IAT Innovation Adoption Theory 13

1 INTRODUCTION

1.1 PROBLEM BACKGROUND

1.1.1 Unsustainable cities

Urbanisation is an ongoing trend in European cities and the rest of the world. In 2010, 73% of European citizens lived in urban areas and it is expected that this percentage will increase to more than 80% in 2050 (European Commission, 2017). The quick growth of cities puts tremendous pressure on the transportation networks of urban areas and European cities increasingly face problems caused by transport and traffic. Urban transport is vital to the economic functioning of cities through the provision of accessibility for goods and people (European Commission, 2017). The provision of goods and people and the presence of activities and services is needed to keep cities attractive and liveable. Many different freight flows constantly enter and leave urban areas, but the current way of organising urban freight transport is inefficient and does not contribute to sustainable development (Quak, 2011).

Moreover, the global rise in average income and standards of living introduce an increased demand for the provision of goods (Dablanc, 2016). The growth of the urban population and changing consumption patterns create a multiplying effect on the demand for freight transport in urban areas. Unfortunately, road-based transportation is causing a variety of negative social, environmental, and economic effects including congestion, air pollution, noise pollution and traffic accidents (Browne, Allen, Nemoto, Patier & Visser, 2012). Urban freight transport contributes to all these negative impacts and threatens the livability of urban areas. Nevertheless, urban areas worldwide will keep the need for supply of goods and the removal of waste products and are therefore dependent on the distribution of freight. The question of how to enhance mobility while at the same time reducing congestion, accidents and pollution is a common challenge for all European cities. Especially for those with historic centres, characterised by increasing levels of tourists, face the challenge to absorb the high levels of demand for passenger and freight transport (Muñuzuri, Larrañeta, Onieva & Cortés, 2005).

1.1.2 Urban freight transport in Amsterdam

One of these cities is the city of Amsterdam and similarly to global developments, the number of people living and visiting this city is increasing (Gemeente Amsterdam, 2019c). For many years, the city of Amsterdam has been an attractive area. The presence of its historical bridges, houses,

canals, restaurants, entertainment and services attracts people. The fast growth of Amsterdam is associated with a huge increase of transport. In 2030, the amount of daily trips is expected to have increased by 20-39% since 2015 (Gemeente Amsterdam, 2019h). Characterised by its small and narrow streets, the increase of daily traffic puts both the accessibility and the quality of life in the city under pressure (van Duin, Kortmann & van de Kamp, 2018). For freight transport, the narrow roads are a major cause of congestion implying longer and unpredictable travel times (van Duin, Kortmann & van den Boogaard, 2014). Congestion also leads to increased levels of environmental pollution, which is one of the main concerns of today (Gemeente Amsterdam, 2019h).

Besides the common problems caused by the increased levels of urban transport. The city of Amsterdam copes with the tremendous challenge to renovate a large part of its historical canal walls and bridges. Amsterdam has around 1600 bridges and 600 kilometres of canal walls and at least 10 kilometres of the city's canal walls are in danger of subsidence and critically need maintenance. These maintenance projects which will have major impacts on urban freight transport (Gemeente Amsterdam, 2019a). The old roads, bridges and quays are not resistant to the heavy vehicles that are used for urban freight transport and alternative ways to deliver goods in the city are needed (Gemeente Amsterdam, 2019e).

In ambition to deal with the current urban challenges the city of Amsterdam is facing, the municipality is taking extensive measures. Research has shown that the worst traffic congestion is found in the historic city centre. Research also showed that a large share of traffic (40 to 60%) in the centre has a destination outside the area. The local government in Amsterdam aims to eliminate car traffic in the historic centre and to relocate heavy traffic to the outskirts of the city (Gemeente Amsterdam, 2019g). To limit the amount of freight vehicles, a weight restriction zone that prohibits vehicles of over 7.5 tons already exists, but exemptions have often been provided and enforcement on offenders is complicated (Ploos van Amstel, 2019a). The increased pressure on the canal walls and bridges increased the urgency to ban heavy freight vehicles. Stricter enforcement of the 7,5 tons would imply major impacts on urban transport. According to Ploos van Amstel (2019b) heavy freight vehicles cover 20% of total freight vehicle movements, but are responsible for 80% of the total volume and weight that is daily transported. Replacing a fully loaded and heavy truck would require 6 to 10 smaller and lighter vehicles which has negative effects on congestion. To improve air quality, the municipality intends to eliminate sources of pollution and focuses on reducing pollution resulting from road traffic. From 2030 on, only emission-free vehicles will be allowed within the entire built-up area (Gemeente Amsterdam, 2019d).

To keep cities liveable and accessible, many initiatives have been proposed in the past, but few are expanding their scale beyond initial experimentation (Zenezini & De Marco, 2016). These initiatives often aimed to improve freight transport sustainability by making changes in the freight transport

operations or the freight transport context (Quak, 2008). Despite many proposals, great breakthroughs have not been made towards improving the sustainability of urban freight transport (Quak, 2011). Initiatives range from policy initiatives such as road pricing to company-driven initiatives such as consolidation and vehicle innovations. Other initiatives aim at changing physical infrastructures or reorganising logistic operations such as integrating inter-modal initiatives. These initiatives aim to reorganise logistic operations by using non-road vehicles that produce lower levels of pollutant emissions. Examples of inter-modal transport systems are systems that make use of rail or waterway networks. Compared to road transport, waterway transport is an environment-friendly and safe transportation mode and could contribute to more sustainable transport systems (Rohács & Simongati, 2007).

The costs for additional transshipment activities usually imply that domestic transport distances are too short to compete with road transport (Van Binsbergen, Konings, Tavasszy & Van Duin, 2014). However, in urban areas with lots of waterways, waterway transport can have advantages over road transport. In Venice and Utrecht for example, freight distribution by boat is common (Nemoto, Browne, Visser & Castro, 2006). As many urban waterway networks are not dense enough to deliver a considerable part of the urban freight volume, the successful implementation of urban waterway transport concepts is limited to few examples (Quak, 2011). The city of Amsterdam has one of the most extensive canal networks in the world and may therefore have the unique opportunity to reclaim its waterway network for transporting urban freight volumes (Johnsen, Duarte, Ratti, Xiaojie & Tian, 2019).

1.1.3 Knowledge gaps and contributions

Theoretical

Implementing urban waterway transport seems to be a relatively underinvestigated topic in scientific literature. The findings of a literature search, presented in Chapter 4, indicate that little research is done to systematically explore the factors that determine the success or failure of implementation. Moreover, no theoretical framework, explaining the dynamic process of urban waterway transport implementation has been found. Research findings indicate that it is important to apply a dynamic perspective on the implementation of urban waterway transport. To fill this gap in scientific literature, this study contributes to Innovation Adoption Theory by systematically exploring success and failure factors to develop a theoretical framework that improves the understanding on innovation implementation.

Practical

Maten, Pielage and Rijsenbrij (2003) explored the potential for inter-modal waterway transport in Amsterdam and found that waterway transport could reduce both the number of vehicles needed and the number of kilometres driven to meet the demand for freight transport. More recently, van Duin

et al. (2014) found that waterway transport could meet the freight demand of restaurants and shops in the central area of Amsterdam, while reducing waiting time for deliveries and without interfering with passenger boats and pleasure crafts. Despite these promising findings, urban waterway transport has not been implemented on a significant scale. The novelty of this research has strong practical implications due to the urgency to deal with rising congestion levels, worsening states of canal walls and recently announced policy measures limiting road accessibility. This research aims to practically contribute by assessing whether it is possible to alleviate societal problems by implementing urban waterway transport and by exploring policy approaches that could increase the likelihood of implementation.

1.2 OBJECTIVE, RESEARCH QUESTIONS AND APPROACH

The main objective is to contribute to a sustainability transition by exploring the potential to implement waterway transport. It is aimed to reach this objective by exploring success and failure factors, by exploring policy approaches to overcome failure factors and by improving the understanding on innovation implementation. Based on this objective, the main research question has been formulated:

To what extent it is feasible to implement urban waterway transport as a means for sustainable freight transport in Amsterdam?

To provide an answer on the main research question, the problem is divided in sub-questions to support a systematic approach. The questions have been determined to align well with the chosen research approach and the selected research methods.

1. *What are the critical success and failure factors for the implementation of urban waterway transport in Amsterdam?*

2. *What policy approach could foster the potential for a transition towards an urban freight transport system integrating waterway transport?*

3. *What theoretical contributions can be made to improve the understanding on implementing urban waterway transport as a means for sustainable freight transport?*

The overall research approach can be typified as an exploratory case study with urban waterway transport in Amsterdam as the selected case. Qualitative data is collected and Innovation Adoption Theory is combined with Transition Management Theory to support the research project theoretically. The majority of the research findings is based on literature analysis and expert knowledge. Desk-research is performed to further explore existing knowledge gaps and to identify the success and failure factors discussed in previous research. Experts are interviewed to identify the success and failure factors specifically related to implementation in Amsterdam. A focus group meeting is held with real-life stakeholders to validate earlier findings and

to pathways to overcome existing failure factors. Triangulation of the desk-research, the interviews and the focus group meeting is done to validate and converge the research findings.

1.3 OUTLINE OF THE THESIS

Chapter 1 introduced the research problem and the main research approach. Chapter 2, elaborates in detail on the chosen methodology and the selected data collection methods. Chapter 3 elaborates on innovation theories that have been used to structure data collection and analysis. Chapter 4 is the first of three chapters that provide research results. Here, the findings of exploring relevant literature are presented. The knowledge obtained during desk-research is used to support the interviews held with experts and Chapter 5 provides the outcomes of these interviews. Chapter 6 provides the results of a focus group meeting, held to discuss preliminary findings and to envision pathways to overcome existing failure factors. Furthermore, triangulation of the three research methods is presented in Chapter 7. The factors determining implementation are reviewed and policy recommendations are made. In Chapter 8, the research lens, data-collection methods and results are critically discussed and an innovative analysis framework is proposed. Moreover, to address the credibility of the research outcomes and to recommend on further research, the limitations of the project are elaborated on. The conclusions are provided in Chapter 9. Based on the conclusions and the limitations of the project, further research is recommended upon.

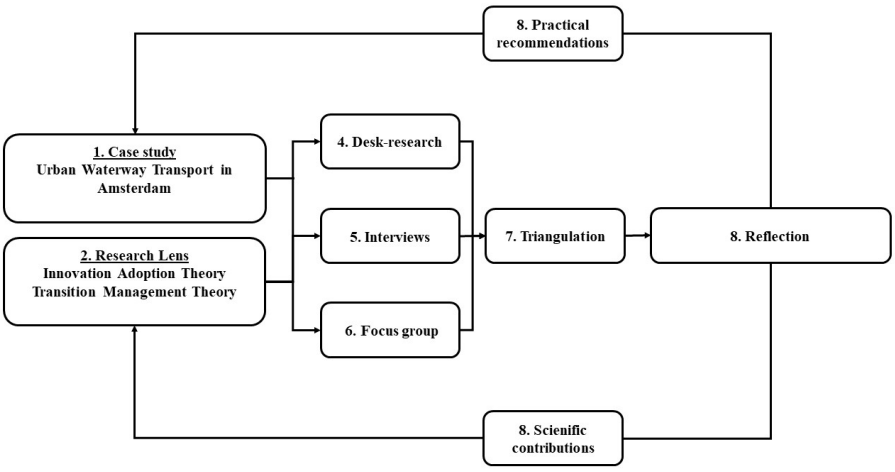

Figure 1.1: Research activities and chapters

2 RESEARCH METHODOLOGY

From the objectives discussed in the introduction it already became clear that the project is focused on the city of Amsterdam. This chapter illustrates which methodology has been applied to provide answers on the composed research questions. To explore the feasibility of implementing waterway transport within city logistics, a qualitative case study approach has been applied. Only qualitative data collection methods have been used. The data-collection methods and the analysis are supported by Transport Innovation Theory and Transition Management Theory. Three project phases can be distinguished: identification of critical feasibility factors, development of strategies to overcome failure factors and reflection on the research project to complement existing theoretical frameworks.

2.1 THE CASE STUDY APPROACH

2.1.1 Suitability of approach

The case study approach is one of several strategies to perform scientific research and is typically used to gain insight into a limited amount of research objects that are restricted in time and space (Verschuren & Doorewaard, 2010). Generally, the case study approach works well for 'why' or 'how' research questions, when the researcher is not able to influence the outcome of events and the focus is on an actual real-life context (Yin, 1989). Case studies can be explanatory, descriptive or exploratory. While 'why' and 'how' questions may indicate that case studies should aim to explain certain phenomena, the case study approach can also well be used within research projects aiming to explore a field of interest. While explanatory case studies focus on giving explicit explanations for on the occurrence of certain phenomena, descriptive studies aim to describe a phenomena after observing and analysing occurrence. The exploratory approach is typically used to open up research possibilities, when there is not much research done on the subject of observation (Yin, 1998). It allows for the exploration and understanding of complex issues and enables a researcher to examine data within a specific context, which makes it a robust strategy for holistic and in-depth analysis (Zainal, 2007).

The objective of the research project is to explore the research questions rather than offering final and conclusive answers. The choice for exploratory case study research is justified by the following notions:

1. From literature search, presented in Chapter 4, it followed that little research has been done to investigate the implementation of waterway transport holistically. Little is done to understand how the broad set of different important feasibility factors influence implementation. A case study is typically used when preliminary research and pre-defined hypotheses are lacking (Mills, Durepos & Wiebe, 2009). It allows for for in-depth examination of complex real-life environments and supports to lay the groundwork for further research (Dubé & Paré, 2003).

2. It also followed from literature search that successful waterway transport concepts seem to heavily depend on situation specific circumstances and the involvement of different stakeholders. As case studies are well suited for analysis of systems where actors play an essential role and context is important (Benbasat, Goldstein & Mead, 1987), this increases the relevance of exploring the implementation of waterway transport for a demarcated case.

2.1.2 Case selection

Based upon two main criteria, the city of Amsterdam has been chosen as the object of interest. The case is selected based on the expected practical value the case study could offer to resolve existing societal problems. The availability of an extensive waterway network and the existence of successful small-scale concepts have raised the question why urban waterway transport is not implemented on a larger scale yet. Secondly, while recently conducted case studies have been found on waterway transport concepts for Gothenburg and Ghent, no recent studies have been found for Amsterdam. This increases the opportunity to provide new or unexpected insights, which could open up directions for further research.

2.1.3 Advantages and limitations

Case studies make it possible to be directly involved and facilitate quick access to qualitative data. Despite this advantage, the approach is often criticised for its potential lack of rigour and the tendency for the researcher to be influenced by its own perception and ideas, caused by biased views. This could influence the direction of the research project, the findings and the conclusions. Furthermore, the absence of quantitative accountability imposes a limitation of a purely qualitative case study analysis (Zainal, 2007). Generalisation of findings is difficult as the research is focused on the specific circumstances applicable to Amsterdam.

To account for the impact of biased interpretations within this project, reflections on the position of the researcher are provided. As generalising findings to other cities and transport systems is not one of the main objectives, limited generalisability does not impose a critical issue. Nevertheless, theoretical contributions are proposed to also contribute to the freight transport challenges of other cities that have the potential to use their waterway networks as a means for urban freight distribution.

2.2 METHODOLOGY: DATA-COLLECTION

To design the research project according to the typical characteristics of case study research, the research activities have been chosen based on Verschuren and Doorewaard (2010) who explain how a case study research project is typically performed. The first and most important characteristic of a case study is the use of a relatively small number of cases, which for this study is just one case: waterway transport within the freight transport system of Amsterdam. Secondly, the case study strategy is characterised by qualitative data and research methods. Data collection is usually focused on depth rather than breadth, which is often created by different and intensive data collection methods. The selected data collection methods have a qualitative nature and consist of: desk-research, expert interviews and a focus group meeting. Finally, a case study typically involves the study of an object in its natural context, which holds that the researcher should get as close as possible to the case and consult experts that are directly involved with the case. The majority of the experts that have been selected to extract data from are closely involved in urban freight transport and represent real-life stakeholders.

2.2.1 Research lens

In order to to explore the wider implementation of urban waterway transport scientifically, a theoretical research lens was required. Using a theoretical lens provides a particular perspective to examine a topic and contributes to a well-structured analysis. Existing theories on a certain academic topic are usually presented in frameworks. For this study, a research lens was desired to improve understanding on how transport innovations get implemented. It was intended to find a lens that provides theoretical ground to explain the adoption of innovations that focus on solving societal issues and contribute to the challenge of sustainable development. In Chapter 3 the selection of a suitable research lens is discussed. **The research lens supported effective data-collection and allowed to reflect on existing theories based upon the empirical research findings of this study.**

2.2.2 Desk-research

To use the knowledge that is present in previous research and to demarcate the case, desk-research is conducted. Analysing literature had multiple purposes: to define relevant concepts, to demarcate the case, to identify existing knowledge gaps, to obtain a first understanding of critical factors, and to account for the frameworks that have been selected as research lenses. Reviewing literature can be a powerful method to get an up-to-date and well-structured overview of the literature in a specific area (Wee & Banister, 2016). A better understanding of relevant concepts is obtained by analysing existing academic literature on urban freight transport. Case demarcation and identifying knowledge gaps and critical factors is done through the analysis of both grey and academic literature. Accounting for the suitability of state-

of-the-art frameworks is done through analysing previous studies exploring the adoption of transport innovations and evaluating different frameworks. To find relevant literature, multiple sources have been used. Searches for academic articles and reports were conducted through the use of academic databases. Three electronic databases (SCOPUS, Science Direct, Scholar GOOGLE) are searched to find relevant academic literature. The languages used are English and Dutch and the time frame is between 1990 and 2019. Based on the examination of abstracts, introductions and conclusions, literature has been selected. For the review of studies, the search strategy started with an exploration of references found in previous research on waterway transport concepts in Europe. Forward as well as backward snowballing is used to compose a list of literature. The main strings and Boolean operators that were used to search for the literature are: "Urban waterway transport", "Inland waterway transport" AND "City logistics", "Waterway transport" AND "Urban freight transport". Different combinations of these strings have been used. Not many peer-reviewed studies were found, which is why relevant insights are also obtained from grey literature, student theses, conference papers, and policy reports. **Desk-research mainly served to deepen the understanding of urban freight transport and to develop a first list of success and failure factors**.

2.2.3 Individual interviews

Interviewing is a powerful method to collect additional information after performing desk-research as it allows to have on-to-one interaction with someone, which makes it possible to ask for better and more detailed explanations in case an answer is not clear (Finkbeiner & Finkbeiner, 2017). Interviews can be structured, semi-structured or unstructured. Structured interviews strictly follow a predetermined interview protocol and each of the interviewees is asked exactly the same questions in a pre-defined and fixed order. This makes it easy to compare the answers of different interviewees, but makes it is hardly possible to probe and further explore topics that participants bring up. Unstructured interviews allow for a more free-flowing conversation style which encourages respondents to come up with topics and issues that were not originally included in an interview protocol (Figgou & Pavlopoulos, 2015). This is very useful when data is collected based on personal experiences of interviewees (Zhang & Wildemuth, 2009).

Based on the knowledge extracted from literature, an initial understanding of the complex urban freight transport system was obtained. This understanding is enriched by conducting 6 exploratory, unstructured, interviews, to discuss the initial desk-research findings and to explore existing waterway transport concepts in Amsterdam. Three waterway transporters were asked to elaborate on their experiences and concepts. Based on recommendations, a list of potential interview participants was set up. The experts on this list together covered all relevant stakeholders analysed in Section 4.3.2. Once the exploratory interviews provided enough input to start with more in-depth interviews, the list of experts and stakeholders was approached by e-mail

or linked-in messages. Eventually, 10 in-depth interviews were conducted. The attitude towards participation was very positive. Rejections were said to be based on time constraints only. An overview of the interviewees and the institutions they represent is shown in Table 2.1.

The interviewees had different backgrounds and were considered to have specific knowledge based on their daily activities. Individual experiences, opinions and visions were explored, which required to deviate from a set of pre-defined questions. The type of questions and the order in which they were asked differed depending on the expertise of the interviewees. Insights from previous interviews were further explored during subsequent interviews. **Expert interviewing mainly served to obtain a rich list of success and failure factors for the implementation of urban waterway transport in Amsterdam.**

Table 2.1: Participants interviews

Number	Institution	Role of interviewee	General attitude
#1	Research Institute AMS	Project Coordinator Roboats	Neutral
#2	Waterway Transporter Mokum Mariteam	Manager	Positive
#3	Waterway Transporter Rederij Kees	Manager	Postive
#4	Waterway Transporter Zoev City	Manager	Positive
#5	Passenger Transporter Amsterdam Boat Events	Manager	Negative
#6	Interest Group VVAB	Director	Positive
#7	University of Applied Sciences (HvA)	Professor City Logistics	Positive
#8	Port of Amsterdam	Commercial Manager	Positive
#9	Beverage Wholesaler Henk Smit	Director	Neutral
#10	Catering Wholsaler Bidfood	Head of Transport	Positive
#11	Municipality of Amsterdam	Mobility Researcher	Neutral
#12	Municipality of Amsterdam	Mobility Researcher	Neutral
#13	Consulting Firm Ecorys	Mobility Consultant	Positive
#14	Research Institution TNO	Logistics Consultant	Positive
#15	Municipality of Amsterdam	Policy Advisor	Neutral
#16	Municipality of Amsterdam	Strategic Advisor	Neutral

Interviewee 1 investigates whether it is possible to use autonomous floating platforms as a means for passenger and freight transport. **Interviewees 2, 3 and 4** manage existing waterway transport concepts in Amsterdam. **Interviewee 5** is the manager of a passenger transport company. **Interviewee 6** is the chairman of an association representing the residents in the inner city of Amsterdam. **Interviewee 7** is a professor in city logistics at the Amsterdam University of Applied Sciences and published multiple articles on urban freight distribution. **Interviewee 8** is the project manager of 'Amsterdam Vaart!' a public-private collaboration coordinating the exploitation of the waterways for the distribution of construction materials. **Interviewees 9 and 10** are managers of catering wholesalers in Amsterdam. **Interviewees 11 and 12** are municipal mobility researchers who investigated the potential for urban waterway transport in Amsterdam. **Interviewee 13** is a mobility consultant at Ecorys who was involved with research on a waterway transport concept in Ghent. **Interviewee 14** is a mobility consultant at research institute TNO and is actively involved with the 'Amsterdam Vaart!' project. **Interviewee 15 and 16** are policy advisers at the municipality of Amsterdam. Furthermore, a pilot experiment has been organised and an interactive session with Amsterdam residents was held in 'Pakhuis de Zwijger'. Reports on these activities are provided in Section A.4 and Section A.3.

2.2.4 Focus group meeting

The final data collection method used is a focus group meeting with real-life stakeholders and experts. A focus group involves a discussion on a particular topic under the direction of a moderator who promotes interaction and makes sure that the discussion remains on the topics of interest (Stewart & Shamdasani, 2014). A focus group meeting can well be used complementary to individual interviews. During a focus group, data is produced through the interaction of a group in an interview process. Interesting ideas can be stimulated by group interaction and group discussions support quality checks of the arguments given by participants. Group discussions therefore have been found to reveal a more nuanced perspective on a topic than could have been discovered through individual interviews (Wildemuth, 2016).

In the first place, a focus group meeting offers the possibility to validate the failure factors that have been identified during the earlier stages of the research project. The focus group meeting made it possible to efficiently discuss different ways to overcome the factors that have been identified during the individual interviews. The participation of real-life stakeholders make that the focus group could have important practical implications. Involving real-life stakeholders was a unique opportunity to develop a policy proposal that could be valuable for real-world application. **The focus group meeting mainly served to validate earlier identified barriers, to decide on the most critical barriers and to discuss how to overcome these barriers.**

Selection of the focus group meeting participants was based on the importance to include a broad set of experts with different backgrounds. The focus group meeting protocol, which was sent to the participants in advance, and a detailed transcription of the meeting are provided in Section A.5 The analysis of relevant stakeholders (Section 4.3.2) served to cover all relevant actors. All experts approached for the focus group meeting were willing to participate. Table 2.2 provides an overview of the participants, their roles and the institutions they represent.

Table 2.2: Participants focus group meeting

Name	Role	Institution
Daan Bloeme	Owner and Manager	Amsterdam Boat Events
Willem Post	Manager	Mokum Mariteam
Bart Verweijen	Manager	ZOEV City
Karin Peskens	Consultant Programma Varen	Gemeente Amsterdam
Maurits van Pampus	Researcher Roboats	AMS
Sarika Jagan	Project Manager	Bidfood NL
Annemieke Bieringa	Straatmanager	BIZ Nieuwmarkt
Joost Smit	Werkgroep Water	VVAB
Betty Nijmeijer	Werkgroep Water	VVAB
Dingeman Coumou	Werkgroep Water	VVAB

2.2.5 Triangulation

A first list of success and failure factors is extracted from desk-research and a second list of factors is extracted from interviews with experts. The focus group served to discuss and validate the identified. The insights from desk-research, expert interviews and the focus group are discussed by methodological triangulation. This may result in three different outcomes. Findings can converge, complement or contradict. Converging results increase validity through verification. When results relate to different objects they can be complementary to each other and highlight different aspects. Results can also be divergent and contradict with each other, which may lead to new insights or recommendations on further research (Heale & Forbes, 2013).

In general, using multiple data sources to explore data on the same topic is useful to capture different dimensions of the same phenomenon. With desk-research a first list of success and failure factors is identified. The interviews focused on the city of Amsterdam in particular. Using multiple data sources to deal with the limitations of using single data collection and analysis methods is referred to as triangulation (Given, 2008). **Triangulation served to discuss and validate the findings obtained with different data collection methods.**

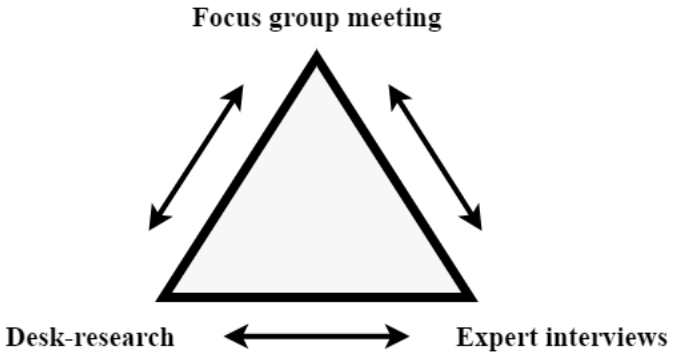

Figure 2.1: Triangulation of research methods

2.2.6 Data-analysis

Once the qualitative data is collected with the research methods, the next step is to get insights from it. Miles and Huberman (1994) argue that analysing data involves three main steps: data reduction, data display and drawing conclusions. The first set of exploratory interviews served to get knowledgeable the field. They were not recorded, but notes have been made during the interviews. The in-depth interviews and the focus group meeting were recorded and fully transcribed.

Data reduction has been based upon the research lens presented in Chapter 3, the transcripts were analysed in an impressionistic manner and the lens served as a scheme to categorise the qualitative data. Although electronic coding is a widely used method to analyse transcripts of interviews, analysis is done manually. Summaries of the expert interviews (Section A.2)

have been written to efficiently review the interview findings based upon the success and failure factors discussed. As the goal of the expert interviews has been to explore the success and failure factors rather than prioritising them, factors have not been treated differently based on the amount of times they were mentioned by different interviewees. This is justified by the assumption that profound knowledge on urban waterway transport is limited and factors that are mentioned once could be equally important as factors mentioned more often. Moreover, the focus group meeting did allow for discussing the relative importance of earlier identified factors which still made it possible to get insight on their relative importance.

2.3 THEORETICAL FRAMEWORK

The previous sections described the overall research approach and the data-collection methods used. The theories that are used to scientifically explore the research questions are discussed in Chapter 3. A schematic overview of the research project is shown in Table 2.3, which lists the main research activities, the research steps, the inputs and the theories used. The research process can be divided in three phases: exploring factors, developing ways to overcome critical failure factors and reflecting on the research process and findings.

The theoretical framework strengthens the study by connecting the data-collection methods with existing theoretical assumptions. Theory has been used to support effective desk-research and expert interviews. In the first phase, Innovation Adoption Theory (IAT) indicated the categories of factors that should be analysed when assessing the feasibility of implementing innovations. The categories of feasibility factors are operationalised by reviewing existing literature and interviewing experts. In the second phase, Business Transition Management (BTM) and the TMC have been put into practice during the focus group meeting. Finally, reflecting on existing theories and the research findings led to academic contributions. The following chapter elaborates in more detail on the theories that have been used throughout the research project.

Table 2.3: Theoretical framework

1. Exploring success and failure factors		
Steps	Inputs	Theory and frameworks
1.1 Select a research lens	Literature analysis	
1.2 Explore factors in existing literature	1.1, Desk-research	PEF Feitelson & Salomon
1.3 Identify factors from expert knowlegde	1.1, 1.2, Individual interviews	PESTEL classification
1.4 Triangulate findings	1.2, 1.3, 2	
2. Developing ways to overcome failure factors		
2.1 Construct a shared vision	1.2 - 1.4, Focus group interview	TMC Loorbach (2010)
2.2 Explore pathways	1.2 - 1.4, Focus group interview	BTM Loorbach & Wijsman (2013)
2.3 Construct pilot experiments	1.2 - 1.4, Focus group interview	BTM Loorbach & Wijsman (2013)
3. Reflecting on process and findings		
3.1 Reflect on research process	1.1 - 2.3	
3.2 Construct an adaptive analysis framework	1.1 - 2.3, Literature analysis	PEF, PESTEL, MLP Geels (2002)
3.3 Propose policy recommendations	2.1 - 2.3	

3 RESEARCH LENS: SUITABLE THEORETICAL FRAMEWORKS

To explore the implementation of urban waterway transport scientifically, a theoretical research lens is required. General literature on innovation adoption is discussed to improve the understanding on innovation diffusion. It has been argued that the implementation of transport innovations does not merely depend on the outcome of innovation diffusion, but on the outcome of societal and political processes. Based on this notion, the Political Economy Model from Feitelson and Salomon (2004) has been selected and complemented to be a suitable research lens for this project. In ambition to overcome existing failure factors, the prescriptive strategy to facilitate sustainable system transitions from Loorbach (2010) is used. This strategy normally constitutes a time span of multiple years, but to put the strategy into practice during a focus group meeting, an adapted approach has been constructed.

3.1 THE ADOPTION OF TRANSPORT INNOVATIONS

3.1.1 Literature on Innovation Adoption

In the literature, many theories on the adoption of innovations can be found. Different theoretical frameworks are proposed to describe the process of innovation adoption. Innovation adoption can be described as a process of different stages an individual or organisation goes through from awareness to continued use of the innovation (Rogers, 2003). Typically, the choice to adopt an innovation is based on weighing a set of evaluative criteria, while keeping in mind certain purposes of using the innovation (Arts, Frambach & Bijmolt, 2011). Studies on the topic of innovation adoption typically build upon Diffusion of Innovations Theory (Rogers, 2003), the Theory of Planned Behaviour (Ajzen, 1985), the Technology Acceptance Model (Davis, 1989) and the Theory of Reasoned Action (Fishbein & Ajzen, 1977).

Diffusion of Innovations Theory aims to explain how new ideas and technologies get adopted and why they do so. Rogers (2003) defines adoption as the decision to fully make use of an innovation and describes the adoption process as a sequence of stages an idea, service or product passes through before it becomes fully accepted by individuals or other decision making units. The Theory of Planned Behaviour describes how people's attitudes, perceived behavioural control and subjective evaluation of the behaviour predict an individual's intention to engage in a particular behaviour, which can be defined as using an innovation. The Technology Acceptance Model describes how new technologies become accepted and used based on the

perceived usefulness and the perceived ease of use. The model is demonstrated in the Theory of Reasoned Action which describes the relationship between the expectations people have on the outcomes of engaging in a particular behaviour and performing the behaviour. Although these theories provide relevant insights on the adoption of innovations in general, it is assumed that the adoption of waterway transport is not merely the outcome of individual decision making.

The variety of urban freight transport actors involved makes that adoption is considered to be better explained as a joint decision of different stakeholders. Moreover, it is expected that implementation of this particular transport innovation requires infrastructure investments and changes in the regulatory framework. This makes that implementation can not simply be analysed as the choice to adopt the innovation or not. This is well aligned with Feitelson and Salomon (2004) who argue that the adoption of societal transport innovations requiring government involvement can better be explained by analysing the interaction of feasibility factors at the societal level.

3.1.2 The Political Economy Framework

It is essential to analyse the impact of changes in transport systems on changes in the economy or the wider society (van Wee, Annema & Banister, 2013). Although a framework specifically addressing the implementation of urban waterway transport has not been found, different frameworks exist to theoretically support the analysis on the implementation of transport innovations (Banister, 2005; van Wee, Marchau & Kleinknegt, 2004; Markard & Truffer, 2008; Van den Bergh, Van Leeuwen, Oosterhuis, Rietveld & Verhoef, 2007). These frameworks provide general understanding to analyse the implementation of innovations, but in ambition to systematically explore success and failure factors, a more pragmatic framework is required.

The Political Economy Framework (Figure 3.1) proposed by Feitelson and Salomon (2004) conceptualises the interaction between different feasibility factors and specifically focuses on innovations that strongly address societal challenges. The framework aims to explain why certain innovations have been adopted while others have not and is based on analysis of transportation and telecommunication innovations. Transport innovations cannot only be analysed as customer products as they often aim to change the behaviour of transport and mobility systems and thereby affect society as a whole. Transport innovations could therefore not simply be analysed as an outcome of atomistic decision making processes, but require the analysis of several societal processes in which governmental institutions are often significantly involved. It is argued that the adoption of transport innovations is determined by their technical, economic, social and political feasibility.

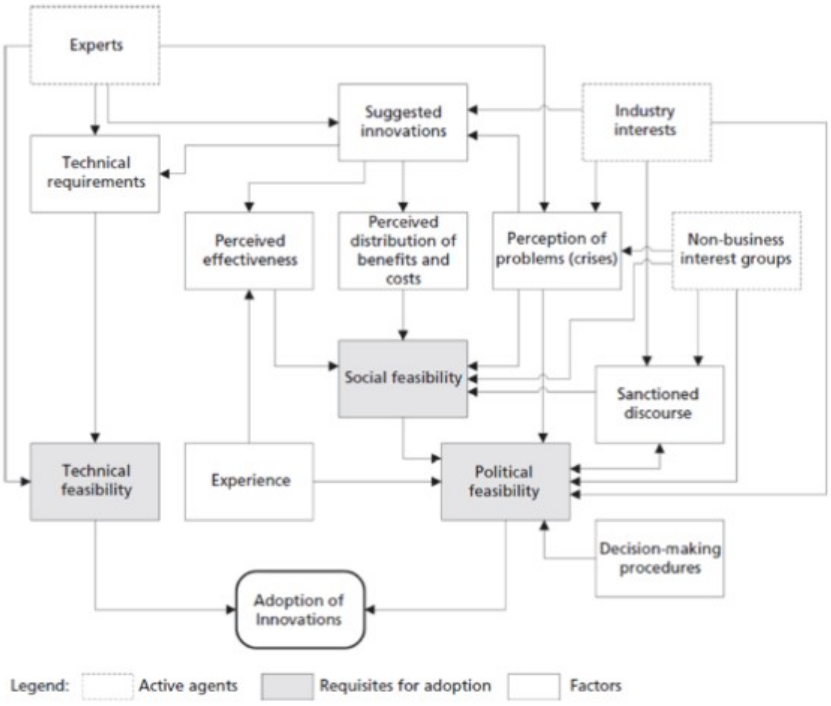

Figure 3.1: The Political Economy Framework (Feitelson & Salomon, 2004)

To be seen as technically feasible, an innovation must work, it must be able to make use of the proposed innovation. Furthermore, innovations need to be perceived as cost-effective. Innovations that do not seem to provide benefits over costs, are not likely to get adopted. To be socially feasible, innovations must be accepted by the wider public. The distribution of cost and benefits, the economic feasibility, together with the social acceptance of society, the social feasibility, determine whether an innovation is perceived as politically feasible. Political feasibility is said to be the outcome of a political process that involves different interest groups. For an innovation to become politically feasible, it must be on the political agenda of decision-makers who decide to support the innovation or not. As often many different innovations are promoted constantly, innovations can only become politically feasible at certain moments in time.

When a current situation is perceived as problematic, innovations aiming to steer the situation in a desirable direction are put on the agenda and have a chance to get adopted. Feitelson and Salomon (2004) argue that the adoption of innovation is determined by the degree to which decision-makers are willing to act for or against the adoption of the innovations. This notion is aligned with the famous theory on public policy making provided by Kingdon and Stano (1984) who argued that in order to make to changes in public policy, there must be a critical problem, an available solution and the political will to solve the problem.

Although the Political Economy Framework provides a good starting point for analysis, the notion of feasibility is considered to be too narrow to capture the complexity of addressing innovation adoption. The importance of

economic feasibility is addressed by including the perceived distribution of costs and benefits, but the viability of the business case for a proposed innovation is not explicitly addressed. Neither does the framework account for the impact of legal rules and regulations on the commercial feasibility. Existing research, discussed in Chapter 4 indicates that the success of existing waterway transport concepts largely depends on commercial feasibility and legal measures to limit the free flow of road transport.

3.1.3 The PESTEL Classification Framework

To address the importance of both the viability of the business case and the impact of the regulatory framework, the Political Economy Framework is complemented with the PESTEL classification framework. PESTEL is an acronym for six sources of change: Political, Economic, Social, Technological, Ecological and Legal. PESTEL analysis is a powerful and widely used tool to identify the changes and the effects of the external macro environment on the competitive position of a firm (Sammut-Bonnici & Galea, 2015). Generally the PESTEL framework is used to analyse and monitor the factors that may have profound impact on how organisations perform, which is especially useful when starting new businesses. Therefore, the framework is considered to be well suited to address the commercial feasibility of innovations. The Political Economy Framework already includes political, social and technical feasibility factors. The PESTEL framework contributes by including economic and legal factors. An overview on how both frameworks are used as a research lens throughout this research project is provided in Figure 3.2.

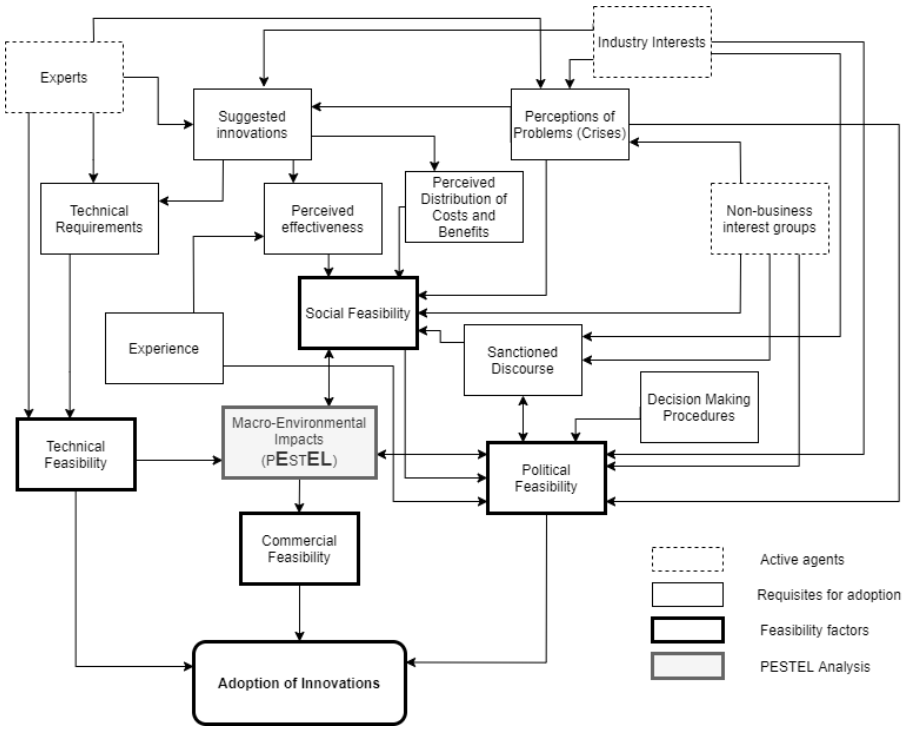

Figure 3.2: An analysis framework for innovation implementation

3.1.4 A combined analysis framework

Like the Political Economy Framework, the adapted framework starts from the assumption that successful adoption of innovations depends on the interaction of different feasibility factors. In the first place, waterway transport needs to be technically feasible: it must be able to transport freight on urban waterways. Secondly, it must be politically feasible: a majority of decision-makers must support urban waterway transport and be willing to develop favourable policies. Political feasibility is closely linked to social feasibility: the extent to which the implementation of waterway transport is accepted by the public. Thirdly, waterway transport must be commercially feasible, there must exist a viable business case for waterway transport operations. The viability of the business case is considered to depend on macro-environmental impacts, which include technical, political and societal impacts and adds economic and legal impacts to the factors that constitute the requisites for adoption. Economic factors are considered to be the factors that determine the distribution of monetary costs and benefits and legal factors are imposed by established or lacking rules and regulations. The combined analysis framework is used to effectively target and analyse the factors determining the likelihood that urban waterway transport will get implemented.

3.2 THE TRANSITION TOWARDS SUSTAINABLE SYSTEMS

3.2.1 A Transition Management Framework

To scientifically explore what policy approach could foster the potential for a transition towards a sustainable urban freight transport system that integrates waterway transport, theory on how to guide sustainability transitions is required. Urban waterway transport is considered to be an innovation focusing on sustainable development. Loorbach (2010) provides a framework that describes four governance activities to guide and accelerate transitions to sustainable systems. Loorbach and Rotmans (2010) and (Loorbach & Wijsman, 2013) further translate these activities into practical steps to perform when managing transitions. The core of these steps is based on the notion of 'selective participation', which can be described as bringing together a group of forerunners that have different backgrounds, somewhere were they can discuss and collectively develop understanding of a complex system and their role within this system. To put the prescribed transition management approach into practice during a focus group meeting, the governance activities are translated into feasible focus group activities. Loorbach and Wijsman (2013, p.24) describes the following activities and visually presents them in the Transition Management Cycle (Figure 3.3):

- Strategic: activities at the level of a societal system that take into account a long time horizon, relate to structuring a complex societal problem and creating alternative futures often through opinion making, visioning and politics

- Tactical: activities at the level of sub-systems that relate to the build-up and break-down of system structures (institutions, regulation, physical infrastructures, financial infrastructures and so on), often through negotiation, collaboration, lobbying etc.
- Operational: activities that relate to short-term and everyday decisions and action. At this level actors either recreate system structures or they choose to restructure or change them
- Reflexive: activities that relate to evaluation of the existing situation at the various levels and their interrelation of misfit. Through debate, structured evaluation, assessment and research societal issues are continuously structured, reframed and dealt with

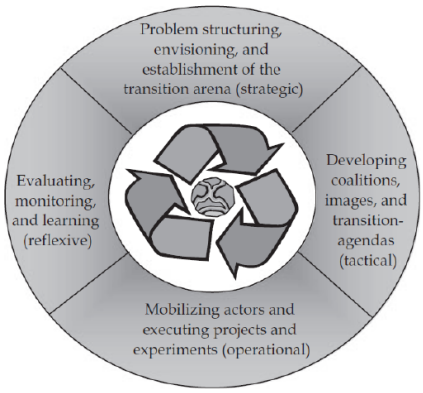

Figure 3.3: Transition management cycle (Loorbach, 2010)

3.2.2 An adapted Transition Management Framework

To fit the Transition Management approach within the given the time span of this research project, an adaptive approach has been constructed. Loorbach (2007) points out that, within transition management, it is important to bring together small groups of forerunners who are able to conceptualise problems and could reframe problems into attractive sustainability visions. This is translated into bringing together a small group of different individuals who perform four tasks in ambition to develop a shared vision on urban freight transport in Amsterdam, to envision pathways to overcome existing failure factors, to identify knowledge gaps and to construct relevant pilot experiments. This is considered to result in an improved understanding on how to accelerate the implementation of waterway transport. In Figure 3.4 the four tasks are presented. In line with the Transition Management Cycle, the four tasks can be described based on four levels.

- Strategic: a group of actors should be brought together to develop a shared vision on urban freight transport in Amsterdam. Here, a group of individuals is asked to discuss how waterway transport contributes to a desired freight transport system.

- Tactical: identifying interdependencies and potential collaborations. Here, a group of individuals is asked to discuss what tasks need to be performed by what actors in order to contribute to the shared vision on freight transport.
- Operational: identifying missing knowledge and pilot experiments. This task serves to identity the knowledge that is missing and experiments that could serve to obtain the required knowledge.
- Reflexive: reflection on the process and experiments is not possible, but requirements can be thought of. Therefore, this step serves to explore what requirements should be met by pilots in order to proceed.

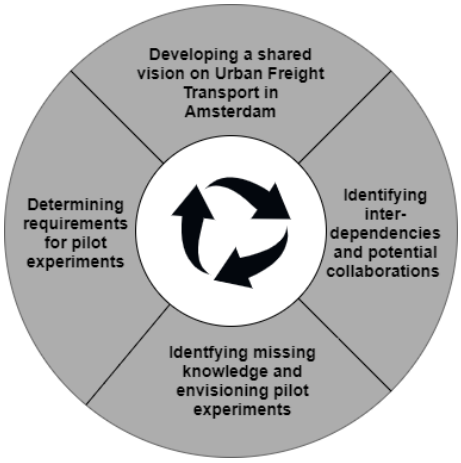

Figure 3.4: Adapted transition management cycle

3.2.3 Applying the research lens

By providing existing theoretical assumptions, the research lens is used to systematically and effectively conduct the research activities. Chapter 4 provides the success and failure factors that were explored. The research lens provides assumptions on the factors that are considered critical. Desk-research is done to explore and fit empirical findings of research on urban waterway transport within the research lens. This led to the insight that existing research has a limited scope on assessing feasibility. The research lens, Figure 3.2, supports a wide exploration of feasibility throughout this project. Chapter 5 provides the interview findings. Interviews served to address the feasibility factors of which little is known in existing literature. During interviewing, the included factors were used as a check-list to verify whether the interviewees reflected upon all feasibility themes. Figure 3.4 is used to put Transition Management Theory into practice and to structure the activities performed during the focus group meeting. Research reflections are made based upon the use of Figure 3.2 and an innovative framework has been constructed to account for the limitations that were recognised during the project. The next chapter provides the findings of desk-research done to explore the implementation of waterway transport in existing literature.

4 DESK-RESEARCH: EXPLORING URBAN WATERWAY TRANSPORT

The research lens presented in the previous chapter provides the basis for the execution of the research activities. Analysing research on the feasibility of urban waterway transport served to enrich the knowledge on the subject and to further explore existing knowledge gaps. Some scientists already indicated theories on the success and failure of waterway transport concepts in other European cities. This resulted in a first list of success and failure factors. Finally, the case of Amsterdam is explored in both academic and grey literature. The challenges the city is coping with, the potential role for urban waterway transport and the types of relevant stakeholders involved are presented.

4.1 OVERVIEW OF RESULTS

Table 4.1 provides an overview of relevant literature on urban waterway transport. The included literature provides insights into the factors that affect successful implementation. The table presents an overview on the research topics of previous studies, the methods that were used, the success and failure factors that were explored and the geographic location for which the studies were conducted. Generally, urban waterway transport seems to be a relatively under-investigated topic in scientific literature. An important outcome of the literature search seems to be that little researchers have systematically explored factors that determine the success or failure of waterway transport implementation in urban areas. The included literature mainly consists of reviews of existing concepts. This indicates that there is little scientific ground on the implementation of urban waterway transport, which supports the choice to conduct an exploratory case study. The following sections summarise and elaborate on the knowledge that is extracted from literature.

Table 4.1: Relevant literature on Urban Waterway Transport

Author	Topic	Methods	Factors explored	Geography
(Maten et al., 2003)	The revival of waterborne transport in Amsterdam	Case Study	Increasing freight demand, municipal regulations, handling costs, potential to reduce amount of road vehicles	Amsterdam
(Nemoto et al., 2006)	Intermodal transport and city logistics policies	Review of Concepts	Reducing emissions, large investments, transshipment locations, transshipment technology, pricing external effects, road transport policies, logistic performances	Europe
(Rohács & Simongati, 2007)	The role of inland waterway navigation in a sustainable transport system	Literature Analysis	Sustainability of waterway transport, transshipment costs, administrative work, cost-effectiveness	Europe
(Desclée, 2011)	Feasibility study for project Elektroboot in Ghent	Case Studies	Road transport policy, critical mass, cost-effectiveness	Ghent, Belgium
(Quak, 2011)	Review of urban freight transport sustainability initiatives	Review of Concepts	Logistical solutions, technological solutions, policy solutions, Including stakeholders, consolidation difficulties, transshipment costs, financial support government, improving accessibility, reducing emissions, density of waterway network	Europe
(Maes, Sys & Vanelslander, 2012)	The potential of urban waterway freight transport to increase accessibility and livability of urban centres	Case Studies	Active involvement of government, reducing emissions, avoid road restrictions, retour flows, employee costs, behavioural changes, transshipment costs, financial support	Europe
(Carlén, Josefsson & Olsson, 2013)	Potential role of urban waterways in sustainable urban freight transport	Case Study, Interviews	Feasibility and sustainability of transporting construction materials, reducing emissions, reducing visual intrusion, transport costs	Gothenburg, Sweden
(van der Meer, 2012)	Exploring the use of waterway transport for urban freight transport in Amsterdam	Case Study, Interviews	Road congestion, cooperation of shippers and transporters, financial governmental support, road transport restrictions	Amsterdam
(van Duin et al., 2014)	The potential of freight waterborne transport in the inner-city of Amsterdam	Simulation Study	Road congestion, interference passenger transport, transport performances, horeca deliveries	Amsterdam
(Janjevic & Ndiaye, 2014)	Inland waterway transport for city logistics	Review of Concepts	Density of inland waterways, the location of shippers, transshipment locations, storage areas, congested roads, accessibility problems, suitable load units, (un)loading system, inclusion of stakeholders	Europe
(Diziain, Taniguchi & Dablanc, 2014)	Urban logistics by rail and waterways in France and Japan	Comparative Analysis	Critical mass, governmental involvement, financial support, road congestion, road transport restrictions, organisational complexity, infrastructure availability, urban transshipment locations, load units	Japan and France
(Trojanowski & Iwan, 2014)	Review of urban waterway initiatives and analysis of Szczecin waterways	Review of Concepts	Direct involvement government, reducing amount of road vehicles	Szczecin, Poland
(Maes, Sys & Vanelslander, 2015)	Review of good practices and investigating scope for expansion	Literature Research, Cost-Simulation	Congested roads, accessibility problems, active local government, internalization of external costs, the image of inland waterway transport	Europe

(continued)

Author	Topic	Methods	Factors explored	Geography
(Jandl, 2016)	Identifying success and failure factors for inland waterway transportation in urban logistics	Case Study, Interviews	Road congestion, noise, road accidents, pollution, visual intrusion, financial support, infrastructure costs, road restrictions, low emission zones, bonus-malus system, cost-effectiveness, transshipment costs, consolidation, nature of goods, weather conditions, transport performances, road restrictions, behavioural changes	Gothenburg, Sweden
(Chevalier, 2016)	Assessing the opportunity of using waterways in Ghent	Case Studies	Close involvement of government, clear societal benefits, waterway network capacity	Ghent, Belgium
(van Duin et al., 2018)	Potential of a system of hub locations distributing horeca goods across the water to guarantee same-day delivery to shopkeepers	Simulation Study	Urban waterway transport performances, horeca deliveries	Amsterdam
(Horvath & Wu, 2017)	Commercial feasibility of Urban Waterway Transportation in Gothenburg	Literature Analysis, Interviews	Commercial viability, operational complications, cost-effectiveness, waste transport, urban goods transport	Gothenburg, Sweden
(Mazzarino & Rubini, 2019)	The feasibility of a mixed passenger and freight transport system	Case Study	Urban transport performance, regulatory framework, political support, transport capacity, stakeholder cooperation, mixed passenger and freight transport	Venice, Italy
(Johnsen et al., 2019)	Autonomous floating platforms to revolutionize urban services	Literature Analysis	Autonomous floating technology	Amsterdam
(Lof & Olsthoorn, 2019)	Exploring the opportunities for waterway transport in Amsterdam	Literature Analysis, Interviews	Urban transshipment locations, lack of space, vague transport policy, vessel restrictions, cost-effectiveness, nuisance on waterways	Amsterdam
(Gemeente Amsterdam, 2019f)	How to organise the exploitation of the Amsterdam canals	Policy report	Transshipment locations, road congestion, emissions, road infrastructure maintenance works, passenger transport, waterway transshipment time-windows	Amsterdam

End of Table

4.2 LITERATURE ON URBAN WATERWAY TRANSPORT

This section provides an overview on the body of knowledge on waterway transport. Urban waterway transport refers to the use of ships to transfer goods from origin to transit points by the urban waterway network of a city (He, 2019). Waterway transport usually offers economies of scale only when large distances are covered. Due to the additional handling costs for transshipment, waterway transport could usually not compete with road transport on short and medium distances (Wiegmans & Konings, 2015). Nevertheless, successful concepts exist and the topic of urban waterway transport received increasing interest in recent years. This section reviews the studies that provided relevant data and provides a comprehensive overview of the literature from which data is extracted.

4.2.1 Europe: available research and successful concepts

Rohács and Simongati (2007) examined the potential role of waterway transport in sustainable transport systems. It is argued that a modal shift seems inevitable and that, if possible, waterway transport should be implemented to increase the level of sustainability as it positively affects environment and society. It is concluded that due to the additional transshipment and the related administrative work it is difficult for waterway transport to become cost-effective enough to be an attractive transport mode within city logistics.

Quak (2011) reviewed a large set of different sustainable freight transport initiatives. It was argued that waterway transport is only feasible in specific circumstances and for a limited part of the total transport flow, in cities with a very high density of waterways. When these circumstances are met, waterway transport could improve accessibility and reduce negative environmental effects. A failure factor is formed by the additional transshipment costs which add to the total transport costs. Economies of scale could be reached when consolidating freight. Therefore, consolidation in combination with urban waterway transport seems an attractive initiative, but the review showed very little successful consolidation examples without financial support from governments. Freight forwarders and carriers usually have problems with cooperation as they look at the inner city transport operator as a competitor.

Janjevic and Ndiaye (2014) partially disagreed with Quak (2011). Through the analysis of several European waterway transport concepts, it is concluded that waterway transport can be used in the context of city logistics for the distribution of freight in several different transport segments, ranging from parcel delivery to catering delivery and waste transportation. For cities without a dense waterway network, the usage of road vehicles to perform a final distance offers solutions. Based on reviewing existing concepts, conditions for successful implementation are discussed. In Lille, waterway transport is used extensively to transport domestic waste. In Paris, waterway transport is performed to transport cargo bikes, loaded with small parcels, to

unloaded them at different transshipment points. The city of Paris also uses the waterways to transport containers with food products on a daily basis to the city centre, from which the containers are loaded on road vehicles that ship the containers to supermarkets. A similar concept is running in London, where vessels are used to transport containers loaded with food an the Thames and unload them relatively close to a large supermarket.

Based on reviewing the conditions in which these concepts operate successfully, the importance of a dense waterway network, the location of freight receivers, and the availability of locations that allow for transshipment and bundling of freight is emphasised. Successful concepts in Europe have in common that the local authorities play an important role in managing innovative transport concepts. The inclusion of both private and public stakeholders seems to be a fundamental factor for the success of existing waterway transport concepts and intervention of public bodies has often been required to financially support the initiatives and to designate sufficient sufficient loading and unloading facilities in the urban areas. It is concluded that waterway transport is only be able to be competitive to road transport when considerable accessibility problems exist. When this is the case, urban waterway transport is highly relevant for cities that posses a dense waterway network connecting a satisfactory number of receivers and shippers, or transshipment platforms that enable inter modal freight transport chains.

Diziain et al. (2014) compared inter-modal freight systems in France and Japan and focused on urban areas. Opportunities to improve systems by promoting modal shifts have been identified for both countries. It was concluded that inter-modal services are difficult to implement for deliveries within urban areas. Normally, only high volume flows are suitable. A number of projects that include inter-modal services within urban areas are explored. It was observed that local authorities in France are increasingly involved with policy making to support waterway transport. Incentives and subsidies are provided to stimulate the development of waterway transport projects. A critical factor for the emergence of urban waterway transport concepts is said to be the increasing levels of congestion in the inner city. Existing concepts aimed to avoid congestion and prepared for regulations restricting access to trucks into city centres. Establishing successful concepts is said to be difficult mainly due to high costs and organisational complexities.

Four factors are said to determine the potential for inter-modal services in urban areas. Existing road networks need to be congested, multi-modal infrastructure must be available, inner city transshipment locations must be available and industrial activities must take place at relevant locations. It is argued that waste and construction materials are the most appropriate freight flows for inter-modal transport. When decision-makers promote modal modal shifts and designate sufficient terminals and access routes, manufactured products and food are also said to be promising targets.

Trojanowski and Iwan (2014) explored whether it is possible to transport freight within the city of Szczecin using the urban waterways. Based on the review of European concepts, it is concluded that the use of waterway transport can significantly reduce the amount of road transport movements. Although European concepts of urban waterway transport are reviewed, focus of their study is more on inland transport towards the city of Szczecin than on transport within the urban area. For waterway transport to be economically efficient in Szczecin, the direct involvement and support of the local government is said to be crucial.

Desclée (2011) provided the results of examining the feasibility of a particular urban waterway transport concept in Ghent. It was found that transporting a critical mass is required to be able to compete with road transport and that as long as the costs for road transport are relatively low, shippers located in Ghent will prefer road transport to waterway transport. A cost-benefit analysis demonstrated that the societal benefits are not able to cover the financial costs for the waterway transport project in Ghent.

Maes et al. (2015) built on the work of Desclée (2011) and deepened the knowledge on the potential for urban waterway transport in Flanders. A thorough review of well working practices lead to the conclusion that there is scope for expansion for waterway transport. It is observed that several European cities cope with accessibility problems due to increasing road transport and a lack of space. Based on reviewing the 'Beer Boat' in Utrecht, the 'City Supplier' and the 'DHL Floating Service Center' in Amsterdam, it is concluded that existing concepts reduce emissions, noise and congestion. It is argued that costs for transshipment form the main failure factor in becoming competitive to road transport. Transport costs can only become competitive to road transport when sufficient volumes are transported and therefore financial support is required during start-up phases.

Chevalier (2016) also assessed the opportunity of using urban waterway transport in Ghent. Based on a set of case studies on existing European concepts it was concluded that the successful operation of waterway transport depends on the close involvement of different stakeholders, clear societal benefits and unique characteristics of available waterway networks. In line with the findings of Desclée (2011) and Maes et al. (2015), it has been concluded that urban waterway transport has significant potential, but due to the high operating costs for transshipment, the financial viability seems to be a critical failure factor.

Carlén et al. (2013) explored the potential role of urban waterway transport in sustainable urban freight transport within the city of Gothenburg. Based on a case study, the potential for transporting mass construction materials is examined. Although focused on mass transport, the case study led to the conclusion that waterway transport is an efficient transport initiative to make freight transport more sustainable. Other students addressed the city of Ghotenburg as well. Jandl (2016) explored whether implementation of a combined goods and waste transportation system is feasible. Strong fail-

ure factors due to a lack of economic viability were identified. Successful implementation is said to depend on the support of decision-makers who must implement regulations to limit the free flow of road traffic. Horvath and Wu (2017) specifically examined the business aspects of operating urban waterway transport of goods and waste and finds that the the commercial viability is limited since transport operators aim to offer cost-efficient transport services, rather than offering cleaner transportation. It is argued that the integration of waterway transport creates numerous operational complications for logistic stakeholders.

4.2.2 Amsterdam: successful concepts and scope for expansion

A distinction can be made between urban waterway transport towards cities and urban waterway transport within cities. Foreign examples, typically constitute waterway transport towards cities. A similar concept, Distrivaart, was introduced in the Netherlands, but due to a lack of demand and technical issues with the loading and unloading system, the concept failed (Maes et al., 2015). Regarding waterway transport within urban areas, three Dutch concepts are often elaborated on in existing literature:

- The Beer Boat is a fully electricity propelled inland ship that sails through the city centre and delivers drinks and other catering products to the quays. Operating the ship requires two staff members and currently, the beer boat is serving around 70 customers, among mainly catering companies. Besides supplying, the boat also performs reverse flows with, for example, garbage from bars and restaurants. The beer boat concept has the capacity of 18 tonnes or 40 to 48 rolling containers, which corresponds with six vans or two truck loads (Municipality of Utrecht, 2019).

- The City Supplier is an electric vessel with a length of 20 meters and a width of 4,25 meters which is used to transport several types of freight on the Amsterdam canals. With a capacity of 85 square meters, the city supplier is able to transport as much as four compact trucks (Mokum Mariteam, 2010). Transshipment is done with a hydraulic crane. Freight is usually unloaded along the canal walls and if required a small electric vehicle performs the final distance on road.

- The DHL floating service centre initially was a typical vessel used for passenger transport for tourists in Amsterdam. In 1997, DHL transformed the vessel into a floating service centre by replacing the benches for passengers by postal sorting tables. The floating centre sails a specific route and distributes mail along the route, from where the mail is further distributed by cyclists. This made it possible to reduce the amount of road vehicles required (Janjevic & Ndiaye, 2014).

Figure 4.1 shows images of the concepts to get insight in the characteristics of the vessels used for urban waterway transport.

Inspired by these three concepts, a couple of researchers explored the potential to expand the use of urban waterway transport in Amsterdam. Maten et al. (2003) recognised that increasing demand for goods, combined with municipal regulations aiming to improve the quality of life, resulted in the use of more and smaller trucks. They stated that this has resulted in a less efficient transport system with a larger total amount of kilometres driven. The potential of urban waterway transport for the distribution of urban goods has been researched by using the city of Amsterdam as a case study. Limitations are found in the width of the canals and the height of the bridges over the canals. These limit the cargo capacity. Furthermore, weather conditions were considered to be a failure factor as in severe winters floating ice can cause problems. It is concluded that waterway transport could contribute to a sustainable society by reducing the required amount of vehicles and the number of kilometres driven. In order to become successful, the societal benefits of waterway transport should compensate for the additional required handling costs.

Figure 4.1: Beer Boat (VGN, 2018), City Supplier (Mokum Mariteam, 2010) and the Floating Service Centre (Depositphotos, 2016)

van der Meer (2012) focused on the City Supplier and explored whether the concept could contribute to reduce the rising levels of road congestion in the historical Nieuwmarkt area. It was concluded that the limited willingness of shippers to cooperate was a main failure factor. The idea was to consolidate the freight of different shippers, but shippers were not willing to hand over their freight to Mokum Mariteam. The research concluded that in order to stimulate the cooperation of shippers, the municipality could play an important role by offering financial support and implementing restrictive transport policies on road transport. van Duin et al. (2014) argued that freight distribution on waterways could be possible on a larger scale in Amsterdam. Considering the traffic on the Amsterdam waterways, a simulation model showed the capability to reduce congestion in the city centre and the ability of waterway transport to fulfil the requirements of restaurants in the inner city, without significant interference with other activities on the waterways.

Built on this, van Duin et al. (2018) developed an additional simulation model to further explore whether waterway transport can be a sustainable solution for the city of Amsterdam. This model showed that with a small number of transshipment locations in the urban area, waterway transport can compete with truck deliveries based on the logistic performances of both modalities. Johnsen et al. (2019) explored whether a fleet of autonomous floating vessels could foster the application of urban waterway transport in Amsterdam. They elaborated on the development of autonomous floating

technology. Although the article does not provide any specific research findings, it is stated that there is real potential for the successful deliverance of autonomous floating technology that can be used for freight transport purposed in the near future.

The municipality recognised waterway transport as a means to alleviate existing problems caused by urban freight transport and issued a research project to further explore its potential. Research done by Lof and Olsthoorn (2019) demonstrated that waterway transport is currently being used for construction projects and waste collection. It was concluded that waterway transport could also be used to distribute food and beverages. Several Amsterdam waterway transporters stated the ambition to expand, but mention the lack of sufficient loading and unloading facilities as the main failure factor for expansion. To stimulate expansion, public support in terms of financial support and policy implementation is considered to be a prerequisite.

In a recently published policy report, the municipality of Amsterdam stated the ambition to stimulate urban waterway transport. In 'Nota Varen Deel 2' the lack of transshipment locations in the urban are is recognised. The majority of the locations that are currently available are extensively used by passenger transporters. Additionally, most of the suitable locations can only be used for a maximum time of 15 minutes, while transshipment of freight often requires more time (Gemeente Amsterdam, 2019f). The municipality is aware of the importance to enable transshipment of freight along the waterways and aims to further explore how to implement urban waterway transport.

4.2.3 Success and failure factors explored

Table 4.2 and Table 4.3 provide an overview of the factors that have been explored in literature. While Table 4.1 showed what factors have been explored by which authors, the tables in this section structure the explored factors according to the research lens. Success factors are considered to be the factors that increase the potential for implementation, while reasons that hold back implementation are considered to be failure factors. Waterway transport could alleviate issues generated by road transport and transport operators could avoid public measures limiting road transport. Success factors come down to the alleviation of societal issues, technical developments and the involvement of all relevant stakeholders.

Table 4.2: Success factors explored in existing literature

Success factors	Sub-factors
Social	Increasing levels of congestion
	Environmental pollution
	Damages to road infrastructure
	Noise nuisance
	Visual intrusion
Commercial (legal)	Avoiding time-windows
	Avoiding road restrictions
	Zero-emission zones
Commercial (economic)	Financial support
	Internalisation of external costs
Technical	Multi-functional (retour flows)
	Universal load units
	Density of waterway network
	Availability of urban hubs
	Availability of infrastructure
	Autonomous technology
Political	Active local government
	Inclusion of all stakeholders

The potential reasons for failing implementation are structured according to the research lens and presented in Table 4.3. As can be observed, existing literature predominantly focuses on factors that frustrate commercial and technical feasibility. Failure factors come down to the additional costs related to initial investments and transshipment, and the lack of infrastructural capacity to support waterway transport in urban areas. Little seems to be known on factors relating to social, legal and political feasibility of implementation.

Table 4.3: Failure factors explored in existing literature

Failure factors	Sub-factors
Social	-
Commercial (legal)	-
Commercial (economic)	Transshipment costs
	High initial investment costs
	Administrative costs
	Obtaining critical mass
	Cost-effectiveness
	Cheap road transport
	Failing cooperation logistic actors
Technical	Insufficient transshipment locations
	Organisational complexity
	Different logistic performances
	Interference passenger traffic
	Density of waterway network
Political	-

4.2.4 Implications for the research project

Despite increased interest in waterborne solutions, no scientific studies incorporating a broad scope on success and failure factors have been found. It is widely recognised that road-based transportation leads to a number of undesired social, environmental and economic impacts. When addressing the negative impacts of road-based transport, policy makers put emphasis on reducing road transport. Little is known on the effects of policy limiting road transport on the potential for waterway transport. Furthermore, studies using a comprehensive framework to identify, analyse and evaluate success factors and failure factors have not been found. When implementing freight transport measures, the interests of different stakeholders should be included.

Desk-research provided a first exploration of success and failure factors, which will be used as input for interviewing experts and stakeholders. The interviews served to verify the factors that have been identified from literature and to contribute them by factors specifically relating to Amsterdam. The remaining of this thesis focuses on implementation within Amsterdam, starting with the following section, which elaborates on the municipal coordination of freight transport and the stakeholders involved.

4.3 LITERATURE ON TRANSPORT POLICY AND DIFFERENT INTERESTS

Several researchers concluded that the successful operation of concepts depends on the close involvement of stakeholders. This section elaborates on how different interests within urban freight transport impose success and failure factors for implementation and explains the role of the local government in Amsterdam. It thereby serves to illustrate the importance of consulting experts and stakeholders when addressing the potential for implementation.

4.3.1 Policy reports and municipal programmes

Implementing solutions to tackle problems caused by freight transport requires understanding of the complex urban freight transport system. Technical complexity is introduced by the technologies used within the freight transport system, such as the vehicles used to perform transport operations. Different types of vehicles are used and mode choices depend on the characteristics of the products that are transported. Additional complexity is introduced by variety of actors involved. Transport initiatives could be a solution for the one, but could form new problem to others (Browne & Allen, 1999). For many cities, rules to regulate the access to city centres such as time-windows and weight restrictions are fundamental for organising the urban space and logistic planning of freight transport (Louise et al., 2019).

In the city of Amsterdam, efficient organisation of the freight transport system is frustrated by the increasing amount of users and the decreasing amount of available space. The critical state of road infrastructure, rising congestion levels and air pollution have created the urgency for stricter municipal rules for access to the city centre. The critical state of the quays and bridges has lead to a ban for heavy freight vehicles in the centre of Amsterdam. Freight vehicles with a weight of more than 7,5 tonnes need to obtain permission by the municipality before they are allowed in the city centre (Gemeente Amsterdam, 2019a). Strict enforcement of the vehicle weight restriction zone, multiple smaller vehicles will be required to supply the same amount of freight, which is said to lead to increasing congestion levels, while congestion already is an existing problem (Rademakers & van Bossum, 2019). In Figure 4.2 the vehicle weight restriction zone is presented together with the routes that allow for heavy freight transport. In Figure 4.2, an overview of the canal walls in critical state ranging from low risk (green) to high risk (red) on subsidence is presented.

Figure 4.2: Weight restriction zone zone and state of the Amsterdam canal walls (Retrieved from: (Lof & Olsthoorn, 2019)

The issue within the freight transport system is based on environmental pollution. Freight transport has negative impacts on air quality and climate change by polluting the environment (Vilarinho, Liboni & Siegler, 2019). Reduced air quality is one of the main concerns for the municipality of Amsterdam and the most effective way to improve air quality is to realise emission-free transport. The municipality of Amsterdam aims to become emission-free in 2030 and gradually implements stricter environmental policy (Gemeente Amsterdam, 2019b)

The municipality aims to find a right trade-off between accessibility, livability and economic development (Gemeente Amsterdam, 2018). Improving accessibility usually is an important governmental goal as a transport system that functions well in combination with the land-use system is essential for the accessibility of urban areas, which is key to maintain liveable and to support economic development. Reduced accessibility is disadvantageous for urban freight transport and decreases livability and economic development, where livability can be broadly described as the social en economic

well being of citizens (Zanella, Camanho & Dias, 2015) and economic development as desired positive changes in income and employment (Ozbay, Ozmen-Ertekin & Berechman, 2003).

A key challenge comes from the fact that local governments often lack knowledge to efficiently organise urban freight distribution. Receivers of freight have specific demands and requirements regarding freight transport. In practice, the outcomes of freight transport and their coherent effects on society, are determined by the decisions of freight receivers rather than those of local authorities. Usually, public authorities do not clearly understand that improving freight transport policy depends on the inclusion of and the negotiation with different stakeholders. When aiming to implement efficient measures, it is crucial to involve different actors and to adapt policies to their needs rather than simply restricting the free flow of truck movements (Dablanc, 2007). Therefore, the next section addresses the most important stakeholders within urban freight transport.

4.3.2 Stakeholders to include

Conflicting stakes make it difficult to implement sustainable solutions within freight transport systems. Inclusion of actors' stakes is important when evaluating potential transport solutions as past initiatives have often failed because stakeholders were not sufficiently involved in the evaluation processes (Ballantyne, Lindholm & Whiteing, 2013; Stathopoulos, Valeri & Marcucci, 2012; Macharis & Kin, 2016). According to Quak (2008), the most crucial stakeholders to include when evaluating freight transport initiatives are: public authorities, shippers, freight transport operators, receivers and residents.

1. The main interest of public authorities usually is to reach a sustainable urban freight transportation system. Public authorities aim to ensure accessibility of the urban area to different categories of freight transport. At the same time they aim to reduce air pollution, greenhouse gas emissions, waste and noise levels. A more sustainable urban freight transport system should improve the resource- and energy-efficiency and cost-effectiveness of the transportation of goods, taking into account the external costs, and it contributes to the attractiveness of the city and the quality of life of the environment by avoiding accidents, minimising the use of land and without compromising the mobility of citizens (Behrends, Lindholm & Woxenius, 2008). To reach this objective, local authorities usually aim to reduce the amount of freight vehicles, nuisance and air pollution by implementing limiting regulations (Quak, 2011).

2. Shippers select freight carriers and request them to deliver freight to a receiver. Normally shippers are responsible for sending freight and arranging transportation. They select transport operators and request them to deliver freight to a receiver. Their objective is to minimise transport costs paid to freight transport operators and are therefore

constantly looking for options to increase efficiency and competitiveness. Shippers could also perform their own transport. In that case, they do not select a freight carrier, but organise transport themselves and both shipper as well as freight transport operator. Shippers are mainly concerned by the price that is offered by freight transport operators together with the service level that can be offered to meet the need of freight receivers (Ballantyne et al., 2013).

3. The main interest of freight carriers usually is to organise urban freight transport in the most efficient way so that it maximises profit. Local regulations and legislation forced by the local authorities frustrate the way freight carriers could organise their freight transport (Suksri & Raicu, 2012). Regulations such as time-windows force freight carriers to organise all transport activities within a limited time period, which often results in transport planning that is far from optimal. Especially, for carriers delivering to different cities, access regulations result in vehicle utilisation problem and inefficient freight transport planning (Quak, 2011).

4. Receivers normally are not involved in the freight transport itself, but their orders initiate the urban freight transport operations. Receivers for which the local area influences their performances, such as cafes and restaurants benefit from an attractive area as this will usually lead to increased interest from customers. Related to deliveries, receivers require a reliable transport system that makes sure freight is delivered in time (Quak, 2011).

5. Residents are actors that are not directly involved in urban freight transport. They are affected by the movement of freight. This group could be complemented by tourists and visitors when also considering the impact on groups that temporarily experience the effects of freight transport (Quak, 2011).

The interaction between the stakeholders that are taken into account during this research project is conceptualised in Figure 4.3. The outcomes of interviews with real-life stakeholders are presented in Chapter 5.

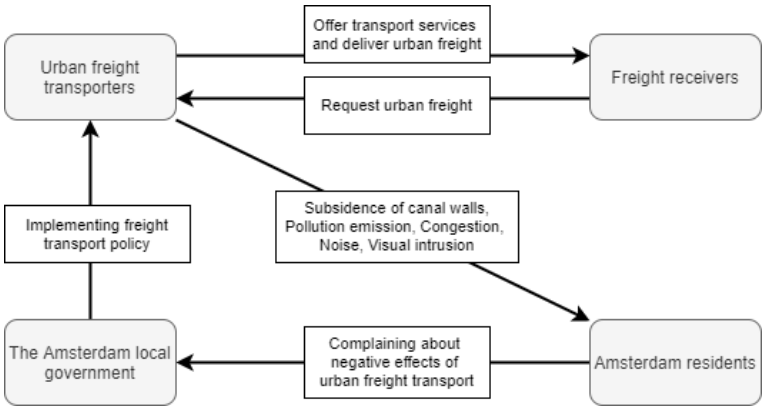

Figure 4.3: Stakeholder interaction. Adapted from (Suksri & Raicu, 2012)

4.4 KEY TAKEAWAYS FROM DESK-RESEARCH

This section provides a brief overview of the key takeaways extracted from existing literature, that will be used in the remaining of this thesis.

- To cope with the challenge of dealing with increasing levels of congestion, many transport initiatives have been explored in recent years. Implementing inter-modal transport systems is generally seen as a way to organise freight transport more efficiently, while having positive impact on sustainability. Due to additional handling costs during transshipments, inter-modal transport is usually considered to only be economically feasible when large distances are covered.
- Concepts in Utrecht, Amsterdam, Paris and London have often been analysed to identify key success factors. In London and Paris, waterway transport is used to transport freight towards cities, after which road vehicles further distribute the urban freight into the city. In Utrecht and Amsterdam, waterway transport is used to transport freight within the urban areas. Ghent and Ghotenburg have been the subject of case study research to determine whether it is possible to implement similar concepts. Strict regulations limiting the free flow of road transport and the active involvement of the local government in terms of financial support are considered to determine feasibility. Little seems to be known on the potential to expand waterway transport in Amsterdam, while existing small scale concepts demonstrate feasibility and the municipality stated the willingness to support wider implementation.

From desk-research it followed that the main stakeholders within urban freight transport are: public authorities, shippers, freight transport operators, receivers and residents. The next chapter will provide the findings of the interviews with experts and stakeholders, conducted to further explore the case of Amsterdam.

5 CONSULTING EXPERTS: SUCCESS AND FAILURE FACTORS

5.1 OVERVIEW OF RESULTS

From the analysis of literature it followed that urban waterway transport could alleviate the negative effects resulting from freight transport. It also followed that the active involvement of local governments has been important for the successful implementation of existing concepts. Previous studies on success and failure factors mainly focused on commercial and technical feasibility. Limited knowledge is available on factors that determine public acceptance and political decision-making. Additionally, little is known on how legal rules and regulations affect the potential for implementation in Amsterdam. In recent policy reports, the municipality of Amsterdam declared its ambition to stimulate freight transport on the waterways, but supporting policy measures have not yet been implemented. To complement the knowledge obtained from desk-research and to focus on the case of Amsterdam, this chapter provides the outcomes of interviews, conducted with real-life stakeholders and experts. Table 5.1 provides an overview of the interviewees and the success and failure factors identified.

Table 5.1: Results interviews

Number	Institute	Field of knowledge	Driving factors explored	Barriers explored
#1	Research institute AMS	Autonomous technology, Roboats	Autonomous technology, reducing emissions, state of canal walls	Legislative barriers, technology readiness
#2	Waterway transporter Mokum Mariteam	Organisation of freight transport on the Amsterdam canals	Multi-functional, reducing emissions, congestion and noise, financial support	Cost-effectiveness, lack of logistic cooperation, municipal support and transshipment locations, lack of critical mass
#3	Waterway transporter Rederij Kees	Organisation of freight transport on the Amsterdam canals	More sustainable transport by reducing emissions, congestion and noise	Cost-effectiveness, very difficult to compete with cheap road transport
#4	Waterway transporter ZOEV City	Organisation of freight transport on the Amsterdam canals	Emissions, congestion, noise, weight restrictions, consolidation, financial support, traffic safety, state of canal walls and bridges, multi-functional	No clear policy, lack of political support and transshipment locations, difficult to compete with cheap road transport, no last-mile performance
#5	Boat tour company ABE	Passenger transport and boat tours	Potential to reduce amount of road vehicles	Interaction passenger transport and pleasure crafts, weather conditions, lack of transshipment locations, obstruction by large passenger transporters
#6	Residents' association VVAB	Societal interests of inner city residents	Reducing emissions, noise and pressure on canal walls	Lack of political support, lack of municipal knowledge on technology and logistic operations
#7	Amsterdam University of Applied Sciences (HvA)	Expert on city logistics and supply chains	Scarcity of space, reducing emissions and congestion, zero-emission policy, weight restrictions, autonomous technology, financial support, pressure from interest groups, economies of scale, value density of freight. density of freight receivers, consolidation	Required licenses, lack of political support, short term vision policy makers, interaction with passenger transport, high initial investment costs, transshipment costs, lack of cooperation between logistic actors, difficult to change logistic planning, diversity of freight, weak transport performances, just-in-time requests, cheap road transport
#8	Port of Amsterdam	Transport of construction materials, Amsterdam Vaart	Increasing amount of construction projects, road congestion, reduced traffic safety, weight restrictions, favourable locations, emissions, reducing pressure on road infrastructure, time windows, autonomous technology, monetising external costs	Lack of transshipment locations, lack of space along canal walls, difficulty to obtain required licenses, interaction passenger transport, transshipment costs, lack of cooperation between logistic actors, cheap road transport
#9	Wholesaler Henk Smit	Distribution of beverages in Amsterdam	Municipal restrictions limiting the free flow of road transport, municipal tendering of transport operations	Lack of transshipment locations, lack of space along the canals, difficulty to find space due to parking spots, conflicting passenger transport, transshipment costs, diversity of product ranges, just-in-time requests

(continued)

Number	Institute	Field of knowledge	Driving factors explored	Barriers explored
#10	Wholesaler Bidfood	Distribution of food and beverages in Amsterdam	Road restrictions, congestion levels, financial support, shortage of truck drivers, consolidation, weight restrictions, time windows, zero emission policy	Product diversity and temperature requirements, transshipment costs, last-mile performance, lack of cooperation between logistic actors, just-in-time requests, lack of cooperation freight receivers, lack of critical demand
#11	In-house research institute Amsterdam municipality	Mobility and logistics in Amsterdam	State of canal walls, congestion, road restrictions, weight restrictions, emissions, density of freight receivers in Amsterdam	Lack of transshipment locations, lack of transport policy, interaction passenger transport, cheap road transport, lack of space along the canals
#12	In-house research institute Amsterdam municipality	Mobility and logistics in Amsterdam	State of canal walls, congestion, road restrictions, weight restrictions, emissions, density of freight receivers in Amsterdam	Lack of transshipment locations, lack of transport policy, interaction passenger transport, cheap road transport, lack of space along the canals
#13	Consulting firm Ecorys	Mobility, logistics and supply chains	Density of freight receivers in Amsterdam, road congestion, traffic safety, pressure on road infrastructure, weight restrictions, time windows, universal load unit, consolidation, financial support, stakeholder collaborations	Underdeveloped transshipment technology, diversity of freight, transshipment costs, employee costs, social contact between shipper and receiver, lack of problem perception, lack of cooperation between logistic actors, just-in-time requests, lack of willingness receivers to adapt planning
#14	Research institute TNO	Logistics, transport of construction products, Amsterdam Vaart	Scarcity of space, congestion, traffic safety, increasing amount of construction projects, vehicle weight restrictions, reducing emissions	Capacity of waterways, no last-mile performance, lack of transshipment locations, difficulty to obtain required licenses, transshipment costs, lack of cooperation logistic actors
#15	Municipality of Amsterdam	Programma Varen, policy on Amsterdam canals	Nuisance of road transport, state canal walls and bridges. congestion. weight restrictions, traffic safety, time windows. emissions, autonomous technology	Waterway capacity, interaction passenger transport, last-mile performance, lack of transshipment locations, difficulty to obtain required licences, transshipment costs
#16	Municipality of Amsterdam	Programma Varen, policy on Amsterdam canals	State of canal walls and bridges, rising congestion levels, weight restrictions, time windows	Lack of existing policy, difficulties to enforce policy, different interests and objectives municipal departments, lack of transshipment locations

End of Table

5.2 EXPLORING THE FIELD

From existing literature it became known that it is highly relevant to include stakeholders' different interests and objectives when analysing the implementation of transport innovations. This section elaborates on the roles of the stakeholders involved in Amsterdam. Consulting experts and stakeholders started after attending a meeting organised by Amsterdam Vaart, a public-private collaboration which actively stimulates freight transport on the Amsterdam waterways.

5.2.1 Amsterdam Vaart!

Waterway transport for construction projects

Initiated by the Port of Amsterdam, Amsterdam Vaart is a collaboration between the municipality of Amsterdam, research institute TNO, the Port of Amsterdam and water company Waternet. To increase inner city accessibility, to reduce hindrance from heavy freight vehicles, to reduce CO_2 emissions and to improve air quality, the collaboration stimulates urban waterway transport for the supply of construction materials. The coalition started with exploring how construction materials could be transported and currently aims to stimulate transport of other flows as well. Interviewees #8 and #14 were actively involved with Amsterdam Vaart projects and were able to elaborate on the success and failure factors they were confronted with. According to them, implementing waterway transport is very difficult as long as road transportation is not frustrated significantly by accessibility problems or restrictive measures. Freight shippers are reluctant to changes and will not quickly select waterway transport as the preferred transport mode. When construction projects are issued by the municipality, waterway transport can be part of the requirements in the tendering process. In this way, a couple of construction projects have successfully been supplied by waterway transport.

Experienced failure factors

The projects have proven that it is possible to successfully transport construction materials on the Amsterdam canals. Results show that waterway transport has reduced the amount of required road vehicle movements, which in turn generated a reduction of CO_2 emissions. To expand the amount of projects supplied by waterway transport, Amsterdam Vaart argues for municipal policies that stimulate waterway transport. Enforcement of the weight restricted zone is expected to be a main success factor, but it is unclear whether the municipality is capable and willing to do this. Furthermore, waterway transporters are obligated to posses a variety of multiple permits and licenses to be allowed to transport freight on the canals. Obtaining these licenses is said to be difficult due to the lack of clear municipal points of contact. Besides establishing these points of contact, the municipality is suggested to designate sufficient transshipment locations along the canals and to create the space required for efficient loading and unloading.

5.2.2 The municipality of Amsterdam

Stimulating Urban Waterway Transport

From policy reports published it already became known that the municipality aims to create a sustainable, balanced and smart urban waterway system that can be used for different purposes (passenger transport, pleasure craft and freight transport). To mitigate pressure on the vulnerable road infrastructure in the inner city, it is highly desirable to reduce the amount of freight transport on the historical roads. The municipality of Amsterdam does not see itself as initiator of such transport modes, but as supporter, by providing clear legislation and economic incentives. Interviewees #11 and #12 have recently conducted research on the potential for waterway transport, commissioned by the municipality. Interviewees #15 and #16 are actively developing transport policy to coordinate the exploitation of the Amsterdam canals. The poor condition of many canal walls and bridges is said to be the main success factor for waterway transport. Since subsidence of canal walls have lead to very unsafe situations, maintenance projects are urgently required and freight transport on vulnerable infrastructure must be prevented. During these maintenance projects, it will not be possible for vehicles to use the roads. The municipality recognises waterway transport as a more sustainable alternative to road transport and considers stimulating waterway transport as a means to enhance accessibility during maintenance projects. Additionally, a modal shift is seen as an opportunity to reduce the amount of road vehicles required to fulfil the freight transport demand. Thereby, waterway transport is expected to further enhance accessibility and livability in Amsterdam.

A lack of transshipment locations

It followed from the interviews with municipal representatives that the lack of sufficient transshipment locations is constraining the ability to successfully transport freight on the Amsterdam waterways. There are very little available locations suitable for loading and unloading of freight and even when technically suitable, it is often not allowed to use them. The required time for loading and unloading of freight often exceeds the maximum time a vessel is allowed to use the docking locations. Moreover, for a very large part, the suitable locations are owned by commercial passenger transporters organising touristic boat tours. Designating suitable transshipment locations is said to be very complex due to the scarcity of space in the urban area. When final shipment is required on road, sufficient space is required to transship freight from the vessels to road vehicles. In most cases, sufficient space is not available due to vehicle parking spots along the canals. Removing these parking spots requires regulatory changes, which further complicates the ambition to realise sufficient transshipment locations. To get insights in suitable transshipment locations and to develop supporting transport policy the municipality aims to monitor pilot concepts executed by private parties.

5.2.3 Shippers

Efficient freight transport

Interviewees #9 and #10 represent two large wholesalers who are responsible for the shipment of food and beverages to freight receivers (hotels, restaurants and cafes) in Amsterdam. The wholesalers are confronted with increasing difficulties to successfully perform their logistic operations. The logistic performances are frustrated by the increasing amounts of people and vehicles in the urban area and municipal road restrictions complicate logistic operations even more. The main objective is to meet the demands and requirements of customers in a way that is competitive to other wholesalers. In ambition to reach this objective, the logistic performances should meet a certain service level at a competitive price. Urban waterway transport is said to be attractive only if it could meet customer requirements against a feasible price. The increasing difficulty to meet customer requirements with current road transport resulted in the exploration of alternatives such as waterway transport, but a major drawback is said to be the lack of clear transport policy on both road and waterway transport.

A lack of clear transport policy

The lack of clarity on the rules and regulations that will be implemented and enforced by the municipality complicate the planning of logistic operations. The municipality announced to stricter enforce the vehicle weight restriction zone, which would have significant impact on how freight can be distributed in the urban centre. Having to divide the load that is currently transported by trucks that exceed the maximum weight would require multiple smaller vans to distribute the same load. The weight restricted zone, in combination with other road restrictions, such as delivery time-windows and zero-emission zones could strongly limit the free flow of freight vehicles and frustrate logistic planning. From desk-research it became known that the potential to avoid these road restrictions has been a strong success factor for existing concepts. However, as long as it remains unclear how policy measures will eventually be implemented and enforced, the wholesalers are not really inclined to shift to waterway transport. For a major part, the ability to meet customer requirements determines the competitiveness of the wholesalers. Offering just-in-time deliveries is considered to create competitive advantages, but this further complicates efficient logistic planning. Other factors that form failure factors for the adoption of waterway transport come from the difficulty to meet product temperature requirements with the vessels that are currently available. Furthermore, consolidation of multiple freight flows is said to be required to cover the costs for additional transshipment, but the lack of willingness of competitors to cooperate and share the same transport means is said to be an important failure factor for the consolidation of freight flows.

5.2.4 Waterway transporters

Expanding waterway transport services

From desk-research it became clear that waterway transport currently takes place on an extremely limited scale and mainly serves to transport construction materials. Interviewees #2 #3 and #4 represent three waterway transporters who aim to expand their freight transport services. Together they form a coalition aiming to increase the amount of freight transport on the Amsterdam canals. Despite clear societal benefits in terms of reducing emissions, congestion, visual intrusion and noise nuisance, the demand for waterway transport is said to be very limited. The main objective is to meet the needs of both freight shippers and receivers, at a price that is competitive to other transport operators. The major drawback for shippers in requesting waterway transport is said to be based on the cost-effectiveness of waterway transport compared to cheap road transport. The main reason for waterway transport to be less cost-effective is based on the additional required transshipment. A way to reduce transport costs would be to use more efficient transshipment technology, but before the waterway transport operators are willing to invest in new techniques, clarity on the transport policies that will be implemented by the municipality is demanded.

5.2.5 Freight receivers

An attractive area and a reliable distribution system

In existing literature, the receivers of freight are described as the actors that are concerned of the service level that can be provided by freight transport operators and the transport prices that are charged. To include freight receivers within the analysis, a couple of cafes and restaurants in the centre of Amsterdam have been asked to elaborate on their order behaviour and transport requirements. From these conversations it became known that for these freight receivers it did not matter in what way freight is delivered, as long as the orders would be delivered in time. Furthermore, it followed from logistic experts (interviewees #7 and #13) that high costs for keeping inventory are an important success factor for just-in-time delivery requests. Receivers are said to benefit from more sustainable transport as the quality of the local area would be more attractive. Although, receivers benefit from a reliable and sustainable distribution system, little is done by receivers to influence the way transport is performed. As also followed from the interviews with wholesalers (interviewees #9 and #10) receivers have little incentive to cooperate with shippers and freight transporters in order to achieve more efficient distribution.

Increasing congestion and decreasing accessibility

Little direct constraints, limiting the performances of receivers, have been identified during the interviews with experts. From the interviews it followed that due to the competition between large amounts of shippers and freight transporters, the increased costs resulting from accessibility issues are

borne by shippers and transporters. However, increasing congestion levels have negative impact on the attractiveness of urban areas and eventually receivers could be confronted by less reliable deliveries due to accessibility issues.

5.2.6 Interest groups

Finally, residents are affected by urban freight transport and experience the negative effects of urban transport. Usually, residents aim to live in a noiseless, safe and healthy atmosphere. Interviewee #6 elaborated on the importance to reduce the amount of freight transport on vulnerable road infrastructure as trucks have been responsible for damages to houses in the centre of Amsterdam.

5.3 SUCCESS AND FAILURE FACTORS EXPLORED

The findings presented above already provided insights in the success and failure factors for the adoption of urban waterway transport. Different real-life stakeholders elaborated on the potential adoption of waterway transport and explained what factors would stimulate a modal shift. They also explained why the adoption is complex and what factors constitute failure factors. To obtain a comprehensive overview on the success and failure factors, the remaining of this chapter systematically addresses the factors identified and uses the research lens to do so. Table 5.2 provides an overview of the success factors identified during the interviews.

Table 5.2: Success factors extracted from interviews

Success factors	**Sub-factors**
Social	Reducing road congestion
	Reducing emissions
	Reducing pressure on road infrastructure
	Reducing noise
	Improving traffic safety
Commercial (legal)	Vehicle weight restrictions
	Zero-emission zone
	Time-windows
	Road restrictions
Commercial (economic)	Cooperation
	Economies of scale
	Financial support
Technical	Zero-emission
	Autonomous technology
	Multi-functional
Political	Pressure from interest groups

Based upon applying the research lens to analyse the outcomes of the expert interviews, the following determinants can be observed as stimulating the implementation of waterway transport:

- **Societal benefits**. All interviewees recognised that current freight transport has negative effects on society. The key success factors for urban waterway transport are based on reducing the negative impacts that are currently caused by urban freight transport. The main advantage of waterway transport comes from the potential to reduce the number of required freight vehicles (trucks and vans) to meet the freight transport demand. Reducing the amount of vehicles at the same time reduce harmful emissions and noise nuisance. The interviewees assumed the vessels that will be used to be electric. A modal shift from heavy trucks to vessels is recognised as success factor as this would mitigate the pressure on canal walls and bridges.

- **Legislation driving a modal shift**. Municipal measures are said to stimulate implementation of waterway transport. Vehicle weight restrictions aim to mitigate pressure on road infrastructure, the zero-emission zone is established to reduce harmful emissions, time-windows are implemented to control the amount of freight vehicles that have access to urban areas, and road restrictions are implemented to steer the flows of road vehicles. Especially weight restrictions are considered to have a large impact. In combination with time-windows, the weight restriction would result in the need for additional chauffeurs, which would quickly result in higher transport costs. Moreover, it is said that not all types of urban freight allow to be transported by smaller vehicles, which may impose the necessity to use vessels instead.

- **Economic benefits compared to road transport**. Increasing congestion levels limit the logistic performances that can be achieved with road transport. If congestion on roads is further increasing, waterway transport must offer higher performances in terms of reliability and transport times. Financial governmental support supports a viable business case. Cooperation between shippers, transporters and receivers could support more efficient distribution and would ease to profit from economies of scale.

- **Technical characteristics**. Waterway transport could be multi-functional. Construction materials, waste and preservable food and beverages are considered to be the most suitable types of freight to be transported by vessels. Furthermore, the development of autonomous technology is said to be a success factor as this could lead to a reduction of operational costs.

- **Political forces** Decision-makers take into account the social and technical feasibility of innovations when developing policy. Additionally, decision-makers are considered to be influenced by typical decision-making procedures and pressure exerted by interest groups. According to interviewee #7, the short term vision of municipal politicians and the focus on personal gains are holding back implementation.

The set of unstructured in-depth interviews with stakeholders and experts provided insights in the factors that are considered to frustrate implementation in Amsterdam. Table 5.3 shows an overview of the failure factors identified during the interviews.

Table 5.3: Failure factors extracted from interviews

Failure factors	**Sub-factors**
Social	Nuisance on waterways
	Interaction passenger transport
	Interaction pleasure crafts
Commercial (legal)	Lack of transport policy
	Unclear future road transport policy
	Unclear future waterway transport policy
	Vessel requirements and licences
	Prohibition to transship freight along canals
Commercial (economic)	Transshipment costs
	Initial investment costs
	Operational costs
	Cheap road transport
	Lack of critical demand
	Failing cooperation logistic actors
Technical	Lack of transshipment locations
	Underdeveloped transshipment technology
	Capacity of waterway network
	Final-mile performance
	Lack of space along canal walls
	Difficulty to change logistic planning
	Weather conditions
Political	Obstructing passenger transport
	Short-term interests of politicians
	Conflicting public interests

Based upon applying the research lens to analyse the outcomes of the expert interviews, the following reason for failure can be distinguished:

- **Excessive exploitation of waterways.** Failure factors related to social acceptability come down to the expected saturation of the Amsterdam canals. According to interviewee #6, residents consider the canals to be used excessively already. Adding vessels for freight transport may increase nuisance and conflicts with passenger transporters. Additionally, interviewees #2 and #4 emphasised on the challenge to deal with established passenger transporters who are reluctant to provide room for freight transporters.
- **Undefined transport policy.** Legislation imposing reasons for failing commercial feasibility of waterway transport relate to the lack of enforcement of municipal measures limiting road transport. These measures are beneficial for the business case of waterway transport, but they are often vaguely defined or poorly enforced.

- **Poor cost-effectiveness.** Implementation would require significant investments, but vague transport policy is preventing actors from investing in waterway transport. Furthermore, a modal shift would require behavioural and organisational changes requiring cooperation between actors. Failing cooperation is often considered to be a reason for limited commercial feasibility.
- **Operational complexity.** Existing small-scale concepts demonstrate that it is technically feasible to perform waterway transport on the Amsterdam canals, but the lack of transshipment locations and the difficulty to perform the final distance on road are often mentioned as technical challenges.
- **Conflicting interests.** Political decision making processes are said to be affected by the pressure resulting from passenger transporters, the short term focus of municipal politicians and the diversity of municipal departments. Conflicting public interests increase the difficulty to develop convenient transport policy.

This section shortly addressed the failure factors explored during the interviews. A more profound analysis is provided in Section 7.3. Here the research findings obtained from the different data collection methods are discussed through triangulation of the methods and findings.

5.4 KEY TAKEAWAYS FROM INTERVIEWS

Based on the interviews, the following notions can be made:

- It followed from the interviews that waterway transport currently takes place on a very limited scale. A public-private collaboration stimulates waterway transport for the supply of construction materials. Expansion is said to be difficult as long as road transportation is not frustrated significantly.
- Worsening road accessibility has led to the development of policy plans to stimulate waterway transport and interest from private logistic parties. Currently, the limited cost-effectiveness is perceived as a main reason for failure. Vehicle weight restrictions are considered to significantly increase the ability for waterway transport to compete with road transport, but restrictions are poorly defined yet. Cooperation between shippers, freight carriers and receivers could increase cost-effectiveness, but logistic actors are reluctant to cooperate. In conclusion, implementation is said to largely depend on public involvement.

The following chapter focuses on how to overcome the failure factors that have been identified. It provides the outcomes of the focus group meeting. During this meeting a group of real-life stakeholders discussed how to overcome existing failure factors in order to accelerate the implementation of waterway transport.

6 FOCUS GROUP MEETING: A TRANSITION ARENA TOWARDS IMPLEMENTATION

The previous chapters resulted in an overview of success and failure factors. It can be concluded by now that feasibility depends on policy implementation. The impact of policy limiting the free flow of road transport affects the commercial viability and new policy would be required to coordinate freight transport. This chapter provides the findings of a focus group meeting to overcome existing failure factors and to develop pathways to the implementation of waterway transport concepts and supporting policies. Table 6.1 provides an overview of the results of the activities (Figure 6.1) that were performed during this meeting.

6.1 OVERVIEW OF RESULTS

The outcomes are based upon group discussions and individual notes made by the participants. First, a shared vision on a desired urban freight transport system in Amsterdam has been developed. The participants were asked to discuss how waterway transport could contribute to long-term goals that were shared by the group. Secondly, earlier identified failure factors were discussed. This served to list tasks that could support to overcome existing failure factors and to steer the current transport system in the desired direction. Strategies were identified by asking the forerunners to explain how they could contribute to the desired transition and what they think is required from other actors. Finally, a discussion on the missing knowledge that is needed was held, which resulted in a list of knowledge gaps and recommended strategies to fill these gaps.

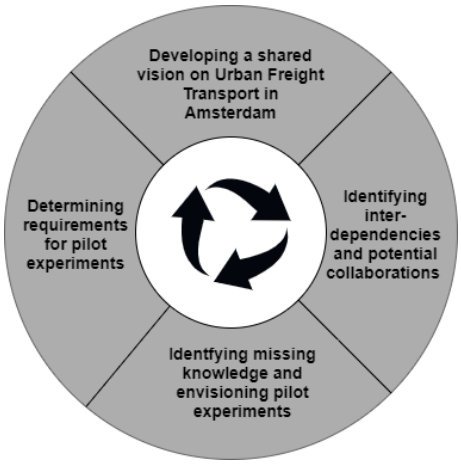

Figure 6.1: Adapted Transition Management Cycle

Table 6.1: Results focus group meeting

Participant	Field of Knowledge	Shared vision (Strategic)	Contributions: (1) Own, (2) Private, (3) Public (Tactical)	(1) Missing knowledge, (2) Envisioned pilots (Operational/Reflexive)
Daan Bloeme (#1)	Passenger transport and boat tours	Quick, flexible, no congestion	1. Passenger transport will not quickly contribute. 2. Smart logistic planning 3. Financial support, transshipment locations and clear legislation	1. Optimal transshipment technology, potential for electric vessels 2. Small waterway transport experiments and LEV's for final distance
Willem Post (#2)	Mokum Mariteam and urban freight transport	Zero-emission, using the waterways, autonomous loading and unloading, sufficient space along the canals	1. Sharing knowledge and equipment, advising policy makers 2. Cooperate and perform final distance 3. Provide legislation, enforce policy and demand waterway transport services	1. Knowledge on future transport policies 2. Long term pilots initiated by the municipality to develop supporting policy
Bart Verweijen (#3)	ZOEV City and urban freight transport	Environmentally friendly, reliable, white label, multifunctional transport means, little nuisance, optimal multimodal combination, level playing field road and waterway transport, sufficient transshipment locations	1. Facilitating pilots, lobbying and networking 2. Willing to engage in long term projects 3. Customer of freight transport, enforce weight restrictions, support financially	1. Knowledge is available 2. Long term pilots. Municipality as customer for construction management, waste and food
Karin Peskens (#4)	Municipal policy on Amsterdam waterways	Quick, efficient. safe, flexible, emission free, noiseless, white label, sufficient transshipment locations, financially supported initiatives, multi-modal, consolidated freight flows, contributing to high accessibility of Amsterdam	1. Developing policy, enabling cooperation between different municipal programs. 2. Ideas and innovation 3. Policy, coordination, legislation, enforcement, providing right information	1. Knowledge on transshipment technology and size of logistic freight flows in Amsterdam 2. Pilots to evaluate different methods
Maurits van Pampus (#5)	Autonomous technology, Roboats	Quick, flexible	1. Executing Roboat experiments 2. Collaboration with other actors 3. Financial support and enforcement weight restrictions	1. Optimal transshipment technology and autonomous technology 2. Pilots to evaluate transshipment methods
Sarika Jagan (#6)	Distribution of food and beverages, Bidfood	Safe, cheap, consolidated flows, cooperation between logistic actors, ability to transport wide diversity of products (meeting temperature requirements), noiseless, using existing infrastructure	1. Providing client base, cooperating with other shippers, consolidating flows 2. Be willing to cooperate and consolidate 3. Designating sufficient transshipment locations, financial support and restricting road transport	1. Technology to meet temperature requirements and how to perform final distance 2. Pilots with consolidating freight flows and monitor effects of white label transport

(continued)

Participant	Field of Knowledge	Shared vision (Strategic)	Contributions: (1) Own, (2) Private, (3) Public (Tactical)	(1) Missing knowledge, (2) Envisioned pilots (Operational / Reflexive)
Annemieke Bieringa (#7)	Interests of entrepreneurs (horeca in Amsterdam)	Efficient, quick, safe, cheap, cooperation of different actors, sufficient transshipment locations, clear time windows, electric	1. Bringing actors together, lobbying, stimulating pilots 2. Cooperation of shippers and receivers 3. Enforcement of transport policy	1. Data on past pilots and foreign concepts 2. Pilots with waste collection in historical centre Amsterdam
Joost Smit (#8)	Interests residents, VVAB	Reliable, safe, noiseless, cooperation shippers and receivers	1. Advising, political pressure, inform residents 2. Must provide technical knowledge 3. Develop transport policy, support financially, provide infrastructure	1. Knowledge on suitable technology 2. Experiments with waste, food and beverages
Betty Nijmeijer (#9)	Interests residents, VVAB	Safe, zero-emission, noiseless, sufficient transshipment locations, cheap, efficient, critical demand, ease pressure on canal walls	1. Support initiatives and pilots and inform residents 2. Must cooperate and develop logistic and technical knowledge 3. Financial support, transshipment locations, legislation, freight transport customer	1. Knowledge on suitable technologies, types of vessels. data on previous experiments 2. Waste collection pilots to evaluate transshipment technology
Dingeman Coumou (#10)	Interests residents, VVAB	Small and electric means, ease pressure on canal walls and buildings, consolidated, mixed freight and passenger service	1. Stimulate pilot concepts 2. Develop technical knowledge 3. Initiate waterway transport and support financially	1. Knowledge on transshipment technologies, data on foreign concepts 2. Pilots for waste collection and distribution of food and beverages

End of Table

6.2 A SHARED VISION

The first activity aimed to construct a shared vision on freight transport in Amsterdam. The focus group consisted of participants with different backgrounds and represented wholesalers, waterway transporters, passenger transporters, interest groups, research institutes and policy makers. The participants individually wrote down the criteria that should be met by the envisioned system. One by one the participants were asked to elaborate on their criteria. This enabled the participants to reflect on each other's vision. Most criteria were widely shared, but are thereby inherently broad and can be interpreted differently. The following subsections elaborate on the criteria that were agreed upon and together form the shared vision as presented in Figure 6.2. The participants mainly complemented on each other by offering additional perspectives. No significant disagreements were observed.

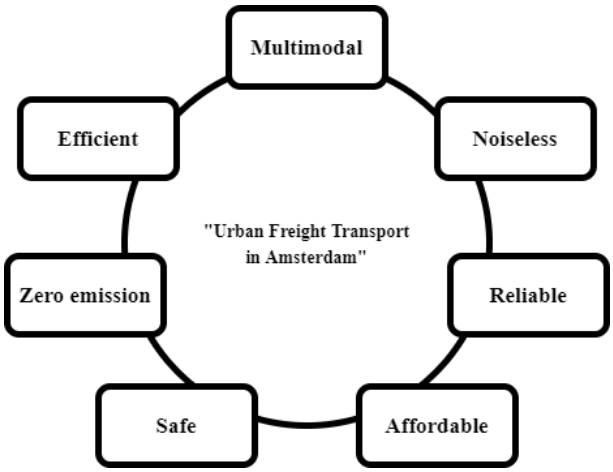

Figure 6.2: A shared vision on urban freight transport

Figure 6.2 provides an overview of the envisioned urban freight transport system in Amsterdam. The process of envisioning this system can be described as follows:

- **Multimodal**. The envisioned transport system is a multimodal system that combines different transport modes. Multimodality was first put forward by participant #4, who argued that transport initiatives often solely focus on optimising road transport flows. To facilitate the increasing demand for freight transport, proposed solutions should take into account the potential to use the waterways. Based upon the locations of origin and destination, the optimal route and modalities should be selected. Participant #5 added that multimodal transport must be flexible. When using different modes, transshipment between transport modes must be flexible in terms of time and location. The system should allow for quick transshipment at a sufficient number of locations. All participants agreed upon the notion that transport initiatives should not focus solely on improving road transport and together stated that different modal options should be considered when determining optimal transport planning.

- **Noiseless**. Mainly put forward by participants #8, #9 and #10 representing the interests of Amsterdam inner city residents, freight transport should be noiseless. Current freight transport is generating noise nuisance, which is said to be one of the main inconveniences for Amsterdam residents. Participant #3 added that neither should animals be confronted with the negative effects of transport noise. The focus group agreed upon the notion that freight transport vehicles should become noiseless, electric and preferably small.

- **Reliable**. A common perspective exists on that freight transport should be reliable in terms of logistic performances. Participants #1 and #7 put forward that freight transport should be quick, while participants #2 and #3 argued that it freight should be delivered according to the requests of customers. According to them, reliability of deliveries is more important than the speed with which freight is transported. Participant #6 added that transport must also be reliable in terms of temperature. Different types of freight require to be transported at different temperatures. Customers must be able to rely on correct treatment of products during transport. After discussing, the focus group agreed upon the importance of reliability and stated that transport does not necessarily need to be quick, as long as the freight transport system enables freight to be received conforming receiver requirements.

- **Affordable**. A general view existed on that transport should be affordable. High transport costs are said to be harmful for transport operators, but eventually also for residents as they will be confronted with rising product prices. Participant #6 stated the importance of transport services to be cheap. Participants #2 and #3, the waterway transporters, critically denoted that the current road transport system has been optimised during the past seventy years. It was agreed upon that transport services should be affordable, but when considering alternative modes, it must be recognised that the implementation phase of a new transport mode is often characterised by high transport prices until significant demand for the services of the new mode is generated. After discussing, the focus group agreed upon the notion that transport services must be affordable, but also stated that additional costs during the implementation phase should not immediately be reason for rejection of new transport modes.

- **Safe**. All participants agreed upon that freight transport should be safe. This includes that freight transport should not be reason for dangerous situations and accidents harming other road or waterway users. It also includes indirect safety effects relating to infrastructure and the subsidence of canal walls. Freight transport should not bring damages to infrastructure or house foundations. This implies that vulnerable road infrastructure should not be used by heavy freight vehicles if they are expected to cause damages that affect safety.

- **Zero emission**. Besides preventing nuisance from noise, freight transport should not generate harmful emissions. Participants #8, #9 and #10 argued that noise nuisance and emissions together constitute the

main reason for nuisance to Amsterdam residents. The focus group shared the perspective that freight transport should not be harmful to the health of humans and environment. Participant #2 argued that the envisioned shift to electric freight vehicles should not lead to permits for vehicles that do not meet weight restrictions. Due to the weight of electric vehicle batteries, the total weight of freight vehicles may increase. The focus group agreed upon the notion that preserving the canal walls from heavy freight transport is more important than the shift to zero emission.

- **Efficient**. It was broadly shared that freight transport should be efficient, which is interpreted as preventing waste of resources such as time and energy. A common perspective existed on the importance of bundling freight. Participant #4 argued that freight is not efficiently bundled at the moment. Freight flows must be bundled more and retour flows should be transported by the same vehicles used for deliveries when possible. Participants #3 and #6 argued that in order to stimulate efficient bundling, freight transport should be a white label service. To optimise efficiency, high load factors must be achieved by combining freight for different forwarders and transport means should be shared. Regarding the use of waterway transport, the focus group agreed upon the importance to organise efficient transshipment and final road transport.

6.3 TOWARDS IMPLEMENTATION

All participants recognised that waterway transport could contribute to reaching the shared vision. The second focus group activity served to reveal why the current freight transport system does not meet the envisioned criteria yet. Emphasis is put on why waterway transport is not applied on a larger scale at the moment. First, the failure factors that were considered to hold back the implementation of waterway transport were discussed. Afterwards, the participants were asked to conceptualise ways to overcome the failure factors identified. This resulted in a set of actions that were considered to enhance the potential for implementation. The focus group agreed upon the importance of experimental pilots and discussed how these could contribute to the adoption of waterway transport.

6.3.1 Validation of failure factors

To conceptualise pathways to reach the envisioned system and to stimulate the implementation of urban waterway transport, it is required to overcome existing failure factors. Desk-research (Chapter 4) and expert interviews (Chapter 5) served to explore success and failure factors. The second focus group activity served to validate and prioritise critical failure factors by means of a group discussion to decide on what factors to focus when aiming to implement waterway transport. This section provides the main outcomes of this discussion.

- **Technical challenges**. According to participants #2 and #3, it is technically possible to transport freight on the Amsterdam canals. Electric vessels with on-board cranes are available and are able to ship freight through the canals, without significant limitations imposed by the capacity of the waterway network. Interaction with passenger transport and pleasure crafts does not have to frustrate logistic operations. Canal cruises do not need to significantly interfere with freight transport as the peaks for passenger traffic do not have to be at the same time as the peaks for freight transport. The waterways are said to be crowded only during a few weekends in summer. However, although canal cruises and freight transport do not necessarily need to interfere with each other, conflicts on passenger transport terminals and freight transport are said to complicate the assignment of sufficient transshipment locations. The main technical challenge is considered to be the realisation of efficient transshipment and the performance of the final distance to receivers. Although it is technically possible to transport freight on the canals, there is a lack of available transshipment locations.

- **Commercial competitiveness**. Commercial feasibility forms an important failure factor, especially during the start-up phase of waterway transport concepts. Participants #2 and #3 argued that due to the lack of a critical mass at the start-up phase, it is impossible to be as cost-effective as road transport. This mass could be obtained by bundling different freight flows. Participant #6 recognises the importance of bundling to reduce transport costs and the amount of vehicle movements, but considers the limited willingness of shippers to cooperate as reason for the failure of bundling. More efficient transshipment techniques are expected to realise cost savings, but these techniques will only be invested in when waterway transport becomes politically and legally supported. The commercial feasibility is said to largely depend on the enforcement of limiting road transport measures. Stricter vehicle weight restrictions are considered to increase the potential for waterway transport as these would lead to cost increases for freight transport on road.

- **Lack of political support**. Participants #7, #8, #9 and #10 argued that the main factor that is holding back the implementation of waterway transport is the lack of political support. This was agreed upon by participants #2 and #3 who stated that the political ambition to stimulate waterway transport is required to realise sufficient loading and unloading locations. Participant #6 elaborated on the importance of clear transport policy in transport planning. Shippers are said to be reluctant to changing transport operations due to uncertainty on what legislation will be implemented and enforced. Participant #4, agreed upon the importance of supporting policy and elaborated on the importance to obtain the knowledge to base legislation on. According to participant #7, stimulating waterway transport would require municipal politicians to be decisive, but due to short-term and conflicting municipal interests, critical decisions are postponed.

6.3.2 Overcoming existing failure factors

It has been concluded by the focus group that the municipality plays a critical role with respect to implementation. The focus group was asked to conceptualise strategies to overcome the failure factors discussed. Conceptualised strategies focused on how to enhance technical and commercial feasibility. The focus group emphasised on gradual implementation of waterway transport and a couple of actions to stimulate waterway transport were discussed. The proposed actions serve to stimulate the execution of pilot experiments to gain the knowledge that is required to base transport policy on.

- **Municipal cooperation**. The municipality is supposed to clarify recently published policy reports. These reports announced several measures limiting the free flow of road vehicles and stimulating waterway transport. Enforcement of these measures has not been clearly specified yet. The future regulatory framework is expected to have large impact on the feasibility of waterway transport. Therefore, the first priority is to align the different municipal departments and to pronounce how to cope with the challenge to develop convenient policy. Besides better internal alignment, the municipality should also include logistic actors and knowledge institutes when developing policies.
- **Financial support**. Participant #3 argued that competing with road transport is only feasible when a critical mass can be transported, which is always problematic in a start-up phase. To increase the demand for waterway transport, it must be feasible to demonstrate how freight can be transported on the Amsterdam waterways. To realise a viable business case, financial support is required as long as the critical demand is not achieved.
- **White label transport**. Logistic flows could be consolidated to achieve a critical demand. Ideally, this would be realised by collaborative agreements between shippers. Alternatively, the municipality could force suppliers to consolidate by implementing strict access rules to certain areas.
- **Political pressure**. In ambition to stimulate decision-making, participants #7, #8, #9 and #10 argue that political pressure can be exerted by interest groups. Interest groups can lobby, share knowledge and arrange informative meetings. Their communication channels can be used to inform the wider public on the subject of waterway transport.

The above mentioned actions contribute to the development of pilot experiments to stimulate the implementation of waterway transport. To increase the knowledge the municipality has on how to coordinate waterway transport, participants #2 and #3 are willing to share the knowledge they acquired by operating waterway transport. Participant #4 elaborated on the municipal ambition to coordinate waterway transport pilots and to monitor the effects on freight transport in Amsterdam. The next section will elaborate on the knowledge that could be obtained by executing pilot experiments.

6.4 CONCEPTUALISING PILOT EXPERIMENTS

During the second activity it was observed that participants considered a lack of knowledge to be a critical limiting factor. The final activity of the focus group meeting served to identify existing knowledge gaps that frustrate a wider application of urban waterway transport in Amsterdam. Knowledge is required for different stakeholders to participate. The focus group was asked to elaborate on what knowledge is considered to be missing. Furthermore, research and pilot experiments are conceptualised to be able to gain the required knowledge.

6.4.1 Knowledge gaps

It followed from discussion that the most critical knowledge gaps are related to the enforcement of transport policy and the the ability to transship freight along the canals. It is not clear how the implemented vehicle weight restrictions will be enforced. There is limited knowledge on what technology to use for transshipment and it is unclear who should be responsible for the final distance on road and what vehicles could best be used for this final distance. Additionally, to evaluate the effects of a modal shift it would be required to have clear data on the urban freight flows in Amsterdam. Reliable data should be collected, but this might be difficult due to the dispersion of data over many different actors. Discussion on the knowledge gaps can be summarised as follows:

- **Enforcement of weight restrictions.** According to participant #4, the worsening state of quays and bridges require stricter enforcement of the maximum weight for freight vehicles in the city centre. According to participants #2 and #3, there are two options to reach the clients if it becomes impossible to use heavy road vehicles in the centre of Amsterdam. The first possibility would be to use smaller and lighter road vehicles instead of heavy trucks, but this is expected to result in increased transport costs as total transport costs are largely determined by the costs for employees. Moreover, the use of more road vehicles to transport the same quantity of freight is expected to have negative effects on congestion. The second option is to use vessels to transport large volumes into the city centre and perform the final distance to the client by small freight carriers. Since the weight restriction zone is expected to have significant impact on the commercial viability of waterway transport, clarity on how the zone will be enforced is said to be highly relevant.
- **Development of technology.** Efficient transshipment is considered to be critical for the success of waterway transport. Participants #2 and #3 argued that vessels with on-board cranes are available, but according to participants #8, #9 and #10, additional knowledge on how to efficiently transship freight is required to be able to convince policy makers to stimulate waterway transport. Participant #6 agreed upon the importance of efficient transshipment and added that for shippers

it is important to know whether it is possible to refrigerate food and beverages. Likewise, knowledge is said to be required to decide on what type of vehicles to use when a final road distance need to be covered. Furthermore, participant #5 stated that several parties have investigated the potential use of autonomous floating technologies to reduce transport costs in the future. One of these parties is the Amsterdam Institute for Advanced Metropolitan Solutions which is involved in a project on developing an autonomous fleet of vessels. It is expected that autonomous technology could reduce transport costs, but additional research is required.

- **Insight into the freight flows in Amsterdam.** According to #4, the municipality of Amsterdam is aware of the scarce presence of loading and unloading facilities available for freight transport and aims to explore the implementation of time windows for loading and unloading freight at passenger terminals. Knowledge on the size of urban freight flows and potential time-windows is said to be required to determine the most suitable locations. Additionally, data is required on the characteristics and size of freight flows to be able to assess the impact of a modal shift.

6.4.2 Pilot experiments

It has been recognised during the focus group meeting that the lack of sufficient transshipment possibilities in the urban area is currently holding back the expansion of waterway transport concepts. Enabling transshipment requires legal permission to exploit space for loading and unloading of freight along the canals. The scarcity of space, the lack of relevant knowledge and the existence of different municipal interests complicate the designation of suitable locations. Stimulating the implementation of waterway transport can be done by co-developing policy and logistic concepts. Which is considered possible when conducting pilots that involve both public and private actors. The importance of pilots to determine what locations can be used for waterway transport purposes is recognised by both actor types.

Pilot experiments are suggested for three types of freight: construction materials, waste and non-perishable foods and beverages. These are considered to be most suitable to be transported on the waterways. The envisioned pilots are long term projects with a duration of at least one and a half year. Participant #5 conceptualised a pilot with autonomous floating platforms to collect waste. Participants #2 and #3 elaborated on a concept to deliver HoReCa products to a transshipment location in the city centre. Small electric vehicles are supposed to distribute the products to receivers and to collect waste products on their way back. Participant #4 argued that for pilots to have political impact, they must attain attention from the wide public.

7 TRIANGULATION: COMBINING THE RESEARCH METHODS

This chapter serves to discuss and validate the outcomes of desk-research, expert interviews and the focus group meeting. Triangulation has been used to test validity through converging the information that was captured from the different methods. This supported the development of a more comprehensive understanding on the implementation of waterway transport. Desk-research supported a broad exploration of factors, interviews focused on the case for Amsterdam and the focus group discussed the current factors that hold against implementation of new concepts. As visually shown in Figure 7.1, the research methods followed a converging sequence. This chapter will elaborate on how the research methods supported each other and explains how similar research findings extracted from different methods contribute to the validation of success and failure factors.

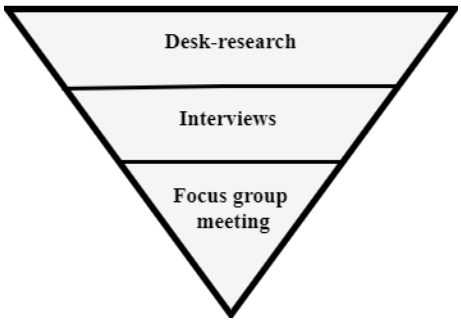

Figure 7.1: Converging flow of research methods

7.1 OVERVIEW OF RESULTS

Table 7.1 provides an overview on how the different methods complemented each other. The research lens has been used to structure the research findings. In short, desk-research led to the insight that successful concepts depend largely on the existence of an extensive waterway network, public involvement and congested roads. Interviews pointed out that limited cost-effectiveness is a main reason for failure, but they also led to the insight that public measures and cooperation are expected to foster cost-effectiveness. From the focus group meeting is became known that involvement and collaboration of public and private actors is necessary to overcome current failure factors and to stimulate the development of more efficient techniques. Collaboration would require clear municipal legislation and the willingness of logistic actors to cooperate in favour of waterway transport.

Table 7.1: Synthesis of findings

Feasibility	Desk-research	Interviews	Focus group meeting
Social	Waterway transport could be interesting for cities coping with road accessibility issues such as congestion, pollution, road damages, noise nuisance and visual intrusion. Existing concepts demonstrate positive effects on society.	The city of Amsterdam is coping with negative effects of freight transport. Waterway transport is considered to have positive societal effects, but the public acceptance is expected to be influenced by the idea that there is not enough space for freight transport.	The focus group emphasised the ability to reduce congestion and to alleviate pressure on road infrastructure. Interaction with other waterborne traffic is not considered to be problematic, but allocating space for waterway transport is expected to generate opposition.
Commercial (legal)	The ability to avoid time-windows, road restrictions, zero-emission zones and vehicle weight restrictions are mentioned as crucial success factors for waterway transport. Little seems to be known on legislation frustrating implementation.	Interviewees put emphasis on the effects of vehicle weight restrictions. Especially in combination with time-windows, weight restrictions increase operational costs for road transport and the attractiveness of a modal shift. Vague and missing legislation is considered to hold back implementation at the moment.	The focus group argued that clarity on the vehicle weight restrictions is of main importance. Limited permission to transship freight along the waterways and disproportionate vessel requirements are considered to hold against implementation.
Commercial (economic)	Existing literature made clear that financial support and internalisation of external costs could foster the potential for implementation. Failing to reach a significant mass is found to be a reason for failure.	Interviewees put emphasis on cooperation and bundling of freight to reach economies of scale, but failing cooperation is said to be problematic for implementation.	The focus group agreed upon the importance of bundling to increase the potential for waterway transport and argued that collective transport could be forced by the municipality.
Technical	From literature it followed that it is technically feasible to perform urban waterway transport on a small scale. Feasibility seems to depend mainly on the availability of infrastructure.	Interviews focused on transshipment technology and ways to perform the final road distance. The lack of efficient transshipment opportunities is often recognised as limiting the logistic operation technically.	The focus group recognised that transshipment technology and ways to perform the final road distance should be further developed. Additionally, the ability to refrigerate food and beverages should be addressed.
Political	A local government active in reducing negative external effects of road transport and inclusion of relevant stakeholders were mentioned as factors stimulating decision making in favour of waterway transport.	Interviewees indicated that political support in the form of legislation and financial support is required for successful implementation. Different municipal interests and strong opposition from passenger transporters frustrate decision making.	The focus group argued that lobbying by interest groups is required to put pressure on decision makers. Dealing with the opposition from passenger transporters is considered to be a major challenge in finding suitable transshipment locations.

7.2 SYNTHESIS OF FINDINGS

7.2.1 Desk-research

From desk-research it became known that the success of waterway transport is largely determined by the existence of significant road accessibility problems, the availability of a dense waterway network and financial governmental support. Scientific research found on the subject mainly focused on the positive environmental effects realised by waterway transporters in European cities. The majority of knowledge on the potential application of waterway transport to perform freight transport in urban areas is solely based on reviewing the same couple of existing concepts. Therefore, often the same conclusions were drawn by different researchers: urban waterway transport can be a more sustainable alternative to conventional road transport if a dense waterway network is available and waterway transporters are financially supported by the local government.

7.2.2 Expert interviews

Interviews indicated that road maintenance projects are expected to enlarge accessibility problems in the coming years. Waterway transport is considered to be a feasible freight transport solution when politically supported. An existing collaboration tends to stimulate a modal shift and demonstrated that shipment of construction materials on the waterways is possible. These projects were characterised by unique properties that favoured waterway transport, such as the availability of cranes for loading and unloading freight. An often mentioned failure factor is the lack of sufficient available transshipment locations. Even though vessels with on-board cranes can be used for loading and unloading, the lack of places that allow for transshipment is considered to be problematic. Facilitating these locations requires complex balancing of different public and private interests.

7.2.3 Focus group meeting

From the focus group meeting it became known that both public and private stakeholders recognise the negative effects of urban freight transport in Amsterdam. The municipality is aware of the need to find solutions for existing problems. Shippers and transport operators recognise problems regarding the accessibility of receivers and search for solutions to offer convenient transport services. Feasibility of waterway transport is considered to depend mainly on the implementation of municipal transport policy. Policy implementation depends on decision-makers who require sufficient knowledge to base decisions on. The lack of in-house technical and logistic knowledge seems to be a critical failure factor for the development of policy. From the focus group interview with a group of experts it became known that organising and monitoring pilots is considered to be an effective way to co-develop both an urban waterway transport system and supporting transport policy.

7.3 REVIEWING FEASIBILITY FACTORS

7.3.1 Social acceptance

Regarding the implementation of urban waterway transport in Amsterdam, social acceptance is influenced by the negative effects of urban freight transport, experienced by residents. Although consumption generates freight transport demand, residents are not directly participating in the logistic operation. Freight carriers generate, but also experience negative effects during transport operations. Social acceptance is based on how society perceives the effects of waterway transport. Increasing levels of congestion, environmental pollution, infrastructure damages, noise nuisance and visual intrusion all stimulate a shift to waterway transport. This is learnt from desk-research and confirmed during expert interviews. The focus group discussions pointed out that for Amsterdam, the ability to reduce infrastructure damages and road congestion levels is seen as a critical success factor at the moment.

The factors that were recognised as reasons for limited social acceptance relate to the capacity of the Amsterdam waterways. From literature, little became known on factors reducing social acceptance, but the interviews pointed out that social acceptance is influenced by expected saturation of the waterways. The wider public is considered to be influenced by the notion that there may not be room for freight transport next to passenger boats and pleasure crafts. Additionally, social acceptance is expected to be frustrated by the need for space to transship freight along the canals. When this space would be created at the expense of public space or parking spaces, opposition is expected. According to the focus group, interaction with other waterborne traffic is not considered to be problematic, but the need for transshipment space is pointed out as crucial for successful implementation.

7.3.2 Commercial viability

Commercial feasibility, the potential for waterway transport to create sufficient revenues to cover the required costs, depends on the competition with road transport. From the analysis of existing literature it followed that a viable business case is critical for concepts to be successful. Commercial feasibility is captured by addressing monetary costs and benefits and the impact of legislation.

From desk-research it became known that to alleviate road congestion, local governments tend to implement legislation. Restricting policy measures such as time-windows, weight restrictions and emission-free zones increase the potential for waterway transport. Little became known on legislation limiting business case viability, but interviewees indicated that vehicle weight restrictions determine whether waterway transport could become commercially feasible. The restrictions limit the possibilities to transport large volumes of heavy and massive freight on roads, while vessels would be able to transport large quantities. The focus group discussions confirmed the importance of vehicle weight restrictions and emphasised the importance to allow freight

transshipment along the canals. Furthermore, it is stated that current policy is solely based on inland waterway transport, which imposes disproportionate requirements to urban waterway transporters.

From an economic perspective, desk-research indicated that financial support is required until a significant mass is reached. As the external costs for waterway transport are low, internalising external costs in the transport price would be beneficial for waterway transport. Feasibility is frustrated by investment and transshipment costs. The interviews with experts pointed out that economic feasibility depends predominantly on efficient transshipment techniques and cooperation. Failing cooperation between freight carriers and freight receivers complicates to reach a significant mass. Furthermore, services such as same day deliveries currently complicate collective freight transport. The focus group emphasised the importance of public financial support until a significant mass is reached. More efficient freight transport could be forced if the municipality limits the amount of freight movements allowed in certain areas.

7.3.3 Technical considerations

To become a feasible freight transport solution, urban waterway transport needs to be technically feasible, which holds that it can work technically. Technical feasibility depends on transshipment, the transport operation itself and the final distance to be covered to reach the end-receiver. In ideal circumstances, the distribution of freight is not necessary and freight is directly delivered to the end-receiver. Preferably, urban waterway transport is also performed for reverse flows, such as garbage and waste products.

Existing literature indicated that technical feasibility is determined by the availability of a dense waterway network, universal load units and urban hubs. Interviewees stated that efficient transshipments and the ability to perform the final road distance are crucial for technical feasibility. Although Amsterdam possesses an extensive waterway network, water depth and the height of bridges limit transport capacity. Ideally, the vessels used are noiseless and do not generate any harmful emissions. Electric vessels do exist, but have a limited action radius. From the focus group it became known that the ability to transport a wide range of products is also considered important. A critical mass could be reached easier when a multitude of different freight products could be transported collectively. Likewise, the ability to refrigerate food and beverages increases the amount of freight that is suitable to be transported on the waterways.

7.3.4 Political decision making

From theory it followed that political feasibility is considered to depend on public decision-making processes influenced by the distribution of costs and benefits and social acceptability. Politicians and decision-makers take into account the preferences of the public and need the support of interest groups.

Innovations considered to be politically feasible usually are the ones that are supported by a large coalition of people and whose cost will be covered by the wider public, given that the costs are low enough to not generate opposition and given that the innovation serves to address an urgent problem (Feitelson & Salomon, 2004).

From desk-research it became known that successful concepts are often characterised by active involvement of the local government and the inclusion of all relevant stakeholders. Little became known on the factors limiting political feasibility for the case of Amsterdam. Interviewees made clear that conflicting public interests and the difficulty to cope with passenger transporters frustrate decision making that is beneficial for waterway transport. Furthermore, municipal politicians are considered to have a short term focus, which complicates long term investments and decisions. The focus group recognised the importance of political support and confirmed the existence of different municipal interests that complicate decision making.

7.3.5 Converging research findings

Based upon interpreting, reviewing and converging the findings obtained with the different research methods, the following factors are considered to be critical for the implementation of waterway transport in Amsterdam:

- **A lack of available transshipment locations.** Most available locations are extensively used by passenger transporters. Other places are scarce due to houseboats and poor states of canal walls.
- **Undefined policy.** Due to a lack of municipal knowledge on technology and logistics, policy development is lacking behind. It is necessary to develop policy on both road and waterway transport, but different interests of municipal programmes frustrate decision making.
- **Failing cooperation.** Inefficient transshipment complicates the competition with cheap road transport. Shippers are not willing to cooperate, while cooperation and bundling is required to reach a significant mass.
- **Individual consumption patterns.** Same day delivery requests complicate efficient planning and receivers are not stimulated to align freight requests with other receivers. Freight receivers are not stimulated to cooperate with shippers, which complicates to reach a significant mass.
- **Unfavourable decision-making processes.** Municipal policy makers are considered to have a short term focus, while implementing waterway transport and infrastructure investments require a long term focus. Promotion of individual political gains frustrates long term thinking.

The following section elaborates on practical policy recommendations to stimulate the implementation of waterway transport in Amsterdam.

7.4 POLICY RECOMMENDATIONS

To contribute to the process of policy development on the implementation of urban waterway transport in Amsterdam, practical recommendations are provided in this section. The recommendations focus on the role of policy makers and the use of knowledge available to organise effective pilots. In the first place, it is recommended to apply the Transition Management Approach to facilitate the development of sustainable pilots. The focus group meeting has proven to be a successful way to bring different viewpoints together and to develop a shared vision on sustainable urban freight transport in Amsterdam. The participatory process of visioning, learning and experimenting is considered to encourage cooperation between logistic actors and to stimulate policy makers to have a long term focus. Therefore, it is recommended to foster the potential for implementation by applying the transition management approach as suggested by (Loorbach, 2007). The following three activities are suggested to bring the approach into practice:

7.4.1 Installing multi-disciplinary team

Desk research indicated that the performances of sustainable transport initiatives largely depend on other transport policies implemented. Active involvement of authorities seems crucial for the success of existing concepts. Expert interviews made clear that large interdependencies exist between local authorities and logistic service providers. Both actor types strongly rely on each other when it comes to efficiently organising urban freight transport. The focus group emphasised that the lack of alignment between different municipal departments frustrates the development of waterway transport. As long as different stakes within the municipality generate friction, goal setting is likely to get pushed forward, which frustrates making progress. A first step to accelerate implementation is to ensure that there exists a shared vision on how to balance different municipal interests. Installing a multi-disciplinary team that combines the knowledge of different municipal programmes enhances decision-making.

7.4.2 Applying past knowledge to new situations

Furthermore, desk-research lead to the exploration of successful waterway transport concepts in Europe. During the focus group interview it became known that these concepts were not widely known. While emphasis often is on conducting new experiments and pilots, limited attention is given to existing concepts and past pilots. A lot can be learnt from the experiences and knowledge gained in other cities. In the past, pilots have already been conducted in Amsterdam. While a lot can be learnt from the disadvantages or limitations of these pilots, logistic service providers do not seem to be aware of these past projects and the possibilities waterway transport offers. It is recommended to collect the knowledge that is already available and complement this knowledge by executing new pilots. To systematically report on new pilots, the development of an unambiguous monitoring tool is re-

commended to be able to easily assess the impact of waterway transport on the Amsterdam freight transport system. Active monitoring is expected to support the continuous development of and reflection on transport policies.

7.4.3 Lead by example and support followers

Finally, desk-research, expert interviews and the focus group pointed out that waste, construction materials and long preservable food products are likely to be the most transportable types of goods concerning waterway transport. During the focus group interview, the idea to design pilots for the collection of waste products was proposed by several participants. Construction projects along the waterways already are supplied by waterway transport. Transport of waste only happens on a limited scale. Nevertheless, this shows that transporting waste has potential to be done at a larger scale. To stimulate waterway transport as a means for other (commercial) flows, the municipality could demonstrate the functionality of waterway transport by requesting waterway transport logistics related to municipal services such as construction projects and waste transport. In case of construction projects, several contractors requested waterway transport services after the municipality demonstrated its feasibility (Amsterdam Vaart, 2019). Complementary to setting examples, funding of starting waterway transport concepts is recommended to cover the costs until a significant transport volume is achieved.

This chapter provided the results of triangulating the different research methods used. Thereby, it constituted the final chapter presenting the research results. In the remaining of this thesis, the research lens, data-collection methods and results are critically discussed and an innovative analysis framework is proposed to contribute to the understanding on waterway transport implementation. Furthermore, the credibility of the research outcomes and the limitations of the project are discussed before providing the conclusions of the project.

8 DISCUSSION

The previous chapters provided the results of the research activities to explore the extent to which waterway transport can be implemented as a means for freight transport in Amsterdam. Theory has been used to fit the results within existing theoretical assumptions on transport innovation adoption. Based on what can be learnt from reflecting on this research project, this chapter blends relevant macro theories and the empirical findings of this research project to contribute to the evaluation of transport innovations. It does so by addressing the coherence with existing research in the field of innovation adoption and by suggesting an analysis framework to address different implementation levels and phases. Finally, the limitations of the research project are acknowledged.

8.1 THEORETICAL CONTRIBUTIONS

In the previous chapter, the research results have already been discussed based on triangulation of the research methods used. This resulted in a synthesis of success and failure factors and the development of policy strategies to foster the potential to integrate waterway transport. This section relates the research findings to existing theoretical assumptions on innovation implementation.

The theoretical assumption that the implementation of urban waterway transport is not merely the outcome of individual choices, but the outcome of societal processes and political decision making is coherent with the research findings. The scarcity of space in Amsterdam requires political balancing of different interests to allocate required infrastructure. The likeliness space is made available depends on the degree to which municipal decision-makers are willing to act for or against the implementation of urban waterway transport.

The research supports the importance of technical, social and political factors for the implementation of innovations. To account for the expected importance of commercial feasibility, the Political Economy Framework was complemented with the PESTEL Classification Framework. Particularly, legal and economic feasibility were included in the research lens to capture commercial feasibility in the evaluation of urban waterway transport. The research findings support the importance of this inclusion as it was found that previous attempts to implement waterway transport have failed due to the incapability to compete with road transport. Although the research findings indicate the importance of economic factors in assessing commercial

feasibility, economic and commercial feasibility could have been addressed separately. Economic feasibility should include the factors affecting the distribution of both monetary and non-monetary costs and benefits concerning the implementation of urban waterway transport. Likewise, legal factors could be addressed separately. Results showed that the extent to which implementation is feasible depends among others on the allocation of space, the legal allowance to transship freight and the enforcement of legislation limiting road transport. The need to develop or adapt legislation is considered to strongly determine political feasibility of implementation.

Furthermore, the research lens did not account for any variation over time in the importance of different factors. The lens did not provide understanding on how the likeliness of implementation could develop over time. Research findings indicated that increasing levels of road congestion, announced road maintenance projects and vehicle weight restrictions are expected to determine the likeliness of successful implementation. Additionally, the results indicated that successful implementation of waterway transport may depend on the potential to organise, monitor and evaluate pilots to fill existing knowledge gaps relating to policy and technology development. This led to the insight that assessing the potential for waterway transport implementation could benefit from a more dynamic approach.

The added value of conceptualising the dynamic interplay of feasibility factors is supported by existing macro theories on policy outcomes. Kingdon and Stano (1984) argued that for governments to change public policy, three streams must come together at a certain moment in time: the problem stream, the policy stream, and the political stream. The three streams theory aligns well well with the implementation of urban waterway transport. Political support is required to stimulate the implementation of waterway transport as a solution for existing societal challenges. Interviews with experts pointed out that waterway transport is considered to be a way to reduce societal problems, but it may be a matter of time until the impact is felt enough to lead to policy changes paving the way for implementation.

Currently, a couple of small scale waterway transport concepts can be observed in Amsterdam. Operators of these concepts aim to conduct pilots to co-develop policy and logistic concepts to enable the pilots to become adopted as the usual way to transport urban freight. At the lowest level, the potential of implementing pilots can be analysed. If pilots are successful, they may continue and get implemented on a wider scale. Waterway transport tends to be a solution for the saturation of road infrastructure and implementation should be assessed on the on the perceived effects waterway transport has on the transport system as a whole. External effects limiting accessibility and sustainability of freight transport should be incorporated to determine the extent to which implementing waterway transport could be a solution for arising problems.

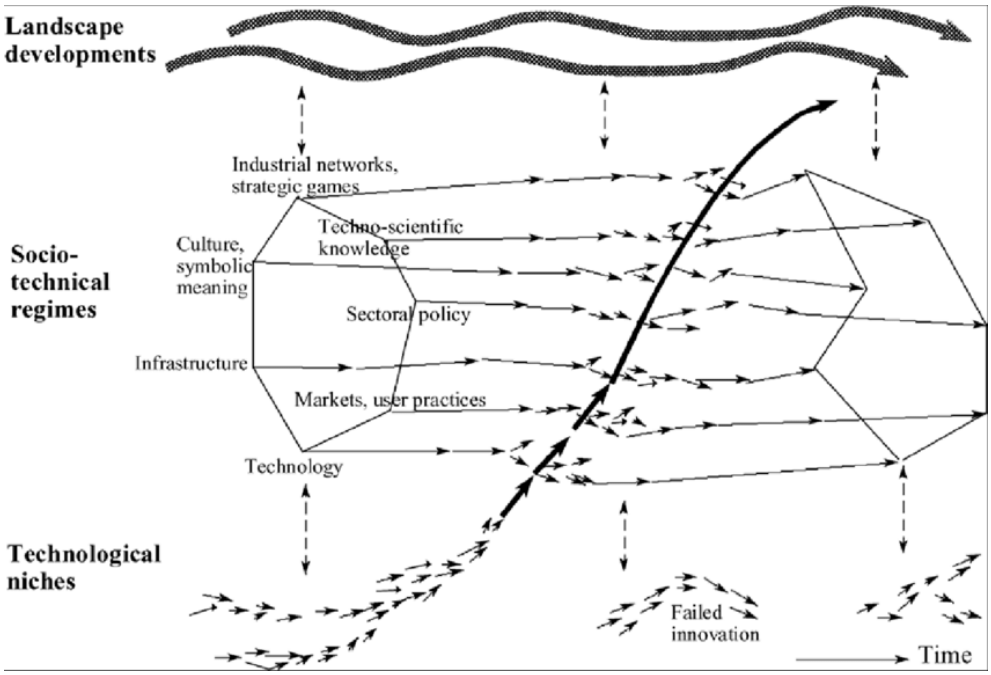

Figure 8.1: Multi-Level Perspective on Transition Theory (Geels, 2002)

Theoretic frameworks that support the dynamic analysis of innovation implementation exist. Geels (2002) conceptualises the niche, the socio-technical regime and the socio-technical landscape levels of society. His Multi-Level Perspective Framework (Figure 8.1) explains how transitions arise from the interconnections between the three levels. The niche level relates to small markets, relatively separated from regular markets. Niches are relatively isolated and here, new technologies can easily develop. These new technologies are sometimes able to influence the higher level, the dominant socio-technical regime which relates to areas where existing regulations allow and limit the development of the new technologies. Elements in the regime level are relatively stable because they are interconnected by the alignment and organisation of different actors. The regime level can be influenced by the landscape level, which relates to broader, non-technological developments. Global forces such as urbanisation or economic growth are able to put pressure on dominant regimes, creating openings for the implementation of innovations. By blending the empirical research findings and the Multi-Level Perspective, an innovative framework to analyse the implementation of urban waterway transport is developed.

Figure 8.2 visually demonstrates how the implementation of urban waterway transport can be analysed. The framework provides insight on the different implementation levels, phases and feasibility factors. The static, but pragmatic Political Economy Framework from Feitelson and Salomon (2004) is complemented with commercial, economic and legal factors and presented in a dynamic multi-level perspective.

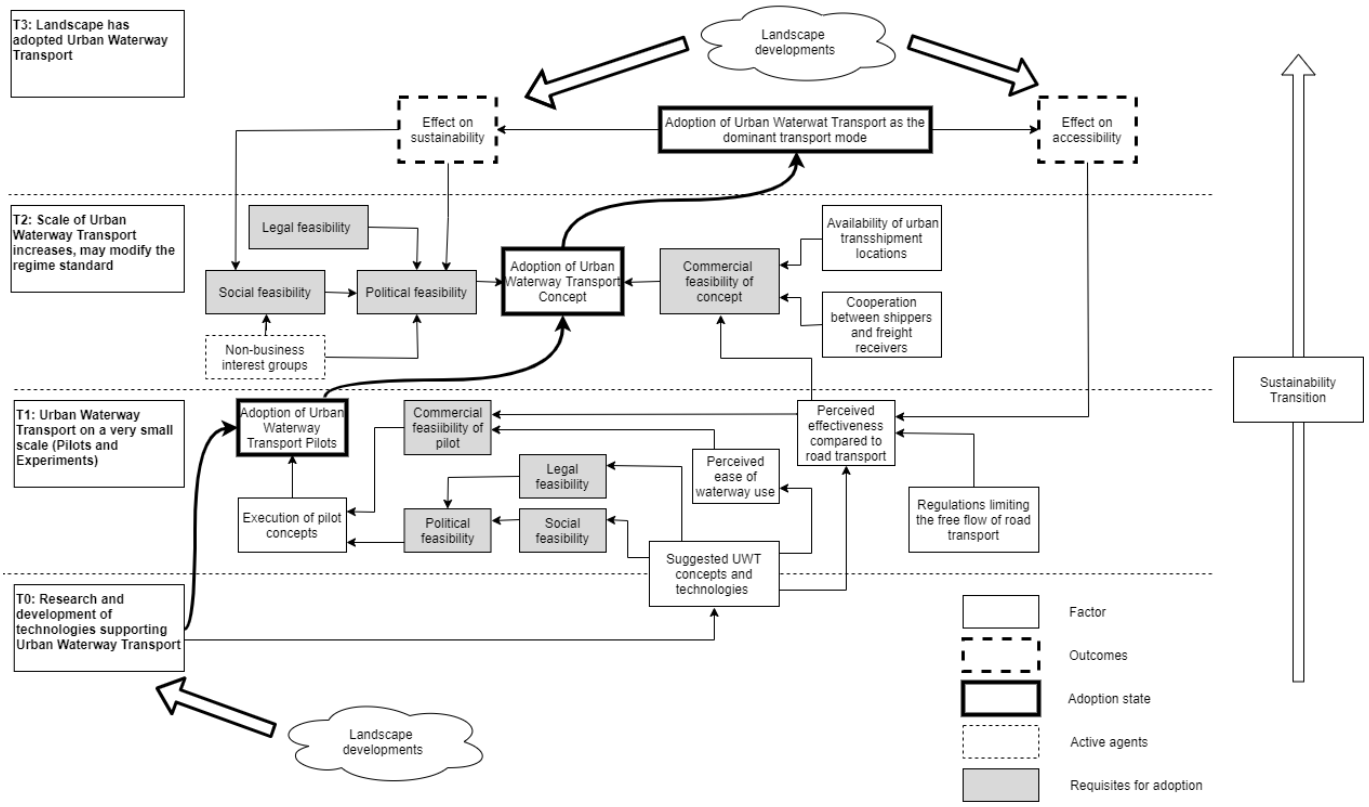

Figure 8.2: An innovative analysis framework to evaluate innovations

Research institutes and researchers are considered to explore technologies to cope with external factors imposing future challenges. In T0, urban waterway transport concepts are being researched. Based on the available technology and knowledge, some concepts are suggested to be experimented with in a real-life setting. Once, concepts have been suggested, the feasibility of conducting pilot experiments should be analysed. Organising pilots does not require fundamental regulatory changes or a solid business model. Execution of pilots simply depends on actors willing to participate and the temporarily legal allowance to conduct the pilot. Successful pilots have a chance to get adopted by society. Based on the pilot, a logistic business model can be developed and required regulatory changes can be made. Depending on the feasibility to make the required regulatory changes and to develop a viable business case, the pilot concept is likely to get adopted in T2, the existing regime. In this phase, the concept is able to expand. It is not a dominant transport mode yet, this phase determines whether waterway transport may be widely adopted or not. Once waterway transport has proven to be a feasible and commercially viable complement to road transport, it could become a dominant transport mode in T3. The effects waterway transport has on sustainability and accessibility may create new openings for implementation in T1.

8.2 LIMITATIONS OF THE RESEARCH PROJECT

Limitations provide insight in what can be concluded from the research and discussing them helps to enhance further research on the topic of innovation implementation. Due to the focus on a single transport innovation for the case of Amsterdam, the research outcomes can be criticised for their limited generalisability. Although generalising research findings has not been the objective of this study, the research findings contribute to the identification of success and failure factors for other cases as the lists of factors can be verified for other cities that may implement urban waterway transport. Also for the city of Amsterdam, the identified success and failure factors could be analysed and verified in more detail. The allocated time span of six months limited the ability to thoroughly explore all factors identified.

The research project has taken a purely qualitative approach. The focus on exploring the research questions rather than providing explicit and measurable answers has been effective to obtain a broad understanding. The research findings and results provide relevant insights for decision-makers, but decision-making should preferably not solely be based on qualitative data. The lack of quantitative accountability of the research findings limits the direct added value to policy making. Furthermore, a major share of the research data collected, is extracted from unstructured interviews with experts and real-life stakeholders who explicitly support waterway transport. A lack of objectivity of the consulted experts may have introduced bias to the research findings. Because interviews are based on social interaction with respondents, interviewers may also become biased due to personal convictions. This research project did not explicitly revisit potential bias and could therefore be enhanced by thorough verification and objective (quantitative) analysis. It is recommended to quantitatively assess the the effects of policy implementation by modelling the effects on the urban freight transport system in Amsterdam.

Finally, the validity of the research findings may be limited by the way the results are interpreted and reported. The majority of the research results is based on the interpretation of qualitative data. A set of potential sources of bias should be taken into account when interpreting the results of the research project. Although most interviews were recorded, reporting qualitative data is subject to selective memory. Results are based on interpretations of things experts have said. Transcription of the unstructured interviews generated large amounts of texts which were difficult to analyse and although the analysis framework used provided structure, transforming transcriptions into research findings is subject to subjective interpretation of conversations. The next chapter provides the conclusions of the research project and answers the main research question.

9 CONCLUSIONS

9.1 MAIN FINDINGS

To conclude this thesis, the main research question, that was proposed in Chapter 1, will be answered and the research objective will be reflected upon. The main objective of this research project concerned exploring to what extent implementing urban waterway transport is feasible in Amsterdam and to give insights into the factors that determine success or failure.

To what extent it is feasible to implement urban waterway transport as a means for sustainable freight transport in Amsterdam?

Using a theoretical lens to structure the project, a mix of three qualitative research methods served to collect relevant data. Triangulation of these methods has been used to test validity through converging the information that was captured from the different methods. This supported the development of a comprehensive understanding on the research topic. Desk-research was used to explore what is known on the adoption of urban waterway transport in existing literature, which resulted in a first list of success and failure factors. This list provided relevant input for the conduction of expert interviews, which made it possible to scope on the factors that particularly determine adoption in Amsterdam. Several experts and real-life stakeholders were consulted to obtain a broad and comprehensive understanding on the factors influencing successful implementation. To determine the factors that currently constitute the most critical failure factors and to envision ways to overcome these factors, a focus group meeting was organised.

The research findings indicate that urban waterway transport is most feasible for freight flows characterised by large volumes and heavy weights. Construction materials, waste products and non-perishable foods and beverages seem to be the most suitable flows to be transported on the waterways. The extent to which waterway transport can be implemented as a sustainable freight transport solution depends in the first place on the condition that the alternative, road transport, becomes less attractive. Increasing levels of congestion, maintenance projects that close off roads and municipal measures limiting the free flow of road transport are reason for worsening road accessibility in Amsterdam. This stimulates implementation of waterway transport, but a lack of transshipment locations, supporting transport policy and logistic cooperation is currently reason for failure. Political support is required, especially during the start-up phase of new concepts, but conflicting public interests and a lack of long-term focus hold against the providence of financial and regulatory support. Allocating the scarcely available space in

Amsterdam is a complex matter of balancing different interests and developing legislation on the exploitation of public space. The research findings indicate that implementation of waterway transport is feasible under the condition that the municipality and private logistic actors collaborate, which can take shape in the form of pilot concepts, co-organised by the municipality, freight shippers, waterway transporters and freight receivers.

Both public and private actors recognise the importance of executing pilots to foster the potential for successful implementation. An important finding of the research is the identification of knowledge gaps regarding the development of transport policy and the use of technology. Experimentation could accelerate co-development of more efficient techniques, logistic concepts and supporting transport policies. Small scale private waterway transporters are willing to participate in long-term pilots to demonstrate the ability to expand. To promote successful public support, three recommendations are suggested:

1. Install a multi-disciplinary municipal team to align the interests of different municipal departments when coordinating waterway transport pilots
2. Collect and use the knowledge that is available from domestic concepts, foreign concepts and pilots that have been performed in the past
3. Request waterway transport for municipal transport services such as waste collection and support additional concepts by financially supporting them during start-up phases

The notion that implementation depends predominantly on worsening road accessibility and the future evaluation of pilots led to the insight that theoretically assessing the potential for waterway transport implementation could benefit from a more dynamic approach. The results indicate that successful implementation depends on how success and failure factors develop over time, but existing frameworks, such as the Political Economy Model from Feitelson and Salomon (2004), do not account for any variation over time in the importance of different factors. Other frameworks, such as the multi-Level framework from Geels (2002), do incorporate a dynamic perspective on innovation implementation, but do not provide insight on what factors to operationalise. This research project theoretically contributes to the understanding on implementing urban waterway transport by providing an innovative analysis framework that incorporates both critical feasibility factors and different implementation phases. It is argued that applying this framework supports both policy makers and scientists in the evaluation of innovations characterised by strong economic and political challenges.

9.2 RECOMMENDATIONS FOR FURTHER RESEARCH

This research project mainly contributes to the limited available knowledge in the area of urban waterway transport. The findings can be used to further investigate the factors that determine success or failure of urban waterway transport. Suggestions for further research logically follow from the feasibility factors included in the analysis framework presented in Figure 8.2. The importance of different feasibility factors is explored, but no in-depth analyses have been performed. Recommendations can be divided in two categories: academic and practical recommendations. Academically, it is recommended to explore the applicability of the suggested analysis framework by applying the framework on other cases to contribute to a better understanding on how innovations get implemented. This could help both policy makers and scientists in the evaluation of innovations. Additionally, research is recommended to operationalise the Transition Management Approach for the development of sustainable urban waterway transport systems. This is expected to increase the practical value of Transition Management Theory.

Practical research is recommended to extend the knowledge on the effects of implementing waterway transport in Amsterdam and other cities that possess extensive waterway networks. Cost-benefit analyses that include the impact of stricter enforcement of the vehicle weight restrictions on the commercial feasibility of waterway transport could be very useful to both public and private actors. Research on transshipment technologies and autonomous floating could provide insights into the impact technology could have on logistic efficiency of waterway transport. Furthermore, it would be interesting to explore in what way negative external effects could best be internalised into the price for urban freight transport. Finally and critical at the moment, research is recommended on what urban locations can be used as transshipment locations, which includes the assessment of implementing time-windows to enable freight transshipment at passenger terminals during predefined time slots.

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A APPENDICES

A.1 SCIENTIFIC PAPER

Implementing urban waterway transport as a sustainable urban freight transport solution for the city of Amsterdam

Maarten Jan Roosmale Nepveu

Delft, The Netherlands

Abstract

Urbanisation levels keep rising and all major cities in Europe face common transport and traffic problems. The city of Amsterdam needs a reliable transport and mobility system to foster economic growth, but at the same time transport is causing congestion, pollution and accidents. In pursuit to overcome these problems, it is suggested to integrate the use waterway transport within the freight transport system. This paper applies Transport Innovation Adoption Theory and Transition Management Theory to scientifically explore the implementation of urban waterway transport. The city of Amsterdam is used as a case study to lay the groundwork for further research on the implementation of waterway transport. Results indicate that legal barriers and lacking transport policy currently hold back the expansion of waterway transport. Organising pilots is suggested as a way to stimulate co-development of transport policy and more efficient logistics concepts. Further research is recommended on transshipment locations, the impact of technology development, monetising external effects and vehicle weight restrictions on the feasibility of waterway transport.

Keywords: Urban Waterway Transport, Urban Freight Transport, City Logistics, Amsterdam

1. Introduction

1.1. Unsustainable cities

Urbanisation is an ongoing trend in European cities and the rest of the world. The quick growth of cities puts tremendous pressure on the transportation networks of urban areas and European cities increasingly face problems caused by transport and traffic. Urban transport is vital to the economic functioning of cities through the provision of accessibility for goods and people, which is needed to keep cities attractive and liveable [1]. Many different freight flows constantly enter and leave urban areas, but the current way of organising urban freight transport is inefficient and does not contribute to sustainable development [2].

The growth of the urban population and changing consumption patterns create a multiplying effect on the demand for freight transport in urban areas. Road based transportation is causing a variety of negative social, environmental, and economic effects including congestion, air pollution, noise pollution and traffic accidents [3]. Nevertheless, urban areas worldwide will keep the need for supply of goods and the removal of waste products and therefore depend on freight transport. The question of how to enhance mobility while at the same time reducing congestion, accidents and pollution is a common challenge for all European cities. Especially for those with historic centres, characterised by increasing levels of tourists [4]. The city of Amsterdam is one of these historic cities facing numerous challenges. For many years, the city of Amsterdam, characterised by its small and narrow streets, has been an attractive area and the number of people living and visiting this city is still increasing [5]. The growth of Amsterdam is associated with huge increases in transport movements, which puts both the accessibility and the quality of life in the city under pressure [6].

Additionally, the city of Amsterdam copes with the tremendous challenge to renovate a large part of it's historical canal walls and bridges. The coming years, maintenance projects will have major impacts on the way freight can be transported [7]. The old roads, bridges and quays are not resistant to the heavy vehicles that are used for urban freight transport and alternative options to deliver goods in the city are needed [8]. The increased pressure on the canal walls and bridges increases the urgency to ban heavy freight vehicles. Stricter enforcement of the vehicle weight restricted zone for heavy freight vehicles would restrict road transport. Heavy freight vehicles cover 20% of total freight vehicle movements, but are responsible for 80% of the total volume and weight that is daily transported. Small and light vehicles are often proposed as solutions, but replacing a fully loaded and heavy truck would require 6 to 10 smaller and lighter vehicles which has negative effects on congestion [9]. Additional measures are required to improve transport performances and to sustain urban freight transport.

To keep cities liveable and accessible, many initiatives have been proposed in the past, but few are expanding their scale beyond initial experimentation [10]. It is being recognised that waterway transport is an environment friendly and safe alternative to road transport and could contribute to more

sustainable transport systems [11], but due to the costs for additional transshipment activities, domestic transport distances usually are too short to enable competition with road transport [12]. Many urban waterway networks are not dense enough to deliver a considerable part of the urban freight volume [2]. The city of Amsterdam, however, has one of the most extensive canal networks in the world and may therefore have the unique opportunity to reclaim its waterway network for transporting urban freight volumes [13]. The number of vehicles needed and the number of kilometres driven to meet the demand for freight transport could be reduced [14] and the freight demand of restaurants and shops in the central area of Amsterdam can be met without significant interference with passenger boats and pleasure crafts [15]. Despite these promising findings, the implementation of waterway transport for urban freight distribution purposed kept a relatively under-investigated topic in scientific literature.

This paper aims to identify the success and failure factors for expanding the scale of waterway transport application in Amsterdam and to contribute to a sustainability transition by exploring implementation strategies. Transport Innovation Adoption Theory and Transition Management Theory are used to explore critical feasibility factors. Desk-research, expert interviews, triangulation and a focus group interview have been performed to collect relevant data. Based on the theories used, two frameworks have been applied to structure data collection, analysis and research findings. From a rich list of failure factors, the critical failure factors are selected based on the focus group interview. Group discussions served to envision policy strategies to overcome these factors. Reflecting on the theories used lead to the construction of an adaptive analysis framework for the implementation of waterway transport concepts. Finally, the research process and findings are discussed and conclusions are presented.

2. Methodology

To explore the feasibility of implementing waterway transport within city logistics, a qualitative case study approach has been applied. In order to to explore the wider adoption of urban waterway transport scientifically, a theoretical research lens is constructed. To obtain a first understanding of the success and failure factors for urban waterway transport, desk-research is performed. To enrich the list of success and failure factors and to further focus on the case of Amsterdam, interviews with real life stakeholders and logistics experts have been conducted. Triangulation served to compare the findings of desk-research and expert interviews as a first validation of success and failure factors, before they would be discussed during the focus group interview. The focus group interview served to validate earlier identified barriers, to decide on the most critical barriers and to discuss how to overcome them.

A schematic overview of the research project is shown in Table 1, which lists the main research activities, the research steps, the inputs and the theories used. The research process can be divided in three phases: exploring factors, developing ways to overcome critical barriers and reflecting on the research process and findings.

Table 1: Theoretical framework

1. Exploring success and failure factors		
Steps	Inputs	Theory and frameworks
1.1 Selecting a research lens	Literature analysis	
1.2 Explore factors in existing literature	1.1, Desk-research	PEF Feitelson & Salomon
1.3 Identify factors from expert knowlegde	1.1, 1.2, Individual interviews	PESTEL classification
1.4 Triangulate findings	1.2, 1.3	
2. Developing ways to overcome failure factors		
2.1 Construct a shared vision	1.2 - 1.4, Focus group interview	TMC Loorbach (2010)
2.2 Explore pathways	1.2 - 1.4, Focus group interview	BTM Loorbach & Wijsman (2013)
2.3 Construct pilot experiments	1.2 - 1.4, Focus group interview	BTM Loorbach & Wijsman (2013)
3. Reflecting on process and findings		
3.1 Reflect on research process	1.1 - 2.3	
3.2 Construct an adaptive analysis framework	1.1 - 2.3, Literature analysis	PEF, PESTEL, MLP Geels (2002)
3.3 Propose a policy recommendations	2.1 - 2.3	

Two frameworks have been selected as most suitable to use as research lenses throughout this research project. The Political Economy Framework is chosen as the basis to structure the analysis of feasibility factors. This framework conceptualises the interaction between technical, social, economic and political feasibility factors and focuses on innovations that strongly address societal challenges [16]. To also address the importance of business case viability and the regulatory framework, the Political Economy Framework is complemented with the PESTEL classification framework, which is an acronym for six sources of change: Political, Economic, Social, Technological, Ecological and Legal sources. Figure 1 shows how both frameworks are used as a research lens throughout the research project.

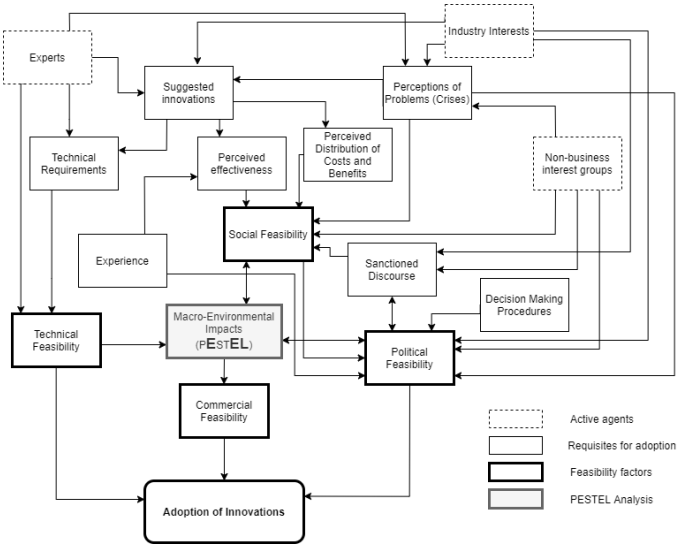

Figure 1: Adapted analysis framework

To scientifically explore how public policy on urban freight transport initiatives can be implemented, a framework describing the governance activities to accelerate sustainability transitions is taken as the basis to explore policy implementation. The core of these steps is based on the notion of 'selective participation', which can be described as bringing together a group of forerunners that have different backgrounds, somewhere were they can discuss and collectively develop understanding of a

complex system and their role within this system [17]. Based upon this notion, an adapted framework has been constructed to structure a focus group interview to discuss how to overcome critical barriers and how to develop supporting policy.

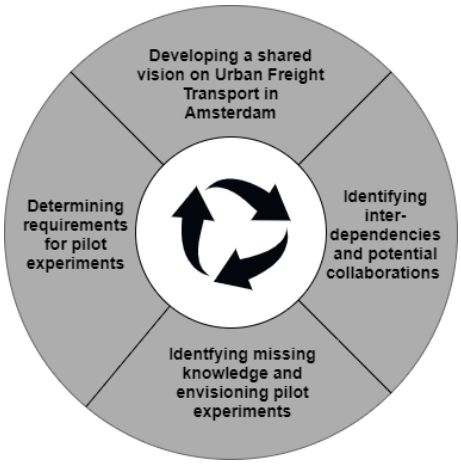

Figure 2: Adapted transition management cycle

Figure 1 and Figure 2 together form the research lens. The main contribution of the lens lies in the inclusion of political, technical, commercial, economic, social and legal factors. Previous studies on urban waterway transport have been found and analysed based on these feasibility factors. To account for the factors during expert interviewing, a broad set of interviewees with different fields of expertise has been approached. A list of knowledgeable interviewees is set up in a way that all feasibility factors can be addressed by the expertise of the interviewees. The factors are used as a guideline during the execution of the interviews to address the different feasibility topics. The adapted Transition Management Framework has been used to structure the focus group interview with a group of experts. The group consisted of participants with different backgrounds and represented wholesalers, waterway transporters, passenger transporters, interest groups, research institutes and policy makers.

3. Results

3.1. Previous research

Urban waterway transport refers to the use of ships to transfer goods from origin to transit points by the urban waterway network of a city [18]. Waterway transport could increase the level of sustainability and has positive effects on environment and society, but due to the additional transshipment and the related administrative work it is difficult to become cost-effective [11]. It is argued that urban waterway transport is only feasible in specific circumstances and for a limited part of the total transport flow, in cities with a very high density of waterways [2]. However, analysis of several European concepts leads to the conclusion that waterway transport can be used in the context of city logistics for the distribution of freight in several different transport segments, ranging from parcel delivery to catering delivery and waste transportation [19]. A critical factor for the emergence of successful concepts is said to be the increasing levels of congestion. Existing concepts mostly aim to avoid congestion and regulations restricting access to trucks into city centres [20]. For waterway transport to be economically efficient, the direct involvement and support of the local government seems crucial [21]. A thorough review of well working practices lead to the conclusion that there is scope for expansion for waterway transport, but transport costs can only become competitive to road transport when sufficient volumes are transported and therefore financial support is required during start-up phases [22]. For the cities of Ghent and Gothenburg, a couple of feasibility studies have been performed. For Ghent it is concluded that the successful operation of waterway transport depends on the close involvement of different stakeholders, clear societal benefits and unique characteristics of available waterway networks [23]. For Gothenburg, transporting mass construction materials in found to be an efficient initiative to make freight transport more sustainable [24]. Implementation of a combined goods and waste transportation system is opposed to strong barriers due to a lack of economic viability. Successful implementation depends on the implementation of regulations to limit the free flow of road traffic [25]. For the Netherlands, three Dutch concepts are often elaborated on in existing literature. The ”Beer Boat” in Utrecht, the ”City Supplier” and the ”DHL floating service centre” in Amsterdam. Inspired by these three concepts, a couple of researchers explored the potential to expand the use of urban waterway transport in Amsterdam.

3.2. An opportunity for Amsterdam

The increasing demand for goods, combined with municipal regulations aiming to improve the quality of life, results in the use of more and smaller trucks and a less efficient transport system with a larger total amount of kilometres driven. A modal shift could reduce this amount, but limitations are found in the width of the canals and the height of the bridges over the canals, which limit cargo capacity [14]. Additionally, the lack of willingness of shippers to cooperate is found as an important reason for the lack of sufficient transport volume [26]. Based on simulating the distribution of food and beverages to supply HoReCa in the Amsterdam centre, it is suggested that with a small number of transshipment locations in the urban area, waterway transport could compete with truck deliveries based on logistic performances, without significant interference with other activities on the waterways [15] [6]. Furthermore, the development of autonomous floating technology is recognised as increasing the potential for waterway transport to become economically feasible [13].

Besides researchers, the municipality also recognised waterway transport as a means to alleviate existing problems caused by urban freight transport. Waterway transport is currently being used for construction projects and waste collection and may also be used to distribute food and beverages. A lack of sufficient loading and unloading facilities is considered to be the main barrier for expansion [27]. The majority of the locations that are currently available are extensively used by pas-

senger transporters and most of the suitable locations can only be used for a maximum time of 15 minutes, while transshipment of freight often requires longer [28]. Based on analysing existing literature, the success and failure factors that have been explored are structured according to the research lens and presented in Table 2 and Table 3.

Table 2: Success factors explored in existing literature

Success factors	**Sub-factors**
Social	Increasing levels of congestion
	Envrionmental pollution
	Damages to road infrastructure
	Noise nuisance
	Visual intrusion
Commercial (legal)	Avoiding time-windows
	Avoiding road restrictions
	Zero-emission zones
Commercial (economic)	Financial support
	Internalisation of external costs
Technical	Multi-functional (retour flows)
	Universal load units
	Density of waterway network
	Availability of urban hubs
	Availability of infrastructure
	Autonomous technology
Political	Active local government
	Inclusion of all stakeholders

Table 3: Failure factors explored in existing literature

Failure factors	**Sub-factors**
Social	-
Commercial (legal)	-
Commercial (economic)	Transshipment costs
	High initial investment costs
	Administrative costs
	Obtaining critical mass
	Cost-effectiveness
	Cheap road transport
	Failing cooperation logistic actors
Technical	Insufficient transshipment locations
	Organisational complexity
	Different logistic performances
	Interference passenger traffic
	Density of waterway network
Political	-

3.3. Stakeholders to include

Transport initiatives could be a solution for the one, but could form the base for new problem to others [29]. A key challenge comes from the fact that local governments often lack knowledge to efficiently organise urban freight distribution. Receivers of freight have specific demands and requirements regarding freight transport. In practice, the outcomes of freight transport and their coherent effects on society, are determined by the decisions of freight receivers rather than those of local authorities. Usually, public authorities do not clearly understand that improving freight transport policy depends on the inclusion of and the negotiation with different stakeholders. Public authorities, shippers, freight transport operators, receivers and residents all have their own stakes and interests. When aiming to implement measures, it is crucial to involve them and to adapt policies to their needs rather than simply restricting the free flow of truck movements [30].

The public authorities' main interest usually is to reach a sustainable urban freight transportation system. They aim to ensure accessibility and to reduce air pollution, greenhouse gas emissions, waste and noise levels at the same time [31]. Local authorities usually try to reduce the amount of freight vehicles, nuisance and air pollution by implementing limiting regulations on road transport [2].

Shippers select freight carriers and request them to deliver freight to a receiver. Normally shippers are responsible for sending freight and arranging transportation. They select transport operators and request them to deliver freight to a receiver. Their objective is to minimise transport costs paid to freight transport operators, which makes that they are constantly looking for options to increase efficiency and competitiveness [32]. Freight carriers' main interest usually is to organise urban freight transport in the most efficient way so that it maximises profit. Local regulations and legislation forced by the local authorities frustrate the way freight carriers could organise their freight transport [33]. Regulations such as time-windows force freight carriers to organise all transport activities within a limited time period, which often results in transport planning that is far from optimal [2].

Receivers normally are not involved in the freight transport itself, but their orders initiate the urban freight transport operations. They usually require a reliable transport system, while they benefit from an attractive area [2]. Residents are not directly involved in urban freight transport. They are affected by the movement of freight and experience negative external effects.

3.4. Experienced success and failure factors

Currently, waterway transport takes place on a very limited scale. A collaboration between the municipality of Amsterdam, research institute TNO, the Port of Amsterdam and water company Waternet stimulates the supply of construction materials to construction projects using the waterway network. Expansion is said to be difficult as long as road transportation is not frustrated significantly by accessibility problems or restrictive measures. A lack of sufficient transshipment locations along the canals and space for loading and unloading is further complicating implementation. Stricter enforcement of the weight restricted zone is expected to be an important driver. According to municipal officials, subsidence of canal walls lead to very unsafe situations. Maintenance projects are urgently required and freight transport on vulnerable infrastructure must be prevented. During these maintenance projects, it will not be possible for vehicles to use the roads. Without intervening, road closures are expected to result in significant accessibility prob-

lems, which makes that waterway transport could be a serious alternative to road transport.

Shippers and freight carriers are confronted with increasing difficulties to meet the requirements of receivers. Operations are frustrated by increasing congestion levels and road restrictions. Waterway transport could provide solutions, but a lack of clear transport policy on both road and waterway transport is said to complicate the modal choice.

Table 4: Success factors identified during interviews

Success factors	**Sub-factors**
Social	Reducing road congestion
	Reducing emissions
	Reducing pressure on infrastructure
	Reducing noise
	Improving traffic safety
Commercial (legal)	Vehicle weight restrictions
	Zero-emission zone
	Time-windows
	Road restrictions
Commercial (economic)	Cooperation
	Economies of scale
	Financial support
Technical	Zero-emission
	Autonomous technology
	Multi-functional
Political	Pressure from interest groups

Table 5: Failure factors identified with interviews

Failure factors	**Sub-factors**
Social	Nuisance on waterways
	Interaction passenger transport
	Interaction pleasure crafts
Commercial (legal)	Lack of transport policy
	Unclear road transport policy
	Unclear waterway transport policy
	Vessel requirements and licences
	Prohibition to transship freight
Commercial (economic)	Transshipment costs
	Initial investment costs
	Operational costs
	Cheap road transport
	Lack of critical demand
	Failing cooperation logistic actors
Technical	Lack of transshipment locations
	Poor transshipment technology
	Capacity of waterway network
	Final-mile performance
	Lack of space along canal walls
	Difficulty logistic planning
	Weather conditions
Political	Obstructing passenger transport
	Short-term interests of politicians
	Conflicting public interests

Existing waterway transporters aim to meet the needs of both freight shippers and receivers, at a price that is competitive to other transport operators. Due to the little available transshipment locations, often a final distance on road is required to reach freight receivers. This final distance quickly increases transport time and costs which currently makes it difficult to charge acceptable prices. Prices could be reduced by consolidation of freight to reach economies of scale, but shippers are said to be reluctant to cooperate. Another way to reduce transport costs would be to use more efficient transshipment technology, but before the waterway transport operators are willing to invest, clarity on the transport policies that will be implemented by the municipality is demanded. Table 4 and Table 5 give an overview of the success and failure identified by interviewing experts and stakeholders.

3.5. A governance approach to accelerate implementation

Based upon a focus group interview with real life stakeholders a shared vision on urban freight transport system in Amsterdam is developed. The envisioned transport system is a multimodal system that combines different transport modes. Transshipment between transport modes must be flexible in terms of time and location. Urban freight transport should be noiseless, reliable, affordable, safe, zero-emission and efficient.

Waterway transport could contribute to this system, but implementation is currently hampered by a set of critical barriers. There is a lack of available transshipment locations and the available locations are extensively used by passenger transporters and houseboats.

It is difficult to obtain a significant transport mass. Inefficient transshipment complicates the competition with cheap road transport and shippers are not encouraged to cooperate as their transport performances are not frustrated by accessibility problems enough to consider a modal shift.

Road and waterway transport policy development is lacking behind due to a lack of knowledge on technology and logistics. Conflicting interests between municipal departments delays policy implementation and municipal policy makers are considered to have a short term focus. Implementing waterway transport would require a long term focus, but promotion of individual political gains frustrates long term thinking.

Individual consumption patterns of freight receivers and changing product ranges of cafes and restaurants are said to complicate the logistic planning. Increasing diversity of products and high inventory costs stimulate same day delivery requirements, which are difficult to meet by waterway transporters.

Legal and political factors are considered to impose the most critical barriers at the moment. It is essential that it becomes allowed to transship freight at locations that allow for loading and unloading. Designating locations would require municipal politicians to be decisive, but due to short-term and conflicting municipal interests, critical decisions are postponed. Decision-making is further frustrated by the pressure of passenger transporters. Although passenger transport and freight transport do

not necessarily need to interfere with each other, conflicts on the use of passenger transport terminals for loading and unloading of freight are said to complicate the assignment of sufficient transshipment locations. To investigate opportunities for transshipment along the canals, to develop supporting policy and to explore efficient logistic concepts, pilot experiments are suggested: long term projects that allow waterway transporters to demonstrate their suitability to transport construction materials, waste products and non-perishable foods and beverages.

4. Discussion

Based on existing theories on the factors that determine the adoption of innovation, a theoretical research lens has been constructed to fit the research project within scientific research on innovation adoption. Desk-research and interviews have been used to identify the success and failure factors for the adoption of waterway transport and a focus group interview is conducted to discuss how the implementation of waterway transport can be accelerated. The results indicate that the successful implementation of waterway transport largely depends on how success and failure factors develop over time. This development is subject to both external and internal uncertainties. Commercial, legal, economic, technical, social and political feasibility heavily depend on each other and on external influences on which little influence can be exerted. Both public and private actors recognise the negative effects of urban freight transport in Amsterdam and the municipality stated to be aware of the need to find solutions for existing problems. Shippers and transport operators recognise existing problems regarding the accessibility of receivers and look for solutions to keep meeting customer requirements.

Feasibility of waterway transport is considered to depend mainly on the implementation of transport policy. Implementation depends on decision-makers who require sufficient knowledge to base decisions on. The lack of in-house technical and logistic knowledge seems to be a critical barrier for policy development. From the focus group interview with a group of experts it became known that organising and monitoring pilots is considered to be an effective way to co-develop urban waterway transport systems and supporting transport policies. It is recommended to install a multi-disciplinary municipal team that aligns the interests of different departments and to use the knowledge that can be obtained by reviewing past pilots and existing foreign concepts. Moreover, the municipality is recommended to demonstrate the functionality of waterway transport by requesting waterway transport logistics for municipal transport services such as waste collection. Commercial initiatives following the municipal example require public funding to start waterway transport concepts until a significant transport volume is achieved.

This paper supports the importance of technical, social and political factors for the adoption of innovations. As expected and in accordance with the research findings, the commercial feasibility of urban waterway transport concepts indeed is considered to be a critical determinant for implementation. Legal and economic factors are addressed as determinants for the commercial feasibility of waterway transport. Although results indicate that economic and legal factors do indeed determine the commercial feasibility, the distinction between economic and commercial feasibility can be considered to be vague. Results also indicate that legal feasibility does not only influence commercial feasibility, but political feasibility as well. A major barrier for the adoption of urban waterway transport is said to be the lack of allowance to use existing terminals as a means for transshipping urban freight.

The research lens used did not account for any variation over time in the importance of different factors. Considering the political process as an outcome of balancing the success and failure factors factors, the framework does not account for future developments that may influence the likeliness of transport innovations to get adopted. Three major drivers are identified: maintenance projects on road infrastructure, increasing road-based congestion and stricter vehicle weight restrictions. To account for the impact of these drivers on the adoption of transport innovations, a more dynamic approach is required.

Instead of addressing the innovation by itself and trying to conclude whether the innovation generates desirable system outcomes, the urban freight transport system should be addressed as a whole. This aligns well with the multi-level perspective that can be applied to explore the implementation of innovations into the relevant societal context of transitions [34]. Changes in socio-technical systems, such as transport systems, are said to take place on three different levels of society: the niche level, the socio-technical regime level and the socio-technical landscape level. Successful transitions are said to arise from the interconnections between these three levels.

The niche level relates to small markets, relatively separated from regular markets. Niches are relatively isolated and here, new technologies can easily develop. These new technologies are sometimes able to influence the higher level, the dominant socio-technical regime which relates to areas where existing regulations allow and limit the development of the new technologies. Elements in the regime level are relatively stable because they are interconnected by the alignment and organisation of different actors. The regime level can be influenced by the landscape level, which relates to broader, non-technological developments. Global forces such as urbanisation or economic growth for example are able to put pressure on dominant regimes, creating openings for new technologies [34].

When applying the multi-level perspective on the case of urban waterway transport, successful adoption is likely to depend the development of innovations in niches and developments that take place in the existing regime and the socio-technical landscape. The three levels can be described as follows:

- The niches are typically formed by the few waterway transport concepts currently active in Amsterdam. These small concepts aim to conduct temporarily pilots to co-develop policy and logistic concepts that would enable the pilots to become adopted as a usual way to transport urban freight.

- The existing regime is typically formed by existing legislation on road and waterway transport and the dominant actors involved with urban freight transport. The usual transport modes for freight transport are trucks and vans. While a relatively stable situation exists, transport innovations that aim to change the regime are being suggested.
- The landscape level cannot easily be influenced by the dominant actors in the existing regime. Relevant landscape developments include the increasing amount of road users and negative effects on sustainability in general. These external developments put pressure on the municipality of Amsterdam and stimulate the development of policies to deal with negative effects such as congestion and environmental pollution.

Figure 3 visually demonstrates how the implementation of urban waterway transport can be analysed. The framework is not meant to serve as a fixed and definite analysis method, but to provide insight in how the adoption of urban waterway transport depends on different phases and feasibility factors. It incorporates the feasibility factors included in the political economy framework and includes them in a dynamic multi-level perspective.

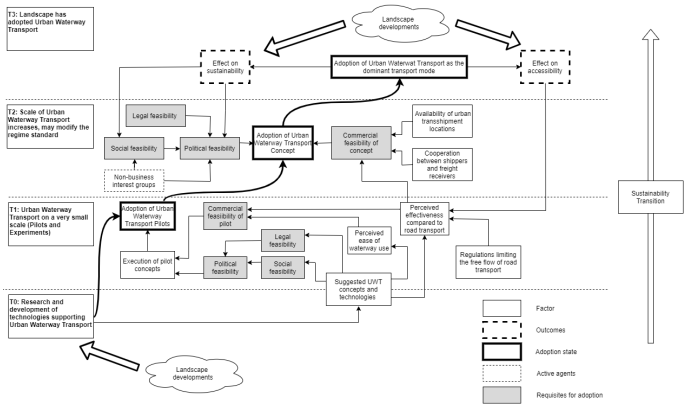

Figure 3: An innovative analysis framework for Urban Waterway Transport

4.1. Limitations of the research project

The research project has taken a purely qualitative approach. The focus on exploring the research questions rather than providing explicit and measurable answers has been effective to obtain a wide understanding on the research topic. The research findings and results, based on qualitative data-collection methods, can provide relevant insights for decision-makers. Yet, decision-making should not solely be based on qualitative data. The lack of quantitative accountability of the research findings limits the direct added value to policy making. Furthermore, a major share of the research data collected, is extracted from unstructured interviews with experts and real-life stakeholders who explicitly support waterway transport. A lack of objectivity of the consulted experts may have introduced bias to the research findings. Because interviews are based on social interaction with respondents, interviewers may also become biased due to personal convictions. This research project did not explicitly revisit potential bias and could therefore be enhanced by thorough verification and objective (quantitative) analysis.

A strong limitation of the research project lies in the way the results are interpreted and reported. The majority of the research results is based on the interpretation of qualitative data. A set of potential sources of bias should be taken into account when interpreting the results of the research project. Although most interviews were recorded, reporting qualitative data is subject to selective memory. Results are based on interpretations of things experts have said. Transcription of the unstructured interviews generated large amounts of texts which were difficult to analyse and although the research lens provided structure, transforming transcriptions into research findings is subject to subjective interpretation of conversations.

5. Conclusion

The first research activity performed was the search for a suitable theoretical lens to scientifically explore the success and failure factors the adoption of urban waterway transport. Legal feasibility and economic feasibility were considered to be sub factors determining the commercial viability of innovations. This resulted in an adapted framework that is used to structure the exploration of factors identified with desk-research and expert interviews. The framework provided a useful tool to explore a broad range of feasibility factors.

Success factors can all be related to two major effects: rising levels of congestion and worsening state of road infrastructure. Increasing road transport has resulted in rising congestion levels and reduced accessibility. A modal shift to waterway transport can reduce the number of freight vehicles required to meet freight transport demand. In the second place, the Amsterdam road infrastructure is not resistant to heavy freight transport vehicles. Maintenance projects are required to restore the state of canal walls and bridges. Given that waterway transport does not expose road infrastructure to unbearable pressures, the worsening state of road infrastructures drives a modal shift to the waterways. A lack of sufficient urban transshipment locations, unclear and lacking transport policy and failing cooperation are found to be the main failure factors.

A focus group interview is organised to determine the factors that are considered as most important barriers. The focus group emphasised the barriers that currently prevent the expansion of waterway transport concepts and discussed what could be done on short-term to overcome these barriers. It was recognised that the lack of sufficient transshipment possibilities in the urban area is currently holding back the expansion of waterway transport concepts. Enabling transshipment requires legal permission to exploit space for loading and unloading of freight along the canals. The scarcity of space, the lack of relevant knowledge and the existence of different municipal interests complicate the designation of suitable locations. Currently, legal barriers limit the feasibility for waterway transport to be an attractive alternative to road transport. To stimulate

the implementation of waterway transport, priority should be on overcoming these legal barriers and to create room for the development of new waterway transport concepts. This can be done by co-developing policy and logistic concepts, which requires knowledge of both public administration and logistics. Conducting pilots that include the involvement of both public and private actors could accelerate co-development. The importance of pilots to determine what locations can be used for waterway transport purposes is recognised by both actor types.

Furthermore, three policy recommendations have been proposed: 1. Installing a multi-disciplinary team, 2. Applying past knowledge to new situations, 3. Lead by example and support followers. These relatively simple activities could accelerate the integration of waterway transport.

Exploring success and failure factors lead to the conclusion that the implementation of waterway transport is determined by a broad range of feasibility factors that are influenced by each other over time. Exploring the second research question lead to the conclusion that legal barriers and political indecisiveness currently hold back the expansion of waterway transport. Waterway transport pilots are required to co-develop waterway transport policy and efficient freight transport planning. This leads to the conclusion that the feasibility of integrating urban waterway transport within the broader urban freight transport system depends in the first place on the feasibility to conduct pilots. This insight provided the main input to suggest an alternative analysis framework when addressing the implementation of urban waterway transport. Exploring success and failure factors should be done for different implementation phases as the relative importance of feasibility factors changes over time.

Successfully integrating urban waterway transport depends on how the drivers and success factors will develop. A modal shift to waterway transport could be a solution to sustainability problems. The more these problems are perceived and experienced, the more attention will be given to potential solutions such as urban waterway transport. In particular, increasing levels of road users which lead to congestion and the saturation of infrastructure are considered to determine the success for waterway transport. Chances for success are enlarged by the negative effects maintenance projects will have on road accessibility. Integration further depends on the willingness of policy-makers to make changes in public policy in favour of waterway transport. Under the condition that it will become possible to conduct pilots that stimulate the cooperation between public and private actors in co-developing policy and logistic concepts, the expansion of waterway transport concepts is likely.

5.1. Recommendations for further research

Suggestions for further research logically follow from the feasibility factors included in Figure 3. This paper contributes to the limited available knowledge in the area of urban waterway transport. The importance of different feasibility factors is explored, but no in-depth analyses have been performed. Recommendations for further research can be divided in two categories. The first category constitutes research on the potential for waterway transport as a sustainable urban freight transport solution in general. It is recommended to use the adapted analysis framework as a research lens to further contribute to a better understanding on how transport innovations get implemented. The second category constitutes research specifically related to the practical implementation of urban waterway transport in Amsterdam.

In particular, research is recommended on four topics that are expected to be highly relevant for the cost-effectiveness and successful adoption of urban waterway transport. In the first place, a cost-benefit analysis that includes the impact of stricter enforcement of the vehicle weight restrictions on the commercial feasibility of waterway transport could be very useful to both public and private actors. Secondly, research on transshipment technologies and autonomous floating technology is recommended to explore what impact technology could have on the operational costs. Thirdly, research on how negative external effects could be internalised into the price for urban transport would be highly valuable for policy makers. Finally, and most critical at the moment, research on what urban locations can be used as transshipment locations for urban freight transport is highly recommended.

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A.2 SUMMARIES OF INTERVIEWS

Exploratory interviews

The exploratory interviews served to explore how waterway transport currently takes place. Based on the analysis of grey literature, it became known which waterway transporters currently exist. Focus was on transporters that were willing to transport food and beverages. Besides the managers of three concepts, the project coordinator of 'Roboats' and the chairperson of 'Werkgroep Water' were interviewed.

'Roboats' is a project commissioned by the Amsterdam Institute for Advanced Metropolitan Solutions and explores the potential for an autonomous fleet of vessels to transport people and freight. From the interview with the project coordinator it became known that before autonomous vessels could be feasible at all, research into the potential for waterway transport in general was required.

From the interviews with the managers of Mokum Mariteam, ZOEV City and Rederij Kees, it became known that competing with road transport has been extremely difficult. Several pilots have been proposed and executed, but often lacked the potential to be cost-effective. Nevertheless, demand for transporting waste and construction materials is said to have increased. Furthermore, the potential to transport food and beverages was expected to increase once the municipality enforces the vehicle weight restrictions more strictly.

From the interview with the chairperson of 'Werkgroep Water', an association representing residents in the inner city of Amsterdam it became known that there is increasing interest from residents who perceive waterway transport as a potential solution to reduce freight traffic in the inner city.

Interviewee 7

Interviewee 7, a professor in city logistics at the Amsterdam University of Applied Sciences explained that three flows have large potential to be distributed by waterway transport: waste products, construction materials, and food and beverages. Waterway transport would be most suitable for freight that can be shipped in large and heavy volumes, such as waste and construction materials. The potential for food and beverages comes from the fact that many restaurants and cafes are located closely to the Amsterdam waterways. To perform waterway transport, specific licenses are required. The municipality of Amsterdam plays an important role by providing these licenses. Obtaining the right licenses is said to be difficult and time consuming, as transport operators need to meet many different requirements. Furthermore, the impact of municipal restrictions on road transport are said to be very important within city logistics and the potential for alternative transport modes. Other challenges are based on the cost-effectivity of UWT. Transshipment is required and quickly increases total transport costs. Bundling of freight could be a way to realise more efficient transport services, but

the potential of bundling depends on the locations of freight forwarders and the willingness to cooperate.

The main drivers for UWT are based on the scarcity of space in the centre of Amsterdam and the increasing levels of congestion. The increasing number of complaints about road transport, made by residents will also affect the chances for UWT. There are significant advantages related to waterway transport, but to benefit from these advantages, political support said to be required. Decision-makers tend to push forward the decision to facilitate waterway transport. For a considerable part, this is said to be done because of the difficulty to coordinate passenger transport. In terms of available technology, transshipment technology needs to get further developed. Another issue is imposed by the availability of vessels. To transport a large share of the logistic flows in Amsterdam, many vessels are required. At the moment, there are only a few companies able to deliver waterway transport services.

Interviewee 8

Interviewee 8, the project manager of 'Amsterdam Vaart!' and commercial manager at the Port of Amsterdam explained the role of the Port of Amsterdam within the 'Amsterdam Vaart project'. Amsterdam Vaart is a collaboration between the Port of Amsterdam, the municipality of Amsterdam and research institute TNO. The collaboration was established to cope with the challenge of reducing road traffic in Amsterdam. With the project, valuable knowledge on how to organise urban waterway transport is obtained. A huge challenge to organise waterway transport comes from acquiring the right licenses. Within the municipality, there are several different programmes that all have common, but sometimes different stakes. Amsterdam Vaart aligns logistic actors and the municipality.

Regarding construction projects, the location of the projects determine for a large part if waterway transport could be favourable compared to road transport. Usually, the economic costs are considered to be higher for waterway transport. Nevertheless, the societal costs for UWT are said to be a lot less. Less harmful pollution and no damages to vulnerable road infrastructure. For construction projects, a significant advantage of waterway transport is created by additional storage space on the vessels used.

When the announced stricter enforcement of vehicle weight restrictions will take place, waterway transport is expected to become more attractive. In some cases, it would not be possible to reach freight receivers by road. Alternatively, many smaller vehicles would be required which increase the levels of congestion.

Closely related to the costs for waterway transport, a 'level playing field' is considered to be important when addressing the potential for urban waterway transport. To create fair competition between road and waterway transporters, it would be desirable to monetise external costs. For construction projects, the municipality reasonably often is the tendering actor. In

these cases, the demand for waterway transport can be included in the tendering process. For the supply of cafes and restaurants, this is not the case. Nevertheless, stricter enforcement of vehicle weight restrictions will also impose problems for the distribution of food and beverages. The potential to use urban waterway transport as a means for the distribution of food and beverages, is determined by the restrictions imposed on road transport.

The urgency to impose restrictions on road transport increases as more pressure on the city centre is expected because of the rising levels of tourists. In ambition to realise a safe transport system, the municipality aims for a reduction of car traffic. When the demand for waterway transport would increase, competition between different suppliers is expected to have a positive effect on the efficiency of waterway transport.

Interviewee 9

Interviewee 9, a manager of a large supplier of beverages, Henk Smit, explained when urban waterway transport would become interesting for the supply of beverages. Ten years ago, waterway transport was performed to transport large quantities of food and beverages from producers to distribution centres. In ambition to also perform waterway transport to distribute food and beverages within the urban area, the potential was explored. Back then, it was not possible to distribute freight within the urban area as there was a lack of space for loading and unloading. Parking spaces would need to be cleared and agreements with passenger transporters would have needed to be made. Back then, there was little urgency to reduce car traffic.

Nowadays, with the worsening state of the bridges and canal walls, the urgency exists, but at the moment there is no interest in urban waterway transport as a means for our freight distribution. In the first place because our customers are not often located along the waterways and secondly because our transport services are still very efficient. Freight is delivered with a truck, which is completely filled with freight for customer in the centre of Amsterdam.

At the moment we have a special permit to use a heavy truck in the city centre. The demand of our customers does not fit in small, electric vehicles. Once this permission is not given anymore, we would need to split the full load over multiple smaller vehicles. Then, waterway transport might become attractive, but only when the municipality strictly prohibits to exceed the maximum weight.

For a considerable part, the negative effects of urban freight transport are generated by suppliers that use heavy freight vehicles for the supply of a limited amount of customers in Amsterdam. It would be wise to consolidate the load of these suppliers outside the city centre. Unfortunately, this is expected to increase transport costs as long as the inner city is easily reachable. Waterway transport will only be used if legislation forces suppliers to

adapt the way transport is performed.

If the municipality aims to stimulate urban waterway transport, they should initiate the concept. This can be done by a tendering process. By allowing a few transporters to exploit the waterways, waterway transport can be coordinated. Yearly revision of the tendering process could guarantee continuous quality.

Another factor that increases the complexity for the distribution of food and beverages is imposed by the increasing diversity of product ranges. Inventory management is required for many different products and this generates the need to be supplied several times a week.

Interviewee 10

Interviewee 10, head of transport of catering wholesaler Bidfood, explains the complexity of organising freight transport in Amsterdam and the execution of waterway transport pilots. Bidfood is a large supplier of food and beverages and supplies three types of products: fresh, frozen and dry (DKW). Increasing difficulty to organise efficient logistic services in Amsterdam is experienced. Therefore, one of the alternatives considered is to use the Amsterdam waterways to supply our customers.

The vehicle weight restrictions further frustrate our logistic performances. An initiative that is often proposed is the use of small and electric vehicles. This would not be feasible for us. Once it is only allowed to use small vehicles, the amount of vehicles required to supply our customers would drastically increase.

Another initiative that is often considered is consolidation and bundling of freight at the outskirts of the city. This could be an attractive option, but depends on the willingness of competitors and customers to cooperate. Freight suppliers depend on customers. As long as our customers are not willing to change the way they get supplied, initiatives will not be likely to succeed.

This also holds for waterway transport. A modal shift to waterway transport heavily depends on the regulations that are imposed to road transport. It is not clear what rules and regulations will be implemented in the coming years. Therefore, suppliers push forward investment decisions on new vehicles. The choice for waterway transport also greatly depends on how the final mile can be performed. Vehicles that are able to perform the final meters need to be further developed.

To stimulate the adoption of urban waterway transport, financial support from the municipality is required. Furthermore, a significant demand needs to exist in order to become economically feasible. A huge barrier to obtain this volume lies in the order behaviour of customers. Nowadays, it is possible to request same day deliveries. This makes it extremely complicated to efficiently plan the transport operation. Overall, clear legislation is required,

technology should be developed, concepts need to get financially supported and cooperation between customers and suppliers is required.

Interviewees 11 and 12

Interviewees 11 and 12, explored the potential for urban waterway transport, commissioned by the municipality of Amsterdam, elaborated on their findings. The research was conducted in 2018 and preceded the development of a policy proposal regarding the exploitation of the Amsterdam waterways (Nota Varen 2). It was recommended to explore feasible loading and unloading locations. Furthermore, the expectation that transporters would prefer road transport over waterway transport as long as road transport would be faster and cheaper, was stated. The worsening state of the Amsterdam canal walls and bridges is said to have a positive effect on the potential for waterway transport.

Overall, the lack of sufficient loading and unloading locations, the limited availability of space along the canals, the lack of clear transport policy, the cost-effectivity compared to road transport and the perception that the Amsterdam waterways are over exploited by passenger transport are recognised as the main barriers.

Interviewee 13

Interviewee 13, a mobility consultant at Ecorys, who explored the potential for urban waterway transport in the city of Ghent, elaborated on the research project. The research was based on the request of a small waterway transporter who wanted to explore the potential to use the vessels that were normally used to transport passengers, to transport urban freight. We concluded that very little was known on the potential for urban waterway transport in the context of freight distribution.

In the first place, the research concluded that finding a specific market for the concept was the most complicated. What freight could be transported and who would be able to benefit from waterway transport. Obtaining a critical mass was considered to be very difficult. The second critical issue is based on transshipment. As waterway transport constitutes inter-modal transport, loading and unloading is required and a final distance need to be performed to the end receiver. Normally, waterway transport is viable for distances larger than 300, maybe even 500 kilometres. Reason is that every transshipment activity involves time losses, costs for infrastructure and employee costs.

Furthermore, a well chosen loading unit is important. Logistic processes are optimised and based on dominant load units such as pallets and roll containers. Changing the load units used would quickly raise complications and objections of logistic actors. Only when end receivers are directly located along the canals, such as in Utrecht, no final road transport is needed. In other cases, the freight needs to be transported to the end receiver. The

means that are used to perform this operation need to be well chosen as well.

Much of attention is given to small and electric vehicles. To replace large and heavy trucks for multiple smaller vehicles is a nightmare for the logistic sector. Much more vehicle movements will be required and many more truck drivers need to be paid for. Employee costs normally constitute a large share of the total transport costs. The additional costs for extra drivers are enormous. When aiming to reduce congestion, dividing the load of a full truck over many small vehicles does not propose solutions.

When aiming for changes in the logistic chain, a critical barrier comes from the conservativity of the logistic sector. This can typically be observed when analysing the potential for bundling of freight. Eventually, suppliers do not want competitors to take over the shipment of freight, even while it would reduce total transport costs. Within urban areas with high levels of congestion, transport costs per load unit are relatively high compared to transport over longer distances between urban areas. In several cases, the supplier is not well informed on the potential cost advantages of bundling at the outskirts of the city. These costs will only further increase when more restrictions on road transport will be implemented.

Smaller suppliers do often want to provide individual services. It is not clear if this is important to the end receiver, to the customer, but within the logistic sector, individual services are considered important. Decision-makers often focus on large suppliers such as DHL, but these large suppliers are often able to perform logistics more efficiently than small suppliers, due to a significant demand. Additionally, small suppliers are less aware of their impact on society.

Authorities play an essential role in managing city logistics. Governments cope with the negative effects of urban freight transport in urban areas. Safety issues, pollution, infrastructure damages, congestion etc. The urban freight system is considered to be a free market. In fact, any organisation can decide to perform freight transport operations. In theory, authorities could limit the amount of freight transporters by implementing caps.

Ideally, a truck with a very high load factor would be used to supply urban areas. Small and inefficient deliveries should then be prohibited. If logistics needed to be performed in the most efficient way, there would probably not be a free market. In some areas, limiting the free market could be a way to organise more efficient transport. However, the question is whether this is juridically feasible. It would probably not be necessary, or desired, to take over the whole market. However, critical areas could be tendered based on sustainability criteria. In cities that allow for large and heavy trucks, these can be used. In other cases, vessels could be used. It is difficult for waterway transport to become economically viable, so financial support is likely to be needed.

The municipality should not perform the transport operation by itself, but it could bring together different logistic actors. Unless the municipality implements strict rules, competitors will not quickly try to collaborate. Facilitating the contact between different stakeholders, exploring the costs for waterway transport and calculating the effects of vehicle weight restrictions on the performances and costs for logistics. When the effects become known by logistic actors, waterway transport might become more attractive.

Social acceptability of transport innovations is complicated by the lack of willingness of suppliers and transporters to cooperate. A second problem is generated by the competition between the many different suppliers. By providing luxury services, such as same day deliveries, it becomes increasingly difficult to organise transport efficiently.

Overall, the determinants for the success of waterway transport in urban areas are largely based on political support. In order to stimulate waterway transport, the alternative, road transport, must be made less attractive. Besides, the technical characteristics of the vessels used are critical. Technology must be developed to efficiently transship freight and juridically, it must be allowed to load and unload within the urban area. Other, smaller determinants, come from the ability to safely store freight at the vessel. A truck can easily be closed. The vessels also need to protect freight against potential theft. An advantage of Amsterdam is that many restaurants and cafes are closely located to the waterways. To stimulate waterway transport, other beneficial characteristics of waterway transport should be emphasised. The ability to transport outside time-windows and the ability to transport large quantities in once could be pointed out.

Interviewee 14

Interviewee 14, a logistics consultant at TNO, further elaborates on the 'Amsterdam Vaart!' projects. TNO is involved in the project by monitoring the effects waterway transport on the amount of vehicle movements and harmful emissions. TNO has been monitoring eight construction projects that were (partly) supplied by waterway transport.

In most cases, waterway transport reduces the amount of road vehicle movements significantly. Nevertheless, in some cases, the waterway infrastructure is insufficient to efficiently distribute construction materials. Generally, construction contractors positively experience waterway transport. To stimulate waterway transport it is important that contractors become aware of the possibilities. For construction projects tendered by the municipality, waterway transport can be demanded in the tendering procedure. Once contractors experience the advantages, such as the additional storage space, waterway transport becomes more attractive.

For the supply of food and beverages, the additional space will probably be less influential. Here, the amount of space available for the efficient transshipment of freight along the canal walls is critical. This may be an

important barrier for its feasibility. Furthermore, the difficulty to obtain all required licenses to perform waterway transport imposes barriers. At the moment, waterway transporters are required to obtain permission from different municipal departments. Especially, the permission to temporarily use space along the canal walls for transshipment of freight and vessel size restrictions complicate the potential to exploit the waterways.

It is expected that the stricter enforcement of vehicle weight restrictions will have significant impact on the potential for waterway transport. To organise freight transport more efficiently, logistic actors should cooperate. Although it could generate more efficient transport operations, suppliers are often not willing to collaborate and share resources. Direct contact between supplier and receiver is considered important.

Cooperation between construction contractors are developing. To stimulate cooperation within the supply of food and beverages, clear transport policy is required. It should be clear what transshipment locations could be used when exploring the potential for waterway transport, especially when end receivers are not directly located on the waterways. In these cases, final transport needs to be performed on road. Transshipment quickly increases the costs for waterway transport. A universal load unit would ease this transshipment. Furthermore, the capacity of the Amsterdam waterways needs to be taken into account. The width of the canals, the height of bridges and the water depth determine the volume and weight that can be transported with the vessels used.

Interviewee 15

Interviewee 15, a senior policy advisor at the municipality of Amsterdam elaborated on the potential for waterway transport and the impact of transport policy. The municipality stimulates urban waterway transport and focuses on the potential for waterway transport before 10:00 and after 22:00.

The main challenges come from the lack of sufficient loading and unloading facilities. Currently, waterway transport is more expensive than road transport, but in many cases road transport operations will need to change due to new transport policies. These policies will be implemented to safeguard the vulnerable canal walls and bridges in Amsterdam. For example, when it will not be possible to use heavy freight vehicles, the load that is normally transported with these heavy freight vehicles needs to be divided over several smaller vehicles. Not all types of freight are suitable to be transported by small vehicles. Moreover, these vehicles generate additional vehicle movements which are expected to have negative effects on congestion levels. Therefore, waterway transport might propose solutions.

Juridically, it is difficult to organise efficient waterway transport. For the transshipment of freight, sufficient locations are required, but the available spaces often serve other purposes such as house boats and passenger transport terminals. Furthermore, waterway transporters that aim to transport

urban freight need to possess the right licenses. Currently, a very limited amount of freight vessels are allowed to transport urban freight. Technically, performing the final mile to end receivers is difficult. Space is needed for transshipment and vehicles are needed to transport. Economically, the costs for waterway transport are usually higher compared to road transport. This may change due to the stricter enforcement of weight restrictions and increasing road congestion levels. The coming months, research will be done to further explore potential loading and unloading locations and time windows.

Interviewee 16

Interviewee 16, a strategic policy advisor, at the municipality of Amsterdam, elaborated on 'Programma Varen'. Programma Varen is part if the municipality and works on the elaboration of policy on the Amsterdam waterways. The municipality recognises that little policy is written on the use of the canals for freight transport. In order to develop policy, cooperation with private actors is sought for. In that way, pilot concepts can be developed and policy can be developed in line with the pilots.

A.3 REPORT PAKHUIS DE ZWIJGER MEET UP

On the 9th of December 2019, Pakhuis de Zwijger organised an event to discuss the future developments on transport in Amsterdam. Pakhuis de Zwijger is a cultural and independent platform, organising meet-ups to discuss societal issues and challenges. One of the main topics discussed this evening was the potential to use the Amsterdam waterways for freight transport. As part of this topic, the interim results of this research project were presented.

At the end of the presentation, an interactive discussion followed with the attendees who formed the public during the event. From this discussion it followed that the people present in the room experienced negative effects from the increasing amount road users in Amsterdam. Especially, the increasing crowds of people in the inner city were experienced as nuisance.

On the question whether it would be a good idea to use the Amsterdam waterways as a means for transport, a large majority agreed on that it would be a desirable initiative. Some attendees wondered whether it would really be feasible to use the waterways as a means for freight transport and mainly considered the interaction with other traffic such as passenger boats and pleasure crafts as problematic.

Finally, the attendees were asked what role the municipality of Amsterdam should play within the potential use of urban waterway transport. Among others, subsidising pilot concepts, facilitating transshipment hubs, road transport pricing, and collaboration with logistic actors were mentioned.

The questions were answered by using the mobile application Mentimeter, which makes it possible to quickly analyse the responses of the public. Although nothing can be said on the significance of the results and the representativity of the attendees at the event. The discussion and the responses on the questions indicate that negative effects of freight transport are experienced, waterway transport is not seen as completely undesirable, the municipality is supposed to be involved, and that uncertainties exist on the potential to successfully interact with passenger traffic and pleasrue crafts. An overview of the Mentimeter responses is provided in Figure A.1, Figure A.2 and Figure A.3.

Figure A.1: Experienced negative effects

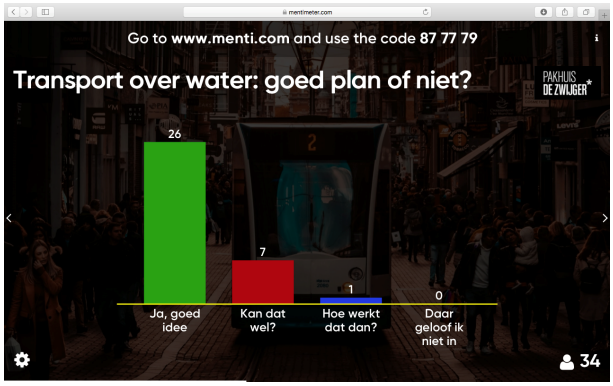

Figure A.2: Public attitude towards urban waterway transport

Figure A.3: Municipal role regarding urban waterway transport

A.4 REPORT EXPERIMENTAL PILOT

In ambition to realise a pilot experiment to evaluate the feasibility to supply the horeca in Amsterdam, several conversations with Bart Verweijen and Roel van der Burg were held. Bart Verweijen is the manager of ZOEV City, a waterway transporter in Amsterdam. Roel van der Burg is a client manager at horeca wholesaler Sligro.

ZOEV City is a waterway transport concept which provides different logistic services. At the moment, mainly construction materials and waste is transported. An overview on how ZOEV City operates is presented in Figure A.4. To increase the amount of transport operations, other markets are sought for. The supply of food of beverages on the Amsterdam waterways is possible, but largely depends on the political support of the municipality of Amsterdam. 100 years ago, almost all freight transport took place on the Amsterdam canals, but in the past decades urban freight transport has been optimised and innovated for road transport. It is very difficult to compete on cost-effectiveness.

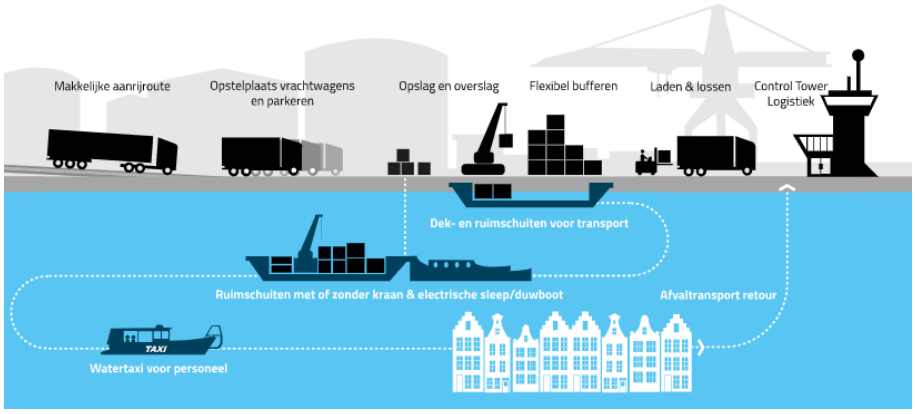

Figure A.4: The ZOEV City concept

Competing with road transport for the supply of food and beverages is said to be complex because of the specific demands of clients (horeca). Clients prefer to receive deliveries "just-in-time' and transporting fresh and frozen products, the vessels used need to be able to refrigerate these products. Before making additional investments, there should be significant demand for waterway transport services to supply food and beverages.

To explore whether and when horeca wholesalers would be willing to use the services of ZOEV City, conversations with Roel van der Burg, client manager for Sligro, have been held. From these conversations it followed that there are two main complications. The first challenge is to find appropriate transshipment locations in the urban area. Secondly, the different types of products (refrigerated, frozen and dry) impose difficulties to be transported by vessels. It is important to transport a sufficient volume in order to be cost-competitive to road transport. The benefit of using vessels lies in the economies of scale that could be generated, but this would only be possible when transport flows of different shippers are combined. Combining differ-

ent flows is said to be very complex as shippers need to be convinced to cooperate.

According to Bart, there are no critical barriers to perform waterway transport. The main problem ZOEV City is confronted with is the lack of locations along the canal walls that allow for transshipment. In ambition to get permission to use a set of suitable locations, ZOEV City requested to use 15 locations along the Amsterdam waterways as transshipment hubs. Depending on agreement of the municipality, these hubs will be used to perform pilot studies with urban distribution.

After several conversations with representatives of large shippers of food and beverages. A pilot experiment was planned to be performed to experience how urban waterway transport could take place.

Figure A.5: Vessel used during pilot experiment

Figure A.6: Transshipment of container

A pilot experiment was performed to analyse how Urban Waterway Transport could take place in Amsterdam. The purpose of the experiment was to observe the potential to distribute horeca freight, using the waterways, to supply a hotel in the Amsterdam city centre. Together with horeca wholesaler Bidfood, waterway transport operator Zoev City and Hotel Pullitzer, the pilot was organised. Five roll containers were successfully shipped from the Food Center Amsterdam to Hotel Pulitzer. A fully electric vessel, with an on board crane, was used to transship the containers from canal wall into the vessel. A trip of 45 minutes was made to successfully arrive at Hotel Pulitzer at Prinsengracht 323.

The pilot provided insights in the technical operation of urban waterway transport. First of all, it was observed that it is possible to transship horeca roll containers from canal wall to the vessel. Secondly, there was no harmful interaction with passenger transport or pleasure crafts. In fact, hardly any other vessels were seen on the canals during the experiment. Finally, the roll containers were successfully transshipped form vessel to canal wall by using the on board crane. The final part of transport was done by rolling the containers to the Hotel.

A.5 FOCUS GROUP MEETING PROTOCOL AND TRANSCRIPT

Opening

Op dit moment vindt transport over water op kleine schaal plaats om bouwmaterialen en afval te vervoeren. Ik onderzoek of dit op grotere schaal kan en of je naast bouwmaterialen en afval ook horecaproducten over water kunt vervoeren.

Tijdens het eerste deel van mijn onderzoek heb ik uitgezocht waarom er tegenwoordig maar heel weinig over water wordt vervoerd. Er zijn verschillende barrières gevonden.

De workshop dient om samen na te denken over het wegnemen van de huidige barrières en het maken van een plan voor de transitie naar een Amsterdams vervoersysteem mét stadslogistiek over water.

Dat zullen we gaan doen in 3 rondes:

1. Het komen tot een gedeelde visie: wat willen we over 25 jaar?
2. Wat is er de komende tijd nodig, van welke partijen, om dit te realiseren?
3. Welke experimenten kunnen we nu al doen om vervoer over water verder te ontwikkelen?

Deelnemers:

Betty Nijmeijer	Vereniging Vrienden van de Amsterdamse Binnenstad, Werkgroep Water
Joost Smit	Vereniging Vrienden van de Amsterdamse Binnenstad, Werkgroep Water
Annemieke Bieringa	Straatmanager Ondernemersvereniging Nieuwmarkt en BIZ Zeedijk
Kim Borgmann	Haven van Amsterdam, Projectleider Amsterdam Vaart
Daan Bloeme	Eigenaar Amsterdam Boat Events
Bart Verweijen	ZOEV City
Willem Post	Mokum Mariteam
Karin Peskens	Programma Varen Gemeente Amsterdam
Maurits van Pampus	AMS Institute, Project Roboats
Sarika Jagan	Bidfood, Projectleider en Procesmanager

Planning

Nummer	Activiteit	Doel
1	Introductie en kennismaking (16:00 – 16:15)	Uitleggen doel van onderzoek en workshop.
2	Het opstellen van een gedeelde visie (16:15 – 16:25)	Waar werken we samen naartoe?
3	Wat kun jij doen en wat moeten anderen doen (16:25 – 16:55)	Wie en wat is daarvoor nodig?
4	Pauze (16:55 – 17:00)	
5	Bedenken van experimenten (17:00 – 17:25)	Hoe vergaren we de nog ontbrekende kennis?
6	Slot (17:25 – 17:30)	

Kennismaking (1 min per persoon)

Een korte voorstelronde zodat iedereen weet met wie we aan tafel zitten en waarom. Zou je jezelf kort willen introduceren?

1. Wie ben je?
2. Op welke manier ben je betrokken bij stadslogistiek over water?
3. Wat zou je graag uit deze middag willen halen?

Gedeelde visie (15 min)

De kracht van de workshop zit in de discussie over punten waar mogelijk onenigheid over bestaat. We zitten hier samen omdat de huidige situatie niet gewenst en niet duurzaam is. Idealiter hebben we een transportsysteem dat voldoet aan de wensen van alle betrokken partijen.

4. Waar moet het vervoersysteem in Amsterdam volgens jou aan voldoen en hoe draagt méér vervoer over water hier aan bij? (3 min)

Ruimte voor discussie:

Zijn we het eens over de ideale situatie, zien we hier al tegenstrijdigheden? Waar zijn we het in ieder geval over eens? (10 min)

Geen enkele partij kan alles alleen, je hebt anderen nodig (25 min)

Op de vraag waarom er niet meer vervoer over water plaatsvindt wordt dikwijls geantwoord dat dit komt doordat andere partijen niet meewerken of omdat er nog belangrijke kennis ontbreekt. Voordat we nadenken over hoe we die kennis kunnen verkrijgen, wil ik je vragen na te denken over wat jij kunt doen om vervoer over water te stimuleren en wat je denkt dat anderen zouden moeten doen.

5. Wat kun je namens jouw organisatie doen om bij te dragen aan de gedeelde visie? (3 min)
6. Wat zouden andere commerciële partijen (leveranciers, vervoerders, ontvangers) moeten doen? (3 min)
7. Wat zouden beleidsmakers van de Gemeente Amsterdam moeten doen om bij te dragen aan de gedeelde visie? (3 min)

	Betty en Joost	Annemieke	Kim	Daan	Bart en Willem	Karin	Maurits	Sarika
Wat kun jij doen?								
Wat nodig van commercele partijen?								
Wat nodig van de Gemeente?								

Figuur 1 - Met Post Its geven we antwoord op de vragen

Ruimte voor discussie:

Komen verantwoordelijkheden overeen met benodigde activiteiten?

Vaak wordt er aan de ene kant gewacht op gepast beleid, terwijl er aan de andere kant op initiatieven van commerciële partijen wordt gewacht. Wat is er nodig om zowel beleid als markt initiatieven te ontwikkelen? (15 min)

Bedenken van experimenten en pilots (25 min)

Experimenten en pilots dragen bij aan de ontwikkeling van initiatieven, technologie en beleid. Ze geven nieuwe inzichten die nodig zijn wanneer er nog belangrijke kennis ontbreekt.

8. Welke kennis ontbreekt er volgens jou nog op dit moment? Welke inzichten zijn er nodig om stadslogistiek over water verder te ontwikkelen? (5 min)
9. Welke experimenten zouden bij kunnen dragen aan het vergaren van die kennis? (5 min)

	Betty en Joost	Annemieke	Kim	Daan	Bart en Willem	Karin	Maurits	Sarika
Ontbrekende kennis								
Experimenten die bijdragen aan het vergaren van die kennis								

Figuur 2 - Met Post-Its aangeven welke kennis ontbreekt en welke experimenten gedaan kunnen worden

Ruimte voor discussie:

Zijn pilots nuttig? Waar moeten ze aan voldoen?

Er zijn de afgelopen tijd al verschillende experimenten gedaan. Het doen van pilots is een begin, maar onvoldoende om een integratie van vervoer over water te realiseren. Hoe zorgen pilots voor een overgang van vervoer over de weg, naar vervoer over water? Waar moet een pilot aan voldoen? (15 min)

Slotvraag:

Om de workshop af te sluiten wil ik je vragen een antwoord te geven op mijn onderzoeksvraag.

10. Onder welke voorwaarden kan stadslogistiek over water succesvol worden geïmplementeerd in het vervoersysteem van Amsterdam, als alternatief voor vervoer over de weg?

Dank voor het meedoen vandaag!

Maarten Roosmale Nepveu

Transscript Workshop Stadslogistiek over Water

Plaatsgevonden op 16 januari 2020

Deelnemers

Daan Bloeme is eigenaar van Amsterdam Boat Events en vaart als aanbieder van rondvaarten dagelijks over de grachten.

Willem Post is eigenaar en manager van Mokum Mariteam. Al sinds 2010 vaart Mokum Mariteam met het schip de City Supplier door de Amsterdamse grachten om met name bouwmaterialen en afvalcassettes te vervoeren.

Bart Verweijen van PK Waterbouw en ZOEV City. Twee jaar geleden met ZOEV begonnen en de handen in een geslagen met Mokum Mariteam omdat we binnen nu en twee jaar verwachten een grote stap te maken naar meer vervoer over water.

Karin Peskens namens Programma Varen van de Gemeente Amsterdam. Werkt niet vast bij de Gemeente maar is tijdelijk ingehuurd. De capaciteit bij de Gemeente is beperkt en daarom heb ik vanuit Royal HaskoningDHV de opdracht gekregen te helpen bij het uitwerken met de Nota Varen 2.

Maurits van Pampus namens het Amsterdam Institute For Advanced Metropolitan Solutions (AMS). Werkend aan het project Roboats; automatisch varende platformen die een rol kunnen gaan spelen in het vervoeren van mensen en goederen.

Sarika Jagan, namens horeca leverancier en groothandel Bidfood Amsterdam en Hoofddorp.

Joost Smit namens de Werkgroep Water van de Vereniging Vrienden van de Amsterdamse Binnenstad. De werkgroep water bekijkt actief hoe vervoer over water meer gestimuleerd kan worden en zit ook bij het bestuurlijk overleg met de Gemeente Amsterdam.

Betty Nijmeijer voorzitter Werkgroep Water van de Vereniging Vrienden van de Amsterdamse Binnenstad. De werkgroep water bekijkt actief hoe vervoer over water meer gestimuleerd kan worden en zit ook bij het bestuurlijk overleg met de Gemeente Amsterdam.

Dingeman Coumou namens de Werkgroep Water van de Vereniging Vrienden van de Amsterdamse Binnenstad. De werkgroep water bekijkt actief hoe vervoer over water meer gestimuleerd kan worden en zit ook bij het bestuurlijk overleg met de Gemeente Amsterdam.

Annemieke Bieringa, straatmanager in de oude Amsterdamse binnenstad in opdracht van een aantal ondernemersverenigingen en werk onder andere voor de BIZ van Dam tot Stopera, ondernemersvereniging Nieuwmarkt en de BIZ Zeedijk en Geldersekade.

Maarten Roosmale Nepveu: student TU Delft, onderzoek naar de mogelijkheden voor stadslogistiek over water.

Reacties op kennismaking

Annemieke: 7 jaar geleden met Mokum Mariteam gesproken en nu praten we er nog over. Wij zouden graag veel meer doen met het water want de buurten zijn niet blij met alle vrachtauto's. Toen is er geloof ik een pilot gedaan op de Nieuwmarkt, maar dit ging niet helemaal goed. Toen is alles weer stil komen te staan en nu zitten we hier weer.

Willem: even kort daarop, Peter Mattie was je voorganger en met hem heb ik geprobeerd de Pilot Nieuwmarkt van de grond te krijgen. Daarom heb ik veel ervaring met het organiseren van een pilot

en dat is dan ook de reden dat ik hier nog een beetje bij zit. Om die ervaring mee te nemen en uit te kunnen leggen waarom dat destijds niet gelukt is.

Ronde 1: opstellen gedeelde visie over het vervoersysteem van Amsterdam

Maarten: in deze eerste ronde wil ik vragen of jullie willen opschrijven waar het vervoersysteem van Amsterdam aan zou moeten voldoen. Op die manier creëren we een lange termijn visie en weten we waar we samen naartoe werken. Waar moet het systeem aan voldoen en hoe kan meer vervoer over water hieraan bijdragen?

Annemieke: het vervoersysteem moet efficiënt, snel, veilig en betaalbaar zijn. Er moet een incentive zijn om mee te willen doen met vervoer over water. Daarvoor moeten er goede samenwerkingen tussen partijen zijn en geschikte locaties om goederen te laden en lossen. Ik denk vanuit de ondernemers, maar ook als inwoner van Amsterdam. Op dit moment zie ik, bijvoorbeeld met vuilnis, dat het allemaal veel te ingewikkeld is. Het is veel te langzaam en onveilig. Wel betaalbaar. Dat moet anders.

Vervoer over water is denk ik alleen haalbaar vanuit de ondernemers als het ook betaalbaar blijft. Je ziet dat veel ondernemers toch gewoon voor de goedkoopste partij gaan. Bij vuilnis is dat de Gemeente. Om te kiezen voor vervoer over water moet er incentive zijn om mee te doen. Zeggen dat het groen en goed voor de stad is, zal voor een grote groep partijen niet genoeg zijn. Datzelfde zal gelden voor bewoners. Er wordt wel veel over duurzaamheid gesproken, maar ondertussen gooit iedereen zijn vuilnis nog gewoon overal neer. Samenwerking tussen partijen en aangewezen locaties om te laden en lossen zijn nodig.

Daan: het vervoer in Amsterdam moet snel zijn, flexibel en er moeten vooral geen opstoppingen zijn. Ik vaar dagelijks over de grachten en zie vaak dat vrachtwagens op de weg aan het uitladen zijn en het verkeer daarachter ophouden. Ik denk dat met vervoer over water je die opstoppingen kunt verminderen. Verder sluit ik me aan bij Annemieke.

Maurits: ik heb daar slechts een klein ding aan toe te voegen. Ik denk dat flexibiliteit er voor vervoer op het water vooral in moet zitten dat je flexibel op verschillende locaties moet kunnen laden en lossen en denk dat hier de grootste uitdaging in zit.

Betty: ik sluit me aan bij mijn voorgangers en wil toevoegen dat ik het belangrijk vind dat het vervoer uitstootvrij en geluidsarm wordt. Op dit moment zijn dat twee belangrijke vormen van overlast gecreëerd door het vervoer in Amsterdam. Dat zijn twee voorwaarden voor een goed systeem, maar voor vervoer over water is het vooral belangrijk dat er goede gealloceerde aanlegsteigers en opslagvoorzieningen beschikbaar zijn.

Mogelijk kun je al nadenken over rollende banden van kades naar de boot. Verder heb ik ook betaalbaar, efficiënt en voldoende volume dat over water kan worden vervoerd. De manier van lossen is volgens mij een grote uitdaging, dat moet ontwikkeld worden. Dat mag ook niet te veel lawaai maken.

Karin: eens met de voorgaande punten. Ik wil benadrukken dat ik denk dat het een multimodaal vervoersysteem moet zijn. We moeten af van het kijken naar enkele oplossingen voor over de weg, maar we moeten bedenken op welke plek je welke modaliteit het best zou kunnen gebruiken die de vraag naar vervoer zou kunnen faciliteren.

Vervoer over water moet daar als modaliteit bij zitten. Dat is nu nog niet zo. Het is al een paar keer genoemd. Efficiëntie is belangrijk. Dat zie ik met name in het bundelen van vervoerstromen. Ook dat gebeurd nog onvoldoende in de logistieke sector.

Dingeman: eens met de voorgaande punten. Ik heb daarnaast opgeschreven dat vervoer kleinschalig moet zijn. Daarmee bedoel ik dat we af moeten van die grote vrachtwagens in de stad. Die belasten de infrastructuur veel te veel. Dat is gebleken met de verzakkingen van de kades. Het vervoer zou ook elektrisch moeten zijn en vooral over het water. Dat is het minst belastend voor de kades en de bebouwing. Want niet alleen de kades, maar ook de funderingen van panden leiden onder zwaar transport en de trillingen die vrachtwagens veroorzaken.

Ik geloof naast vervoer over water ook in het bundelen in distributiecentra aan de rand van de stad. Zodat stromen gebundeld de stad in kunnen. Dan kun je dat kleinschalig doen met kleinere voertuigen. Verder denk ik ook aan personenvervoer over het water.

Sarika: ik kijk er wat breder naar. Voor mij, en Bidfood, is het belangrijk dat wanneer wij voeding leveren dat we goed letten op de vereiste temperatuur waarop deze geleverd wordt. Over het water kan, maar gekoeld, vers en ongekoeld in één keer leveren is nu niet mogelijk met de boten die beschikbaar zijn. Dat moet dus worden ontwikkeld. Ongekoeld kan prima over het water. We hebben het dan over de stroom DKW goederen. Droge KruideniersWaren. Dat zijn ook meteen de zwaarste goederen en met het grootste volume. Het zijn die goederen die nu met onze vrachtwagens de kades en bruggen het meest belasten.

Dagverse en diepvries goederen worden dagelijks in kleine hoeveelheden aangeleverd en die kunnen dus makkelijk met een kleiner, bijvoorbeeld elektrisch, vervoersmiddel. Verder kijk ik ook naar andere opties zoals het metro- en tramnetwerk waar ‘s nachts niets mee wordt gedaan. Ik denk dat het vervoersysteem in de toekomst een combinatie moet zijn van de infrastructuur die we hebben.

Joost: ik sluit me ook aan bij wat er gezegd is en vind betrouwbaarheid en veiligheid van het systeem het belangrijkst. Voor betrouwbaarheid van vervoer over water denk ik dat de regelmaat erin moet zitten. Dat is voor afnemers belangrijk. Als er straks meer concurrentie op het water komt tussen verschillende vervoerders, moet je ook daar weer afstemmen wie, waar, wanneer mag zijn zodat je elkaar niet ook op het water in de weg gaat zitten. Laad en lostijden kunnen daar een belangrijke rol spelen, of een logistiek centrum waar goederen moeten worden aangemeld. De combinatie met andere vervoerwijzen lijkt me inderdaad erg belangrijk en daarnaast moet je het vervoersysteem goed afstemmen met de plannen voor autoluw en de kades en bruggen.

Bart: er mogen geen negatieve effecten zijn op gezondheid van mensen en milieu. Hoge betrouwbaarheid van leveringen. Dan maakt het nog niet eens uit of dit heel snel is, als goederen er maar zijn op het moment dat ze er moeten zijn. Daarnaast is white label belangrijk. Ofwel, goederen moeten gebundeld worden en verschillende leveranciers moeten samenwerken om het vervoer niet meer met al die verschillende merknamen te vervoeren.

Als we de logistiek opnieuw mochten uitvinden dan zouden verschillende leveranciers goederen allemaal samen in één goed gevulde vrachtwagen stoppen. Daarnaast zouden de vervoersmiddelen breed inzetbaar moeten zijn. Wanneer ik vervoer over water wil ik bijvoorbeeld zowel afval, bouwmaterialen als horeca producten vervoeren.

Daarnaast is het belangrijk dat bewoners geen tot minimale overlast ondervinden van het vervoer. Dat heeft dan, naast die gezondheidseffecten, te maken met geluidsoverlast. Het systeem moet een optimale combinatie zijn van vervoer over water met vervoer over de weg. Je gaat het niet alleen

redden met vervoer over de weg óf vervoer over water. Er moet daarom een goede interface komen tussen water er weg.

Verder is ‘een gelijk speelveld’ nog niet genoemd. Er is nu geen eerlijke concurrentie tussen vervoerders die over de weg vervoeren en vervoerders die over water vervoeren. Vervoerders over water moeten bij het wegvaren uit de haven, havengeld betalen. Daarna moet je wanneer je Amsterdam in vaart opnieuw havengeld betalen. Daarnaast zijn de boetes op het water extreem en buitensporig hoog voor het te hard varen. Ook moeten vervoerders over water aan allerlei keuringen voldoen. Op één bootje hebben we vijf brandblussers aan boord. Die keuringen komen allemaal vanuit de regelementen voor de binnenvaart. De binnenvaart kan 1000 ton vervoeren. Die moeten voldoen aan hele zware regels en dat is terecht. Als die te hard varen, probeer het schip dan maar af te remmen met die enorme lading. Terwijl we voor het vervoer over de grachten met maximaal 90 ton varen. We liggen dan relatief snel stil en mochten we ergens tegen aan varen dan geeft dit een stuk minder schade dan zo’n binnenvaartschip.

Verder moeten er voor vervoer over water laad en loslocaties komen. Bij Artis staat er nog eentje. Vroeger hadden we langs de kade hele mooie kranen. Die staan nu verder nergens meer. Ik zou overigens die kranen niet op de kade terugzetten, maar werken met kranen op de boot.

Willem: veel is er al genoemd, maar ik wil inhaken op het punt dat vervoer in Amsterdam betaalbaar, ofwel goedkoop moet zijn. Waar we met vervoer over water tegen concurreren is een efficiëntieslag van zo’n 70 jaar aanvechten. Tegen het vervoer zoals dat nu is ontstaan. Dat betekend daarom dat het concurreren met vervoer over de weg een heel lastig verhaal is.

De enige manier waarop je vervoer over water op basis van de kostprijs kan laten concurreren met vervoer over de weg is het verkrijgen van een behoorlijke schaalgrootte. Dat is in een opstartfase altijd een groot probleem. Als vervoerder krijgen we meteen de vraag ‘wat kost het?’ bij het organiseren van een pilot moet ik uitleggen waarom het voor één partij een stuk duurder is. Dat komt omdat ik een groter volume zou moeten vervoeren om schaalvoordelen te bieden.

Dat is hét antwoord op de vraag waarom er nu niet méér over water wordt vervoerd. Beide partijen, aanbod en vraag van vervoer over water moeten risico’s en kosten dragen. Vragende partijen vinden alles prima, zolang het maar geen geld kost.

Het vervoer over water zou autonoom moeten kunnen laden en lossen. Je moet iets hebben waarmee je op het land en op het water, goederen kunt overslaan. Dat moet een voorziening zijn. Het neerzetten van een zware kraan op de kade heeft een zelfde effect als een zware vrachtwagen, dus dat moet je niet willen. Er moet voldoende ruimte zijn aan de grachten om te kunnen lossen. Op sommige trajecten in de binnenstad liggen slechts wat bootjes die worden gebruikt voor de pleziervaart, maar er zijn ook trajecten die helemaal vol liggen met woonboten. Als je mij vraagt hoe ik het over 25 jaar zie, dan stel ik dat we dat iets minder zullen hebben zodat er ruimte vrijkomt voor het laden en lossen.

Verder moeten we niet vergeten dat je er met het bereiken van de kade nog niet bent. Je moet het vaak nog minstens 50 / 60 m verder vervoeren tot de afnemer. Ook daar moeten faciliteiten voor komen en daar is ruimte voor nodig. Het lukt niet om met pallets door fietsnietjes door te rijden. Dat betekent dat er vanuit de Gemeente voldoende moet worden meegewerkt aan het tot stand brengen van die overslagplaatsen. Op zo’n manier dat dit overslaan op een efficiënte manier gedaan kan worden en je beter kunt concurreren met transport over de weg.

Ik wil nog één ander punt maken en dat gaat over het aangekondigde distributiecentrum op de haven. Het ALC. Informatievoorziening en controle is erg belangrijk. De aangekondigde plannen zijn niet reëel. Je kunt vanaf de haven niet in 7 minuten in de binnenstad zijn. Daar worden wij straks op aangekeken als we klanten vertellen dat we er veel langer over doen.

Maarten: we zijn het aardig eens over de punten waar het vervoersysteem in Amsterdam aan moet voldoen en hoe transport over water hier een rol in kan spelen. Wat zijn nu de belangrijkste hindernissen om tot een integratie van vervoer over water te komen.

Annemieke: politieke wil

Wilem: mindset. De Gemeente Amsterdam heeft ambities, maar niet de ambitie om plannen ambitieus uit te voeren.

Betty: nota varen geeft aan dat de gemeente maar een heel beperkt budget wordt stopt in nader onderzoek naar vervoer over water. De Gemeente Amsterdam is niet erg voortvarend als het gaat om het stimuleren van vervoer over water.

Dingeman: het heeft hoofdzakelijk te maken met de politiek. Dat is een erg ingewikkeld onderwerp en dat zien we nu ook weer. Dit project vergt aandacht voor op de lange termijn, maar gemeentelijke politici zijn niet ingesteld op deze lange termijn. Politici zijn ingesteld op vier jaar en snel scoren. Daar zit het grote probleem. Het ambtenarenapparaat loopt daar achteraan. Met de kades en bruggen is nu natuurlijk wel het moment vervoer over water door te zetten.

Betty: het is ook een gebrek aan ideeën en daar zouden wij natuurlijk een bijdrage aan kunnen leveren.

Willem: ik kan ter illustratie wel wat meer vertellen over die pilot die we op de Nieuwmarkt wilden starten waarbij de doelstelling van de Gemeente was om de Nieuwmarkt gebundeld te beleveren over zowel het water als de weg. Waarbij je vers en diepvries over de weg zou vervoeren en ongekoelde goederenover het water.

Mijn doelstelling als projectleider was om 15 ondernemers te vinden die bereid waren om mee te doen met de pilot en met die 15 te kijken naar de verschillende leveranciers die op dat moment bij hen de goederen binnen brachten. Samen wilden we dan de leveranciers overtuigen om de goederen elders af te leveren om vervolgens gebundeld en geclusterd over het water naar de Nieuwmarkt te vervoeren.

Er was toen geen enkele leverancier die daarin mee wilde doen en er was geen enkele ondernemer die in staat was voldoende druk uit te oefenen op die leveranciers om dat toch te forceren. Dat is toen de reden geweest waarom die pilot niet van de grond is gekomen.

Veel leveranciers hanteren een kostprijs. Ze leveren Franco aan huis af en in die kostprijs voor de goederen zit dan een stukje logistiek. Veelal betekent dit dat het busje waarmee ze rijden geen onderdeel is van de kostprijs, maar van de overhead kosten (vaste lasten). De leveranciers hebben geen weet van de daadwerkelijke logistieke kosten. Het lukte daarom niet om ze ervan te overtuigen op een andere plek af te leveren. Het zou vanuit regelgeving moeten komen dat ze dit wel doen.

Maarten: zelfs als die wil vanuit de Gemeente er is, moeten leveranciers er toe gezet worden mee te werken. Sarika, zou je als leverancier kunnen reageren op Willem en kunnen uitleggen hoe we er voor zouden kunnen zorgen dat Willem en Bart horecagoederen zouden kunnen vervoeren?

Sarika: wat heel lastig is, is dat je een horeca onderneming niet kunt vertellen welke leverancier er in welke straat mag leveren. Dat wil geen enkele onderneming. Iedereen wil z'n eigen exclusieve producten hebben. Dat je moet gaan bundelen is een feit, dat moet gebeuren om minder voertuigbewegingen te krijgen. Dat een leverancier niet meewerkt, heeft te maken met dat het vervoer over water onvoldoende gestimuleerd wordt. Als leverancier geloven wij dat het straks niet mogelijk is om al onze goederen nog over de weg te kunnen gaan vervoeren in de toekomst. Dat moet dus op een andere manier. Wij geloven aan de ene kant in lichte en elektrische voertuigen en aan de andere kant in vervoer over het water.

Wij zijn wel om, maar die klanten van ons die moeten ook om. We hebben nu een keer hotel Pullitzer geleverd en meteen kwam de gedachte om naast de horeca goederen ook meteen het linnengoed te gaan vervoeren over water. Het kost enorm veel tijd en energie om die klanten ervan te overtuigen op een andere manier geleverd te krijgen. We hebben voldoende volume, massa, nodig om die boot te kunnen vullen. We spreken veel met klanten, maar onze klanten zitten ook niet allemaal in hetzelfde gebied. Als we andere klanten willen leveren dan hebben we weer ontheffingen nodig voor laad en los locaties nabij andere klanten. Je moet echt per locatie kijken hoe we voldoende massa kunnen leveren over het water.

Dingeman: In Utrecht vaart toch al een Bierboot, daar kan het wel.

Willem: die kennen we. Die is deels betaald door de Gemeente Utrecht en de achterliggende gedachte daarvan was dat de kades daar niet in staat waren om het goederenvervoer te dragen. Het is daar een verordening vanuit de Gemeente geweest. Omdat de bierboot daar deels betaald wordt door de Gemeente, net zoals een afvalboot die daar vaart, is het mogelijk. Ze hebben er inmiddels drie boten varen.

Dingeman: Dat zou een voorbeeld moeten zijn voor Amsterdam.

Maarten: nog even terug op wanneer leveranciers bereid zijn om goederen te laten vervoeren over water? Is daar eerst de politieke wil en daarmee samenhangende regelgeving nodig of kan het toch vanuit de leveranciers, ondernemers en vervoerders zelf komen?

Sarika: wij kunnen zeker samenwerken met andere partijen maar we hebben de Gemeente heel hard nodig voor het opstellen van wet en regelgeving. Die moet de Gemeente opstellen, maar diezelfde Gemeente weet niet hoe en welke regelgeving. Dat moeten wij nu proef matig met pilots ontdekken zodat we kunnen laten zien 'wat handig is'.

Annemieke: Zo zijn wij ook bezig met de Zeedijk. Met een pilot waarbij we de Gemeente vragen om laad en lostijden in te voeren. Als er steeds meer buurten worden afgesloten in het kader van de autoluwe binnenstad dan moet je wel over het water. Niet iedereen kan voor twaalven met vrachtwagens leveren. Dan raakt de hele stad verstopt. Ik denk dat die tijdvensters een stimulans geven om meer te gaan kijken naar de mogelijkheden voor vervoer over water.

Willem: daar moet ik toch even op reageren. Het instellen van die tijdvensters dwingt leveranciers om met steeds meer en steeds kleinere voertuigen de wegen steeds drukker te maken. Wat je dan nu in één route met een grote vrachtwagen doet in pakweg drie/vier uur kan dan niet meer, maar er moet wel geleverd worden en dan dus met meer tegelijkertijd. Puur alleen het instellen van tijdvensters, zal geen bijdrage leveren. Het is onvoldoende om die stap te maken naar vervoer over het water.

Maarten: Karin, zou jij willen reageren op het vormen van Gemeentelijk beleid dat nodig is om het vervoeren over water te ondersteunen?

Karin: Ja, vooropgesteld, er is nog geen beleid en regelgeving dat specifiek gaat over het vervoeren over water. Dat weet de Gemeente ook erg goed en daarom wordt er nu ook capaciteit geboden en ben onder anderen ik ingehuurd om te bepalen waar we vervoer over water wél mogelijk kunnen maken. Dat zal op transitieniveau moeten gaan.

Het is dus echt niet zo dat we morgen kunnen zeggen: dit is ons fantastische plan en we hebben alles opgelost. Wat Sarika zegt klopt. Er is nog geen basis voor beleid dat vervoer over water ondersteunt en dus moet de Gemeente die basis gaan opbouwen. Er moeten voldoende mensen aan werken, er moet voldoende beleid komen, er moet duidelijk beleid komen. Wat wij proberen duidelijk te maken is dat dit stapsgewijs moet gebeuren en moet samengaan met de markt.

Er is al veel onderzoek gedaan en er is ook veel bekend over vervoer over water. Met name als we kijken naar andere steden en toch wordt er vaak gezegd dat er nog veel meer onderzoek gedaan moet worden. Wij als programma varen doen ook heel veel onderzoek en kijken naar hoe ondernemers, vervoerders en leveranciers kunnen bijdragen.

Joost: dan legt de gemeente de bal dus toch weer bij andere partijen.

Karin: Dat doet de gemeente niet. De wil is er zeker, maar het is een hele opgave.

Betty: Die wil moet dan wel worden uitgedrukt na zoveel jaren van discussie. Anders kun je die wil ook niet serieus nemen.

2e ronde: het nadenken over coalities en strategieën

Maarten: dan wil ik hiermee graag de eerste ronde afsluiten omdat we al aan het nadenken zijn over wat de Gemeente zou moeten doen om bij te dragen aan het veranderen van het huidige vervoersysteem. Het gaat er nu om dat er wordt nagedacht over wat je met jouw organisatie kunt doen om bij te dragen aan een ideaal vervoersysteem dat vervoer over water integreert en daarnaast over wat andere partijen volgens jou zouden kunnen of moeten doen. Zowel andere commerciële organisaties als de Gemeente Amsterdam.

Ik zou graag met Bart en Willem willen beginnen omdat die dagelijks bezig zijn met vervoeren over water en tegen de hindernissen aanlopen.

Willem: Ik wil graag bijdragen door de kennis die ik in de afgelopen 10 jaar heb opgedaan, te delen. Dat geldt voor zowel bedrijven als overheidsinstanties die daar baat bij hebben. Zelfs al zouden het concullega's kunnen zijn. Daar doen we niet moeilijk over. Wij stellen ook ons materieel beschikbaar om vervoer over water uit te voeren.

We proberen met name aan de Gemeente duidelijk te maken dat we weten hoe vervoer over water werkt. We hebben de knowhow, we kennen de markt en we kennen de stad.

Bart: Op de eerste plaats dragen wij bij door het faciliteren van pilots. Zowel door de dient te leveren als door het regelen van vergunningen. Dat kan alleen omdat wij ook echt veel weten over het water. We weten waar het wel en niet kan.

Ik lobby enorm. Om ze te helpen, om te laten zien wat de mogelijkheden zijn en ditzelfde doe ik bij bedrijven. Er is beleid geschreven over de 7,5 ton zones. Dat klinkt als muziek in de oren voor ons als vervoerders, maar dat beleid moet dan wel worden ingevoerd. Dan hebben voor zowel de weg, als het water duidelijkheid en die ontbreekt nu. Het beleid voor 7,5 ton is er en daar staan hele goede

dingen in. Er wordt dan vaak gezegd dat het allemaal moeilijk te handhaven is. Wij stellen dat je eerst de regels moet invoeren en daarna moet bepalen hoe je het gaat handhaven. Regels stellen, dan volgt de rest relatief vanzelf.

Willem: Dat moet ik nog even nuanceren. Die 7,5 zone is nog exclusief eventuele accu's van elektrische vrachtwagens. Dan kom je alweer uit op 10 ton.

Bart: die plannen voor 7,5 ton zijn dus erg goed en belangrijk om duidelijkheid te scheppen over water nu wel en niet mogelijk is. Wanneer we de business case doorrekenen voor over het water en voor over de weg is die regeling van enorm belang. Zolang niet duidelijk wordt hoe en wanneer die regeling ingevoerd wordt, remt het de overgang naar vervoer over water. Het is enorm belangrijk die regeling dus tot uitvoering te brengen in plaats van alleen op papier te zetten.

Van commerciële organisaties en dan met name van leveranciers heb ik nodig dat er anders wordt nagedacht over de kosten voor duurzaam transport. Veel organisaties zeggen wel te willen verduurzamen. Ik weet dat duurzaamheid geld kost, niet duurzaam vervoeren is nog altijd het goedkoopst, maar als je naar de toekomst kijkt dan zie je ook wel dat de huidige manier van vervoeren niet haalbaar is op lange termijn. Leveranciers moeten nu dus enigszins over hun eigen business model heen stappen om voor de toekomst bestendig te zijn.

Ook zou ik heel graag samenwerken met commerciële organisaties die het laatste stukje transport van kade naar de afnemer kunnen doen, maar tot nog toe is er niemand opgestaan. Dan moet ik het zelf doen. Ook het lobbyen van de VVAB is buitengewoon belangrijk, dat helpt zeker.

Willem: ik wil graag nog toevoegen waar de Gemeente voor nodig is. Regelgeving is een belangrijk punt. Dat moet aangescherpt worden. Handhaving is daaraan gekoppeld. Begin met regelgeving.

Ander puntje is stimulering. Niet alleen stimulering in vorm van geld, maar ook wat er wordt geschreven. Het nieuws dat de Gemeente publiceert. Positieve berichtgeving vanuit de Gemeente. Een onafhankelijk nieuwsorgaan dat publiceert is enorm belangrijk voor het bouwen van een goed imago voor vervoer over water.

Bovendien kan de Gemeente Amsterdam zich naar ons toe zien als opdrachtgever.

Bart: ontzettend belangrijk punt.

Willem: Als laatste dan. De Gemeente moet duidelijkheid geven en al is het maar een stip ergens ver weg op de horizon. Een punt waarvan je zegt: dat is het punt waarop wat er nu gebeurt, niet meer kan en mag. Of dat nu 2030, 2040, of 2050 is maakt niet uit. Die stip bepaalt namelijk of bedrijven wel of niet na gaan denken over aanpassingen. Ze moeten daar dan naartoe gaan werken. Nu wordt dat enigszins gedaan door de plannen voor autoluw en de emissie-vrije zone, maar voor vervoer over water is er nog te weinig stimulans.

Dingeman: vervoer over water moet gecommuniceerd worden als een van de hoofditems van de gemeente.

Bart: in die zin is het erg goed wat Sharon Dijksma heeft gedaan met de 2025 regeling. Alles elektrisch. Daarom heeft nu wel iedereen het erover. "Dat gaan we redden hoor" wordt er inmiddels ook gezegd.

VVAB: Wij hebben helaas geen technische kennis. Tot ontbreekt ons, maar op het gebied van adviseren (van de Gemeente) kunnen wij het nodige doen. We hebben ook een eigen blad en website dus ook op het gebied van communiceren kunnen we belangrijk zijn. Er zit heel veel

bestuurlijke ervaring bij de leden van de VVAB. Van zowel bestuurders als oud-ambtenaren. Zo weet ik bijvoorbeeld dat het jaren geleden al onmogelijk was om woonboten uit te kopen van de Amstel. Dat soort know-how zit bij de VVAB en bovendien zitten we ook bij Sharon Dijksma aan tafel.

Betty: aan die tafel is ook dat goederenvervoer aan de orde gekomen. Maar dat was in die hele Nota Varen discussie ook maar een klein onderdeel. Wij als VVAB zullen in ieder geval initiatieven ondersteunen en zorgen dat vervoer over water nadrukkelijker onder de aandacht komt. De pilot voor het ophalen van vuilnis ligt op een presenteerblaadje. Kom op met een budget zouden wij willen zeggen.

Willem: ik zie de VVAB ook als een communicatiekanaal richting de bewoners.

Betty: Laten we eerst proberen die Gemeente te overtuigen

Bart: Ja, de Gemeente, maar in combinatie met leveranciers. Beide moet je overtuigen. Leveranciers van voeding en de ophalers van afval moeten gaan inzien dat dit vervoer over water gaat helpen.

Betty: dat overtuigen van die horecaleveranciers lijkt me erg moeilijk, maar afval zou toch makkelijk moeten gaan.

Bart: het systeem voor afval ophalen is buitengewoon complex.

Willem: het is een slangenkuil.

Bart: voor de beeldvorming, ze zijn even complex. Distributie van voeding is niet moeilijker dan het ophalen van afval.

Maarten: dan zou ik graag afsluiten met het vaststellen van samenwerkingen die we graag zouden zien.

Annemieke: we zitten hier bij Accenture, dat multidisciplinaire samenwerken is bij de bedrijven als deze. Als je een klant hebt gaan ze alle afdelingen langs want anders doe je het niet goed. Als je een project als vervoeren over water succesvol wil stimuleren dan moet je ook met alle partijen aan de slag. Bewoners, ondernemers, leveranciers, Gemeente en vervoerders, maar iemand moet de regie houden. Daar kijk je dan inderdaad voor naar de Gemeente. Die vormen het beleid. De overige partijen kunnen uitvoeren, lobbyen, maar hebben te weinig macht / hulpbronnen om invloed uit te oefenen over het geheel. De Gemeente kan dit wel.

Maarten: Karin, is het Programma varen bezig met het vormen van samenwerkingsverbanden met andere partijen?

Karin: Waar we met Programma Varen absoluut mee bezig zijn is het samenwerken met Programma Logistiek en Programma Kades en Bruggen. Daar hebben we echt wel de handen ineen geslagen. Dat zijn de programma's binnen de Gemeente. De raakvlakken tussen deze programma's zijn erg groot. Die programma's zijn opgericht om verschillende doelen te behalen. Die doelen hebben raakvlakken maar ze kunnen ook conflicteren. Ook binnen de Gemeente is het moeilijk om met die verschillende programma's een optimaal plan op te stellen.

We moeten daarom met de programma's bij elkaar zitten en aan de politiek duidelijk maken wat er wel en wat er niet kan. Daarbij moet je onderscheid maken tussen verschillende gebieden. In het centrum is er straks bijvoorbeeld niet veel meer te kiezen, omdat daar echt ingrijpende werkzaamheden plaats zullen vinden om die kades en bruggen te repareren.

Binnen de Gemeente moet dus al samengewerkt worden. Daarnaast moet er ook absoluut gewerkt worden met de branche en kennisinstellingen etc. en die kant gaan we ook op. Er moet ook capaciteit voor zijn. Die is schaars. Het is lang niet altijd onwil. Je kunt pas goed beleid maken als je weet wat er speelt en dat vergt tijd en capaciteit.

Betty: beleid kan ook op gang komen vanuit de praktijk. Vanuit de uitvoerders.

Willem: Daar zitten ook risico's aan. Om een concreet voorbeeld te geven: die Nota Varen 2, dan zijn er eigenlijk twee gescheiden belangen. We hebben het over de evenementen en passagier vaart, en de overige vaart. Ik ben verbaasd dat Daan er zonder advocaat is. Die partijen uit de passagier vaart die nemen standaard, bij iedere bespreking, een advocaat mee. Dat betekent dat werkelijk tot op ieder puntje je voorzichtig moet zijn met wat er gezegd wordt omdat die advocaten alles alleen maar vertragen.

Als we één ding niet willen namens goederenvervoer over water, dan is het dat plannen vertraagd worden. Dat is alleen in het voordeel van die passagier vaart.

Die passagier vaart is best wel conflicterend.

Maarten: Waarom is die passagier vaart dan zo vijandig tegen het vervoer van goederen over water.

Willem: Ze zijn niet per se vijandig tegen goederenvervoer over water, maar ze zijn bang dat er beperkingen worden opgelegd aan hun verdienmodel. Een verdienmodel dat ze al jaren lang als een verworven recht beschouwen. Die beschouwen de grachten als een soort monopolie voor de rondvaart.

Er zijn een aantal grote partijen die eigen steigers hebben. De vraag vanuit de Nota Varen 2 is of het mogelijk om wat meer op en afstap plaatsen te maken, verdeeld over de stad. Dat wil meteen zeggen dat er wat van die verworven rechten moeten worden losgelaten door die grote partijen. Dat is haast onmogelijk.

Betty: er is nu een bepaald volume passagier vaart dat is vastgesteld als de maximale norm. Dat vervoeren van goederen dat komt daar nog eens bij.

Daan: er is inderdaad een norm afgesproken, maar het is nog maar de vraag of die norm stand gaat houden. Er worden inderdaad legers advocaten ingezet en er lopen nog allerlei rechtszaken. Ik acht de kans niet groot dat die norm, dat maximale aantal passagier boten, stand houdt.

Dingeman: daar ben ik het niet mee eens. Uiteindelijk zal een rechter toch moeten concluderen dat er beperkte mogelijkheden zijn om de Amsterdamse wateren. Die kan niet, omdat er zo'n 50 jaar geleden vergunningen zijn gegeven, dat eeuwig durend maken.

Willem: nog even terugkomend op die vijandigheid van de passagier vaart. Als we het hebben over het water als infrastructuur dan heeft het water nog niet de drukte die uitbreiding van vrachtvervoer gaat beperken. Wel zul je tijdvensters voor de verschillende vormen van vervoer moeten vinden voor de drukke gedeeltes op de grachten.

Dat doen we nu al vanuit onszelf. Binnen de grachtengordel varen wij maar tot elf uur. Daarna wordt het drukker. Niet eens alleen doordat er veel rondvaarboten komen, maar hartje zomer stappen er weer allemaal toeristen, zonder enige kennis, op waterfietsen. Maar oke, kortom: ruimte is geen vijandigheid. Dat past wel, als je gebruik maakt van tijdvensters.

Dingeman: dat is ook een taak voor de Gemeente. Het communiceren dat het drukker gaat worden omdat er simpelweg belangrijke redenen zijn om gebruik te moeten gaan maken van het water voor het vervoer van goederen.

Maarten: we hebben het veel over de politieke wil. Klopt het dat die politieke wil vooral uitgedrukt zou moeten worden in het aanwijzen van laad en loslocaties?

Betty: Ja, aanlegplekken en budgetten voor pilots zodat uitvoerders kunnen ondervinden wat de voor en nadelen zijn van vervoeren over water.

Joost: Ja, regelgeving en subsidieregelingen voor de start. Regelgeving zodat voor zowel weg- als watertransport duidelijk wordt wat er wel en niet mag en regelgeving die zorgt dat watertransport op een eerlijke manier kan concurreren met wegtransport.

Annemieke: Ja, wat op het land geldt, geldt vaak niet op het water. Wat je in de binnenstad ziet is dat er op het water veel meer mag dan op de wal. En daar moet je ook van af.

Karin: het klopt dat er andere regelgeving geldt voor aan de wal en voor op het water. Ik denk dat je als je vanuit de logistiek kijkt, je moet bepalen wat de beste route is. Goederen moeten van A naar B en je bekijkt op basis daarvan of je beter over de weg, of beter over het water kunt vervoeren. Het moet geen 'je moet over de weg' of 'je moet over het water'. Je moet bepalen wat de beste route is.

Maarten: daar wil ik de tweede ronde mee afsluiten zodat we kunnen nadenken over welke kennis er nu ontbreekt en welke experimenten we zouden kunnen doen om die kennis te verkrijgen.

Ronde 3: welke experimenten dragen bij aan het verkrijgen van ontbrekende kennis

Dingeman: experimenten met efficiëntere overslag methoden

Maarten: ik zou graag beginnen met Maurits. Kun je vertellen over de experimenten die nu met Roboats worden gedaan?

Maurits: er wordt nu een full scale Roboat geproduceerd en die zal in de loop van het jaar af zijn. Dat is een autonome boot waar we erg veel mee willen gaan varen. We focussen op het ophalen van vuilnis en dat kunnen we op verschillende manier insteken. Experimenten die we graag zouden doen zitten in het overslaan van vuilnis tussen water en land. Daar moeten verschillende opties worden uitgewerkt.

Annemieke: wat is een roboat?

Maurits: een roboat is een robot boat, die autonoom, zonder schipper, kan varen. Omdat de snelheid van boten een stuk lager ligt dan op de weg, is autonoom varen op het water minder risicovol dan autonoom rijden.

Betty: ik zou heel graag meer experimenten zien met vuilnis. Experimenten om per buurt of wijk het huisvuil op te halen en te bepalen of dit een gewenste manier is. Ik zou vooral niet te groot beginnen. Kleinschalige experimenten die je makkelijk van de grond krijgt met enkele ondernemers. Er zijn ook al een aantal pilots geweest, die waren niet altijd succesvol. Is er voldoende informatie over waarom die zijn mislukt.

Willem: het laatste experiment dat we hebben gedaan was het afval ophalen van de 9 straatjes. De factor die er voor heeft gezorgd dat dit niet door is gegaan hing met verschillende dingen samen. De

pilot speelde zich af in de tijd van het falen en de problemen van het Afval en Energie Bedrijf. Dat werd als een van de redenen genoemd. Een andere reden die werd genoemd was gebaseerd op een financieel plafond waar niet aan kon worden voldaan. Althans, wij hebben nooit inzage gehad in hoe dat financiële plafond tot stand is gekomen.

De Gemeente gaf dat plafond mee in de aanbesteding, wij kwamen daar wel het dichtst bij. We hebben daarom wel verdere gesprekken gevoerd, maar de Gemeente heeft uiteindelijk toch de stekker eruit getrokken. Nu zijn ze opnieuw aan het bekijken of ze het als aanbesteding op de markt kunnen brengen en we zijn razend benieuwd wat er dan nu gewijzigd is in de inschrijving. Om te bepalen of het nu dan wel lukt.

Betty: moeten er niet ook experimenten worden gedaan om te kunnen laden en lossen over woonboten heen.

Willem: Wij werken al met een kraan die dat zou kunnen, maar ik denk niet bewoners accepteren om met afval en zware goederen boven die woonboten te hangen.

Bart: om eerlijk te zijn, heb ik geen last van de rondvaart. Ik heb ook geen last van woonboten. Ik heb echt genoeg mogelijkheden om de komende jaren aan de gang te gaan. Als ik kan laten zien dat vervoer over water een mooi systeem biedt dan komen er vanzelf meer ruimte en technische innovaties. Planologen gaan dan ook inzien dat ze rekening met ons moeten houden. Dan komt het wel. Er hoeven dus nog geen woonboten weg, er hoeven ook geen steigers van Lovers of Blue Line weg. Ik heb wel een aantal vaste ligplaatsen nodig waar ik aan mag meren en niemand anders en daar ben ik mee bezig.

Experimenten die ik voorstel zijn pilots van minimaal 1,5 jaar. Inclusief stimulering.

Karin: we hebben het steeds over pilots. Wat bedoelen we daar eigenlijk mee.

Joost: experimenten die niet rendabel zijn vanaf de start en dus financieel ondersteund moeten worden. Als dan blijkt dat het werkt kun je schaalvoordelen behalen en op grotere schaal vervoeren zodat het mogelijk wel rendabel wordt.

Maarten: Karin en Sarika, ik ben benieuwd naar de kennis die jullie nog nodig hebben om aan de ene kant gepast beleid te vormen en aan de andere kant meer klanten te willen leveren over water.

Sarika: Wij zijn al bezig met het benaderen van onze klanten om geleverd te krijgen over water. We hebben al veel gesprekken gevoerd om te bepalen hoe we op een duurzamere manier onze klanten in de toekomst kunnen beleveren. Daar is vervoer over water als mogelijkheid uitgekomen en daarom zijn we begonnen met de eerste leveringen over water.

Annemieke: ik zou wel graag een pilot op de Zeedijk zien. Daar rijden ontzettend veel vrachtwagens terwijl de ruimte erg beperkt is. Zouden jullie (Bidfood) daar geen pilot kunnen doen. Ik heb het dan over de vrachtwagens die het bier en de dranken leveren.

Sarika: dat zouden we graag doen, maar we zijn geen Heineken. Wij leveren dus niet zoveel dranken bulk. Klanten moeten wel voldoende van ons afnemen om over het water te gaan leveren.

Wel kun je kijken naar consolidatie. Wanneer de Gemeente zegt dat je niet meer allemaal apart de stad in mag maar eist dat er een onafhankelijke vervoerder voor verschillende leveranciers gaat vervoeren, dan kan het wel. Zo kijken we met de pilot die wij voor Hotel Pullitzer gedaan hebben naar welke leveranciers zij nog meer hebben. Daar willen we dan mee in gesprek om te bepalen of we alles gebundeld kunnen leveren. Ondertussen hebben we dan weer andere klanten die we willen

toevoegen. Daar kijken we met Bart naar. Het doel is dus het doen van een eenmalige levering om te bepalen hoe wat op structurele basis kunnen gaan aanbieden.

Annemieke: en die kennis is er dus nog niet. Hoe je dat op structurele basis zou kunnen gaan doen. Die kennis zou bij de Gemeente bekend moeten zijn. Er zijn al meerdere pilots gedaan in het verleden en van andere steden zou je die kennis ook binnen kunnen halen. Ik zou pleiten voor één centraal punt waar alle pilots verzameld zijn. Alle initiatieven die nu worden al worden genomen moeten bij de Gemeente bekend zijn. Daar moet de kennis vandaan komen om beleid vormen.

Karin: die kennis hebben we en die initiatieven kennen we

Annemieke: dan is het wel belangrijk dat de Gemeente bekend maakt dat ze van die initiatieven op de hoogte zijn.

Maarten: in de Nota Varen 2 stond duidelijk de vraag of de branche met pilotvoorstellen zou willen komen. We vroegen ons net al kort af wat dan met een 'pilot' bedoeld wordt. Karin, weet jij wat er daar bedoeld werd?

Karin: de vraag is inderdaad echt wat er onder een pilot wordt verstaan. Wij als programma varen mogen nu invulling geven aan wat wij als 'pilot' zouden willen bestempelen. Dat wil niet zeggen dat er niet meerdere kunnen zijn. Mijn insteek is een pilot in te vullen als een project dat heel veel effect heeft en politieke druk oplevert. Een pilot die bijdraagt aan de politieke wil en bekendheid genereert.

Wij als programma varen hebben dat binnen de Gemeente al nodig om meer capaciteit te krijgen. Dus een pilot waar we op de eerste plaats van kunnen leren en daarnaast ook grote impact heeft. Dat zie ik als een pilot. Dat wil niet zeggen alle andere eenmalige proefvaarten niet als pilot bestempeld kunnen worden of door mogen gaan, maar als ik drie 'pilots' moet aandragen bij het Gemeente bestuur dan moeten dat lange termijn pilots zijn met grote impact.

Maarten: zijn er dan vanuit Nota Varen 2 al ideeën over dit soort grootschalige pilots?

Karin: daar kan ik niet veel over zeggen omdat eerst duidelijk moet worden wat we als pilot definiëren.

Dingeman: waarom zou je geen open prijsvraag uitschrijven. Een prijsvraag zodat de creativiteit kan loskomen bij mensen die wellicht helemaal niet bekend zijn, maar die zeggen dat ze dat regelen.

Willem: dat is in principe wat er is gedaan bij die aanbesteding voor de pilot op de Negen Straatjes. Er zijn toen veel partijen opgestaan om totaal out of the box, totaal onbekend met logistiek en techniek te kijken hoe invulling kon worden gegeven aan het opalen van het afval.

Dingeman: die aanbesteding moet wellicht breder worden uitgezet.

Betty: er moeten vanuit de branche voldoende initiatieven komen die de Gemeente helpen bij het kiezen en vormen van pilots. Er moet niet gewacht worden tot een precieze definitie voor het woord pilot wordt gevonden.

Karin: er wordt zeker niet gewacht. Laat dat duidelijk zijn.

Sarika: Ook wij als leverancier zijn zeker niet aan het wachten. Wij betrekken de Gemeente erbij en we zijn verschillende dingen aan het uitproberen. We hebben Kim Borgmann erbij betrokken van Amsterdam Vaart! Die heeft al aangegeven dat als wij dit op meer structurele basis gaan doen, zij ook voor ons bijhouden, monitoren, wat het oplevert.

Betty: Sarika zit hier al namens een sector. Dat werkt. We zouden ook andere sectoren aan tafel moeten hebben. De vuilnissector zit hier nu niet.

Karin: die vuilnissector is aangehaakt. Er vinden heel veel dingen parallel aan elkaar plaats. Om beleid te maken heb je een lange aanlooptijd nodig. Dat wil niet zeggen dat daarmee de markt stil staat. Wat we proberen te doen en wat ook mijn rol is, is om die markt aan te haken en in kaart te brengen wat de ideeën zijn die daar spelen en die mee te nemen in het te voeren beleid. Dat is in ieder geval wat we proberen te doen. Daar hoort de afvalsector zeker bij. Je hebt bevoorrading, bouwlogistiek en afval.

Willem: Ja, als je kijkt naar vervoer over water dan heb je bouwlogistiek, afval en bevoorrading. Dat zijn de drie geschikte sectoren als je kijkt naar volumestromen. Die drie samen, die dus geschikt zijn voor vervoer over water, pak je al meer dan het grootste deel van de totale stroom die de stad in en uit gaat.

Bart: samen met Mokum Mariteam zijn we druk bezig op het Oosterdok. Daar gaan we een hele nieuwe manier van afvalinzameling beginnen. Kleine karretjes over de weg, gecombineerd met de afvoer over het water in bulk. Daar is de Gemeente ook actief bij betrokken. Dat is een pilot van drie jaar. Ik kreeg daar eerst maar een jaar voor. Ik ben actief bezig geweest om daar drie jaar van te maken. Een jaar is te kort. Ik moet substantieel investeren. Karren kopen, grond huren, pand maken. En zelfs dan moet ik het als een raket afschrijven in drie jaar, maar in die drie jaar kan ik een systeem introduceren. Dat is een pilot die kan werken.

Met een jaar kom je nergens. Je kunt dan niet voldoende laten zien of het werkt. Daarom zijn we ook met Bidfood bezig met vervolgplannen voor de komende tijd. Anders breng je niets in beweging. Als je iets doet, dan dus minimaal een jaar, moet je gaan investeren, dan minimaal drie jaar.

Maarten: dan hebben we mogelijk een aantal pilots. Waar moeten die dan aan voldoen om niet slechts pilot te blijven, maar structureel te worden en opgenomen te worden in het vervoersysteem.

Karin: er zijn verschillende rollen en verschillende verantwoordelijkheden. Of die pilot laat zien dat het financieel haalbaar is, dat er een verdienmodel is dat standhoudt, dat is dan aan de ondernemers. De rol van de Gemeente hierbij is slechts het faciliteren van dat stukje grond.

Bart: waar de gemeente dan weer bij helpt is het overhevelen van klanten. Als klant speelt de gemeente dus een belangrijke rol. Dan gaat er iets in beweging komen. Zoiets wil ik ook met voeding doen. Met afval kunnen ze klanten overhevelen, maar met voeding kan dat niet. Daar hebben we leveranciers voor nodig en daar zijn we nu dus ook mee bezig. Vervolgens bepalen we daaruit weer hoe de Gemeente ons daarbij kan helpen.

Ik zou het wel terecht vinden dat de Gemeente ons hierbij helpt. Voor afval doen we haast een publieke taak. De Gemeente kan ons helpen door toestemming en vergunningen te geven. Al is het maar voor dat ene jaar. Als we niet van toevoeging zijn voor de stad zijn we zo weer weg, maar als we dat wél zijn, dan moeten we dat plekje kunnen houden.

Maarten: belangrijkste rol van de Gemeente is dus faciliteren van vergunningen, toestemming geven en meewerken.

Bart: ja, meewerking. Helpen met vergunningen. Er spelen allemaal verschillende kleine dingen die het me moeilijk maken. Wanneer ik een paaltje in de grond sla dat aangeeft dat ik daar wil afmeren, komt opeens iedereen beweging. Iedereen heeft dan plots plannen op die ene plek, terwijl er de afgelopen 30 jaar niets gebeurt op die plek. Plotseling moet er van alles gebeuren en dáár moet de Gemeente even bij helpen. Dat wij die plek aangewezen krijgen.

Annemieke: en juist daar heb je dus dat multidisciplinaire team nodig vanuit de Gemeente. Die niet alleen bij varen zit, niet alleen bij logistiek of vergunningen en handhaving, maar die samen gaan zitten en zeggen: we gaan het op deze manier, multidisciplinair doen. Dan kan het heel snel.

Willem: inderdaad. Eén aanspreekpersoon. Die hebben we nodig. Een loket. Een aanspreekpunt met daarachter een multidisciplinair team. Wat er nu gebeurt is dat ik van persoon naar persoon wordt gestuurd om dingen voor elkaar te krijgen. Ik ben constant aan het zoeken naar de juiste persoon binnen de Gemeente.

Karin: daar willen we absoluut vanaf.

Annemieke: er is geen collectief geheugen. Wat er allemaal al aan pilots is geweest, is niet duidelijk bekend en dat zou allemaal netjes gedocumenteerd moeten worden.

Maarten: afsluiting en dankwoord.

Uitwerking Post-It's

Opstellen van Gedeelde visie: waar moet het vervoersysteem in Amsterdam aan voldoen?

Daan: - Snel - Flexibel - Geen opstoppingen - Vervoer over water kan voor minder opstoppingen zorgen.	Willem: - Uitstootvrij - Via het water - Autonoom laden / lossen - Voldoende ruimte om water en aan de wal
Bart: - Geen negatief effect op gezondheid van mens en milieu - Hoge leveringsbetrouwbaarheid - White label: goede samenwerkingen - Breed inzetbaar: vervoersmiddelen voor verschillende markten - Geen tot minimale overlast voor bewoners - Optimale combinatie tussen water en weg - Gelijk speelveld tussen weg- en water. Haven geld en boetes onredelijk - Laad en loslocaties voor watertransport (vroeger stonden er overal kranen)	Karin: - Snel - Efficiënt - Veilig - Flexibel qua locatie - Uitstootvrij en geluidsarm - White label - Laad en loslocaties, geen kranen op de wal! - Subsidies voor startende ondernemers (voor 1 jaar om te starten) - Efficiënte kade wal (geen obstakels) - **Efficiënt en multimodaal, gebundeld vervoersysteem incl. vervoer over water dat bijdraagt aan de bereikbaarheid van A'dam**
Maurits: - Snel - Flexibel in tijd en locatie	Sarika: - Veilig - Niet te duur - Toepasbaar in de business - Consolideren - Goede samenwerking - Voldoen aan temperatuureisen - Voldoen aan geluidsnormen - Gebruik van bestaande infrastructuur
Joost: - Betrouwbaar - Veilig - Geluidsarm - Goede samenwerking tussen aan en afvoer	Betty: - Veilig - Uitstoot- en geluidsarm - Efficiënt - Goed gealloceerde aanlegsteigers + opslag plekken - Lopende banden van boot naar kade - Betaalbaar - Efficiënt - Voldoende volume - Ontlasten drukte en kades
Dingeman: - Kleinschalig (geen grote vrachtwagens) - Elektrisch - Vooral over het water: zo min mogelijk belasting voor wal en bebouwing - Distributiecentra voor gebundeld transport - Ook personen vervoer over water - Van en naar hotels over het water	Annemieke: - Efficiënt - Snel - Veilig - Betaalbaar - Incentive om mee te doen - Goede samenwerking partijen - Goede locaties steigers - Duidelijke laad en los tijden - Elektrisch vervoer

Vormen coalities en strategieën: wat doe je zelf, wat is nodig van private, en publieke partijen?

Daan: - De passagier vaart zou niet snel bijdragen aan vervoer van goederen. Mogelijk kleine en lichte spullen of verkoop boten. - Commerciële partijen zijn nodig voor het vervoeren en het ontwikkelen van schepen en het bedenken van een slim logistiek systeem. - Gemeente helpt door subsidies, creëren van ruimte en aanlegplekken en regelgeving.	Willem: - Ik kan kennis delen die ik heb opgedaan. Ik ben bereid mijn materiaal te delen. Ik denk mee en opper ideeën om de Gemeente te ondersteunen. - Commerciële partijen moeten openstaan voor samenwerkingen. Ze zijn bijvoorbeeld nodig voor de last-mile. Ze moeten juiste informatie verschaffen omtrent mogelijkheden vervoer over water. - Gemeente nodig voor regelgeving, handhaving, stimulering en als opdrachtgever.
Bart: - Faciliteren van pilotprojecten, Lobbyen / netwerken - Over eigen schaduw stappen: niet alleen over duurzaamheid praten, stappen zetten door budgetten te reserveren voor langdurige projecten - Gemeente nodig als opdrachtgever. Stimuleren pilots van 1,5 jaar. Invoeren en handhaven van 7,5 ton zone beleid. Subsidies verlenen ter stimulering van de business case voor pilots op lange termijn.	Karin: - Open mind set. Gemeente kan beleid vormen. Duidelijkheid bieden. Samenwerken. Handen ineen slaan met andere Gemeentelijke programma's. Regelgeving implementeren. - Branche nodig voor ideeën en innovaties - Gemeente nodig voor beleid, sturing, regelgeving en handhaving, duidelijkheid en informatie verschaffing. Stip op horizon plaatsen die duidelijkheid geeft over beleid.
Maurits: - AMS kan pilots en experimenten uitvoeren met Roboats gericht op autonoom varen Business case uitwerken met commerciële partijen. Logistiek model maken. - Samenwerkingen starten - Gemeente nodig voor subsidies en duidelijkheid regelgeving 7,5 ton zone.	Sarika: - Klantmassa aanbieden om vervoer over water mogelijk te maken. Onderzoeken of 3 in 1 leveringen mogelijk zijn - Samenwerken met leveranciers die supply chain willen verduurzamen zodat we handel kunnen consolideren en efficiënter kunnen vervoeren over water en haalbaarheid vergroten. - Gemeente kan helpen met vergroten bereikbaarheid over het water door op en afstapplekken aan te wijzen. Stimuleren van consolidatie door white label besluit. Meedenken over te ontwikkelen wet en regelgeving. Subsidies verlenen voor het opstarten van projecten over het water.
Joost: - VVAB kan adviseren, bestuurlijke druk uitoefenen. Communiceren met website en eigen blad. Veel bestuurlijke ervaring binnen de vereniging. - VVAB heeft technische kennis nodig van commerciële partijen - Gemeente moet regelgeving bieden, pilots financieren zolang volume nog ontoereikend is. Gemeente kan ook voorzien in fysieke aan en afvoerpunten	Betty: - VVAB kan initiatieven en pilots ondersteunen. We kunnen pilots stimuleren bij de Gemeente en naar bewoners communiceren door evenementen te organiseren. - Moet samenwerken met commerciele partijen wanneer pilots ondersteund moeten worden. Technische kennis en uitvoering moet van hen komen. - Gemeente nodig voor budgetten en aanlegfaciliteiten bieden. Regelgeving opstellen en aan positieve berichtgeving doen. Daarnaast Gemeente ook als opdrachtgever voor afval.
Dingeman: - VVAB kan positief stimuleren en pilots ondersteunen. - Technische kennis nodig van andere partijen - Gemeente moet voortouw nemen en een stip op de horizon plaatsen en daar naartoe werken. Pilots opzetten en subsidies beschikbaar stellen.	Annemieke: - Ik kan partijen samenbrengen, lobbyen, ondernemers aanspreken en helpen pilots met hen te starten. Via de BIZ en ondernemersverenigingen subsidie aanvragen - Ondernemers, leveranciers nodig - Ambtenaren nodig voor handhaving en politiek voor beleid. Multidisciplinair team vanuit de Gemeente.

Welke kennis ontbreekt nog en welke pilots / experimenten voorstellen?

Daan: - Techniek nodig voor efficiënt en bij voorkeur elektrisch afladen van vracht van schepen. - Experimenteren met vervoer over water en LEV's die laatste stuk doen.	Willem: - Geen kennis meer nodig, maar duidelijkheid over de regelgeving in verband met benodigde investeringen. - Een concrete pilot die geïnitieerd of begeleid wordt door de Gemeente. Zodat regelgeving daarop gebaseerd kan worden.
Bart: - Kennis hebben we - Pilots met Gemeente als opdrachtgever voor vervoeren van bouwmaterialen (straatwerk) , afval en food.	Karin: - Kennis is nodig, maar moet ook al meer bekend zijn dan dat we nu weten. Informatie die bekend is breed delen. Nu veelal percepties en aannames. Ontbrekende kennis over de technische maatregelen. Meer kennis nodig over de goederenstromen en de omvang daarvan. Dit is nodig om veranderingen te kunnen monitoren en te kunnen reguleren. - Pilots kunnen laten zien welke werkwijzen gewenst zijn.
Maurits: - Meer technische kennis nodig voor het efficiënt overslaan van de boot naar de kade. Onderzoek naar autonoom varen. - Verschillende opties voor overslagtechniek testen en veel autonome vaaruren maken.	Sarika: - Kennis nodig over hoeveel van onze handel over het water zou kunnen. Kennis nodig om ook gekoeld en vries te kunnen vervoeren tot aan de klant. Dus last mile ook nog. Technische kennis om sneller over te kunnen slaan van containers. - Experimenteren met consolideren van handel van verschillende grote leveranciers die duurzaamheid belangrijk vinden. Experimenten met white label vervoer, mogelijk afgedwongen door de Gemeente.
Joost: - Technische kennis nodig. - Experimenteren met vuilnis ophalen, bierboot concept, horeca leveringen	Betty: - Technische kennis nodig. Wat voor kranen gebruiken. Welke boten gebruiken. Kennis over de evaluaties van eerdere pilots. - Pilots om afval op te halen en dan met name om laad en los technieken te testen.
Dingeman: - Technische kennis voor het overslaan van vracht. - Naast nieuwe experimenten voor verzamelen van al bestaande kennis over eerdere initiatieven en werkende concepten in het buitenland.	Annemieke: - Naast kennis is meer historisch besef nodig. Leren van verleden. Afkijken bij andere steden. Kennis over laden van afval op de boot. - Pilots voor ophalen afval en leveren dranken. Bedrijfsafval van de Nieuwmarkt en Geldersekade.