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The Evaluation of Megaprojects: Understanding the Nuances of Success and Failure

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Colophon

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Preface

Dear reader,

With the completion of this research and the writing of this thesis, my student years are coming to an end. I have very much enjoyed studying in Groningen over the past few years. I started my bachelor's in Human Geography and Planning in 2018, and now, almost six years later, I am finishing my master's in Environmental and Infrastructure Planning.
Throughout my studies, I have been searching for where my true passion lies within this field. Unfortunately, I can't say that I found it in this research, but that doesn't take away from the fact that I look back positively on this period. I have learned an incredible amount over the past months, particularly in the field of project management. Specifically, from the theory, the megaproject cases, and the practice of managing a 'large' project myself, namely this research.
Moreover, I had the opportunity to conduct interviews with very passionate and dedicated individuals, from whom I gained valuable insights. After each interview, I felt a sense of fulfillment because I had learned a wealth of new things. Hereby, I would like to extend my gratitude to all the interviewees.
I would also like to express my appreciation to my supervisor, Bert de Groot. I found your guidance very pleasant, helpful, and constructive. You provide feedback in a positive and substantive manner, for which I am extremely grateful.
Finally, I would like to thank my father, brother, and Iris for their support over the past period.

I hope you enjoy reading this thesis.

Maarten van Dommele,

Groningen, July 2024

Abstract

Megaprojects in infrastructure planning are lengthy, costly, and highly complex. They are funded by taxpayer's money and have a large societal impact. These projects often exceed time and budget estimates, leading some to conclude that they are unsuccessful; nevertheless, they still occur frequently. It seems that their success or failure is more nuanced, which means that we need to gain a better understanding of megaproject success. Therefore, this study examines five major highway projects in the Netherlands by comparing ex-ante cost-benefit analyses (CBAs) and ex-post evaluations. Since ex-post evaluations of megaprojects are rarely conducted, this study uses an evaluation framework and in-depth interviews as a replacement. Results reveal that despite time and budget setbacks in some cases, the examined megaprojects seem to be successful in their expected outcomes. It appears that the effects on broad societal themes are often missing in ex-ante CBAs, and these effects are difficult to evaluate in ex-post situations. Project stakeholders are positive about broader forms of evaluation that do not only use time, cost, and scope as criteria but also allow for consideration of broader societal effects. Ideally, this would be a combination of narrative evaluation supported by quantitative analyses. The insights from these types of evaluations should not be used to punish but as a tool from which lessons can be drawn. The degree of subjectivity in these evaluations is highlighted, emphasizing the importance of who conducts them. Future research could explore how broader societal effects can be measured in ex-post evaluations and how different forms of evaluations can complement each other. A follow-up study directly building on this research could compare the results of the studied cases with the perceptions of other types of stakeholders. This could be done by conducting ex-post evaluations with, for example, stakeholders who were not professionally involved in these megaprojects, such as local residents or users. Taking this broader perspective will contribute to a more nuanced view of megaproject success.

Key concept: megaprojects; project management; project evaluation; project success; cost-benefit analysis; ex-post evaluation

Table of contents

Index

List of figures

List of tables

List of abbreviations

CBA	Cost-Benefit Analysis
CEA	Cost-Effectiveness Analysis
CPB	Central Planning Bureau
DBFM	Design, build, finance, maintain contract
EIA	Environmental Impact Assessment
MCA	Multi-Criteria Analysis
MIRT	Meerjarenprogramma Infrastructuur Ruimte en Transport
NPV	Net present value
PPP	Public private partnership
SEE	Steunpunt Economische Expertise
TN/MER	Trajectnota / Milieueffecten rapportage

Chapter 1 - Introduction

1.1 Background

Humans have been capable of imagining, managing and accomplishing huge structures for thousands of years. Ancient works like the Great wall of China, the Egyptian Pyramids, or Roman water infrastructure are still tangible today. And in today's world, extraordinary buildings, modern infrastructure and huge stadiums are still being built. To build these major accomplishments, humans often take a project-based approach. A project refers to "any temporary endeavor undertaken to create a unique product, service or result." (Project Management Institute, 2021). Or, "the engines that drive innovation from idea to commercialization." (Shenhar & Dvir, 2007). Project-based work is becoming increasingly popular among organizations as a means to deliver value (Ika & Pinto, 2022). It is primarily the large-scale projects with many stakeholders, high costs, and lengthy development times that are complex. Scholars refer to them in literature as 'megaprojects'. Various definitions of megaprojects are employed, but a commonly used and widely recognized definition is that of Flyvbjerg who defines them as: "large-scale, complex ventures that typically cost a billion dollars or more, take many years to develop and build, involve multiple public and private stakeholders, are transformational, and impact millions of people." (Flyvbjerg, 2014, p.6). Despite the impressive creations produced by megaprojects, a clear negative image has emerged when it comes to megaprojects. According to Flyvbjerg (2014), megaprojects often fail as they suffer from severe cost and time overruns. Furthermore, there is a lot of reporting on megaprojects in the media in which a rather dismal view is presented (Volden & Welde, 2022). Whether the portrayal in the media is justified or not, the fact remains that megaprojects often exceed their time and budget constraints (Flyvbjerg, 2017). To state that a megaproject has failed purely based on time and cost overruns might be short-sighted. For as long as project management is a topic of study, the debate on what determines the success or failure of (mega)projects has been ongoing. There are several aspects that make this question difficult and highly debatable. For example, the definition of success and failure is very context-dependent and subjective (Shenhar & Holzmann, 2017). Second, the question if a project that doesn't meet the criteria set in the initial scope is a failed project (Atkinson, 1999; Turner & Xue, 2018). Third, there is a lack of reliable evaluations after a project is completed, also known as ex-post evaluations (De Jong et al., 2019; Volden, 2018). And finally, it is hard to measure the (societal) benefits or value that these projects generate (Zwikael, 2024). Thus, to summarize, megaprojects are becoming increasingly common. They often involve cost and time overruns and frequently receive negative media coverage, therefore tend to be considered 'unsuccessful'. Still, there is debate on how to define success or failure partly due to vagueness of the concept of value and lack of proper evaluations.

1.2 Societal relevance

Currently, society is facing all sorts of major challenges. From housing shortage to the energy transition, and from outdated infrastructure to urbanization. In order to approach these types of challenges, large-scale, expensive, and long-lasting projects; megaprojects are carried out. As we use megaprojects as a tool for major challenges in our society, it is crucial that we critically understand them. Due to their size, impact, and the way in which they are financed, megaprojects are always closely connected to society. First of all, due to their size, they often take a long time to construct. They can sometimes take between 10 to 15 years to finish. During this construction period, the space on which the project is executed, and its adjacent space can suffer from heavy nuisance. Perceived nuisance influences residential satisfaction regarding these types of projects (Hamersma et al., 2014). Furthermore, megaprojects can be considered as 'displacements', as they transform landscapes in a relatively short time (Gellert & Lynch, 2003). This means that they have a huge impact on the livability of an area. Finally, megaprojects are often (partly) financed with public funds, meaning that society indirectly pays for them. As for their size, impact, and type of financing, it is critical for society to understand how they work and how they become successful. Despite megaprojects' seemingly negative performance, more and more megaprojects are being built (Söderlund et al., 2017). This is what Flyvbjerg et al. (2003) refer to as the 'megaproject paradox'. If megaprojects are indeed performing so poorly, why do we continue to build them? Whether the negative image of megaprojects is entirely justified is open to debate. It is crucial that an honest depiction is provided, so that society understands the value of megaprojects. To make this clearer, it is important to investigate how the value of megaprojects is determined. Once this is clearer, it will be easier to determine whether undertaking megaprojects is a rational decision.

1.3 Scientific relevance

Scholars in the field of megaproject research indicate that there is still a great need for both theoretical and empirical knowledge about megaprojects (Flyvbjerg, 2014; Söderlund et al. 2017; Eskerod & Ang, 2017). Söderlund and colleagues selected seven leading articles in the field that write about megaprojects from different perspectives based on various theories. One of the recurring themes in these articles is the question of how to measure the success or failure of megaprojects. Although there is a wide body of literature, there is still no consensus on what success regarding megaprojects really means (Shenhar & Holzmann, 2017). This is an incentive to conduct further research to the evaluation of megaprojects.

Furthermore, the relation between megaprojects and society is quite vague. According to Winch (2017) there is a research gap in the link between megaprojects and society. Eskerod & Ang (2017) consider society as an important stakeholder of megaprojects therefore more knowledge about the connection between society and

megaprojects is needed. Moreover, Söderlund et al. (2017) state that the impact of megaprojects on society is a crucial research theme, which is another incentive for studying the connection between project value and society. This can be done by identifying the societal benefits of megaprojects and investigating how they turn out in society. In practice, this means the broadening of ex-ante evaluations and finding ways to evaluate societal benefits in ex-post situations.

Although most (mega)projects are required to conduct an ex-ante cost-benefit analysis (CBA), there are hardly any good evaluations after projects have been completed (ex-post evaluations) (Volden, 2018; De Jong et al., 2019). Ex-post evaluations of megaprojects might help us in better understanding the real value that was generated by a project. Also, comparing ex-ante CBAs with ex-post evaluations can teach us about aspects related to megaproject management. Eventually, ex-post evaluations can reveal different results from those reported in the media (Volden & Welde, 2022).

Building on previous debates and research gaps, this study delves deeper into the question of how to define the success or failure of megaprojects. It does so by critically investigating and comparing ex-ante CBAs and ex-post evaluations, addressing the need for more insights into ex-post evaluations. Additionally, this research provides extra empirical data on megaprojects. Thus, this study contributes to the academic debate by providing insights on how to add nuance to the success or failure of megaprojects.

1.4 Problem statement

Megaprojects often have a negative reputation, primarily due to frequent cost and time overruns (Flyvbjerg, 2017). This issue can be seen as a disruption in the 'Project Management Triangle', a model illustrating the balance between scope, cost, and time. In this model, the scope represents the predefined work to be completed as part of the project. Or the unique product, service, or result the sponsor expects from the project (Schwalbe, 2015, p. 6). Furthermore, there has been an ongoing debate about how the success or failure of megaprojects is determined. Success and failure are subjective concepts, making it complex to evaluate different (mega)projects in the same manner. Some researchers argue that there is an overemphasis on the three aspects of the Project Management Triangle (Atkinson, 1999; Judgev & Muller, 2005; Turner & Xue, 2018). More consideration should be given to the societal benefits that a project yields (McLeod, 2023; Zwikael, 2024; Turner & Xue, 2018; Volden, 2019). Another issue related to determining project success or failure is that many projects do not undergo thorough ex-post evaluations. In many countries, including the Netherlands, ex-ante evaluations are a mandatory part of the exploration phase in the project cycle. However, similar evaluations after project completion are uncommon. This means that while in-depth analysis is conducted before the start of a project to facilitate well-considered, rational decisions, there is insufficient evaluation afterward to assess the actual outcomes.

Thus, megaprojects frequently suffer from a negative reputation, leading to questions about the justification of this perception. The criteria for determining their success or failure are subject to debate, partly because of the scarcity of ex-post evaluations. Additionally, there is an oversight in considering the societal benefits or value these projects may bring when assessing their outcome.

Research problem:
There is a lack of nuance in the evaluation of megaproject success or failure.

1.5 Research objective and research questions

The main objective of this research logically derives from the problem statement. The aim of this research is to obtain a more nuanced understanding of megaproject success and to examine the role that ex-post evaluations can play in this context. To achieve this goal, the following main research question and sub-questions have been formulated.

Main research question:
How can we better understand the success or failure of megaprojects?

Sub-questions:

RQ1: *Why do megaprojects often suffer from a negative image?*

RQ2: *How is the success or failure of megaprojects measured and how could it be measured?*

RQ3: *What is the role of ex-post evaluations in determining project success or failure?*

RQ4: *What are the differences between the results of ex-ante CBAs and ex-post evaluations, and what challenges arise when comparing them?*

RQ5: *What are the opportunities and challenges for ex-post evaluations in the context of megaprojects?*

1.6 Reading guide

This thesis starts with a literature review in Chapter 2. Based on this literature review, the theoretical framework is developed. Chapter 3, the methodology, presents the research design, discusses the various research methods that were used, and introduces the cases that were studied. In Chapter 4, the results of the case study research are presented first, followed by the results related to the other sub-questions. In Chapter 5, a

discussion of the results is presented, in which the results are compared against the theoretical framework, followed by answering the main research question. After that, the theoretical implications and the implications for planning practice are presented. In the final chapter, the research is reflected upon, and suggestions for future research are made. A final personal reflection is also included.

Chapter 2 - Theoretical framework

In this chapter, the theoretical background of this thesis is presented. First, the main concepts; *project, megaproject, project management, project success,* and *project evaluation* are clarified. Thorough attention is paid to the challenges of megaprojects and megaproject management, after which theories related to project success are discussed. Next, project evaluation is discussed, followed by the presentation of the evaluation framework by Volden (2018). This framework serves as the basis for the in-depth interviews conducted for the case study research. Finally, the conceptual model is presented.

2.1 - What are (mega)projects?

2.1.1 - Defining the concept of a project

To better understand megaprojects, it is crucial to first understand the concept of a project. It is helpful to examine various definitions and reflect on them to enhance our comprehension. The word 'project' comes from Latin and is closely related to the words 'design' and 'plan'. According to the *Project Management Institute*, a project is "a temporary endeavor undertaken to create a unique product, service or result." Schwalbe (2015) compares a project with the concept of an operation, and argues that projects are different from operations because projects end when their goals have been reached or when they are terminated. Looking from a more instrumental perspective, projects can be considered as "the engines that drive innovation from idea to commercialization." (Shenhar & Dvir, 2007). Furthermore, project-based work is becoming increasingly popular among organizations as a means to deliver value (Ika & Pinto, 2022). Although these definitions are formulated differently, they all have some aspects in common. Based on these definitions, it can be derived that projects are temporal, they have specific objectives, and we can use them as a means. Schwalbe (2015) created a list of project attributes. Two of them could be added to our understanding of the concept, namely, the fact that projects require resources, and they have to deal with uncertainty. Projects can vary widely in scope and scale. From a kitchen renovation to constructing a new highway, and even this specific study, each can be classified as a project. Smaller projects tend to be more straightforward to manage, involving fewer stakeholders, presenting simpler challenges, and requiring clear and direct paths to success. Moving to the other end of the spectrum, we encounter the giants. In the literature they are referred to as 'megaprojects'.

2.1.2 - Defining the concept of a megaproject

Just like with the standard project, the concept of a megaproject also has various definitions. Compared to typical projects, megaprojects are substantially larger in scale and budget, they are more complex, have a bigger impact, a longer duration, and high levels of risk and uncertainty (Flyvbjerg et al., 2003; Clegg et al., 2017). Söderlund et al. (2017) have compiled several definitions from leading scholars each offering different perspectives. Flyvbjerg, currently one of the leading scholars in the field, defines them as follows: “Megaprojects are large-scale, complex ventures that typically cost a billion dollars or more, take many years to develop and build, involve multiple public and private stakeholders, are transformational, and impact millions of people.” (Flyvbjerg, 2014, p. 6). Although this definition is considered comprehensive, it should be noted that the exact definition of a megaproject is highly context dependent. A complex multi-million dollar project in a third world country can be considered a megaproject despite costing less than 1 billion dollars. This shows that the one billion dollar criterion serves as an illustration rather than a requisite. To shift focus from the monetary criterion, Zhai and colleagues also provide a clear definition: “Megaprojects exhibit extreme complexity, substantial risks, long duration and extensive impact on the community, economy, technological development, and environment of the region or even the whole country.” (Zhai, Xin, and Cheng, 2009, p. 99). Their definition places more emphasis on the impact of megaprojects on various aspects of society. From a sociological perspective, megaprojects can be considered as ‘displacements’. This is what Gellert and Lynch (2003, pp. 15-16) describe as “projects which transform landscapes rapidly, intentionally, and profoundly in very visible ways, and require coordinated applications of capital and state power.” And finally, Ashkanani and Franzoi (2022) mention that megaprojects represent a complex, unstable, non-linear, irregular, uncertain, unpredictable, and highly dynamic environment.

The various definitions illustrate differing perspectives, but they also show similarities on many aspects. It can be concluded that megaprojects are substantially large in scale, highly complex, long in duration, costly (often over a billion dollars), involve many stakeholders, and have a substantial impact on and transform society, sometimes causing displacements.

2.2 The reality of megaprojects

2.2.1 Why are megaprojects so popular?

Megaprojects are an age-old phenomenon that have spanned across various cultures. The Egyptians built the Pyramids, the Chinese the Great Wall of China, and the Romans accomplished all kinds of infrastructure megaprojects. Flyvbjerg (2014) illustrates how megaprojects have increased and are still increasing both in scale and frequency. One way to understand the popularity of megaprojects is presented by

Flyvbjerg in a theory about the *four sublimes of megaprojects*. Firstly, the *technological sublime* referring to the optimistic view of technology in American culture during the 19th and 20th centuries. Frick (2008) applied this to megaprojects, describing it as the thrill engineers and technologists feel when undertaking large and innovative projects, driven by the desire to extend the limits of technology to create the tallest, longest, fastest, or largest structures. Secondly, there is the *political sublime*, which involves the personal gratification politicians derive from initiating megaprojects. This involvement improves their visibility and boosts their public exposure. Thirdly, the *economic sublime* which is related to the economic impulse associated with megaprojects. Business people and trade unions profit significantly from megaprojects and all sorts of jobs emerge when undertaking them, fueling economic activity. Finally, there is the *aesthetic sublime* which relates to the beauty and design appeal appreciated by both designers and the public in the aftermath of a megaproject. Flyvbjerg (2014) describes this as the "pleasure people experience by using and looking at something very large and iconically beautiful." Frey (2017) suggests a potential fifth sublime, the *community pride sublime*. According to Frey, people enjoy sharing tales of the significant achievements their community has accomplished to feel superior to others. Another argument for this additional sublime is given by Söderlund et al. (2017) who argue that megaprojects constitute a symbol of success.

Reflecting on the four sublimes, it can be argued that they serve both as incentive for megaprojects and as a potential risk. Regarding the political sublime, a failing project can cause political damage for politicians. The economic sublime is not only about the direct financial aspects but also includes broader economic benefits such as accessibility, societal value, and livability. The aesthetic and community pride sublimes, on the other hand, are challenging to estimate in advance and even harder to monetize. Furthermore, these aspects are seldom measured after project completion.

2.2.2 The problems with megaprojects

Much is written about megaprojects because of their grandeur, uniqueness, and aesthetic appeal. However, there exists substantial focus on the challenges they face in literature. The four sublimes seem to overshadow all kinds of crucial issues that cause problems leading to failure of megaprojects. Flyvbjerg (2011) formulated the *Iron Law of Megaprojects* which states that megaprojects are "over budget, over time, under benefits, and over and over again." According to research into a megaproject database developed by Flyvbjerg, only one to eight megaprojects in a thousand are within budget and time and deliver the expected benefits. On the one hand, the appeal of megaprojects as a model for both public and private initiatives is at an all-time high, with the scale and frequency of these projects reaching unprecedented levels. On the other hand, the performance of managing megaprojects is notably weak leading to failures in terms of cost, time, and value. This is what Flyvbjerg (2003) refers to as the *megaproject paradox*.

2.2.3 Causes of the problems

Over the past decades, extensive research has been conducted in the field of megaprojects, with many studies focusing on the causes underlying their apparent failures. Flyvbjerg (2017) identified ten key factors that megaproject actors often overlook, leading to multiple problems. This list was devised by Flyvbjerg, but is based on various articles and theories by other authors within the megaproject literature. Based on Flyvbjerg (2017) and a discussion by Söderlund et al. (2017) the ten factors are presented below. Due to their long planning horizons and complexity, megaprojects are 1) *risky and long*. Megaprojects are often led by planners and managers with a 2) *lack of deep domain experience*. Megaproject management has to deal with 3) *multi-actor processes*, meaning governance mechanisms have to be established across various institutional regimes and cultures. Planners and managers have a 4) *uniqueness bias* and tend to see their projects as unique which impedes learning from other projects. In the front-end phase of the project, there is often already 5) *overcommitment* to a certain project concept resulting in "lock-in" situations and a lack of research to alternative options. Project developers tend to have an 6) *optimism bias* meaning they underestimate the costs and time and overestimate its value. The scope of the project usually changes over time, as a result of this 7) *change during project life cycle*, the eventual project is likely to be different from the initial project plan. Megaprojects are 8) *overexposed to Black Swans* and project managers tend to ignore this. Black Swans are extreme events with massively negative outcomes (Taleb, 2007). These unplanned events are often unaccounted for in budget, time and scope, 9) *unaccounted for complexity and black swans*. As a result of all these factors, 10) *misinformation* about costs, time, and benefits are the norm regarding megaprojects.

These ten factors presented by Flyvbjerg show that there is much to learn with respect to megaprojects and megaproject management. In recent years, many articles related to megaprojects have been published in project management journals. The next section gives a brief overview of current day megaproject research.

2.2.4 Megaproject research

Wawak and Wozniak (2020) conducted a study on the evolution of project management studies. The results of their study show that megaprojects have been a topic of interest only since 2010. When looking at the progress of megaproject research, Söderlund et al. (2017) show that research in this field has developed rapidly over the past years. Mainly in the fields of management and organization studies, economic geography, and urban planning, megaproject research has increased. According to the article, four pressing and critical issues in megaproject management research are identified: first, the existence and prevalence of megaprojects; second, their management and organization; third, their success and underperformance; and fourth, the future of megaprojects and their ability to address major societal challenges. In this study, the

objective is to develop a better understanding of megaproject success and to investigate how ex-post evaluations can contribute to this. Although there are interfaces with all four issues mentioned by Söderlund et al. (2017), this research best aligns with the third theme which highlights the success and performance of megaprojects.

2.3 Project management

Many of the issues described in the literature regarding megaprojects are related to *project management* or in this context *megaproject management*. In this section, definitions of project management are presented and reflected upon.

2.3.1 Defining project management

While reviewing the conceptualizations of project and megaproject, it becomes clear that (mega)projects need some sort of control or supervision to be initiated, executed and become successful. This very general description can be referred to as project management. Based on an earlier definition by Oisen (1971), Schwalbe (2015, p. 8) defines project management as “the application of knowledge, skills, tools and techniques to project activities to meet the project requirements.” Samset and Volden (2016, p. 3) define it as “the processes established to organize and manage resources required to complete a project within defined scope, quality, time, and cost constraints.” And a more abstract definition comes from Turner (1999, p 6) who defines project management as “the art and science of converting vision into reality.” Mainly the second definition emphasizes the cost, time, and scope components. In the literature, traditional definitions of project management often include these three criteria, commonly referred to by scholars as the *Iron Triangle of Project Management*. This concept serves as the foundation for the current debate regarding *project success*.

As an explicit field of research, project management began to develop in the mid-20th century (Paton et al., 2010). Early scientific literature describes a preference for quantitative and positivist techniques and methods in project management (Clegg et al., 2017). The discipline had evolved from traditional engineering and therefore was seen as rather rational, linear, and value neutral. This traditional view assumes that projects can be managed in a universal way based on best practices. During the 1970s, a new view based on soft-systems thinking was emerging. This perspective emphasized the social and interpersonal aspects of project management. Instead of only striving for the perfect scope, time, and costs, it highlights the facilitation of the entire process to meet the needs and expectations of the stakeholders.

Although this new perspective emerged, the Iron Triangle (or Triple Constraint) is still a deeply rooted concept in the field. The concept represents the relationship between key performance criteria (time, cost, and scope). Projects are often considered successful when they meet these three criteria. Atkinson (1999) argues that the Iron Triangle falls

short in the way we view project success and management. He questions: If projects are within budget, time, and meet the quality, but are, for example, not used by the customers, not liked by the sponsors, or don't provide any effectiveness, then why would we consider them successful? Pollack et al. (2018) studied 45 years of literature about the Iron Triangle and found that time and cost have always been part of it, whereas the status of quality is contested. Other criteria instead of quality are scope, performance, or requirements.

2.3.2 How about megaproject management?

Although megaprojects also need to be managed and project management is involved, it is important to acknowledge the difference between a project and a megaproject. The definition of Schwalbe (2015) does not differentiate between projects and megaprojects. Clegg et al. (2017) stress that there is a difference between projects, large projects, and megaprojects, where the latter should be considered as a different category and therefore be managed in a different way. Megaproject management should focus on context-dependent, interpersonal, and lived experience management, rather than universal models, early definition, and quantification (Clegg et al., 2017). According to Van Marrewijk (2007), challenges regarding megaproject management are related to achieving the project goals amidst a multitude of requirements and expectations, within a highly complex and uncertain setting, in which numerous sources of risk exist. Giezen (2012) states that within planning and development practice, risks and uncertainties are often ignored, making megaprojects inflexible and susceptible to unforeseen events and therefore a challenge to manage. This relates to Flyvbjerg's statement that project managers often ignore 'black swans'. Qazi and colleagues (2016) argue that the management systems of megaprojects therefore often rely on experience and intuition rather than considering risks.

Clegg et al (2017) also stress the importance of *sense-making* and *power dynamics* in megaproject management. Sense-making refers to the ongoing retrospective development of plausible images that rationalize what people are doing. The more 'mega' a project, the harder it becomes to make sense of due to the greater span of contractors, subcontractors, external authorities, stakeholders, and a longer time frame for all of them. Clegg et al. (2017) distinguish three important aspects of sense-making: *social context,* how does the context make sense; *personal identity,* how do I position myself in the context; and *retrospective meaning*, what was its meaning in the past.

Power dynamics play a crucial role in sense-making and megaproject management as well. A well-known example of this is shown in a case study by Flyvbjerg (1998), where he demonstrates how power shapes rationality. Clegg and colleagues view a megaproject as an arena where players from various power fields are engaged. These players, each with different interests, are the stakeholders of the project. The strong power relations between these stakeholders substantially impact the processes and

outcomes of the project. Unlike regular projects, megaprojects attract considerable attention and involve a high number of stakeholders. As a result, they feature highly fluid power dynamics, with shifting power relations among stakeholders that shape the project's reality (Clegg et al., 2017).

Ashkanani and Franzoi (2022) created an overview of challenges, failures and issues, and success factors related to megaproject management. Typical challenges are inadequate management skills, lack of experience, and the duration it takes to complete the project. Research shows that these challenges lead to unstable management structures and poor monitoring and control as many team members leave the project before completion (Ashkanani & Franzoi, 2022).

It can be concluded that there is ongoing debate about the management of megaprojects. Some see it as a rather technical process in which certain universal process steps lead to a successful megaproject, whereas others consider megaprojects as unique entities which all need a different approach. Some emphasize the Iron Triangle as a key guideline, while others place greater importance on stakeholder satisfaction. There is consensus that megaprojects are not merely large projects, but they are especially more complex in their nature. This complexity makes them particularly challenging to manage.

2.4 Defining success

Getting back to Söderlund et al. (2017), one of the pressing research issues related to megaprojects is defining their success or failure. Research by Slavinski et al. (2023) illustrates the most prominent research themes in the history of the *International Journal of Project Management*. One of the five most prominent themes is *Project Success*. Despite the vast majority of megaprojects failing to meet traditional success criteria (*Iron Triangle* - Atkinson, 1999*)*, they are increasing in size and frequency (*Megaproject paradox* - Flyvbjerg, 2003*)*. Success and failure are concepts that depend on how you define them. Also related to megaprojects, it is crucial to first understand how they are defined, measured and applied.

2.4.1 Project success versus project management success

First of all, a distinction can be made between *project success* and *project management success*. De Wit (1988) and Cooke-Davies (2002) make this distinction and describe project management success as being measured against the traditional criteria of success (i.e. time, cost, and scope), whereas project success should be measured against the overall objectives of the project. The two are inextricably linked, however, good project management does not always lead to a successful project and vice versa. "The operation was a success, but the patient died." Even though a project meets its traditional success criteria, it is possible that the objectives are not fulfilled.

2.4.2 Factors versus criteria

Another important distinction that must be made is between project success factors and project success criteria. Mišić and Radujković (2015) highlight this difference and describe it based on the ideas of earlier scholars: Project success factors are the circumstances which can influence the success (in)directly (Lim & Mohamed, 1999), whereas project success criteria are the measures by which projects can be judged in terms of failure or success (Cooke-Davies, 2002). According to Mišić and Radujković, it is still not clear what are the causes of megaproject success and failure. Therefore, they have evaluated the topic through a literature review. Findings indicate that the most important success factors warranting further research are *competence development* and *stakeholder management*. Additionally, while the three traditional criteria of success (Iron Triangle) remain valid today, they alone cannot determine the success or failure of a project.

2.4.3 A literature review of project success

As Atkinson (1999) illustrated, the traditional criteria for project success are deeply rooted in project management literature. Although traditional scholars often refer to the Iron Triangle, the criteria for project success post-implementation vary widely. Atkinson (1999) challenged the Iron Triangle by arguing that time and cost estimations are pure guesses and quality of scope is a subjective phenomenon. Therefore, he proposed a new way of considering success criteria called the *Square Root*. In this model, the criterion of stakeholder benefits is being added to assess project success. This model consists of three categories of project success in which success criteria are being placed based on: 1) technical strength of the resultant system; 2) the benefits to the resultant organization (direct benefits); 3) the benefits to a wider stakeholder community (indirect benefits).

Judgev and Müller (2005) conducted a study to the evolving understanding of project success. They show how our definition of project success has evolved over several decades. This work offers a thorough understanding of the concept of project success and the way in which we perceive it. Tukel and Rom (2001) highlight the importance of scope and argue that scope is the primary determinant of project success. Belout (1998) stresses the importance of project management's value to optimize efficiency and effectiveness. Efficiency is about maximizing the output for a given level of input, and effectiveness means achieving the goals or objectives.

Pinto et al. (2022) describe how project success conceptualization and assessment has become more and more multidimensional, holistic, and dynamic over the past decades. Today, evaluating project success involves various perspectives, including who is making the assessment, when it is being made, what criteria are being used, the type of project being evaluated, and the context in which the project is delivered. Tsoukas (2016) further argues that the notion of project success has grown more complex over the years. Pinto et al (2022) identify three key themes in contemporary project success

literature. The first theme is the measurement of project success, particularly in terms of a project's lifecycle extension. Some argue that a shift from a final evaluation to interim assessment during other project's life stages is needed and might lead to success. Second, the measurement of project success with stakeholders and benefits extension. This is substantiated by Scheepers et al. (2022) who demonstrate that benefits realization management is crucial for successful delivery of a project and, therefore, should be a central aspect of the project management process. And third, the definition of project success should be expanded for various contexts. The growing focus on benefits realization as a key factor in project success allows different sectors, organizations, and projects to establish their own specific target benefits to be achieved from a project leading to a context-dependent definition of project success.

2.4.4 Success criteria

The Organisation for Economic Cooperation (OECD) has effectively advocated for the systematic, and ideally, flexible and adaptive application of their evaluation criteria. They have defined six evaluation criteria: *relevance*, *coherence*, *effectiveness*, *efficiency*, *impact*, and *sustainability*. These criteria serve as a normative framework used to determine the worth of a project (not necessarily a megaproject) (OECD, 2023). Many evaluation frameworks in the literature are built around these criteria (Ika, 2018; Volden, 2018; Williams & Samset, 2010).

According to Turner and Xue (2018) who are critical of the traditional way of assessing megaproject success, megaprojects are highly complex ventures and therefore characterized by *non-linearity*. Hence it is impossible to make an accurate cost and time estimation. Thus, measuring megaproject success by indicators which were based on *guesstimates* is inappropriate (Turner & Xue, 2018). Moreover, given the complexity of megaprojects, minor variations in inputs can result in significant alterations in outputs. Therefore, the initial time and cost estimates hold minimal validity (Turner & Xue, 2018). Although time and cost targets only are insufficient indicators for overall success, they are necessary because megaprojects need to yield a valuable outcome within a timeframe and budget that makes it valuable. Turner and Xue do not want to completely abandon time and cost but rather use them in a different way to measure success. To do so, they have developed a four sublime framework to assess the success of megaprojects. The main objective of this framework is to assess success by evaluating if the megaproject produces an outcome of value at a time and cost that makes it valuable. Their framework is a combination of existing frameworks and theories about (mega)project success. First, the three levels of project success as defined by Xue (2009) are being used. *The output*, the project deliverable; *The outcome*, new competencies desired by the project owner and sponsors; *The goals or impact*, the achievement of high-level goals. Volden (2018) also developed an evaluation framework based on various

criteria, which incorporates the three levels of project success outlined by Xue (2009). This framework will be used in this study and is further explained in section 2.6.

2.5 Evaluation

As Samset and Volden (2016) argue, project evaluation can be essential for enhancing project success and learning purposes. Evaluation in project management can be defined as “the systematic investigation of the effectiveness of a project or other intervention.” (Volden, 2018). Evaluation typically includes a process where primary evaluation criteria are broken down into more detailed questions that are relevant to the specific conditions being assessed (Samset & Christensen, 2015). Rossi et al. (2004) mention that an evaluation demands evaluation expertise and a careful application of scientific methods, with an emphasis on addressing practical issues and providing value to project stakeholders. Evaluations can take place at different stages in the project life cycle. Evaluation of (social)projects and programs became particularly popular in the 1960s and its aim was to learn from successes and failures and improve forward planning (Volden, 2018). Each stage of the project life cycle raises different evaluation approaches that are needed. There can be distinguished between the following evaluation aspects: i) the need for the project (relevance); ii) project design and logic/theory; iii) the implementation of the project; iv) its outcome or impact; (what it has actually achieved); v) its cost and efficiency (Rossi et al., 2004). One form of evaluation is the cost-benefit analysis (CBA). This method provides insight into the (expected) costs and benefits of a project. In the context of transport projects, ex-ante assessments using CBAs are quite common (De Jong et al., 2019). However, ex-post evaluations are conducted very rarely.

2.5.1 Ex-ante evaluation (CBA)

It is essential for policymakers, politicians, and project developers to have a structured and reliable understanding of the costs and benefits of megaprojects in advance to substantiate their choice of project conception. The choice of concept should be validated based on a business case that outlines the anticipated benefits and strategic outcomes of the project (Jenner et al., 2012). Public (mega)projects are often evaluated ex-ante, and certainly in transport projects, ex-ante evaluation is generally a requirement (Van Wee & Kroesen, 2022). Ex-ante evaluation offers strategic insights into key decisions at an early stage, when the opportunity to influence the direction of a project is highest. This method seeks to identify the optimal approach or conceptual solution among possible alternatives (Samset & Christensen, 2015). Therefore, it is an essential part of the business case (Volden, 2019). There are several methods available for ex-ante evaluations. The three most commonly used methods are Cost-Benefits Analysis (CBA), Multi-Criteria Analysis (MCA), and Cost-Effectiveness Analysis (Mouter et al., 2020). Also, evaluations that focus on the environmental impacts of projects, such as

Environmental Impact Assessments (EIA), are becoming more common. When looking at large public transport projects, ex-ante assessments of projects by means of CBAs are quite common, and are mandatory in some countries (The Netherlands, Norway, United Kingdom). The primary aim of CBA is to aid decision-making in the public sector, and ex-ante CBA assists in determining whether to proceed with a project (Boardman 2006). The CBA quantifies a project's societal value by converting its societal effects into monetary terms, based on the amount individuals are willing to pay from their private income. These financial impacts are then compiled into a final metric, the net present value (NPV). A positive NPV indicates that the project enhances societal welfare (Mouter, 2020). So, CBA assesses a project's societal value by quantifying its societal effects and converting both costs and benefits into comparable monetary terms. Although CBA is a widely used evaluation method, it has its pros and cons. The method can serve as a guideline for collecting the necessary data in a systematic way. However, according to Hansjurgens (2004), limits are that CBA might underestimate the costs associated with irreversible changes because it typically assumes that most effects can be quantified and compensated. It can also fall short in accurately forecasting and valuing long-term impacts and CBA can lead to decisions that favor present-day benefits at the expense of future generations. Other limitations listed by Mouter et al. (2014), are for example, that CBA is always incomplete; effect estimations are always uncertain; and effects that are difficult to estimate have a relatively weak position. Yet, professionals in the decision-making process for spatial-infrastructure projects believe that CBA must have a role in the appraisal of projects. Moreover, they prefer the use of CBA to support a 'go' or 'no go' decision for investments over situations without ex-ante evaluations (Mouter et al., 2013). In 2022, an addition was made to the general CBA guidelines in the Netherlands, advocating for greater attention to broad prosperity (CPB, 2022). Broad prosperity has several characteristics aimed at addressing the limitations of CBAs. It takes a broad view of prosperity, considering aspects such as health, safety, and the living environment. It also considers the well-being of future generations, the distribution of prosperity, and the effects on prosperity in other countries.

2.5.2 Ex-post evaluation

While ex-ante evaluations occur before the start of a project, ex-post evaluations are conducted after the project's completion, often during its operational phase. Börjesson et al. (2014) describe three main differences between ex-ante and ex-post evaluations. Firstly, the uncertainties associated with estimating costs and benefits are smaller in an ex-post evaluation compared to a standard ex-ante evaluation. Secondly, one of the hypothetical scenarios stated in the ex-ante CBA has become real when the ex-post evaluation is performed. Factors like economic growth, population growth and varying societal trends are uncertain in an ex-ante situation. However, in ex-post evaluations they can be known. Thirdly, an ex-post evaluation will not be used as a decision support. Ex-

post evaluations have multiple other purposes. According to Samset and Christensen (2015), their main goal is to assess the lessons learned in an undertaking. Andersen et al. (2008) state that conducting ex-post evaluations in the operational phase provides valuable learning that can enhance the design and decision-making for future similar projects. Additionally, De Jong et al. (2019) point out that ex-post evaluations are valuable for verifying if projects have achieved the anticipated benefits, and for identifying which projects perform better or worse than expected, along with the reasons for these outcomes. While ex-ante evaluations are quite common, ex-post evaluations are rarely conducted. Only in the transport sector, some developed countries do require ex-post evaluation. These are then often solely focused on the economic aspects (cost performance and benefit-cost efficiency) (Volden & Welde, 2022). But even in the transport sector ex-post evaluations are rather uncommon. Worsely (2014) refers to them as the "weak link" in the assessment process within OECD countries. The infrequent use of ex-post evaluations for learning may stem from a belief that each project is unique, leaving little to learn across different projects and sectors. Other reasons include limited time and resources, and political disinterests, as evaluations may seem to limit political choice (Dahler-Larsen, 2012). In the literature, it is emphasized that systematic ex-post evaluations should be conducted to learn about the costs and benefits that can be expected (Flyvbjerg et al., 2003; Volden, 2018).

2.6 Evaluation Framework Volden (2018)

Since ex-post evaluations of megaprojects are generally not conducted, an existing evaluation framework is used as a basis for this research. This study employs the evaluation framework by Volden (2018) to assess the success of various large road projects in the Netherlands. This framework combines existing theories on project evaluation by Samset (2003) and Xue (2009) and uses a standard set of evaluation criteria from the OECD-DAC, an internationally recognized institution for evaluation studies. According to Volden (2018), each project follows a *logic model* which can be used for evaluation (*Figure 1*). The logic model consists of the inputs, output, outcome, and societal objective. After defining the logic model, the OECD-DAC evaluation criteria can be used. These criteria are 1) *Relevance (need for the project)*; 2) *Efficiency (whether the uses of resources and time are reasonable)*; 3) *Effectiveness (whether stated goals are achieved)*; 4) *other impacts (what other positive or negative effects may occur because of the project)*; 5) *sustainability (whether the positive effects persist after the conclusion of the project)*. In Volden's (2018) framework, a sixth criterion is added: *benefit-cost efficiency*, which examines the outcome in relation to total costs. The evaluation approach enabled in this framework aligns with the note by CPB (2022) on broad prosperity, making it relevant for this study. Volden's framework has previously been used to evaluate large-scale public road projects and therefore is considered suitable as a basis for this analysis. Ex-post evaluation of public investment projects

addresses actual positive and negative net impact of projects. Therefore, it is a helpful tool in indicating project success. Volden and Samset (2013) recommend that systemic ex-post evaluations of public investment projects should be carried out to learn from experience. The evaluation framework by Volden (2018) is used as a basis for ex-post evaluations of the different cases.

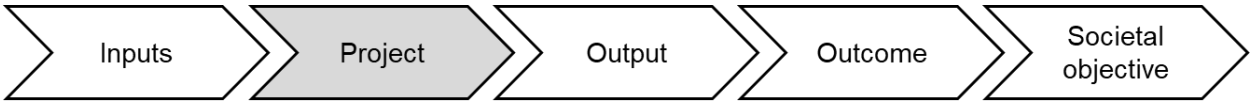


Figure 1: Logic Model - Evaluation framework (Volden, 2018) (Created by the author)

Level of success	Evaluation criterion	Definition
Operational	Efficiency	This criterion concerns project implementation and outputs in terms of cost, time and quality, and how economically the project organization has converted inputs into outputs.
Tactical	Effectiveness	Concerns whether the agreed outcome has been obtained and to what extent the project has contributed to this outcome.
Strategic	Other impacts	This includes all consequences beyond the agreed outcome (i.e. side effects) that can be attributed as the result of the project, positive and negative, short term and long term, for different stakeholders.
	Relevance	A project is relevant if there is a need for what the project delivers. Project relevance is measured in relation to national political priorities, but also stakeholders' preferences. It is essential to bring conflicts of interest to light as part of the evaluation.
	Sustainability	A project is sustainable if its benefits are likely to persist throughout its lifetime. This usually requires that the total impacts (financial, environmental and social) are acceptable in the long run.
	Benefit-cost efficiency	This should be measured in terms of total willingness to pay in relation to cost, or secondarily in terms of outcome in relation to cost (i.e. cost-effectiveness).

Table 1: Evaluation criteria - Evaluation framework (Volden, 2018) (Created by the author)

2.7 Conceptual Model

Figure 2 represents the conceptual model of this research. As described, project success was initially determined using traditional evaluation criteria such as time, cost, and scope, commonly referred to as the Iron Triangle. These criteria are now often considered as measures of project management success. It has become clear that project success does not only depend on these three criteria but also on broader evaluation criteria. These broader criteria are reflected in the framework by Volden (2018) which considers *efficiency, effectiveness, other impacts, relevance, sustainability,* and *benefit-cost efficiency*. In the conceptual model, both aspects of project management and broader evaluation aspects are considered to influence project success. Since ex-ante and ex-post evaluations determine the way in which these aspects are being evaluated, they have an impact on the way project success is perceived.

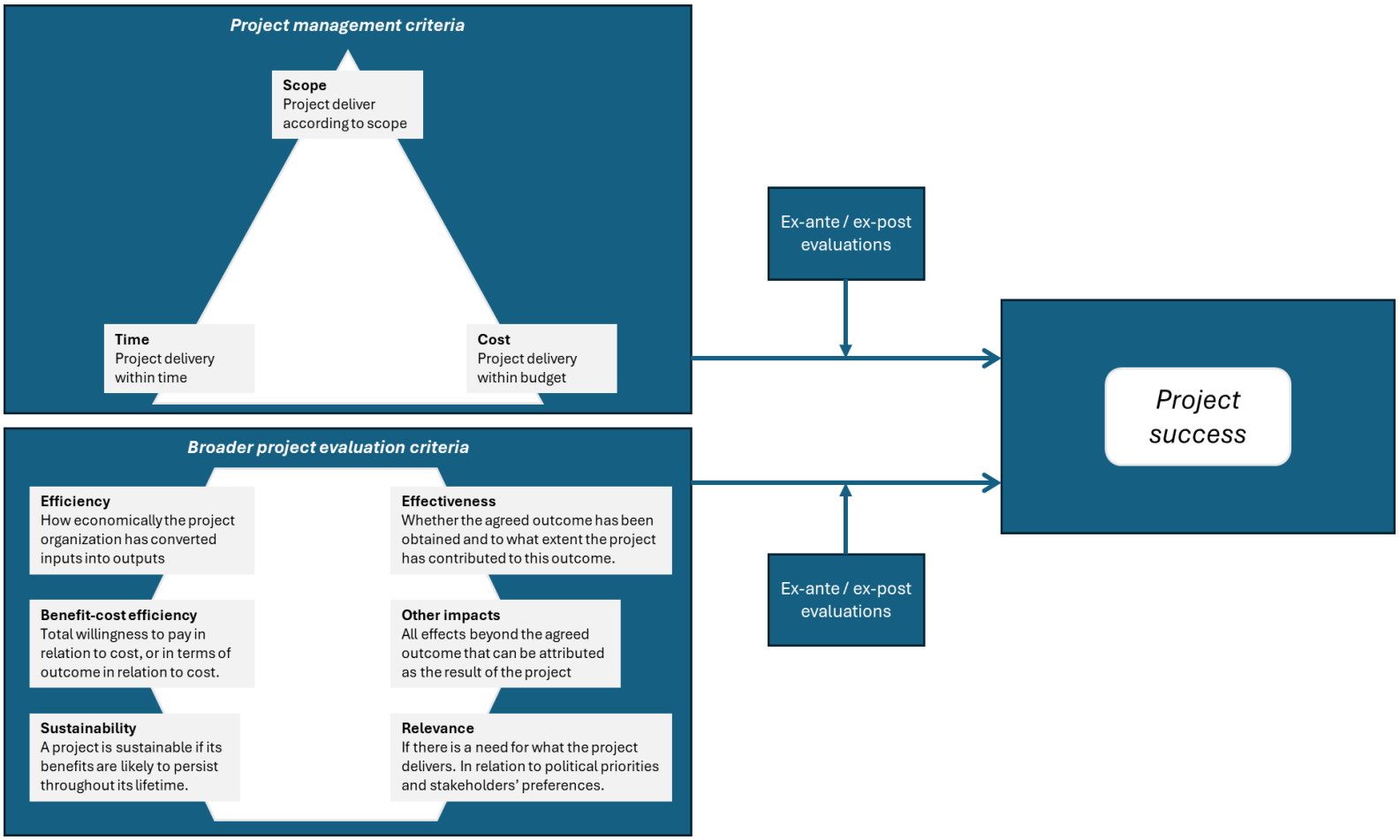


Figure 2: Conceptual model (Created by the author)

Chapter 3 - Methodology

This chapter presents the methodology of this research. First the research design is explained followed by the research methods. For each of the research methods, the data collection and analysis are described. Next, the case selection and case descriptions are presented. Finally, there is a reflection on the ethical considerations of this research.

3.1 Research design

The main objective of this research is to investigate how we can better understand the success or failure of megaprojects, with a specific focus on the role of ex-post evaluations. Based on five sub-questions, the main research question will be answered thereby addressing the research objective. Each sub-question will be answered and discussed based on a specific qualitative research method. Figure 3 is a representation of the research design that was used.

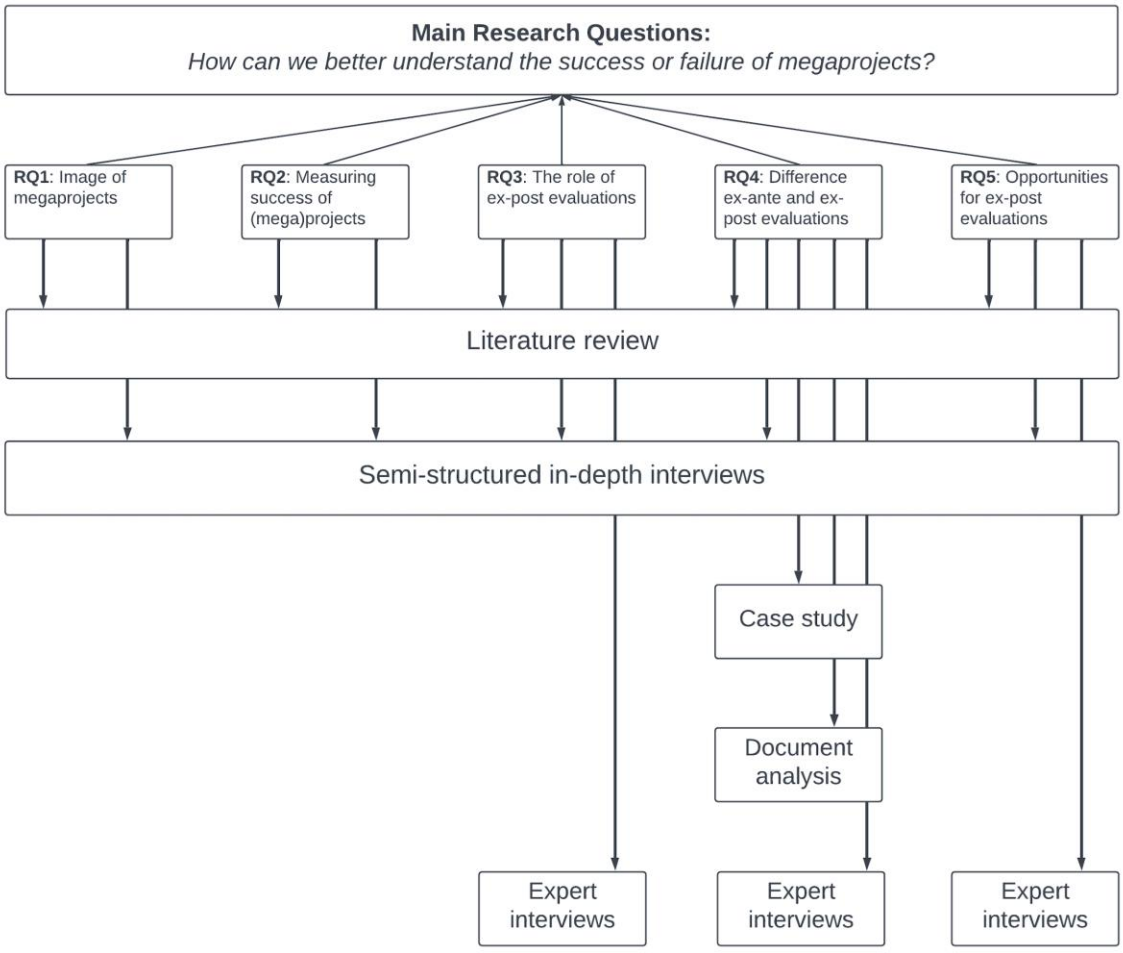


Figure 3: Research design (Created by the author)

3.2 Research methods

3.2.1 Literature review

First a literature review was done focusing on the key concepts of *megaprojects*, *project management*, *project success*, *project evaluation,* and *ex-post evaluation*. A literature review facilitates the identification of gaps, trends, and findings related to these research topics. The emergence of the phenomenon of megaprojects in the literature is relatively recent, having only been actively described since 2010 (Wawak & Wozniak, 2020). In recent years, there has been extensive writing on megaprojects. In 2017, the *Oxford Handbook of Megaproject Management* was published, compiling relevant articles in the field of megaproject management. Due to its relevance in the field, articles from this handbook were chosen as a basis for the literature on megaprojects. Through forward and backward referencing from this handbook, additional relevant articles were selected.

For the other four concepts, leading academic journals in the field were used as the basis for the collection of articles. These included the *International Journal of Project Management*, *Project Leadership and Society*, and the *International Journal of Managing Projects in Business*. Within these journals, applicable articles were selected based on citation index and publication year. Initially, a long list of 60 articles was created, with abstracts, results, and conclusions read. From this list, 30 articles were selected that were relevant to the research question in this study. These articles were summarized and stored in an Excel database for accessibility and overview. Ultimately, this list of 30 articles forms the basis for the theoretical framework and supports the sub-questions.

Based on the literature review, the key concepts were identified and incorporated into a conceptual model. Concepts and theories were examined from various perspectives and then contextualized within this study. Several evaluation frameworks were recognized in the literature, and it was chosen to use the evaluation framework by Volden (2018) as a basis for the in-depth interviews.

3.2.2 Case study research

The second research method that was used in this study is case study research. A case study is an in-depth, multifaceted investigation using qualitative methods, of a single social phenomenon (Feagin et al., 1991). A case study approach is beneficial for researching social aspects, including people's perspectives and actions (Yin, 2003). Hence, it is a suitable method to explore the way in which megaprojects are being evaluated. Important for case study research is the unit of analysis. The individual unit or the cases in this study are five megaprojects. These are all major road-infrastructure projects located in the Netherlands. With five cases, it is possible to explore each case in sufficient depth while also providing a range of perspectives that can offer more comprehensive insights into the research topic. Furthermore, multiple cases allow for triangulation of data, where findings from one case can be cross verified with others

(Kaman & Othman, 2016). For each of the cases, the ex-ante and ex-post evaluations are studied. Case study research offers a comprehensive understanding of a phenomenon within a single setting. Cases are selected from the real world and deal with real-life contexts therefore making the findings relevant to similar practical situations. The in-depth character of case study research is useful for this study because to investigate how evaluation takes place, a thorough understanding of evaluations in real life examples is needed. Taking a case study approach gives the opportunity to also get a contextual understanding of the evaluation of megaprojects. This is relevant because it allows us to examine whether contextual factors such as location, time, and type of project, influence how evaluations are conducted. The case study approach is taken to answer sub-question 4. Due to the case study approach, it becomes possible to perform an in-depth analysis of the ex-ante and ex-post evaluations of five megaprojects.

3.2.3 Document analysis

Within this case study research, a document analysis was used for each of the selected cases. Information about the specific cases was gathered through desk research and document analysis. The Dutch government provides online files on public projects, including the selected megaprojects (Ministerie van Infrastructuur en Waterstaat, 2022). General information about the projects, such as duration, costs, and project scope, was sourced from the *MIRT Project overviews* for the various years during which the projects were constructed (Rijksoverheid, 2022). For each project, several documents about ex-ante analyses were collected including CBAs, Environmental Impact Assessments (TN/MER), and Route Decisions (TB). Furthermore, through contacts with the Economic Expertise Support Center (SEE) and the executive organization of the Ministry of Infrastructure and Water Management (Rijkswaterstaat), it was possible to obtain additional documents, such as a project accountability report. For each case, a summary has been made for various ex-ante documents, which are included in the appendix (*Appendices A-E)*. Ex-ante documents were analyzed with a deductive code tree (*Appendix H) u*sing Atlas Ti. This program offers a tool for qualitative data analysis.

3.2.4 Semi structured in-depth interviews

Ex-post evaluations are very uncommon for (mega)projects (Volden & Welde, 2022; Worsely, 2014). Consequently, there were hardly any official ex-post evaluations available for the selected cases. There are internal evaluation documents within Rijkswaterstaat, but these are not publicly available. Only for the case A2 Passage Maastricht an ex-post evaluation by the Central Planning Bureau (CPB) was available (CPB, 2018). To compensate for this lack of information, it was decided to conduct semi structured in-depth interviews with individuals who are or have been closely involved with the selected megaprojects. Through these interviews, missing information and expert

views on the projects were gathered. The evaluation framework of Volden (2018) was formed the structure of these interviews. The interview guide can be found (*Appendix F)*.

Semi-structured interviews offer the opportunity to deviate from the structure and delve deeper into information that comes up during the interview. Given the exploratory nature of this research, this was a suitable choice. Furthermore, it was chosen to perform these interviews in-depth, meaning to dive into a deeper understanding of the thoughts and experiences of the interviewees. It was decided to interview different individuals involved in each project. The interviewees and their roles are displayed in *table 3*. The interviews were conducted to address the missing ex-post evaluation. People involved in the construction phase were interviewed, as they had insights into the effects that became visible during or shortly after the project's implementation. Often, these individuals continued to closely follow the project because they felt connected to it, providing valuable insights into effects that occurred long after the project's completion. Additionally, interviews were conducted with individuals involved in the control phase, who could offer insights into the long-term effects. These interviews were conducted online via Microsoft Teams. In accordance with the interviewees, the interviews were recorded for transcription purposes. The interviews were analyzed with the help of Atlas Ti. For the structuring of data, deductive coding was used based on the framework of Volden (2018). The code trees can be found in appendix H.

3.2.5 Expert interviews

In this study, two expert interviews were conducted with an employee of the Economic Expertise Support Center (SEE) of the Dutch government. An expert interview is useful for obtaining in-depth insights and knowledge from individuals who possess specialized expertise and authority in a particular field (Döringer, 2021). A preliminary interview was conducted to explore the various ex-ante evaluation methods. This was done prior to the in-depth case study interviews. The information from this interview was used to develop the interview guide for the in-depth interviews. The second expert interview took place after all the in-depth interviews were completed and served as a reflection on the results. The interview guide for the reflection interview can be found in *appendix G*.

ID	Case	Organization/Function	Date & duration	Purpose
E1	n/a	Economic Expertise Support Center (SEE)	10-04-2024 (45 min) 24-06-2024 (45 min)	Information about CBAs Expert interview to evaluate results
R2	A50	Environmental manager - Rijkswaterstaat	24-04-2024 (60 min)	Evaluation
R3	A4	Program manager and project leader - Province of Zuid-Holland	30-04-2024 (60 min)	Evaluation
R4	A2	Environmental manager - Rijkswaterstaat	30-04-2024 (60 min)	Evaluation
R5	A9	Project leader commissioning - Rijkswaterstaat	02-05-2024 (60 min)	Evaluation
R6	A9	Contract manager - Rijkswaterstaat	02-05-2024 (60 min)	Evaluation
R7	A4	Director of Asset Management - Rijkswaterstaat	06-05-2024 (60 min)	Evaluation
R8	A9	Project director - Rijkswaterstaat	07-05-2024 (60 min)	Evaluation
R9	A2	Project control manager - Rijkswaterstaat	08-05-2024 (60 min)	Evaluation
R10	A15	Contract manager - Rijkswaterstaat	10-05-2024 (60 min)	Evaluation

Table 2: Overview of interview respondents (Created by the author)

3.3 The selected megaproject cases

3.3.1 Case selection

In this research, five road-infrastructure megaprojects in the Netherlands were selected for a case study. Cases in the Dutch context were chosen because the Netherlands is a densely populated country. As a result, infrastructure projects have greater impact on society than just accessibility, unlike in sparsely populated areas. The goal is to compare ex-ante CBAs with ex-post evaluations. To potentially compare the megaprojects with each other, it was decided to select cases that took place in the same context. Therefore, it was decided to choose cases in the same country in approximately the same time. Additionally, cases were selected for which ex-ante CBAs had been conducted. Since 2007, the Netherlands has implemented the *Meerjarenprogramma Infrastructuur Ruimte en Transport* (MIRT), a policy framework for the development of integrated infrastructure. This program encompasses all large-scale infrastructure projects in the Netherlands, including several megaprojects. Additionally, it is a requirement for projects in this program to conduct an ex-ante CBA during the exploratory phase of the project. For the case selection, only projects that were completed at least

three years ago were selected so that their potential societal effects could be observed. The initial focus was on projects costing over one billion euros, aligning with Flyvbjerg's definition of megaprojects (Flyvbjerg, 2014). Ultimately, cases costing slightly less than one billion euros were also selected because there were not enough cases exceeding this threshold and Flyvbjerg's one billion euro threshold is arbitrary, as discussed in Chapter 2. Megaprojects are defined not only by their cost but also by their complexity, duration, number of stakeholders, and societal impact. The selected cases were all technically complex, relatively long-term projects, involving numerous stakeholders and having a societal impact. *Table 2* displays an overview of the selected cases based on the information found in MIRT overview documents between 2011 and 2022 (Ministerie van Infrastructuur en Waterstaat, 2022).

3.3.2 Case descriptions

A2 Passage Maastricht

The project A2 Passage Maastricht (A2) is a large-scale infrastructure project aimed at improving traffic flow and road safety in the city of Maastricht. It involved constructing a 2.3 km tunnel to replace the busy surface motorway that intersected the city center of Maastricht. According to the MIRT, the budget was €704 million in 2011 and €847 million in 2017. Construction began in 2010, and the project was completed and opened in 2017. The project is notable for its extensive stakeholder involvement in the form of Public-Private Partnerships (PPPs) and combination of infrastructure and area development.

	Budget start	Budget end	Time construction phase	Type of project	Goals
A2 Passage Maastricht	€704 million	€847 million	2010-2017	Infrastructure and area development including a tunnel in an urban area.	Improve traffic flow and safety in Maastricht.
A4 Delft-Schiedam	€898 million	€658 million	2011-2016	A new highway including a land-tunnel	Create a new connection between Rotterdam and The Hague
A9 Gaasperdammerweg	€1,068 million	€1,203 million	2015-2020	A new land-tunnel in an urban area	Improve traffic flow and livability of adjacent neighborhoods.
A15 Maasvlakte-Vaanplein	€1,428 million	€2,058 million	2011-2015	Road widening including new bridge	Create a redundant road between Rotterdam harbor and hinterlands.
A50 Ewijk-Valburg	€317 million	€270 million	2011-2017	Road widening including new bridge	Resolve traffic issues on the A50 trajectory between Ewijk and Valburg.

Table 3: Overview cases (Created by the author, data retrieved from MIRT documents)

A4 Delft-Schiedam

The A4 Delft-Schiedam project (A4) was designed to complete the missing link in the Dutch highway network between Delft and Schiedam. With this new highway, there was a better connection between Rotterdam and The Hague, and the adjacent road network was relieved. The project involved building a 7 km highway, including a 2 km land tunnel to reduce environmental impact and noise for nearby residents. According to the MIRT, the budget was €898 million in 2011 and €658 million in 2016. Construction began in 2011 and the project was completed in 2016. The project involved more than the construction of a new highway, as an integrated development approach was used. Thanks to an integrated cooperation agreement (IODS), many other local projects were carried out.

A9 Gaasperdammerweg

The A9 Gaasperdammerweg (A9) project is part of the overarching Schipol-Amsterdam-Almere (SAA) infrastructure programme. The A9 highway runs through the residential district Amsterdam Southeast. For the project, the road was widened, and a 3 km land-tunnel was built to replace the former road. This was done to realize a smoother traffic flow and improve the livability of the adjacent neighborhoods. According to the MIRT, the budget was €1,068 million in 2017 and €1,203 million in 2022. Construction began in 2015 and the tunnel was completed in 2020.

A15 Maasvlakte-Vaanplein (MaVa)

The A15 Maasvlakte-Vaanplein project (A15) involves a section of the A15 highway between the Rotterdam Harbor and Rotterdam. The project included road widening and the construction of a new bridge over the Botlek. The goal of the project was to create a redundant road between the port of Rotterdam and the hinterland. According to the MIRT, the budget was €1,428 million in 2011 and €2,058 million in 2016. The construction began in 2011 and the project was completed in 2015.

A50 Ewijk-Valburg

The A50 Ewijk-Valburg project (A50) was originally part of a larger initiative between Ewijk and Grijsoord. The goal of the project was to resolve traffic congestion issues in the area. To achieve this, the road was widened and a new car bridge crossing the Waal River was constructed. According to the MIRT, the budget was €317 million in 2011 and €270 million in 2017. The construction began in 2011 and the project was completed in 2017.

3.4 Ethical considerations

One of the primary goals of research ethics is to ensure the well-being of research participants (Wassenaar, D. & Mamotte, N., 2012). Conducting interviews is a research method where careful attention to detail is crucial. There are several ethical considerations that are important to observe to ensure the validity and reliability of the research (Clifford et al., 2010). Prior to the interviews, a consent form was sent out to the interviewees (*Appendix J)*. At the beginning of each interview, the content of the interview was clearly explained, permission to record the meeting was requested, and it was emphasized that the interview could be stopped at any time. To ensure the privacy of the interviewees, it was decided to anonymize them in this thesis. The recordings and transcripts were stored on a computer accessible only to the researcher and will be deleted within two weeks after the completion of this thesis.

Chapter 4 - Results

This chapter presents and analyzes the collected data. For each case, first the ex-ante evaluation documents are presented. These include the expectations about the projects from an ex-ante perspective. Subsequently, the results of the interviews for each case are presented. The results are presented based on the six-criteria evaluation framework by Volden (2018). The six criteria that are used are: *efficiency, effectiveness, other impacts, relevance, sustainability,* and *benefit-cost efficiency (Tabel 1).* After evaluating the different cases, the results from the in-depth interviews and expert interview regarding the remaining sub-questions are presented.

4.1 Results case study

4.1.1 A2 Passage Maastricht

Ex-ante evaluations

In 2004, Ecorys conducted a pre-CBA study on the economic effects of the tunneling of the A2 in Maastricht (Ecorys, 2004). In 2006, a similar study was completed and acknowledged as the official CBA of the project. However, this document was not publicly available. Therefore, the Ecorys (2004) study is used instead. This study concluded that the construction of the tunnel will lead to travel time savings for road traffic and benefits for freight transport due to the increase in delivery reliability (*Appendix A3*). The tunneling will increase the regional product and employment in South Limburg, particularly in Maastricht, during the period 2012-2014. The benefits calculated in this study show that their value is approximately €1 billion. Furthermore, it stresses the travel time losses for road traffic during construction. Finally, it emphasizes the importance of an integrated vision for the northern and southern parts of the city, as well as an integrated vision for the adjacent neighborhoods. It is noted that the construction of the tunnel will reduce barrier effects.

Furthermore, a TN/MER was conducted by Oranjewoud in 2005. This TN/MER includes an overview of 15 aspects (effects, contributions, and project goals) in which an assessment is provided for 12 variants (Oranjewoud, 2005). The tunnel alternatives score high for traffic flow, accessibility, noise pollution, landscape integration, spatial integration, safety, and economy. They have no impact on, or score low on emissions, immission (deposition of substances or gasses in a specific location), and groundwater (*Appendix A4*).

Ex-post evaluation (CPB, 2018)

Ex-post research by the Central Planning Bureau (CPB) looks at the livability benefits for existing houses due to the tunneling of the A2 in Maastricht (CPB, 2018). This was done by using a hedonic price analysis, which is a valuation method used to

determine the willingness to pay for various effects. With this method, the increase in housing prices was assessed. The researchers compared the price increase of houses near the tunnel to those located more than two kilometers away in Maastricht. If the houses near the tunnel showed a more rapid increase in value, this was attributed to the improved livability resulting from the tunneling. Their analysis concluded that the total livability benefits for existing houses within one kilometer was around €220 million. This finding highlights the importance of livability benefits in the Cost-Benefit Analysis of urban infrastructure projects.

Ex-post evaluation interviews

Regarding *efficiency*, the interviews reveal that the project experienced multiple delays due to new safety measures and several budget increases because of scope changes. Nevertheless, the project was completed on time, and the interviewees agreed that the pre-agreed inputs were efficiently converted into the desired outputs.

"There were a few adjustments because the regulations regarding tunnel safety had changed." (R4)
"We aimed for the tunnel to be operational by 2016 from the very beginning, and we achieved that." (R4)

The project's *effectiveness*, or the tactical goals, were all achieved and deemed very successful according to the interviews. The noise issues were resolved, air quality improved, accidents decreased, and housing development on both sides of the road received a boost. The effectiveness of the market approach, which opted for a PPP, is also emphasized. Both the TN/MER and the pre-CBA mentioned that the tunnel variants have positive effects on noise, air quality, and safety, which aligns with the results of the interviews.

"According to air monitoring stations, air quality has improved. This is because all those trucks are no longer driving through the city." (R4)
"The noise problem has been resolved because the road is now underground." (R4)

Other effects that were not anticipated include the livability benefits mentioned in the CPB (2018) report and the project's current role as a model for other tunnel projects. The successful and compliant completion of the tunnel may have resulted in fewer issues with tunnels constructed later.

The successful completion of this tunnel had the effect of reducing complications with tunnels constructed later." (R9)

The project was considered highly *relevant* by the interviewees. The CBA and TN/MER also indicate that there were sufficient reasons to address the A2 issue. An interesting finding from one of the interviews related to relevance is the remark that the national prioritization at the time of the project decision was very favorable.

"Today, it might be more challenging to get a tunnel project like this approved. In that sense, we were fortunate that all parties came together around the year 2000 with the idea for a tunnel." (R4)

From a *sustainability* perspective, the construction of the tunnel established a new route that, in theory, could last for hundreds of years. The fact that houses are being built on the green corridor is also permanent. The interviews highlight the enduring livability component, stating that the long-term benefits will persist because the road is a tunnel. The issues with traffic lights and air quality have been resolved and will remain so.

"The issues with traffic lights and air quality have been resolved with the tunnel, and this can naturally be translated into sustainability gains." (R9).

Looking at the *benefit-cost efficiency*, it could be concluded that the CBA and TN/MER were too pessimistic. The CPB (2018) study shows that the livability benefits are much higher than expected. Results from the interviews also mention other aspects not explicitly covered in the ex-ante documents, such as the "pride" that has emerged. One of the interviewees stated that residents of Maastricht are "proud of the tunnel". Also, the expansion effects of the area development around the tunnel are better than expected.

"The neighborhoods and Maastricht are proud of the tunnel." (R4)
"Around €1.2 to €1.3 billion was spent on construction costs, and when you see what the project is now delivering, it will be recouped very quickly." (R9)

Overall, it can be concluded that the project delivered more benefits than anticipated in the ex-ante documents. While the ex-ante documents estimated the total benefits to be around €1 billion, an ex-post study revealed an additional €220 million in livability benefits that were not previously accounted for. The TN/MER indicated that the tunnel might have negative effects on emissions, immission, and groundwater. However, interviews suggested that emissions have improved since most freight traffic now travels underground. There was no information available about immission and groundwater. Furthermore, the TN/MER predicted potential positive impacts of the tunnel, which were confirmed by the interviews. These include improved air quality, less noise nuisance, and improved safety.

4.1.2 A4 Delft-Schiedam

Ex-ante evaluations A4

In 2006, Ecorys conducted a CBA for the A4 project. Three types of effects were assessed and categorized into a total of nine sub-effects. Conclusions were written for each of these (Ecorys, 2006). Direct effects include, for example, a 3.5% increase in commuter traffic in the area, and a 1% increase in business traffic. Regarding travel time benefits, the CPB assigned a 25% travel time valuation. Indirect welfare effects are also

discussed; for instance, commuters might take jobs further away due to shorter travel time and a stronger competitive position of companies in the region can lead to increased employment that benefit from travel time savings. The welfare effect of these indirect effects is estimated to be 20%-30% of the value of the direct benefits (*Appendix B4)*.

The TN/MER for this project was conducted in 2009 (Rijkswaterstaat 2009b). It was used to evaluate the effects on nature of different variants based on various criteria and sub-criteria. In this document five variants are presented and analyzed. The variant that was ultimately included in the final route decision, is variant 1b: *A4 IODS Adjusted Tunnel Mouth*: a wide tunnel with covered main and parallel lanes, without flipping the Delft-Schiedam connection. The TN/MER shows that the construction of this variant has a negative impact on the natural criteria of destruction and fragmentation. Destruction meaning the road could lead to complete disappearance of local natural values, and fragmentation referring to the fragmentation of species habitats. It scores neutral for the criteria of disturbance, drying, and pollution (*Appendix B3*).

In 2009 an additional CBA was conducted by Rijkswaterstaat (Rijkswaterstaat, 2009a). This CBA focuses on five categories and examines the associated sub-effects. Five different variants are compared. Variant 1b ultimately scores the highest in terms of the cost-benefit balance. Conclusions from this CBA indicate that the A4 Delft-Schiedam alternatives perform better than the A13 and A13/A16 alternatives. The effects on accessibility provide the greatest benefits for all variants. The indirect effects are estimated to range between €222 million and €339 million.

Ex-post evaluation interviews

Efficiency: According to the MIRT documents, the project experienced a substantial financial windfall due to favorable tendering outcomes (Rijksoverheid, 2015). However, an interview revealed that new tunnel legislation implemented between 2006 and 2010 required adjustments to the tunnel design and thus exceeded the budget.

"If you look purely at the construction costs, excluding the price increase due to the tunnel legislation, the project did remain within budget." (R3)

Regarding *effectiveness*, the interviews revealed that the project has been very effective in solving certain issues. For example, improvements in traffic flow on the surrounding network, and increased predictability were mentioned. The latter refers to the previous situation in which the travel time between Rotterdam and The Hague by road was highly unpredictable. Another interviewee mentioned that while implementation of the project was effective, it also felt like a prestige project to him.

"I think it's extremely effective. Of course, there are still issues, but for example, in terms of travel time, you can now drive from Rotterdam to The Hague and vice versa without any problems." (R3)
"I think it has helped to some extent, but in my opinion, it was also somewhat of a prestige project." (R7)

Mentioned *side effects* of the project include the uncertainty that was eliminated by the decision to build the road. The TN/MER addresses the environmental effects, indicating that the A4 variants have a negative impact in terms of destruction and fragmentation. The construction of the highway led to the destruction of nature. However, the interviewees also highlight various compensatory measures taken to mitigate this impact, and mainly thanks to the IODS agreement, the region is ahead on certain climate goals.

"The discussion about the A4 lasted for decades. This was a significant source of uncertainty for people in the area. An important effect is that this uncertainty has now been removed." (R3)
"Farmers in this area are much further along in terms of climate goals related to nature and water because they were encouraged by the IODS agreement at the time." (R3)

The *relevance* of the project, according to one interviewee, is primarily linked to its strategic location and its importance to major economic hubs such as the Port of Rotterdam and the greenhouse horticulture sector in Westland. It is argued that this new road connection was necessary to accommodate the economic growth in the area. It is noted by the interviewee that if you ask someone who is less interested in economic growth, they will likely have a different perspective on the relevance.

"There is Mainport Rotterdam, greenhouse horticulture in Westland, and two major cities, Rotterdam and The Hague. It is crucial that this economic area remains well connected." (R3)

Regarding *sustainability*, both interviewees noted that since it is a new highway, sustainability is inherently debatable. However, they also mentioned several lasting green effects, such as additional nature connections, and newly created nature areas. The TN/MER highlights the effects of a tunnel on the groundwater level. One of the interviews revealed that there have been concerns among various parties about the long-term groundwater levels. The long-term impact of this road on the groundwater remains unclear.

"Ultimately, it's a road, and a lot of cars drive on it." (R3)
"There have also been concerns about the long-term impact on the groundwater level." (R3)

With regards to *benefit-cost efficiency*, one of the interviewees mentioned that they believe the road has already repaid its economic benefits threefold, primarily due to the side effects that have arisen from future-proofing the surrounding area concerning climate and environmental challenges. The other interviewee argues that when looking purely at the cost per kilometer, it was a very expensive project compared to one at ground level. The CBAs indeed indicate that the costs for the tunnel alternatives are much higher, but the cost-benefit balance is also higher.

"In terms of economic benefits, the road has already paid for itself three times over. Also due to side effects, such as the area now being prepared for certain climate and environmental challenges." (R3)
"Purely looking at the cost per kilometer, it was a very expensive project compared to a highway at ground level." (R7)

Despite scope changes, the inputs seem to have been efficiently converted into the desired outputs. The project appears to have been effective in solving certain traffic problems and has also fostered strong regional cooperation. The interviewees consider the project relevant, but they note that it depends on the perspective from which it is viewed. It was, at least, relevant for ensuring economic growth. In terms of sustainability, the project contributed to sustainable development among local farmers. Regarding benefit-cost efficiency, opinions are divided. One interviewee claims that the road has long since paid for itself, while another notes that the cost per kilometer was extremely high.

4.1.3 A9 Gaasperdammerweg

Ex-ante documents

There were no ex-ante documents available specifically for the A9 project because this project is part of the larger SAA program. The TN/MER for the SAA program specifically addresses several aspects of the A9 project (Arcadis, 2008). It concludes that, in the chosen plan for a land tunnel, there will be relatively large reduction in noise compared to other alternatives. Furthermore, the document states that the A9 project will bring substantial traffic disruption in the construction phase. Therefore, it was decided to construct the tunnel in two phases.

In a CBA, it is concluded that the integration costs for the submerged options of the A9 are high for all alternatives (Decisio BV & 4Cast, 2006). It is not possible to calculate a cost-benefit ratio for the individual routes. Additionally, the benefits are highly dependent on the traffic-related effects. The spatial effects of infrastructure are hardly considered in the welfare calculations of the CBA. The same applies to distribution effects and contributions to strategic objectives.

In a second opinion by the CPB on the earlier CBA, the covering or tunneling of parts of the A9 project is discussed. It concludes that covering or tunneling will have a positive effect on local air quality, reduce noise pollution, and generate revenue from the sale of land on and around the tunnel (CPB, 2007). This can also create a more attractive urban landscape, positively impacting the living environment. On the other hand, the covering and tunneling will require additional provision for the transport of hazardous materials.

Ex-post evaluation interviews

For the A9 project, it is more challenging to compare evaluations because the project is part of a larger program (SAA). As a result, the project is not individually listed in the MIRT project books, and there is no CBA available solely focused on A9.

Looking at *efficiency*, initially the project was ahead of schedule and could have been completed earlier than planned. However, new fire resistance requirements necessitated modifications to all walls and ceilings in the tunnel. Because the project was ahead of schedule, it was possible to carry out these additional tasks before the planned completion date.

"Another solution chosen for the fire safety issue was the installation of additional heat-resistant cladding. This caused a delay of nearly a year." (R4),

Regarding *effectiveness*, the CBA and TN/MER indicated that covering/tunneling would have positive effects on local air quality, reduce noise pollution, create land for housing, and contribute to a more attractive urban landscape. The interviewees mainly focused on the project's effectiveness in addressing the traffic bottleneck, which has been found to be very effective so far. One of the interviewees also addresses stakeholder satisfaction, noting that after the project's completion, stakeholders are positive about the tunnel's impact.

"Eliminating daily traffic congestion was the goal regarding traffic flow, and that has been achieved." (R5)
"I believe all stakeholders are very satisfied with how the tunnel was constructed and the impact it has had." (R6)

Various *other impacts* were mentioned in the interviews. For example, there were several unexpected events during the project for which solutions were found, benefiting other (tunnel) projects in the Netherlands to this day. For instance, the issue with fire-resistant concrete that arose. Additionally, at the end of the construction phase, a problematic invasive plant species was discovered in parts of the tunnel. Lessons from these events are now applied in new tunnel projects. These are unforeseen issues that could not have been anticipated in ex-ante documents.

"Because we took steps to improve fire safety at that time, current projects in the construction phase are now reaping the benefits." (R5)

According to the interviews, the *relevance* of the project is linked to the relevance of the entire SAA program, which aims to improve the accessibility of the entire region and its economic importance for the Netherlands. One interviewee noted that relevance is very subjective. Someone who lives along this road will have a different perspective on the project's relevance than someone who never uses it. The specific relevance of the A9

in the ex-ante documents is mainly associated with improving the livability of the surrounding area. By tunneling, air quality will improve, noise pollution will decrease, and the barrier effect between neighborhoods in Amsterdam Southeast will be eliminated.

"Talking about relevance, you need to look more broadly at the entire SAA program. Its goal is to improve accessibility for the entire region and the economic importance of the Netherlands as a whole." (R8)
"But if you ask the same question to a resident along the route, you'll get a completely different answer." (R8)

Regarding *sustainability*, the interviewees highlighted several (unexpected) sustainability aspects of the project. There was a focus on certain sustainable practices that were implemented during the project. Also, the solar fields, which were added later to the scope, were mentioned.

"Glow-in-the-dark asphalt was installed in the tunnel, reducing the need for lighting and thus consuming less energy." (R6)
"The solar panel field, which was added to the scope during the course of the project, can potentially meet the tunnel's energy consumption needs." (R6)

The interviewees indicated that they did not yet have a clear view of the benefit-cost efficiency of the project. They also doubted whether they were in the right position to make a judgment on this matter.

"That's an accountant's question. You would need to include not only the technical figures but also the social figures, which is not my area of expertise." (R5)

Despite an unexpected setback, the project's inputs were efficiently converted into the desired outputs, mainly because the project was ahead of schedule. The project appears to have been effective in solving traffic issues and has led to various livability improvements. Other impacts of the project include the development of solutions for unforeseen events, from which similar projects can learn The interviewees consider the project relevant, but they note that this depends on perspective. Various measures were mentioned that demonstrate consideration for sustainability. The interviewees could not comment on the benefit-cost efficiency.

4.1.4 A15 Maasvlakte-Vaanplein

Ex-ante documents

The TN/MER emphasizes that the A15 is a crucial transport route connecting the Rotterdam port and industrial area with the European hinterland (Commissie m.e.r., 2000). The project aims to improve accessibility and traffic safety. Additionally, it seeks to enhance spatial quality by reducing clutter, alleviate ecological bottlenecks, eliminate barriers, and reduce the number of people affected by noise pollution. Ultimately, the

utilization alternative with a new bridge that can also accommodate train traffic was chosen. The evaluation considered traffic and economic impacts as well as effects on spatial planning and the environment. Effects related to the *utilization alternative* include improved traffic flow, relatively improved load on the underlying road network, and enhanced traffic safety, but a lower score regarding reliability of traffic handling. All alternatives show improvements to the spatial structure and provide a better situation for the transport of hazardous materials. However, concerning soil and water, all examined variants score poorly compared to the reference situation (*Appendix D3*).

Since the publication of the TN/MER, work has been ongoing on a route decision for a *utilization alternative*, including the construction of a new 2x2 lane bridge at the Botlek crossing. This CBA by Ecorys (2005) provides insight into the economic effects of the proposed solutions, particularly in the debate about replacing the bridge with an alternative connection. The CBA shows that all tunnel options are less socially beneficial compared to the bridge options. It was found that the number of complex situations occurring with a tunnel is the same as with a bridge with two lift openings, making the impact on nautical safety identical for both alternatives. Since the likelihood of a calamity is very small and varies little between the options, the effect on social returns is minimal. Finally, it is noted that if the connection is closed for an extended period, it will impact the image of the Port of Rotterdam (*Appendix D4*).

Ex-post evaluation interviews

The A15 project was conceived to accommodate the future growth of Mainport Rotterdam and regional traffic. The main outputs are the expansion of road capacity to 2x3 + 2x2 lanes, the reconstruction of two traffic junctions, and the construction of a new bridge over the Oude Maas (Nieuwe Botlekbrug). The interviewee, an operations manager, mentioned that it is currently difficult to assess whether the inputs have *efficiently* achieved the desired outputs. This is because the project is under a Design Build Finance Maintain contract (DBFM), with the maintenance phase still running for another 25 years. In this type of contract, the contractor is responsible for the design and construction of the project, as well as its financing and total maintenance.

"It is difficult to predict 20 to 25 years ahead what the costs will be and what efforts will be required to keep the area available." (R10)

In terms of *effectiveness*, the aim was to improve traffic flow in the Mainport Rotterdam region and address the nautical bottleneck at the Oude Maas. If the project would not have been executed, there would now be substantially more traffic congestion, and the connection between the port and the hinterland would be worse. Additionally, the project has created a redundant road system. This means that if one road needs to be closed, there is always an adjacent road that can remain open, ensuring continued traffic flow in case of disruptions. The interviewee highlighted that this redundancy works well

in practice. Before the project, a malfunction in the bridge would result in the closure of the entire route, severely impacting shipping and causing economic damage.

"In terms of traffic flow, it has definitely had an impact. The infrastructure is in place, and while there are still traffic jams, traffic has also increased, which always happens. You can see that traffic flow has improved." (R10)

When looking at *other impacts* the anticipated changes in air quality were milder than expected in the TN/MER. The interview primarily highlighted the effects of the DBFM contract form. The contractor has considerable work to ensure that third parties do not damage the infrastructure, as any non-compliance results in fines for the contractor. Another side effect mentioned is that the availability of the road is higher than in comparable projects. The interviewee believes this is due to the DBFM form, which ensures thorough monitoring of the road's condition.

"Our contractor has a lot of work to ensure that third parties do not damage their infrastructure. If the infrastructure does not meet the standards, the contractor receives a fine." (R10)

According to the interviewee, the *relevance* of the project was high and will remain. The CBA and TN/MER indicate that the *utilization alternative* was chosen, which includes the construction of a new bridge. This alternative is expected to yield the most benefits in the long term. The interviewee mentioned that the availability of a hinterland connection is crucial for the project's relevance. The TN/MER thoroughly examines the aspect of traffic safety. However, it states that in the Botlek area, none of the alternatives solves the issue, some homes being within the risk contour of hazardous substances.

"When the route is closed, freight traffic, sometimes carrying hazardous materials, has to detour 95 km. You don't want that. Therefore, you want the route to be reliable." (R10)

Regarding *sustainability*, the interview reveals that due to the contract duration, the entire consortium benefits from each other's developments in sustainability over 20 years. The project is also considered sustainable in terms of civil constructions, with the interviewee stating that it will easily last over 100 years. Additionally, research is being conducted into the installation of solar panels over large areas of the project.

"As for civil structures, it is certainly sustainable; it will definitely last 100 years." (R10)
"They are not installed yet, but research is also being conducted into a number of solar fields in the area." (R10)

The *benefit-cost efficiency* is assessed as 'neutral' by the interviewee.

"I would consider that neutral." (R10)

Summarizing, it is unclear how efficient the project will be because it was executed under a DBFM contract and therefore is still considered unfinished. The project has been effective in resolving traffic congestion, which aligns with the expectations outlined in the ex-ante documents. Among other effects, the positive impact of the DBFM contract is highlighted, something not mentioned in the ex-ante documents. The project is considered relevant as it provides a solution for the fragile road connection between the port and the hinterland, thereby holding substantial economic value. In terms of sustainability, the DBFM contract's advantage is again noted, as involved parties can benefit from each other's expertise. The benefit-cost efficiency is estimated to be neutral.

4.1.5 A50 Ewijk-Valburg

Ex-ante documents

In 2005, a TN/MER was completed for the Ewijk-Grijsoord route (Rijkswaterstaat, 2005). The A50 highway plays an important role for both national and international traffic as well as regional traffic in the Arnhem-Nijmegen area. Within the region, the A50 serves a crucial function for cross-river traffic over the Waal and the Neder-Rijn. In previous years, various 'utilization measures' have already been taken. The goal of this TN/MER is to find solutions for the inadequate flow and insufficient capacity of the A50 from Ewijk to Grijsoord. Additionally, it aims to provide insight into the environmental impacts, such as noise pollution, air quality, nature, and landscape. The TN/MER shows that all alternatives that are rated best from the perspective of traffic and transportation lead to the most extensive interventions at the expense of nature and landscape (*Appendix E3*).

The route decision for A50 Ewijk-Valburg was taken in 2010. In the route decision, the terms 'modest' and 'efficient' are frequently mentioned (Commissie m.e.r., 2010). Traffic forecasts for 2020 are taken into account. Both junctions are to be reconstructed in a 'modest' and 'efficient' manner. The route decision also considers reducing noise pollution compared to the year 2000. Additionally, it investigates whether a speed limit is necessary to comply with air quality standards (*Appendix E4*).

Ex-post evaluation interviews

The Ewijk-Valburg project was part of the original plan to widen the Ewijk-Grijsoord route. The goal was to address the traffic congestion on this route by widening the road to 2x4 lanes. This included the construction of a new Waal Bridge and the reconstruction of two junctions. All these measures were completed within the agreed budget. Yet, the planned completion was delayed due to delays in the repair work on the existing bridge. The inputs were thus quite *efficiently* converted into the planned outputs. According to the interview, some funds were even returned because all outputs had been realized with less money.

"From the moment the scope was set - the decision for 2x4 lanes, the new Waal Bridge, and converting junctions - we remained strictly within the time and budget." (R2)

"Ultimately, we even returned about 5 or 6 million because we had surplus funds." (R2)

When the first section of the road opened in May 2013, the traffic congestion disappeared immediately. Therefore, it can be concluded that the project was very *effective*. However, looking a few years ahead, the congestion has shifted a few kilometers down the road, although it no longer exists on the specific section.

"The project was definitely effective. We opened it in May 2013, and from one day to the next, the traffic jams were gone." (R2)
"If you look now, a few years later, the traffic jams have actually moved from this section to another area." (R2)

Initially, the interviewee mentioned that he couldn't identify any concrete *other impacts*. He noted that whenever a traffic bottleneck is resolved, the congestion tends to move a few kilometers down the road, which is something you can anticipate in advance. An unexpected effect was the initial resistance from local residents who feared that the road widening would increase noise pollution. Thanks to various noise mitigation measures, the road is now quieter than before the project.

"Initially, there was a lot of resistance to the widening, mainly due to concerns about noise pollution. Now, in 2024, you don't hear any complaints about noise pollution anymore because it's hardly an issue." (R2)

The *relevance* of the project was high at the time, as the route had been high on the traffic jam top 50 list for years. The TN/MER anticipated substantial noise pollution as a result of the project. In practice, however, the noise pollution has been less severe than expected. The interviewee noted that many new houses have been built along the highway and that residents have scarcely complained about noise since the project's completion. This could be attributed to the use of porous asphalt, and the installation of noise barriers. The interviewee highlights improving traffic flow, accessibility, and livability as the most important aspects of the project's relevance. Additionally, they mention the economic significance, noting that the Dutch economy heavily relies on logistics, and such a road widening ensures the efficiency of the logistics sector. The TN/MER reveals a contrasting tendency between the positive assessment for traffic and transport and the negative impacts on nature and landscape, which the interviewee also cites as the main opposition to the project.

"The enormous economic importance is that a significant part of the Dutch economy relies on logistics, and such a road widening ensures that this logistics network can continue to operate efficiently." (R2)

The *sustainability* aspect was not extensively investigated, so the interviewee could not provide a clear answer on this. The TN/MER outlines various measures to minimize damage to nature and the environment.

Regarding benefit-cost efficiency, the interviewee mentions that the project was predicted to generate €115 million per year in travel time savings. If this calculation is accurate, the project would have paid for itself in three years.

"In terms of travel time savings, it was predicted to be 115 million per year. If that's accurate, the project would pay for itself in three years." (R2)

Overall, the efficiency of the A50 project was considered good, but delays in work outside the project led to a later-than-expected completion. The project remained well within budget. The project obtained the expected results of solving the traffic congestion. Though, as is common in road widenings, the congestion moved elsewhere. Other effects showed that the noise pollution for local residents was less severe than anticipated. The project's relevance was high, as the route had been at the top of the congestion rankings for years. Regarding sustainability, the interviewee could not make any statements. On benefit-cost efficiency, the interviewee noted that in terms of travel time savings, the project had paid for itself within three years.

4.1.6 Comparing cases

All cases are based on clear traffic problems, which are resolved in each case by increasing road capacity. Cases A2, A9, and A4 (partly) are projects that took place in highly urbanized areas. Consequently, the ex-ante documents emphasize an integrated area approach, which focuses not only on the construction or widening of a road but also on improving the overall livability of the area.

From cases A2 and A4, the value of collaborative partnerships is explicitly highlighted. Both cases initiated multi-layered collaboration prior to the project, with a strong emphasis on PPPs. Case A9 is a project that is part of the SAA road program, and it has been repeatedly noted that the project cannot be viewed independently from the larger program. Another commonality among these three cases is that they all dealt with stricter tunnel regulations during the exploration or construction phases of the project. For the A4, this led to delays in the exploration phase because the tunnel design had to be completely revised. The A9 project was already in the construction phase when it was discovered that the concrete did not meet fire safety requirements. This caused delays, but since the project was ahead of schedule, it was still completed on time.

In interviews for these three cases, the aspect of "learning effect" and "confirmation" were frequently mentioned. Massive delays and escalating costs during earlier tunnel projects had caused a bad reputation for tunnel constructions in the Netherlands. Independently, it was noted that these three projects helped to end bad reputation because they were relatively successful in terms of time and budget.

For all five cases, there are generally positive responses regarding air and noise effects. In the tunnel projects A2 and A9, it is noted that thanks to tunneling, air quality has greatly improved, and noise pollution decreased. The A4 is a completely new route,

which inevitably caused a decline in air quality in the immediately adjacent areas. However, the construction of the A4 may have improved air quality on adjacent routes, due to reduced traffic and congestion on those sections. Similarly, in the cases of the A15 and A50, the air and noise effects are reported to be more positive than initially expected. A possible reason for these findings could be the strict process that such projects in the Netherlands must follow. All these projects are required to conduct an Environmental Impact Assessment, which reports the environmental and nature-related impacts of these projects. As a result, projects may implement better measures to mitigate negative effects on the environment and nature.

4.2 Interview results other topics

In the semi-structured interviews, further attention was given to the image of megaprojects, how project success is measured; the role of ex-post evaluations; and the opportunities and challenges for ex-post evaluations in the context of megaprojects were explored. After all the data were analyzed and the results became known, they were discussed in an expert interview with an official from the SEE.

4.2.1 Negative image megaprojects

The negative image of megaprojects is primarily linked to the way the media reports on them. It was not denied that megaprojects often exceed time and budget, but it was mentioned that the media often fails to convey the nuance accurately. Additionally, it was noted that it is more interesting for the media to report on failed projects than on success stories.

“Nuances are often missing in media coverage.” (R8)
“Yes, that’s partly the media. There are many projects that are completed on time and within budget, but that’s less interesting.” (R2)

It was acknowledged that when things go wrong, it is understandable that a negative image arises. However, what the public is not well aware of is the fact that megaprojects are inherently complex and full of uncertainties, making accurate predictions impossible. This nuance is rarely conveyed to the public.

“When things go wrong, it’s understandable that this results in a negative image.” (R7)

4.2.2 Measuring success

Results reveal that project success is still often measured using conventional criteria like time, cost, and scope. It turns out that evaluations rarely take place, and when they do, the emphasis is too much on these conventional criteria. Furthermore, it emerges

that there is a belief that broad ex-post evaluations can provide a more nuanced picture of project success. The interviewees further added that evaluations will always remain somewhat subjective.

"It still focuses too much on whether a project is delivered on time and within budget." (R4)
First, it should be identified which elements you consider important and recognize that this is also an arbitrary choice." (R8)

Overall, most interviewees view evaluations positively. They believe evaluations should not be used to punish but rather as a tool for learning and improvement. They also mentioned that currently, evaluations rarely take place, which is a shortcoming.

Such an ex-post evaluation should really be done not just to be instructive, not to punish, but to serve the future." (R9)
"I don't see many evaluations; maybe that's the shortcoming - we should take evaluations more seriously and do more with the results." (R4)

4.2.3 The role of ex-post evaluations in determining project success

The interviews reveal that ex-post evaluations are seldom conducted and, as a result, do not play a role in the determination of project success. Reasons cited for the lack of ex-post evaluations include the sector's forward-looking focus and uncertainty about who benefits from these evaluations.

"When one project is finished, another project needs to be started." (R4)
"Who has anything to gain from conducting thorough evaluations?" (R3)

The impact of evaluations also heavily depends on who conducts them. One interviewee noted that if the project team performs the evaluation, they are more likely to produce a positive assessment. This ties into a recurring theme from the interviews: the subjectivity of evaluations beyond the traditional three success criteria.

"It also depends on whom you ask. If you ask a project team, they are more likely to create a success story than if you ask the financier." (R8)

Furthermore, it emerged that current forms of evaluation fall short in accounting for the larger, often invisible effects that megaprojects can have. For instance, they do not consider the multiplier effect that some projects can generate. An example given is the Eastern Scheldt storm surge barrier, which was significantly over budget and behind schedule at the time. However, today it is considered highly successful and serves as the flagship of Dutch water engineering.

"In my view, 'multiplier effects' carry more weight than simply looking at what a project has cost." (R8)

Also, it is noteworthy that ex-post evaluations occur so infrequently, given that the route decision for MIRT projects specifies that ex-post evaluations are mandatory. These ex-post evaluations are intended to assess whether the effects outlined in the TN/MER have been realized.

"In the TB, it states that we, as Rijkswaterstaat, are required to conduct an evaluation, but this almost never happens." (R2)

Results from the expert interview underscore the importance of ex-post evaluations for a thorough understanding of project success. Without ex-post evaluations, it is impossible to determine which expectations from the CBA have been met and which have not.

"Without them you can't fully comprehend what was ultimately realized by the expectations of the CBA." (E1)

4.2.4 Opportunities and challenges for ex-post evaluations

There is a generally positive attitude towards ex-post evaluations. Firstly, it is believed that these can contribute to providing a more nuanced picture. Ex-post evaluations offer the opportunity to assess project success based on more criteria than just time, cost and scope. This could lead to more attention being given to the 'invisible effects' that many megaprojects encounter. Narrative ex-post evaluations, for instance, could address these aspects.

"You often deal with nearly invisible effects, sometimes positive, sometimes negative. These should be incorporated more into a narrative evaluation." (R3)

The potential self-reflection and learning effects that ex-post evaluations could offer are often highlighted. They could ensure that project stakeholders better reflect on how the project outcomes turned out and what went well or poorly. Thus, ex-post evaluations are seen as a crucial tool for future projects. Lessons learned can be applied to improve the execution of future projects.

"I think you can learn a lot from these types of evaluations, and you should use that to your advantage in how you approach projects." (R4)

But challenges regarding ex-post evaluations are also emphasized. One interviewee stressed that ex-post evaluations should never give the impression that fully rational choices can be made.

"The downside of an ex-post evaluation is that it suggests that you can make a rational decision about whether or not to invest in a project, but I believe that doesn't do justice to the overall vision." (R8)

Furthermore, one interviewee mentioned that the danger of ex-post evaluations could be that those conducting them might aim to formulate 'shocking conclusions'. They pointed out that these evaluations ultimately also serve as political instruments. This poses a challenge if ex-post evaluations are to become a standard part of the project cycle.

"Evaluations gain an interest in formulating 'shocking conclusions'. Ultimately, evaluations are just political instruments as well." (R3)

Finally, several political challenges were highlighted. Conducting ex-post evaluations properly requires a substantial amount of time and budget. Additionally, there is ambiguity about who should conduct these evaluations. It is not clear which institutions have the expertise to carry out such evaluations effectively.

"Truly measuring the societal effects of such a project, to my knowledge, does not fall within the expertise of Rijkswaterstaat." (R6)

Results from the expert interview highlight the broad research possibilities that can be achieved with ex-post evaluations. For instance, ex-post evaluations can be used to investigate whether the chosen mobility strategy works. One example mentioned relates to the "parallel effects" that often occur when road capacity is increased. It has been proven that this 'draws' commuters away from trains. The expert interviewee argues that ex-post evaluations can provide insights into these effects and therefore are important for future policy-making.

"Ex-post evaluations have more of a 'research' effect compared to ex-ante evaluations. They reveal insights that can help improve future ex-ante analysis." (E1)

Chapter 5 - Discussion and Conclusion

In this section, the results are discussed by topic and placed within the theoretical framework. The discussion highlights points where the results reinforce, contradict, or complement existing theories. Each topic concludes with an answer to the corresponding sub-question. Subsequently, the main research question is answered, followed by the implications for planning theory and practice.

5.1 Discussing and answering the research questions

5.1.1 Ex-post evaluations

Clearly, the role of ex-post evaluations is very small. The case study reveals that ex-post evaluations rarely take place, and therefore do not play a role in determining project success. This aligns with what Volden and Welde (2022) mention. It also corresponds with Worsely's (2014) assertion that ex-post evaluations are the "weak-link" in the assessment process of megaprojects. Proponents of ex-post evaluations see them as the ideal tool to create a more nuanced picture of the success or failure of megaprojects. A multitude of evaluation criteria can be used to tailor an evaluation to a specific megaproject. Subsequently, ex-post evaluations could be used to assess how the effects described as expectations in ex-ante evaluations have turned out in reality. The results show that reasons why ex-post evaluations do not happen in practice are because there is a lack of political will. If disappointing results emerge, it could damage the image of a politician, so why take the risk? Perhaps it is also related to the idea of Schwalbe (2015) who argues that projects end when their goals have been reached or when they are terminated. Flyvbjerg (2014) identified four sublimes that underlie our interest in megaprojects. One of these is the political sublime, which suggests that it is politically attractive to undertake a megaproject. Ex-post evaluations would be a suitable means to retrospectively determine whether these projects delivered what politicians initially promised. This can help determine whether the political justification for these projects was grounded. As shown in the results, this could be an argument why politicians might resist ex-post evaluations, as it could damage their political image.

Megaprojects are complex and must deal with great uncertainties and therefore exhibit non-linear behavior (Turner & Xue, 2018). Therefore, ex-post evaluations should not serve as punishment but rather as a learning tool. Results from the interviews support this and advocate for the learning aspect of ex-post evaluations instead of punishment. Furthermore, Clegg et al (2017) highlight the concept of sense-making as an important aspect regarding megaprojects. The larger the project, the harder it becomes to make sense of it. This applies to both closely involved stakeholders and the public. Ex-post evaluations could play a crucial role in better elucidating megaprojects, thereby contributing to sense-making. In the interviews, this idea is supported, and it emerges

that conducting ex-post evaluations, for example, in a more narrative form can contribute to a better understanding and clearer picture of megaprojects.

Remarkable is that document analyses and interviews reveal that certain ex-ante documents do include a note stating that ex-post evaluations of the expected effects are mandatory. In practice, they do not take place. The reasons given are a lack of time, money, and political will to conduct them, which is in line with Dahler-Larsen (2012). But also, the question of 'who' should conduct these evaluations frequently arises in the results, a question for which the literature does not provide a clear answer. The person who conducts the evaluation is closely related to the objectivity of it. Results from the expert interview show that this can be done by the same agencies that conduct the ex-ante evaluations.

What is the role of ex-post evaluations in determining project success or failure?

Currently, ex-post evaluations play no role in determining project success because they are rarely conducted. When they are performed, the focus tends to be on hard figures. However, this study demonstrates that due to the complexity of megaprojects, a broader form of evaluation is necessary. Such an approach would better capture the less visible societal effects that many megaprojects entail.

5.1.2 Project success

The literature indicates that for many years there has been advocacy for a broader definition of project success than merely considering the traditional success criteria: time, cost, and scope. De Wit (1998) and Cook-Davies (2002) argue that project success should be measured based on the overall objectives of a (mega)project. The interviews reveal that project success is still measured using these traditional success criteria. It turns out that evaluations rarely take place, and when they do, the emphasis is too much on the Iron Triangle criteria (Atkinson, 1999). Furthermore, it emerges that there is a belief that broad ex-post evaluations can provide a more nuanced picture of project success. This aligns with De Jong et al. (2019) who highlight the value of ex-post evaluations for verifying whether projects have achieved the anticipated benefits.

Furthermore, the results frequently highlight the subjective nature of defining projects success. It is noted that the perception of megaproject's success is highly dependent on the perspective from which it is viewed. This underscores the importance of stakeholder values as highlighted by Eskerod and Ang (2017). For example, people living directly next to a construction site of a megaproject will have a different perspective on the project's success compared to commuters who use the project daily (Hamersma et al., 2014). Additionally, perspectives and subjectivity arise again the question of 'who' should conduct these ex-post evaluations, and who thereby largely determines success.

From the interviews, however, there are also voices of stakeholders who consider the standard success criteria as self-evident. This is in line with Belout (1998), who emphasizes the impact of project management's value on efficiency and effectiveness, thereby on project success. Purely looking at the construction phase, it makes sense that these criteria are seen as valid. A project leader is, after all, evaluated based on these criteria. This is contradictory to the idea of Atkinson (1999), who argued that for megaprojects, these criteria are based on pure guesses. Therefore, he considers them irrelevant as success criteria. Moreover, these preliminary estimates are influenced by an optimism bias (Flyvbjerg, 2017). One interviewee reveals an understanding for this optimism bias, because without optimism bias, far fewer megaprojects would be undertaken. A comparison is made with King Willem I, the "Canal King". If a cost-benefit analysis had been applied at the time, those canals would never have been built. And now, a few hundred years later, we can see the success of this infrastructure.

How is the success or failure of megaprojects measured and how could it be measured?

Success is primarily measured using traditional project management criteria. A broader form of evaluation is desired by many because these three criteria insufficiently address the societal impacts of megaprojects. Conducting ex-post evaluations would be beneficial, and when they are conducted, the arbitrary nature of these evaluations must be acknowledged.

5.1.3 The negative image of megaprojects

Humanity has been undertaking megaprojects for millennia and will likely continue to do so. When a megaproject is completed and stands the test of time, it often becomes something to be proud of, a symbol or product of competence, an achievement by humanity. Nevertheless, during or shortly after construction of many megaprojects, the focus tends to be on what has not been achieved, what is going wrong, how much extra it will cost, or how much longer it will take. Flyvbjerg (2011) shows that only 1 to 8 out of 1000 megaprojects are completed within budget and on time. However, Volden and Welde (2022) demonstrate that many megaprojects are more successful than commonly assumed, and they argue that the media play a substantial role in this perception. On the one hand, this is due to a shortsighted definition of project success, on the other hand, due to a negative bias. The psychological phenomenon that negative news sells better may play a role (Stafford, 2014). The results from the interviews also link the negative image to over-simplified media coverage and a focus on negative news. The results indicate that it is not denied that megaprojects often exceed time and budget, but it is questioned whether this automatically means a project has failed.

Due to their size and complexity, the risks cannot be accurately calculated upfront leading to cost misestimations. This aligns with what Flyvbjerg (2017) and Söderlund

(2017) describe as the overexposure to “black swans”. For example, the projects used in this study faced changes in tunnel legislation and new insights into concrete fire safety. These are events that could not have been predicted in advance. Despite these unexpected challenges, these projects now have a substantial societal value. They have resulted in a better traffic flow, improved air quality, and economic growth. However, the extent of these benefits is unclear because no comprehensive ex-post evaluations are conducted. Due to the lack of these evaluations, projects are primarily assessed on how well they stayed within time and budget, while their ultimate success revolves around the outcomes they deliver.

The image, therefore, depends on how a megaproject is framed. Results of one interview gave the example of a megaproject involving the construction of the largest sea lock in the world (Zeesluis IJmuiden). This project has faced a lot of criticism in recent years for being too expensive and having too little societal value. What is not highlighted, however, is the value this project brings to the Dutch hydraulic engineering sector. Additionally, the fact that it is the largest sea lock in the world partly explains the high costs. This demonstrates that the way a project is framed is crucial for its image. Research by Ninan et al. (2022) confirms the idea and shows that framing strategies influence the perception of a project.

Why do megaprojects often suffer from a negative image?

Megaprojects often exceed their timeframes and budgets, thereby failing to meet conventional success criteria. As a result, they are labeled as unsuccessful by the media. Additionally, it is difficult for outsiders to understand the complexity of megaprojects, leading to an unbalanced and simplistic portrayal. This lack of nuanced reporting further contributes to their negative image.

5.1.4 Ex-ante and ex-post evaluations: differences and challenges when comparing them

In line with what was stated in the literature, no ex-post evaluations had been conducted for these projects. Only for the A2 project was an ex-post evaluation conducted by the Central Planning Bureau (CPB, 2018), which examined the livability benefits. To address the lack of ex-post evaluations, interviews were conducted with project stakeholders following an evaluation framework by Volden (2018). In this framework, six evaluation criteria are addressed: *efficiency*, *effectiveness*, *other impacts*, *relevance*, *sustainability*, and *benefit-cost efficiency*.

Looking at the agreed-upon outputs, the tangible products were always delivered, although sometimes not within the agreed time and budget. Overruns in time and budget were caused by scope changes, stricter tunnel legislation, and other unforeseen changes. For all five projects, the inputs were efficiently converted into the desired outputs. For the A4 and A9 cases, new tunnel legislation caused delays, but interviewees agreed that despite this setback, the *efficiency* was still sufficient.

The results show that all projects were *effective* in achieving the agreed-upon outcomes. Frequently mentioned tactical outcomes relate to traffic flow, traffic safety, accessibility, air quality, noise nuisance, and spatial integration. Ex-ante documents make precise predictions about these aspects, but ex-post, there are no publicly available figures on these aspects. In some interviews, it was mentioned that actual studies were conducted on, for example air quality, but for other outcomes, the exact figures are not known.

The criterion of *other effects* yielded varied results. This was to be expected, as the definition of this criterion is very broad, encompassing "all consequences beyond the agreed outcomes." In several projects, it was mentioned that certain setbacks encountered during the construction phase could make the project serve as a model for future projects. It was also emphasized that in some projects, local residents were initially strongly opposed, but after completion, that resistance had disappeared. In the A2 case, it was mentioned that the residents of Maastricht feel connected to the tunnel and are even proud of it. This reinforces Frey's (2017) suggestion of the *community pride sublime*. However, in the expert interview, it was indicated that community pride and its benefits are a vague phenomenon and difficult to measure.

The results show that the *relevance* of the projects was primarily linked to addressing specific traffic issues that need to be resolved. This problem formed the basis for the relevance. Additionally, the projects were considered relevant because they also tackled other societal issues, for example, improving air quality and integrating a city district. Once again, it emerges that relevance strongly depends on perspective.

When discussing sustainability, the interviews mainly focused on the sustainable applications incorporated into the project. The goal of this evaluation criterion was to determine whether benefits of a project persist throughout its lifetime. Given that these are large infrastructure projects, it can be concluded that the physical structure can last for decades. However, in the case of road widening, while it may solve a traffic congestion problem, the congestion normally shifts a few kilometers down the road. This is an example that can bring the sustainability of these projects into question. The expert interview highlighted the need for better research into these kinds of effects to better determine whether a project achieves the desired result.

"There needs to be a broader perspective. For example, consider the parallel effects that occur when you increase road capacity. This 'pulls' people away from the parallel train connection." (E1)

Finally, regarding the *benefit-cost efficiency* criterion, opinions were divided on whether it could be answered or not. As Volden (2018) acknowledged, this criterion is technical to calculate. Some project stakeholders claimed that, purely looking at the costs and benefits in terms of saved traffic hours, a project had paid for itself within a few years. Other results indicated that it was not possible to answer this criterion.

What are the differences between the results of ex-ante evaluations and ex-post evaluations, and what challenges arise when comparing them?

The expectations in ex-ante evaluations are supported by calculations and forecasts. In the ex-post evaluation interviews, these hard numbers were missing, making comparisons difficult. Tangible products and their associated outcomes were achieved for all projects. However, strategic goals were not well-defined and therefore hard to assess.

5.1.5 Opportunities and challenges for ex-post evaluations in the context of megaprojects

Various researchers advocate for a more nuanced view of megaproject success arguing that ex-post evaluations could play a role in this (De Jong et al., 2019; Volden & Welde, 2022). The results of this study reveal a positive outlook on the possibilities of ex-post evaluations. The opportunities lie mainly in conveying a more nuanced picture, creating an overview, and the learning effects these evaluations can bring. This view aligns with Andersen et al. (2008) who state that conducting ex-post evaluations can enhance design and decision-making for future similar projects. This conflicts with the *uniqueness bias* surrounding megaprojects as described by Flyvbjerg (2014), which indicates that learning effects from megaprojects often do not materialize because each megaproject is considered a unique challenge. However, this did not emerge in the interviews. A possible explanation could be that the projects studied are all part of the uniform MIRT program, giving them a clear commonality.

The biggest challenge that emerges is related to the necessary political will. The results show that ex-post evaluations should not serve as punishment, but as a tool for improvement. However, it is understandable that such evaluations are linked to political reputations.

> *"It depends on the willingness to expose yourself to potential criticism. This is related to the political willingness to do so or not." (E1)*

Another challenge lies in determining who should conduct these evaluations and how they can be done objectively. It has been repeatedly mentioned that perspective and subjectivity play a crucial role in evaluations. It should be acknowledged that conducting an evaluation cannot provide an entirely objective picture. This presents an opportunity for narrative evaluation, where the focus is not solely on figures but includes a broader justification for the outcomes.

What are the opportunities and challenges for ex-post evaluations in the context of megaprojects?

Comprehensive ex-post evaluations can play a crucial role in providing a nuanced picture of project success. The learning aspect that these evaluations bring is particularly

essential. The challenge is the political willingness to accept and handle potential criticism as a result of negative evaluations.

5.2 Answering the main research question

How can we better understand the success or failure of megaprojects?

A better understanding of the success or failure of megaprojects begins with recognizing a more nuanced view of project success. Megaprojects are too complex to be judged solely by the three traditional criteria of project success. Delivering a project on time, within budget, and within scope certainly indicates some level of success, but it does not tell the whole story. When determining project success, more attention should be given to other success criteria that focus on desired outcomes, unexpected outcomes and the societal impact of the project.

One way to achieve this is through ex-post evaluations. These evaluations are not systematically conducted due to a lack of political will, time, and money, even though they can provide a more nuanced narrative. Ex-post evaluations should elucidate the actual effects of megaprojects. By comparing these evaluations with ex-ante documents, it can be determined whether the desired and expected results have been achieved. They should not serve as a tool for punishment, but as an instrument for learning and improvement.

Ex-post evaluations should be broadly designed to include less visible societal effects as well. They should be based on quantitative data about traditional success criteria, as well as qualitative data to capture a fuller picture of project outcomes. This study shows that while some aspects are difficult to assess, insights can still be gained through ex-post evaluation interviews with involved parties. Additionally, it must be acknowledged that evaluation will always involve arbitrary choices and subjectivity. Therefore, a crucial question is *who* can conduct these evaluations. This could be done by agencies that conduct ex-ante evaluations as they are already expected to be independent when performing ex-ante evaluations.

Finally, to achieve this, a change in the current way of evaluating megaprojects is necessary. This change requires political will and a culture that prioritizes learning over punishment. There needs to be an acceptance that megaprojects are too complex to be accurately predicted in advance. At the same time, there must be willingness to conduct these evaluations.

5.3 Theoretical implications

This research emphasizes the importance of broadening the definition of project success for megaprojects beyond conventional criteria alone. Traditional criteria such as time, cost and scope are insufficient to capture the full range of outcomes and impacts of megaprojects. This implies that project management theories should incorporate a more

holistic set of success criteria. For example, criteria related to societal and environmental impact, or criteria which measure other forms of broad prosperity.

Furthermore, the findings of this study suggest that megaprojects are inherently complex and subject to substantial uncertainties. This challenges existing project management theories that often assume a more predictable and linear progression of projects. Theoretical frameworks related to megaprojects need to account for non-linear behaviors and the dynamic nature of megaprojects.

The study shows that while some project evaluation criteria are difficult to investigate, insights can still be gained through ex-post evaluation interviews with project stakeholders. It thereby highlights the critical role of ex-post evaluations in understanding the true impact of megaprojects. Therefore, project management theory should give more attention to ex-post evaluations as a standard practice, emphasizing their value in learning and continuous improvement.

Moreover, the results in this study demonstrate that stakeholder perspectives and the accompanying subjectivity play a crucial role in the evaluation process of megaprojects. Hence, a theoretical implication would be to incorporate stakeholder value analysis and subjectivity measures as key components of evaluation frameworks.

The research also reveals specific barriers preventing ex-post evaluations from being implemented, the most important of which is the current lack of political will. This underscores the crucial influence of political context on megaprojects. For researchers, this means that project management theories should better consider the broader political and institutional environments in which megaprojects are embedded.

An existing evaluation framework was used in this research, and although evaluating or improving the framework was not a research objective in itself, this study reveals areas for improvement. Two of the societal impact evaluations criteria, namely *sustainability* and *benefit-cost efficiency* turned out to be difficult to evaluate. In an adjusted framework, these criteria should be further developed to specify how they should be used in evaluation.

Finally, the findings support the adoption of learning-oriented evaluation approaches, where the focus is on deriving lessons and fostering improvement rather than assigning blame. Thus, a shift from punitive to developmental evaluation models is needed in project management. The role of narrative evaluations which provide a broader justification for outcomes beyond quantitative measures, could play a role in this.

5.4 Implications for planning practice

The well-known and overall goal of planning practice is to improve the world around us. Megaprojects seem to perform poorly, but this is largely due to the use of oversimplified success criteria. This study demonstrates that it is indeed possible to conduct ex-post evaluations using an evaluation framework through interviews. However, it becomes clear that the results for some evaluation criteria are difficult to capture.

Planning practice has a role to play in developing practical methods to evaluate challenging criteria, for example, the sustainability of a megaproject.

Furthermore, this study shows that performing ex-post evaluations of megaprojects with project stakeholders provides a very detailed view, but it is somewhat one-sided. In practice, more room should be given to other stakeholders, such as residents and users of megaprojects. It is important to understand how they assess these projects and determine whether megaprojects have been successful for them. Planning practitioners are typically able to engage with these types of stakeholders. Therefore, planning practitioners can contribute to this effort.

A phenomenon noted in the literature is the uniqueness bias surrounding megaprojects. This study investigated five megaprojects that had the similarity of being part of an overarching program, the MIRT. This made the projects comparable to one another. Given the clear emphasis on the learning aspects of evaluations, it is crucial for planning practice not to view megaprojects too much as unique cases but rather seek out similarities so that the learning effect of evaluation can be utilized.

Finally, this study demonstrates that ex-post evaluations can make a substantial contribution to research on mobility measures and strategies. Ex-post evaluations can be used to investigate whether expected results are actually achieved, thereby assessing the effectiveness of a mobility measure. Since planning practitioners often deal with mobility measures, these evaluations should be used more frequently to test whether the implemented policies have led to the desired results. Thus, planning practitioners could use ex-post evaluations to measure the effectiveness of their policies.

Chapter 6 - Reflection

In this final chapter, the strengths and limitations of this research are discussed. Following this, recommendations for future research building on this study are provided. Lastly, I conclude with a personal reflection.

6.1 Strengths

To gain a better understanding of project success, the comparison of ex-ante expectations with ex-post outcomes was fundamental. It was clear from the outset that ex-post evaluations of megaprojects are very rare. By using a proven evaluation framework, it was possible to compare with ex-ante documents, test the framework in a new context, and collect empirical ex-post evaluation material. This simultaneously addressed three research suggestions from existing literature. Moreover, conducting evaluations in this manner allowed for a more narrative and broad form of evaluation.

It was intentionally decided to first conduct an exploratory interview with an expert in CBAs, who also has a deep understanding of evaluations in general. This helped improve the structure of the in-depth interviews and provided additional information on where ex-ante documents could be collected. After completing all the in-depth interviews, a concluding expert interview was conducted to reflect on the results. This approach ensured that the collected data and results could be better contextualized.

Finally, another strength is that various types of stakeholders were interviewed for the in-depth case interviews. This included individuals involved in the construction phase, professionals engaged during the operational phase, and project managers. By using the framework from different perspectives, a broader and more comprehensive picture of the success of megaprojects was obtained.

6.2 Limitations

The research also has certain limitations. Firstly, regarding the reliability of the results. It is important to mention that for the ex-post evaluations, only one to three people per case were interviewed. Although these individuals were closely involved in these projects, they never possessed all the necessary information to conduct a complete and thorough evaluation. As a result, the outcomes of the various evaluation criteria are based on the insights and opinions of these individuals rather than on factual studies. Moreover, because of their involvement with the projects, their view on the project’s success might have been biased. To obtain a less biased view, future research should consider multiple individuals with different areas of expertise for each case. Furthermore, it would be beneficial to cross-check the responses for each evaluation criterion with other interviewees.

Secondly, the selection of cases based on their inclusion in the MIRT program means the findings may not be applicable to megaprojects outside of this specific program. For example, this program requires ex-ante evaluations and provides a certain structure. The case selection based on this program limits the generalizability of the results to other contexts or types of projects that may not have similar evaluation mandates or structural frameworks. Therefore, future research should not focus solely on cases from the same program.

Thirdly, due to the broadly defined criteria in the evaluation framework, the responses to the evaluation questions varied substantially between the different cases. This variability made it challenging to compare the results across the cases. Additionally, this broad approach sometimes resulted in missing data for certain evaluated criteria, further complicating the analysis and comparison of the findings. Therefore, future research should place greater emphasis on refining the evaluation criteria, and any missing information should be pursued and gathered from other project stakeholders after the initial interviews.

6.3 Recommendations for future research

There are several possibilities for future research following this study. Firstly, it would be interesting to explore how the framework by Volden (2018) works in other contexts. For example, in other countries or with different types of megaprojects. This study focused on large-scale road projects, but another interesting group of megaprojects could be other types of infrastructure for example public transport or energy infrastructure.

Furthermore, there is also an interesting research gap regarding different forms of evaluation. This study indicates a need for a broader form of evaluation. Future studies could explore how to specifically shape and structure them. It would be interesting, for example, to investigate how narrative evaluations and evaluations based on quantitative results can complement each other. Also, investigating which institutions are most suitable for conducting these evaluations is a relevant topic of study.

Lastly, a concrete follow-up to this study would be to validate the results of the ex-post interview with other stakeholders. The current results come from stakeholders who were closely involved with the project. It would be highly valuable to evaluate the cases with other stakeholders who were not involved or were involved in different ways. This could include local residents or daily users. Through survey research, the effects could be evaluated and then compared with the results from this study.

6.4 Personal reflection

Conducting this research and writing this thesis were enjoyable and fulfilling at times, but it was mainly a challenge. Early in the process, I knew I wanted to research megaprojects, but it took me a long time to determine the right angle. After much contemplation, I initially decided to focus on stakeholder satisfaction of megaproject

users, but I soon realized this was too difficult to investigate within the limited time I had. Ultimately, with the guidance of my supervisor, I decided to explore different evaluation methods related to megaprojects.

I found it fascinating to get an understanding of how expectations were set for five different megaprojects years ago and how these expectations materialized in practice. This taught me something about that time and how these expectations were supported by technical calculations. Even more enjoyable was conducting the in-depth interviews with the involved individuals. They often provided extensive background stories to the various general data I had extracted from the ex-ante documents. These interesting stories and insights have made me very enthusiastic and taught me a lot about project management in practice.

The biggest challenge for me was clearly articulating and presenting the data from the interviews in the results section. I found it difficult to decide which quotes were important enough to include in the results and which to leave out. I often doubted the validity of the research because it sometimes felt like I was missing certain results.

On a positive note, I have learned an immense amount about the theme of megaprojects. I am now aware of the challenges and opportunities that come with these types of projects. Moreover, I have learned a great deal from the diverse opinions of various experts, which has encouraged me to form my own critical viewpoint. I am very much looking forward to applying my acquired theoretical and empirical knowledge in my future work.

References

Andersen, E.S., Birchall, D., Jessen, S.A. and Money, A.H. (2008). Exploring project success. *Baltic Journal of Management*, 1(2), pp.127-147. doi:https://doi.org/10.1108/17465260810844278.

Arcadis (2008). *TN/MER Schiphol - Amsterdam - Almere*. Available at: https://open.rijkswaterstaat.nl/open-overheid/onderzoeksrapporten/@207610/trajectnota-mer-fase-2-schiphol/. [Accessed 14 April 2024].

Ashkanani, S. and Franzoi, R. (2022). An overview on megaproject management systems. *Management Matters*, 19(2). doi:https://doi.org/10.1108/manm-01-2022-0006.

Atkinson, R. (1999). Project management: cost, time and quality, two best guesses and a phenomenon, it's time to accept other success criteria. *International Journal of Project Management*, 17(6), pp.337-342. doi:https://doi.org/10.1016/S0263-7863(98)00069-6.

Belout, A. (1998). Effects of human resource management on project effectiveness and success: toward a new conceptual framework. *International Journal of Project Management*, 16(1), pp.21-26. doi:https://doi.org/10.1016/S0263-7863(97)00011-2.

Boardman, A.E. (2006). *Cost-benefit analysis : concepts and practice*. Upper Saddle River, Nj: Prentice Hall.

Börjesson, M., Jonsson, R.D. and Lundberg, M. (2014). An ex-post CBA for the Stockholm Metro. *Transportation Research Part A: Policy and Practice*, Vol. 70, pp.135-148. Available at: https://www.worldtransitresearch.info/research/5382/ [Accessed 8 June. 2024].

Clegg, S., Biesenthal, C., Sankaran, S. and Pollack, J. (2017). Power and Sensemaking in Megaprojects. *Oxford University Press eBooks*. Oxford University Press. doi:https://doi.org/10.1093/oxfordhb/9780198732242.013.9.

Clifford, N., French, S. and Valentine, G. (2010). Key methods in geography. Los Angeles, Calif.: Sage.
Commissie m.e.r. (2000). Trajectnota/MER Rijksweg 15 Maasvlakte-Vaanplein. Available at: https://www.commissiemer.nl/docs/mer/p08/p0835/835-38mer.pdf. [Accessed 14 April 2024].
Commissie m.e.r. (2010). *Tracébesluit A50 Ewijk-Valburg*. Available at: https://api.commissiemer.nl/docs/mer/p08/p0831/831-118tracebesluit.pdf. [Accessed 14 April 2024].

Cooke-Davies, T. (2002). The "real" success factors on projects. *International Journal of Project Management*, 20(3), pp.185-190. doi:https://doi.org/10.1016/S0263-7863(01)00067-9.

CPB (2007). *Second opinion op de nieuwe kosten-batenanalyse Schiphol-Amsterdam-Almere.* Available at: https://www.cpb.nl/sites/default/files/publicaties/download/second-opinion-op-de-nieuwe-kosten-batenanalyse-schiphol-amsterdam-almere.pdf. [Accessed 14 April 2024].

CPB (2018). *Leefbaarheidsbaten A2 tunnel Maastricht zeer aanzienlijk: meer dan 200 miljoen*. Available at: https://www.cpb.nl/sites/default/files/omnidownload/CPB-Notitie-22-mei-2018-Leefbaarheidsbaten-A2-tunnel-Maastricht.pdf. [Accessed on 10 April 2024].

CPB (2022). *Maatschappelijke kosten-batenanalyse en brede welvaart; een aanvulling op de Algemene MKBA-Leidraad.* Available at: https://www.pbl.nl/uploads/default/downloads/cpb-pbl-2022_notitie-mkba-en-brede-welvaart-een-aanvulling-op-de-algemene-mkba-leidraad_4928_1.pdf#:~:text=In%20een%20MKBA%20wordt%20niet,niet%20in%20MKBA's%20worden%20meegenomen. [Accessed on 10 April 2024].

Dahler-Larsen, P. and Schwandt, T.A. (2012). Political culture as context for evaluation. *New Directions for Evaluation*, 2012(135), pp.75-87. doi:https://doi.org/10.1002/ev.20028.

De Jong, G., Vignetti, S. and Pancotti, C. (2019). Ex-post evaluation of major infrastructure projects. *Transportation Research Procedia*, 42, pp.75-84. doi: https://doi.org/10.1016/j.trpro.2019.12.008.

De Wit, A. (1988). Measurement of project success. *International Journal of Project Management*, 6(3), pp.164-170. doi:https://doi.org/10.1016/0263-7863(88)90043-9.

Decisio BV & 4Cast (2006). *Aanvullende KBA berekeningen Planstudie Schiphol - Amsterdam - Almere.* Available at: https://open.rijkswaterstaat.nl/open-overheid/onderzoeksrapporten/@22657/aanvullende-kba-berekeningen-planstudie/. [Accessed 14 April 2024].

Döringer, S. (2021). 'The problem-centred expert interview'. Combining qualitative interviewing approaches for investigating implicit expert knowledge. International Journal of Social Research Methodology, 24(3), pp.265–278. doi:https://doi.org/10.1080/13645579.2020.1766777.

Ecorys (2004). MKBA *Ondertunneling A2 Maastricht: Economische effecten en ruimtelijke potenties*. Available at: https://a2maastricht.nl/innovatieve-aanpak/aanbesteding-en-procedures/archief-planprocedures [Accessed 14 April 2024].

Ecorys (2005). *MKBA Onderzoek economische effecten Botlek verbinding: Quick scan analyse van effecten*. Available at: https://open.rijkswaterstaat.nl/open-overheid/onderzoeksrapporten/@206549/MKBA_Onderzoek_Economische_Effecten_Botlek [Accessed 14 April 2024].

Ecorys (2006). *MKBA Onderzoek kosten en baten A4 Delft-Schiedam: Eindrapport*. Available at: https://open.rijkswaterstaat.nl/open-overheid/onderzoeksrapporten/@206549/onderzoek-kosten-baten-a4-delft-schiedam/ [Accessed 14 April 2024].

Eskerod, P. and Ang, K. (2017). Stakeholder Value Constructs in Megaprojects: A Long-Term Assessment Case Study. *Project Management Journal*, 48(6), pp.60–75. doi:https://doi.org/10.1177/875697281704800606.

Feagin, J. R., Orum, A. M., & Sjoberg, G. (Eds.). (1991). *A Case for the Case Study*. University of North Carolina Press. http://www.jstor.org/stable/10.5149/9781469663814_feagin

Flyvbjerg, B. (1998). Rationality and Power: Democracy in Practice. *Social Forces*, 78(2), p.806. doi:https://doi.org/10.2307/3005579.

Flyvbjerg, B. (2006). Five Misunderstandings about case-study Research. *Qualitative Inquiry*, 12(2), pp.219–245. doi:https://doi.org/10.1177/1077800405284363.

Flyvbjerg, B. (2011). Over Budget, Over Time, Over and Over Again. *Oxford Handbooks Online*. Oxford University Press. doi:https://doi.org/10.1093/oxfordhb/9780199563142.003.0014.

Flyvbjerg, B. (2014). What You Should Know about Megaprojects and Why: an Overview. *Project Management Journal*, 45(2), pp.6-19. doi:https://doi.org/10.1002/pmj.21409.

Flyvbjerg, B. (2017). Introduction: The Iron Law of Megaproject Management. In: B. Flyvbjerg, ed., *The Oxford Handbook of Megaproject Management*. Oxford: Oxford University Press, pp.1-18.

Flyvbjerg, B., Skamris Holm, M.K. and Buhl, S.L. (2003). How common and how large are cost overruns in transport infrastructure projects? *Transport Reviews*, 23(1), pp.71-88. doi:https://doi.org/10.1080/01441640309904.

Frey, T. (2017). Megaprojects Set to Explode to 24% of Global GDP Within a Decade. Future of Construction. https://futureofconstruction.org/blog/megaprojectsset-to-explode-to-24-of-global-gdp-within-a-decade/

Frick, K.T. (2008). The Cost of the Technological Sublime: Daring Ingenuity and the New San Francisco–Oakland Bay Bridge. *University of California Transportation Center*. doi:https://doi.org/10.4337/9781848440173.00020.

Gellert, P.K. and Lynch, B.D. (2003). Mega-projects as displacements*. *International Social Science Journal*, 55(175), pp.15–25. doi:https://doi.org/10.1111/1468-2451.5501002.

Giezen, M. (2012). Keeping it simple? A case study into the advantages and disadvantages of reducing complexity in mega project planning. *International Journal of Project Management*, 30(7), pp.781-790. doi:https://doi.org/10.1016/j.ijproman.2012.01.010.

Hamersma, M., Tillema, T., Sussman, J. and Arts, J. (2014). Residential satisfaction close to highways: The impact of accessibility, nuisances and highway adjustment projects. *Transportation Research Part A: Policy and Practice*, 59, pp.106–121. doi:https://doi.org/10.1016/j.tra.2013.11.004.

Hansjurgens, B. (2004). Economic valuation through cost-benefit analysis? possibilities and limitations. *Toxicology*, 205(3), pp.241-252. doi:https://doi.org/10.1016/j.tox.2004.06.054.

Ika, L.A. (2018). Beneficial or Detrimental Ignorance: The Straw Man Fallacy of Flyvbjerg's Test of Hirschman's Hiding Hand. *World Development*, 103, pp.369-382. doi:https://doi.org/10.1016/j.worlddev.2017.10.016.

Ika, L.A. and Pinto, J.K. (2022). The 're-meaning' of project success: Updating and recalibrating for a modern project management. *International Journal of Project Management*, 40(7), pp.835–848.

Jenner, S., Chan, G., Frankenberger, R. and Gabel, M. (2012). What Drives States to Support Renewable Energy? *The Energy Journal*, 33(2). doi:https://doi.org/10.5547/01956574.33.2.1.

Judgev, K. and Müller, R. (2005). A Retrospective Look at Our Evolving Understanding of Project Success. *Project Management Journal*, 36(4), pp.19-31. doi:https://doi.org/10.1177/875697280503600403.

Kaman, Z.K. and Othman, Z. (2016). Validity, Reliability and Triangulation in Case Study Method: An Experience. *Qualitative Research Conference (QRC) 2016 24-26 May 2016*, Penang, Malaysia. Available at: https://qualitative-research-conference.com/download/proceedings-2016/88-zettiey%20350-356.pdf. [Accessed 25-05-2024].

Kerzner, H. (1987). In search of excellence in project management. *Journal of Systems Management*, v.38 (2), pp.30-40.

Koopmans, C. and Mouter, N. (2020). Cost-benefit analysis. *Standard Transport Appraisal Methods*, 6, pp.1-42. doi:https://doi.org/10.1016/bs.atpp.2020.07.005.

Lim, C.S. and Mohamed, M.Z. (1999). Criteria of project success: an exploratory re-examination. *International Journal of Project Management*, 17(4), pp.243-248. doi:https://doi.org/10.1016/S0263-7863(98)00040-4.

McLeod, S. (2023). Rethinking public infrastructure megaproject performance: Theorizing alternative benefits, and the need for open science in project research. *Project Leadership and Society*, vol. 4, 100080. doi:https://doi.org/10.1016/j.plas.2023.100080.

Ministerie van Infrastructuur en Waterstaat (2022). *Home - MIRT Overzicht.* Available at: https://www.mirtoverzicht.nl/. [Accessed 3 May 2024].

Mišić, S. and Radujković, M. (2015). Critical Drivers of Megaprojects Success and Failure. *Procedia Engineering*, 122(2015), pp.71-80. doi:https://doi.org/10.1016/j.proeng.2015.10.009.

Morris, P.W.G. (1994). *The management of projects*. London: Thomas Telford.

Morris, P.W.G. and Hough, G.H. (1987). *The Anatomy of Major Projects—A Study of the Reality of Project Management*. John Wiley & Sons Ltd., Chichester. Available at: https://inis.iaea.org/search/search.aspx?orig_q=RN:21028774 [Accessed 8 Jun. 2024].

Mouter et al. (2013). Attitudes towards the role of Cost–Benefit Analysis in the decision-making process for spatial-infrastructure projects: A Dutch case study. *www.mkba-informatie.nl*. Available at: https://www.mkba-informatie.nl/mkba-voor-gevorderden/publicaties-over-mkba/mouter-et-al-2013-attitudes-towards-role-costbenefit-analysi/ [Accessed 8 Jun. 2024].

Mouter, N. (2014). Cost-Benefit Analysis in Practice. doi:https://doi.org/10.4233/uuid:57ddef96-3232-411b-a184-6c2aa4a4cfeb.

Mouter, N., Dean, M., Koopmans, C. and Vassallo, J.M. (2020). Comparing cost-benefit analysis and multi-criteria analysis. *Standard Transport Appraisal Methods*, pp.225-254. doi:https://doi.org/10.1016/bs.atpp.2020.07.009.

Nassim Nicholas Taleb (2007). *The black swan : the impact of the highly improbable*. New York: Random House.

Ninan, J., Mahalingam, A. and Clegg, S. (2021). Power in News media: Framing Strategies and Effects in Infrastructure Projects. International Journal of Project Management, 40(1). doi:https://doi.org/10.1016/j.ijproman.2021.09.003.

OECD (2023). *Evaluation Criteria - OECD*. www.oecd.org. Available at: https://www.oecd.org/dac/evaluation/daccriteriaforevaluatingdevelopmentassistance.htm.

Ofer Zwikael (2024). Benefits Classification to Enhance Project Value Creation. *International Journal of Project Management*, pp.102574–102574. doi:https://doi.org/10.1016/j.ijproman.2024.102574.

Olsen, R. P. (1971). Can Project Management Be Defined? *Project Management Quarterly, 2*(1), 12–14.

Oranjewoud (2005). *Onderzoek alternatieven en varianten A2-passage Maastricht*. Available at: https://www.commissiemer.nl/docs/mer/p07/p0744/744-160alternatieven_bijl_002.pdf [Accessed 14 April 2024].

Paton, S., Hodgson, D. and Cicmil, S. (2010). Who am I and what am I doing here? *Journal of Management Development,* 29(2), pp.157-166. doi:https://doi.org/10.1108/02621711011019297.

Pinto, J.K. and Slevin, D.P. (1988) Critical Success Factors in Effective Project Implementation. In: Cleland, D.I. and King, W.R., Eds., Project Management Handbook, 2nd Edition, Van Nostrand Reinhold, New York, 902-909.

Pinto, J.K., Davis, K., Ika, L.A., Jugdev, K. and Zwikael, O. (2022). Coming to terms with project success: Current perspectives and future challenges. *International Journal of Project Management*, 40(7). doi:https://doi.org/10.1016/j.ijproman.2022.09.001.

Pollack, J., Helm, J. and Adler, D. (2018). What is the iron triangle, and how has it changed? *International Journal of Managing Projects in Business*, 11(2), pp.527-547. doi:https://doi.org/10.1108/IJMPB-09-2017-0107.

Project Management Institute (PMI) (2021). *The standard for project management and a guide to the project management body of knowledge (PMBOK guide).* 7th ed. Newtown Square, Pennsylvania: Project Management Institute.

Qazi, A., Quigley, J., Dickson, A. and Kirytopoulos, K. (2016). Project Complexity and Risk Management (ProCRiM): Towards modelling project complexity driven risk paths in construction projects. *International Journal of Project Management*, 34(7), pp.1183–1198. doi:https://doi.org/10.1016/j.ijproman.2016.05.008.
Rijksoverheid (2015). *MIRT Projectenoverzicht 2015*. Available at: https://zoek.officielebekendmakingen.nl/blg-378811.pdf. [Accessed 24 March 2024].

Rijkswaterstaat (2000). *Trajectnota/MER Rijksweg 15 Maasvlakte - Vaanplein: Hoofdrapport*. Available at: https://www.commissiemer.nl/docs/mer/p08/p0835/835-38mer.pdf [Accessed 14 April, 2024].

Rijkswaterstaat (2005). *Trajectnota/MER A50 Ewijk-Grijsoord*. Available at: https://open.rijkswaterstaat.nl/publish/pages/126175/rapport_trajectnotamer_a50_ewijk-grijsoord.pdf [Accessed 14 April 2024].

Rijkswaterstaat (2009a). *Maatschappelijke Kosten-Batenanalyse voor alternatief A4 Delft-Schiedam en alternatief A13 + A13/A16*. Available at: http://www.omgevingseconomie.nl/wp-content/uploads/2012/03/MKBA-Rijksweg-A4-Delft-Schiedam.pdf [Accessed 14 April 2024].

Rijkswaterstaat (2009b). *Trajectnota/MER A4 Delft-Schiedam Deelrapport Natuur*. Available at: https://www.commissiemer.nl/docs/mer/p14/p1420/1420-336natuur.pdf [Accessed 14 April 2024].

Rijkswaterstaat (2010). *Tracebesluit A50 Ewijk-Valburg Deel A: Besluit, Toelichting en Kaarten*. Available at: https://api.commissiemer.nl/docs/mer/p08/p0831/831-118tracebesluit.pdf [Accessed 14 April 2024].

Rossi, P.H., Freeman, H.E., & Rosenbaum, S. (2004). Evaluation: A Systematic Approach, *Contemporary Sociology A Journal of Reviews*, 36(4).

Samset, K. (2003) *Project Evaluation - Making investments succeed*, Tapir Academic Press, Trondheim, Norway.

Samset, K. and Christensen, T. (2015). Ex Ante Project Evaluation and the Complexity of Early Decision-Making. *Public Organization Review*, 17(1), pp.1-17. doi:https://doi.org/10.1007/s11115-015-0326-y.

Samset, K. and Volden, G.H. (2016). Front-end definition of projects: Ten paradoxes and some reflections regarding project management and project governance. *International Journal of Project Management*, 34(2), pp.297-313. doi:https://doi.org/10.1016/j.ijproman.2015.01.014.

Scheepers, H., McLoughlin, S. and Wijesinghe, R. (2022). Aligning stakeholders perceptions of project performance: The contribution of Business Realisation Management. *International Journal of Project Management*, 40(5).

Schwalbe, K. (2015). *Introduction to Project Management*. 5th ed. Minneapolis, Mn: Schwalbe Publishing.

Shenhar, A. and Holzmann, V. (2017). The Three Secrets of Megaproject Success: Clear Strategic Vision, Total Alignment, and Adapting to Complexity. *Project Management Journal*, 48(6), pp.29–46. doi:https://doi.org/10.1177/875697281704800604.

Shenhar, A.J. and Dvir, D. (2007). Project Management Research—The Challenge and Opportunity. *Project Management Journal*, 38(2), pp.93–99.

Slavinski, T., Todorović, M. and Obradović, V. (2023). The past will guide us: What the future could bring according to the last 40 years of IJPM? *International Journal of Project Management*, 41(5), pp.102481-102481. doi:https://doi.org/10.1016/j.ijproman.2023.102481.

Söderlund, J., Sankaran, S. and Biesenthal, C. (2017). The past and Present of Megaprojects. *Project Management Journal*, 48(6), pp.5–16. doi:https://doi.org/10.1177/875697281704800602.

Stafford, T. (2014). Psychology: Why Bad News Dominates the Headlines. [online] BBC. Available at: https://www.bbc.com/future/article/20140728-why-is-all-the-news-bad.

Tsoukas, H. (2016). Don't Simplify, Complexify: From Disjunctive to Conjunctive Theorizing in Organization and Management Studies. *Journal of Management Studies*, 54(2), pp.132-153. doi:https://doi.org/10.1111/joms.12219.

Tukel, O. and Rom, W.O. (2001). An empirical investigation of project evaluation criteria. *International Journal of Operations & Production Management*, 21(3), pp.400-416. doi:https://doi.org/10.1108/01443570110364704.

Turner, J.R. (1999) The Handbook of Project-Based Management, 2nd edition, McGraw-Hill, London

Turner, J.R. and Xue, Y. (2018). On the success of megaprojects. *International Journal of Managing Projects in Business*, 11(3), pp.783-805. doi:https://doi.org/10.1108/ijmpb-06-2017-0062.

Turner, R. and Zolin, R. (2012). Forecasting Success on Large Projects: Developing Reliable Scales to Predict Multiple Perspectives by Multiple Stakeholders over Multiple Time Frames. *Project Management Journal*, 43(5), pp.87-99.

Van Marrewijk, A. (2007). Managing project culture: The case of Environ Megaproject. *International Journal of Project Management*, 25(3), pp.290-299. doi:https://doi.org/10.1016/j.ijproman.2006.11.004.

Van Wee, B. and Kroesen, M. (2022). Attitude changes, modelling travel behaviour, and ex ante project evaluations. *Transportation Research Interdisciplinary Perspectives*, 16, p.100724. doi:https://doi.org/10.1016/j.trip.2022.100724.

Volden, G.H. (2018). Public project success as seen in a broad perspective. *Evaluation and Program Planning*, [online] 69, pp.109-117. doi:https://doi.org/10.1016/j.evalprogplan.2018.04.008.

Volden, G.H. (2019). Assessing public projects' value for money: An empirical study of the usefulness of cost–benefit analyses in decision-making. *International Journal of Project Management*, 37(4), pp.549-564. doi:https://doi.org/10.1016/j.ijproman.2019.02.007.

Volden, G.H. and Samset, K., 2013. Etterevaluering av statlige investeringsprosjekter. *Konklusjoner, erfaringer og råd basert på pilotevaluering av fire prosjekter*.

Volden, G.H. and Welde, M. (2022). Public project success? Measuring the nuances of success through ex post evaluation. *International Journal of Project Management*, 40(6). doi:https://doi.org/10.1016/j.ijproman.2022.06.006.

Wassenaar, D.R. and Mamotte, N. (2012). Ethical Issues and Ethics Reviews in Social Science Research. Oxford Handbooks Online. Oxford University Press. doi:https://doi.org/10.1093/oxfordhb/9780199739165.013.0019.

Wawak, S. and Woźniak, K. (2020). Evolution of project management studies in the XXI century. *International Journal of Managing Projects in Business*, 13(4), pp.867-888. doi:https://doi.org/10.1108/ijmpb-01-2020-0002.

Williams, T. and Samset, K. (2010). Issues in Front-End Decision Making on Projects. *Project Management Journal*, 41(2), pp.38-49. doi:https://doi.org/10.1002/pmj.20160.

Winch, G. (2017). Megaproject Stakeholder Management. In: B. Flyvbjerg, ed., *Oxford Handbook of Megaproject Management*. Oxford University Press, Oxford, pp.339-361.

Worsley, T., 2014. Ex-post assessment of transport investments and policy interventions.

Xue, Y. (2009). A results-based monitoring and evaluation system for key infrastructure projects. Unpublished Ph.D. Thesis, Lille School of Management, Lille, France.

Yin, R.K. (2003). *Case study research: design and methods*. 3rd ed. Thousand Oaks, Calif.: Sage Publications.

Zhai, L., Xin, Y. and Cheng, C. (2009). Understanding the Value of Project Management from a Stakeholder's Perspective: Case Study of Mega-Project Management. *Project Management Journal*, 40(1), pp.99-109. doi:https://doi.org/10.1002/pmj.20099.

Appendices

Appendix A: Documents Case A2 Passage Maastricht

Appendix A1: Overview document analysis A2

Document Analysis - A2 Passage Maastricht				
Doc. Type	**Year(s)**	**Organization**	**Description**	**App.**
MIRT Project book documents	2011-2017	National Government	Concise overview of tasks, solutions, finances, and management decisions.	A2
(pre) CBA	2004	Ecorys	Research into the economic effects and spatial potentials.	A3
TN/MER	2005	Oranjewoud	TN forms the basis on which the competent authority makes a choice between different alternatives. MER outlines the environmental consequences of a plan before a decision is made	A4
Tracébesluit	2010	National Government	Description of measures, including mitigating and compensatory measures, and the justification for them.	n/a
ex post evaluation	2018	CPB	Ex post study on the livability benefits of the A2 tunnel in Maastricht	n/a

Appendix A2: MIRT Project overview A2

MIRT Project book A2 Passage Maastricht (2011-2017)	
Inputs	Time schedule 2010: Route decision (Tracébesluit) 2011: Start of construction (Start realisatie) 2016: Opening (Openstelling) Costs 2011: €704M 2017: €847M Scope Providing a solution for the multiple issues of traffic flow and accessibility in the city and region, as well as the quality of the living environment
Outputs	The complete integration of the A2 and A79 highway intersection A new connection road between the A2 and A79 highways More green spaces and recreational areas in the Landgoederenzone (a cultural-historical area) A tunnel between the Geusselt and Europaplein junctions A park lane above the tunnel New city entrances at Geusselt and Europaplein
Outcomes	Solving traffic management issues Improving the accessibility Improving the quality of the living environment Improving (traffic) safety Reducing barrier effects

Appendix A3 - (pre) CBA (Ecorys, 2004)

(pre) CBA Ecorys (2004)	
Content	- Opportunities given the traffic model and urban planning vision - Structural economic effects on adjacent neighborhoods (several scenarios - How to leverage opportunities in relation to economic policy - Consequences during construction
Conclusions	The construction of the tunnel leads to travel time savings for road traffic. Additionally, there are benefits for freight transport due to increased delivery reliability. Approximately 30% of these benefits occur within Maastricht, 20% benefit individuals or businesses active in Maastricht but residing or based elsewhere, and about 50% benefit through traffic.
	The tunneling increases the regional product and employment in South Limburg, particularly in Maastricht, during the period 2012-2014 compared to the average annual growth.
	The initial indicative calculation of the benefits shows that their value is approximately €1B. These benefits need to be weighed against the negative impacts during the construction phase.
	During construction, there are travel time losses for road traffic, losses due to decreased delivery reliability for freight transport, and longer routes as traffic is rerouted. About 35% of these impacts directly affect the city, around 25% affect individuals or businesses active in Maastricht but not residing or based there, an approximately 40% impact through traffic passing through Maastricht. The economic impact of these effects is limited but should not be underestimated.
	The document emphasizes the importance of an integrated vision for the North and South sides of the city. A spatially coherent concept is strongly recommended, as is an integrated vision for the adjacent neighborhoods (Wittevrouwenveld Noord and Wyckerpoort). It is noted that the construction of the tunnel reduces the barrier effects.

Appendix A4 - TN/MER (Oranjewoud, 2005)

Category	**Aspect**	**Conclusions Related to Tunnel Alternative**
Traffic	Flow	All alternatives have a very positive effect on the flow of the main road network, the A2.
	Accessibility Maastricht	Variants with a tunnel at the traverse have a positive effect on the accessibility of Maastricht.
Livability	Noise	The noise pollution along the traverse decreases significantly in all variants, except for the Liege and West alternatives.
	Emissions	The alternatives and variants have hardly any effect on the total emissions of air pollutants compared to the reference situation, and are therefore considered neutral in terms of emissions.
	Immissions	The immission calculations show that the tunnel variants create a bottleneck at the tunnel exits, where the air quality standards of the 2005 Air Quality Decree are exceeded over a wide area.

Nature and Landscape	Nature	The tunnels in the traverse alternative lead to either drying out or waterlogging of urban nature if no mitigating measures are taken.
	Landscape	All variants have a negative effect to varying degrees on landscape values, structure, and appearance. For the tunnel alternatives, this is due to the integration effects in the valuable Landgoederenzone landscape.
Space	Space Usage	The (bore) tunnel variants have a limited effect on space usage. The tunnel variants are only negatively assessed due to the temporary effects during the construction phase, which are greatest in the traverse variants.
	Spatial Planning	The tunnel variants and variants with an eastern ring road enable spatial developments along the traverse that align with municipal spatial policy.
Other	Cultural Historical Value and Archeology	All alternatives lead to a degradation of cultural historical and archaeological values. The slightly negative assessment of the tunnel alternatives is due to the integration in the Landgoederenzone and the potential archaeological values along the traverse, which are not considered highly significant.
	Groundwater	All alternatives and variants have a somewhat negative effect on groundwater. The difference between the alternatives and variants in terms of groundwater as a whole is limited. However, there are differences at the criterion level. Tunnel variants are negatively assessed due to their effects on groundwater levels and flows.
	Surface Water	The effects of the alternatives and variants on surface water are limited. The main concern is the potential degradation of a watercourse in the Landgoederenzone. This effect is present in all variants
	Safety	All alternatives and variants have a neutral to positive effect on safety overall. (This is because all variants largely remove the transport of hazardous substances from urban areas).
	Economy	The approach to the A2 leads to positive effects for the economy. The lasting effects are positive for all alternatives and variants. The temporary effects of the traverse tunnels result in a slightly lower assessment.

Appendix B: Documents Case A4 Delft-Schiedam

Appendix B1: Overview document analysis A4

Document Analysis - A4 Delft-Schiedam				
Doc. Type	**Year(s)**	**Organization**	**Description**	**App.**
MIRT Project book documents	2011-2016	National Government	Concise overview of tasks, solutions, finances, and management decisions.	B2
Tracébesluit	2010	National Government	Description of measures, including mitigating and compensatory measures, and the justification for them.	n/a
TN/MER	2009	Rijkswaterstaat	TN forms the basis on which the competent authority makes a choice between different alternatives. MER outlines the environmental consequences of a plan before a decision is made	B3
CBA	2006	Ecorys	Study on the costs and benefits of the A4 Delft-Schiedam Project	B4
CBA	2009	Rijkswaterstaat	A Social Cost-Benefit Analysis to determine whether and to what extent the social benefits outweigh the costs they incur.	n/a
IODS Convenant	2006	IODS	Collaboration between stakeholders in Delft-Schiedam. Initiated in 2001 and officially signed in 2006 with the aim of integrated area development	n/a

Appendix B2 - MIRT Project overview A4

MIRT Project book A4 Delft-Schiedam (2011-2016)	
Inputs	Time schedule - 2009: TN/MER (Environmental Impact Assessment) - 2010: Route decision (Tracébesluit) - 2012: Start of construction (Start realisatie) - 2016: Opening (Openstelling) Costs - 2011: €898M - 2017: €658M → Tender windfall of - €292,5M → Occurred risks €70M Scope - Providing a solution for the traffic capacity issues between Rotterdam and Den Haag. Improving livability in the region.
Outputs	- A new 7 km highway (A4) between Delft and Schiedam - Towards Schiedam, there will be two lanes, with space reserved for a third - Towards Delft, there will be three lanes - In the quiet area of Midden-Delfland, the road will be semi-submerged over a distance of 2.5 km - There will be embankments with vegetation on both sides - A recreational connection will be constructed over the semi-submerged road - At the Groen-Blauwe Slinger plan, the road will be fully submerged over a distance of 1.5 km - The Zweth river will be crossed via an aqueduct - Near the residential area of Schiedam and Vlaardingen, there will be a 2 km land tunnel - The top of the tunnel will be landscaped with greenery - The tunnel roof in Schiedam will be constructed to accommodate sports fields - Noise barriers will be installed near Delft
Outcomes	- Solving traffic capacity problems of A13 highway - Improving accessibility of the Rotterdam - The Hague area

	- Improving livability of Overschie - Reducing cut-through traffic

Appendix B3 - TN/MER (Rijkswaterstaat, 2009)

Criterion	Score Variant 1b	Sub-Criterion	Assessment/Standard
Destruction: The construction of a roadway and structures in a valuable area leads to the complete disappearance of local natural values	min min → very negative compared to the reference situation	Change in area of valuable areas	Number of hectares
		Area change in habitat of highly protected and/or red list species	Expert judgment
Disturbance: Can relate to noise, light, and vibrations	zero → neutral	Noise disturbance of existing route: surface area of valuable area between old and new disturbance contours	Number of hectares
		Light disturbance of new route	Expert judgment
Fragmentation: means the breaking up of a species habitat into multiple smaller, spatially separated habitats	min → slightly negative compared to the reference situation	Intersection of valuable areas	Number of intersections
Drying: Where the construction of the highway leads to the creation of structures in the ground (tunnel sections), this can disrupt groundwater flows, causing local drying	zero → neutral	Dried area of valuable areas	Number of hectares
		Drying of habitat for highly protected and/or red list species	Expert judgment
Pollution: Can relate to NOx, heavy metals, organic substances, and road salt, among other things	zero → neutral	Pollution of habitat for nutrient-sensitive protected species habitats	Expert judgment

Appendix B4 - CBA (Ecorys, 2006)

Effect	Subeffect	Conclusion
Direct effects	Traffic effects	The construction of the A4 has a modest traffic-attracting effect for the Netherlands as a whole. In the area around the A4, the commuter traffic will increase by 3.5%. Business traffic will increase by 1%.
	Travel time benefits	The CPB has applied a 25% travel time valuation.
	Costs	The estimates for construction costs have a wide range from €160M to €810M.
Indirect effects	Welfare effects	- Imperfections in the labor market - Cluster and agglomeration benefits - International competitive position

		- Other effects The direct effects not only lead to additional travelers but also affect other markets in the economy. As a result of shorter travel times, companies can attract the same number of employees from further away; business trips lead to lower travel costs and thus cheaper for the company. More people can participate in the labor market. People can accept jobs further away because companies can produce cheaper, resulting in reduced business and freight costs.
	Calculation with the REMI-NEI model	Using the model, it is estimated that as a result of the reduction in business and freight travel costs, a total of 750-900 extra jobs can be created in the Netherlands by 2020.
	Employment effects per region	A stronger competitive position of companies in Groot-Rijnmond can lead to increased employment in regions that benefit from travel time savings.
	Regional product and national product	
	Migration	Higher employment, according to model calculations, is only slightly associated with migration. Relatively few people will decide to move as a result of improved accessibility and employment opportunities.
Additional indirect effects for the CBA	Increased employment	The welfare effect of indirect effects is estimated at 20%-30% of the value of the direct benefits.

Appendix C: Documents Case A9 Gaasperdammerweg

Appendix C1: Overview document analysis A9

Document Analysis - A9 Gaasperdammerweg				
Doc. Type	**Year**(s)	**Organization**	**Description**	
MIRT Project book documents	2011-2022	National Government	Concise overview of tasks, solutions, finances, and management decisions.	C2
Tracébesluit (SAA)	2011	National Government	Description of measures, including mitigating and compensatory measures, and the justification for them.	n/a
TN/MER	2008	Arcadis	TN forms the basis on which the competent authority makes a choice between different alternatives. MER outlines the environmental consequences of a plan before a decision is made	n/a
CBA (SAA)	2006	Syconomy & Decisio	Cost-Benefit Analysis for the overarching Schiphol-Amsterdam-Almere Program	n/a
CBA Second opinion	2007	CPB	Supplement and second opinion on the CBA from 2006	n/a

Appendix C2 - MIRT Project overview A9

MIRT Project book A9 Gaasperdammerweg (2011-2022) (part of Schiphol-Amsterdam-Almere)	
Inputs	Time schedule - 2008: TN/MER (Environmental Impact Assessment) - 2011: Route decision (Tracébesluit) - 2014: Start of construction (Start realisatie) - 2020: Opening (Openstelling) - 2026: Opening wisselstrook Costs - 2017: €1068M - 2022: €1203M Scope - Improving road accessibility in the Schiphol-Amsterdam-Almere corridor - Enhancing the integration of roads into the urban environment - Anticipating future developments such as the expansion of Almere to maintain good accessibility
Outputs	- Five lanes per direction - Reversible lane - 3 km long tunnel - Park on top of the tunnel
Outcomes	- Improve traffic flow, and thereby the accessibility of the Northern Randstad - Enhance quality of life through better air quality and reduced noise pollution - Create connections between neighborhoods in Amsterdam Zuidoost

Appendix D: Documents Case A15 Maasvlakte-Vaanplein

Appendix D1: Overview document analysis A15

Document Analysis - A15 Maasvlakte-Vaanplein				
Doc. Type	**Year(s)**	**Organization**	**Description**	
MIRT Project book documents	2011-2016	National Government	Concise overview of tasks, solutions, finances, and management decisions.	D2
Tracébesluit	2010	National Government	Description of measures, including mitigating and compensatory measures, and the justification for them.	n/a
TN/MER	2000	Rijkswaterstaat	TN forms the basis on which the competent authority makes a choice between different alternatives. MER outlines the environmental consequences of a plan before a decision is made	D3
CBA	2005	Ecorys	Research on the economic effects of the Botlek connection. A quick scan analysis of impacts	D4

Appendix D2 - MIRT Project overview A15

MIRT Project book A15 MaVa (2011-2016)		
Inputs	Time schedule - 2000: TN/MER (EIA) - 2010: Route decision (Tracébesluit) - 2011: Start of construction (Start realisatie) - 2015: Openstelling Costs - 2011: Target budget: €1428M (including BLD contribution of €118M and third-party contributions) - 2012: Target budget: €1185M (including third-party contributions) - 2013: Target budget €1983M (including third-party contributions) - 2015: Target budget for construction, management, and maintenance: €2053M (including third-party contributions) - 2016: Target budget for construction, management, and maintenance: €2058M (including third-party contributions) Scope - Increase road capacity to accommodate autonomous traffic growth and the main port of Rotterdam to prevent future traffic handling issues - Reconstruct Vaanplein and Beneluxplein to separate different types of traffic - Build a new bridge over the Oude Maas to resolve the nautical bottleneck
Outputs	- Section Benelux-Vaanplein: Expansion to 2x3 lanes + 2x2 lanes - Reconstruction of Vaanplein and Beneluxplein - Construction of a new bridge over the Oude Maas
Outcomes	- Proactively improve traffic handling for the Mainport of Rotterdam - Resolve the nautical bottleneck at the Oude Maas - Create a redundant road: Better accessibility to and from the port area in case of road closures.

Appendix D3 - TN/MER (Rijkswaterstaat, 2000)

Type Effect	Subgroup	Statement TN/MER
Traffic & Economy	Flow	The Expansion Alternative and the Utilization Alternative both represent an improvement compared to the reference situation. The capacity bottlenecks are largely resolved, thereby improving the accessibility of the area.
	Reliability of Traffic Handling	In general, traffic handling in the Expansion Alternative is less vulnerable than in the Utilization Alternative due to a more spacious road profile.
	Load on Underlying Road Network	The load on the underlying road network is slightly better in the Utilization Alternative than in the reference situation but is worse than in most variants of the Expansion Alternative.
	Traffic Safety	Traffic safety on the underlying road network and the Europort sub-area improves in the Utilization Alternative compared to the reference situation.
	Vulnerability	In general, traffic handling in the Expansion Alternative is less vulnerable than in the Utilization Alternative due to a more spacious road profile.
	Future Value	Due to differences in freight transport (distance traveled, quantity, number of trips), the expansion of Rijksweg 15 will have a more significant effect on other modalities (shipping, rail, pipeline). No judgment can be given about which parts of the expansion of Rijksweg 15 are intended for the use of the Betuwe Route.
	Business Climate	The business climate improves: the lifting of capacity bottlenecks saves the travel time loss per year compared to the current situation of €95M annually.
Spatial Planning & Environment	Spatial Structure, Nature, and Recreation	All variants improve the spatial structure of the area, nature, and the possibilities for recreation.
	Noise and Vibrations	For this aspect, there are no differences per sub-area.
	Air Quality	Air quality improves compared to the reference situation in all Europort sub-area variants I and II both MMVs. For other Europort sub-area variants, the Expansion Alternative and the MMVs score equally well or better.
	Transport of Hazardous Substances	Due to improved traffic safety in the Europort sub-area I, all variants score better than the autonomous situation. In the Botlek area, one of the variants solves the bottleneck due to the location of an existing establishment within the IR contour. In the Europort sub-area, the effects of the variants hardly differ; variant IIIa (overpass) scores the least.
	Soil and Water	All variants - including the MMVs - score worse than the reference situation due to the excavation work required for the realization.
	Compensation	Most variants that belong to the Expansion Alternative in the Europort sub-areas I and II cause a significant compensation obligation compared to the reference situation, including the acquisition of the Boswet. This applies to all variants with a more spacious road profile than the Utilization Alternative. There are significant differences between the variants; all score better than the reference situation.

Appendix D4 CBA (Ecorys, 2005)

Category	Type	Information
Costs	Investment Costs	Investment in infrastructure; removal of buildings; relocation of gas pipeline
	Maintenance and Management Costs	Maintenance of bridge/tunnel; Maintenance of OWN
Direct Effects	Effects of Bridge Opening for Maritime Shipping	Benefits €1.4M per jaar
	Effects of Bridge Opening for Road Users	Benefits €1,2M per jaar
	Effects of Detouring Hazardous Substances	Benefits €0,3M per jaar
	Effecten of Congestion on OWN	Not quantified
Indirect Effects	Land Use	The tunnel variants offer little potential for (double) land use along the banks compared to the bridge variant. Considering other environmental effects, building along Rijksweg 15 is no longer possible, so no benefits along the HWN are expected.
External Effects	Effects on HWN	In the project adaptation, traffic on the HWN uses a tunnel instead of a bridge. This leads to other external effects. In tunnel variants, there is a concentration of effects at the exits. Depending on the construction around the HWN, this leads to positive or just negative effects. Since there is no housing along the bridge, there is no noise or visual hindrance. The difference in visual effects is therefore minimal.
	Effects on OWN	In variant I, traffic with hazardous substances uses the OWN. This means an increase in noise, visual hindrance, and traffic safety on the OWN. On the other hand, an improvement for the HWN is expected, but the characteristics of the OWN (denser buildings and a mix of slow traffic) will cause a net negative effect.
	Detouring via OWN	In variant I, next to other routes, there is a distance of additional kilometers on the OWN, which has an extra negative effect. The calculation of the direct effects is assumed at more than 54,000 extra vehicle kilometers.
	Maritime Safety	The difference in nautical safety between the tunnel variants and the reference variant (a bridge with 2 lifting points) is quantified by the number of complex situations to compare. A study by PMC commissioned by RWS ZH shows that in all complex situations occurring with a tunnel, it is the same as with a bridge with 2 lifting points. Although there are qualitative differences between a bridge and a tunnel, these do not affect safety, such as visual limitations, radar reflection, pillars (navigation safety), and height, depending on a certain number of ships, these differences are not included in the calculations.

Appendix E: *Documents* Case A50 Ewijk-Valburg

Appendix E1 - Overview Document Analysis A50 Ewijk-Valburg

Document Analysis - A50 Ewijk-Valburg				
Doc. Type	**Year(s)**	**Organization**	**Description**	**App.**
MIRT Project book documents	2011-2017	National Government	Concise overview of tasks, solutions, finances, and management decisions.	E2
Tracébesluit	2010	National Government	Description of measures, including mitigating and compensatory measures, and the justification for them.	E4
TN/MER	2005	Rijkswaterstaat	TN forms the basis on which the competent authority makes a choice between different alternatives. MER outlines the environmental consequences of a plan before a decision is made	E3

Appendix E2 - MIRT Documents (A50 Ewijk-Valburg)

MIRT Project book A50 Ewijk-Valburg (2011-2017)	
Inputs	Time schedule - 2010: Route decision (Tracébesluit) - 2011: Start of construction (Start realisatie) - 2014: Oplevering - 2017: Daadwerkelijke openstelling Costs - 2011: Target budget: €317M (including BLD contribution of €54M) - 2012: Target budget: €268M - 2013: Target budget: €269M - 2015: Target budget: €270M - 2017: Target budget: €270M Scope - Increase road capacity to accommodate the growth of car traffic and thereby ensure good traffic handling
Outputs	- Road widening to 2x4 lanes between Ewijk and Valburg - A new additional Waal Bridge - Modifications to the Ewijk and Valburg junctions
Outcomes	- Solving the traffic congestion issues on this route - Future-proofing this route in terms of traffic handling

Appendix E3 - TN/MER Ewijk-Grijsoord (Rijkswaterstaat, 2005)

Theme	Aspect	Research
Traffic and Transport	Accessibility	From Table 3, it is evident that the route speed in all A50 alternatives meets the target value of 60 km/h. This is not the case in the reference situation. The degree of traffic flow in the A50 alternatives is apparent from the I/C ratios shown in Figure 4. Most alternatives meet the target value of 0.85. Widening Alternative 4.0 and Utilization Alternative 7.2 provide the lowest route speeds and the greatest risk of congestion with the poorest traffic performance. The widening alternatives 5.0, 5.2, and 5.4 are flexible when it comes to handling traffic stagnation on the main roads in the region. This is due to the wide roadway with 2x4 lanes, where both lanes can act as flow lanes in the new bridges in these alternatives. The wide clearance in the widening alternatives 5.0, 5.2, and 5.4 offers good possibilities in case of incidents to develop the traffic flow from lane B to A.
	Mobility	
	Traffic Safety	
	Flexibility of Network	
Economy	Direct Economic Effects	The economic effects of all A50 alternatives are very positive. In the reference situation, there is direct financial damage due to poor traffic handling on the A50. In all alternatives, this damage disappears, which on an annual basis is calculated to be approximately 130 million euros in 2020
	Indirect Economic Effects	
Nature and Landscape	Nature	The unavoidable land use by the expansion of the A50 leads to a negative assessment on the theme of nature and landscape, especially since the scope of the affected area is larger. The relatively favorable assessment of alternative 6.0 (MMA) is partly due to the application of noise-reducing asphalt and lowering the maximum speed to 100 km/h throughout the entire day, thereby limiting disturbance in nature reserves. Including new ecological connections has a positive effect. To the east of the new Waal Bridge, part of the kolk near Ewijk must be filled in under alternative 5.2. This reduces the habitat of the strictly protected knoflookpad. In the other alternatives, the new bridge is located on the west side, and there is little to no impact on the habitat. Because the impact on flora and fauna can be avoided by choosing another alternative, such as alternative 5.2, when assessing the Flora and Fauna Act, no serious objections arise. The effects on landscape, cultural history, and archaeology are related to the land use. This connection is shown in Figure 5, where the comparative assessment of the various alternatives in terms of graphically represented. Notably, there is a slight improvement for the aspect of nature in the MMA compared to the reference situation. The reason for this is the defragmentation by including new ecological connections.
	Landscape	
	Cultural History and Archaeology	
	Soil and Water	
Environment	Air	In terms of the environment, the assessment for all alternatives is neutral to slightly positive. This is shown in Figure 6. Here, the values for the theme and the aspects within it are graphically represented. Differences between the alternatives are present for the aspect of air and, to a lesser extent, for the aspect of noise and vibrations. For the broadest alternatives, good traffic flow means the emission of air pollutants is the lowest. These alternatives receive the lowest rating for noise and vibration. This is due to construction phase effects. For smaller alternatives, congestion and emission of air pollutants decrease less. The effects on noise and vibrations are slightly better for these alternatives than for the broadest alternatives. The MMA is the only alternative assessed as slightly positive for both noise/vibration and air quality due to positive values. Figure 7 shows the number of homes with a noise burden between 60 and 70 dB(A) decreases for all alternatives, but there is also an increase in homes with a noise burden >70 dB(A). Figure 8 shows the number of homes where the NO2 emission standard (annual average) is exceeded decreases compared to the reference situation. Important effects on external safety and social aspects are not present.
	Noise and vibrations	
	External safety	
	Social aspects	
Spatial Planning	Living and working	For spatial planning, the effects of expanding the existing A50 are less than building a new road. The expansion requires less land area, although some agricultural land will be used and some cables and pipelines need to be adjusted. The total effect on spatial planning is therefore slightly less. In the MMA and utilization alternative 7.2, there will be no use of the Nederrijn River.
	Agriculture	
	Recreation	
	Infrastructure	

Appendix E4 - Tracébesluit A50 Ewijk-Valburg (Rijksoverheid, 2010)

Standpoint	Description
Modest expansion to 2x4 lanes	The Ewijk-Valburg section will be expanded from 2x2 to 2x4 lanes. Capacity increases in both directions with two lanes added, partly to replace the existing peak hour lane on the eastbound side. This is a robust solution based on the traffic forecasts for 2020 and in view of future road works and possible emergencies. To minimize space requirements, the existing narrow median strip will be used for the construction, and no emergency lane will be applied on the south side.
Extra Waal Brdige to the west of the current Waal Bridge	The existing Waal Bridge in the ASO does not provide any possibilities for increasing the number of lanes. On the west side of the existing bridge, a new bridge with 1x4 lanes with an emergency lane is required. A new bridge on the east side would affect the habitat and breeding area of the strictly protected common pipistrelle. Due to the alternatives for a new bridge on the west side of the existing bridge, exemption will likely be granted under the Flora and Fauna Act, which makes this alternative feasible. Due to the physical limitations on the existing bridge, no co-use with the bicycle path by permit holders or the new bridge will be possible under these conditions.
Ewijk Junction (MMA variant)	Ewijk Junction will be implemented in a modest or sober manner with a compact direct connection between the ASO and A73 (MMA variant). This implementation has the least environmental impact and involves the lowest investment while offering a good solution for the traffic problem.
Valbrug Junction (utilization solution)	Valburg Junction will be implemented in a modest or sober manner according to the utilization solution presented in the TN/MER. This solution proves technically feasible and less problematic for the 2020 traffic demand than other studied solutions.
Noise on nature	In the Trace Decision, the increase in noise levels compared to the year 2000 in the Ecological Main Structure (EHS) and in the designated nature areas will be compensated. The starting point is confirmed by the Nota Mobility that in the EHS the acoustic situation in 2010 should not be worse than in 2000 and in 2020 the worsening of the nature area's character is the focus, with compensation measures being applied, such as noise-reducing asphalt, priority. In the Trace Decision, further research into new and existing noise measures will be conducted to limit the noise nuisance due to traffic increases.
Air quality	Given the developments in legislation and regulations on air quality, the Trace Decision keeps the air pollution assessment light, with the situation in 2010 as a starting point. Additionally, a speed limit will be considered if necessary to meet air quality standards.
Traffic forecasts	In the Trace Decision, the traffic forecasts are updated based on the Nota Mobility, focusing on the effects on the environment and potential compensatory measures.
Road lightning	Lighting will be implemented according to the "Implementation Agreement on Road Lighting" by the Ministry of Transport, Public Works and Water Management. In rural areas during quiet hours, 20% of the lighting will be switched off. In adverse conditions (such as tight curves or merging lanes) in rural areas, the standard will be reduced by 20%. In tunnels, during quiet hours, 50% of the lighting will be switched off. In junction areas, lighting will be adjusted based on traffic intensity and safety, with 100% lighting during quiet hours.

Appendix F: Interview Guide – Semi-structured in-depth interviews

INTERVIEW GUIDE

Beste, allereerst wil ik u bedanken voor uw tijd en interesse om mee te werken aan mijn onderzoek. Mijn naam is Maarten van Dommele en ik zit momenteel in de afrondende fase van mijn master Environmental and Infrastructure Planning aan de Rijksuniversiteit Groningen. Voor mijn afstudeerscriptie doe ik onderzoek naar de evaluatie van megaprojecten. Megaprojecten gaan vaak over het geplande budget en tijd heen en worden dan soms bestempeld als 'gefaald', maar ligt dit niet iets genuanceerder? Grootschalige projecten worden op voorhand doorgaans intensief geëvalueerd (ex ante evaluaties). Zo is in Nederland de maatschappelijke kosten-batenanalyse een verplicht onderdeel voor grootschalige infrastructuurprojecten. Evaluaties van (mega)projecten naderhand (ex post evaluaties) vinden nauwelijks plaats terwijl deze een goed inzicht zouden kunnen geven in het succes.

Het doel van mijn onderzoek is om een beter begrip te krijgen van het succes of falen van megaprojecten en te achterhalen welke rol ex post evaluaties daarin kunnen spelen.

Hiervoor heb ik de volgende deelvragen opgesteld:

- 1) Waarom hebben megaprojecten vaak een negatief imago en is dat imago correct?
- 2) Hoe wordt het succes of falen van megaprojecten gemeten en hoe zou het gemeten kunnen worden?
- 3) Wat zijn de tekortkomingen van huidige evaluaties van megaprojecten en hoe kunnen deze verbeterd worden?
- 4) Waarom zijn evaluaties (MKBA's) tijdens en na een project zo ongebruikelijk in tegenstelling tot ex ante evaluaties?
- 5) In hoeverre verschillen de initiële verwachtingen uit ex ante evaluaties van de ex post evaluaties?
- 6) Wat zijn de kansen en uitdagingen voor ex post evaluaties in de context van megaprojecten?

In dit interview staat deelvraag 5 centraal en daarbij ligt de focus op de ex post evaluatie. Ik wil ingaan op [**megaproject X**] en aan de hand van dit interview graag met u [**expert** / **ervaringsdeskundige**] ingaan op wat het project heeft opgeleverd, nu, een aantal jaar na oplevering.

Opbouw interview

Vraag 1: Zou u zichzelf kunnen voorstellen en kunnen toelichten wat uw functie is/was binnen [**megaproject X**]?

Ex ante beeld van het project

Om een gestructureerd beeld te krijgen van het project zou ik graag aan de hand van de *LOGIC MODEL* het project willen langsgaan. Dit model bestaat uit de volgende aspecten:

Fig. 1. The logic model for a project.

Vraag 2: Zou u op basis van de volgende aspecten kort kunnen toelichten wat het initiële plan was?

A) Inputs: Wat waren de begrote kosten, tijdschema en scope van het project?

B) Output: Welke directe en tastbare producten moesten worden opgeleverd? (bijv. wegverbreding, aanleg tunnel, aanleg brug, etc.)

C) Outcome: Welke tactische uitkomsten moesten behaald worden met behulp van de output? (bijv. verbeterde verkeersdoorstroming, snellere verbinding, etc.)

D) Societal objectives: Welke maatschappelijke doelen (strategische doelen) moesten uiteindelijk gerealiseerd worden met behulp van het project? (bijv. betere leefomgeving, meer werkgelegenheid, etc.)

Ex post beeld van het project

Nu we een goed beeld hebben van de situatie voorafgaand aan het project is het tijd om te kijken naar de uitkomsten en effecten na realisatie van het project. Inmiddels is [**project X]** [**x jaar**] afgerond. Ik kijk graag samen met u terug op de volgende aspecten van het project.

Vraag 3: Wat zijn neveneffecten die aan het project kunnen worden toegeschreven die op voorhand niet beoogd waren?

Ik maak gebruik van een evaluatie framework met **zes evaluatiecriteria** die gekoppeld zijn aan de mate van succes. (efficiëntie; effectiviteit; overige effecten; relevantie; duurzaamheid; kosten-baten efficiëntie).

Vraag 4 (Output - Efficiëntie): Kijkend naar de afgesproken kosten, tijd, en kwaliteit van het project, hoe efficiënt zijn de inputs (kosten/tijd) omgezet in de gewenste output?

- Is het project binnen kosten en tijd gebleven? (waarom wel/niet?)
- Scope, budget en planningen kunnen gewijzigd zijn, maar waren die wijzigingen binnen de marges?

Vraag 5 (Outcome - Effectiviteit): Hoe effectief is het project geweest om het initiële probleem op te lossen of het beoogde doel te behalen?

- Is het gerealiseerde project (als middel) effectief geweest om het initiële probleem op te lossen of het beoogde doel te behalen?
- Is het doel bereikt, ongeacht hoeveel middelen?

Vraag 6 (Maatschappelijke impact - Overige effecten): Welke gevolgen buiten de overeengekomen resultaten kunnen worden toegeschreven aan het project?

- Zowel positief als negatief
- Op korte en lange termijn
- En voor verschillende belanghebbenden

Vraag 7 (Maatschappelijke impact - Relevantie): Een project is relevant als er behoefte is aan wat het project oplevert. De relevantie van een project wordt gemeten in relatie tot nationale politieke prioriteiten, maar ook de voorkeur van belanghebbenden.

- Voorziet het project nu nog in maatschappelijke behoeften?
- Wat waren en zijn de nationale politieke prioriteiten voor het project?
- Wat waren de voorkeuren van de belanghebbenden?
- Wat waren de belangrijkste belangenconflicten?

Vraag 8 (Maatschappelijke impact - Duurzaamheid): Een project is duurzaam als de voordelen blijven bestaan gedurende de levensduur van het project. Dit vereist

meestal dat de totale effecten (financieel, milieutechnisch en sociaal) op lange termijn acceptabel zijn.

- Hoe ziet het verloop van de totale effecten er uit na **[X] jaren**?
- Pakken deze uit op de gehoopte manier en hoe zou u dat verklaren?

Vraag 9 (maatschappelijke impact - Baten-kosten efficiëntie): Hoe is de relatie tussen de inputs (kosten/tijd) en de totale waarde die het project heeft opgeleverd?

- Met de kennis van nu na een aantal jaar, hoe is de relatie tussen de inputs en de totale waarde die het project heeft opgeleverd?

Afluiting

Vraag 10: Zijn er vanuit u nog vragen of opmerkingen die u graag zou willen benoemen voor het einde van dit interview?

Ik wil u heel hartelijk danken voor uw tijd en interesse. Indien u nog vragen heeft kunt u uiteraard contact met mij opnemen.

Appendix G: Interview Guide: Expert Interview

INTERVIEW GUIDE EXPERT INTERVIEW 24-06-2024

Afgelopen tijd heb ik onderzoek gedaan naar het project succes van megaprojecten. Daarbij heb ik gekeken naar hoe deze projecten geëvalueerd worden. Het blijkt dat ex ante evaluaties normaliter plaatsvinden. Deze zijn in Nederland in de vorm van een MKBA en/of TN/MER. Na afronding van projecten wordt gekeken of deze binnen tijd, budget en scope zijn opgeleverd. Echter worden er doorgaans geen evaluaties gedaan om te bekijken of de gewenste/verwachte effecten daadwerkelijk zijn uitgekomen.

Ik heb voor vijf grote wegprojecten gekeken naar ex ante documenten en door middel van interviews met projectmanagers geprobeerd te achterhalen hoe de gewenste/verwachte effecten hebben uitgepakt.

De onderzochte cases

1. A2 Passage Maastricht
2. A4 Delft-Schiedam
3. A9 Gaasperdammerweg
4. A15 Maasvlakte-Vaanplein
5. A50 Ewijk-Valburg

1. Hoe zou het succes of falen van (mega)projecten volgens u gemeten moeten worden?

2. Wat zou de rol van ex post evaluaties kunnen zijn in het bepalen van project succes?

3. Hoe zouden deze ex post evaluaties er inhoudelijk uit moeten zien?

4. Is het waardevol om ex post evaluaties te vergelijken met ex ante evaluaties en zo ja, hoe zou deze vergelijking kunnen plaatsvinden in de praktijk?

5. Wat zijn kansen en uitdagingen voor ex post evaluaties in de context van megaprojecten?

6. Uit mijn onderzoek blijkt dat:

- Ex post evaluaties een genuanceerder beeld van (mega)project succes kunnen bieden.

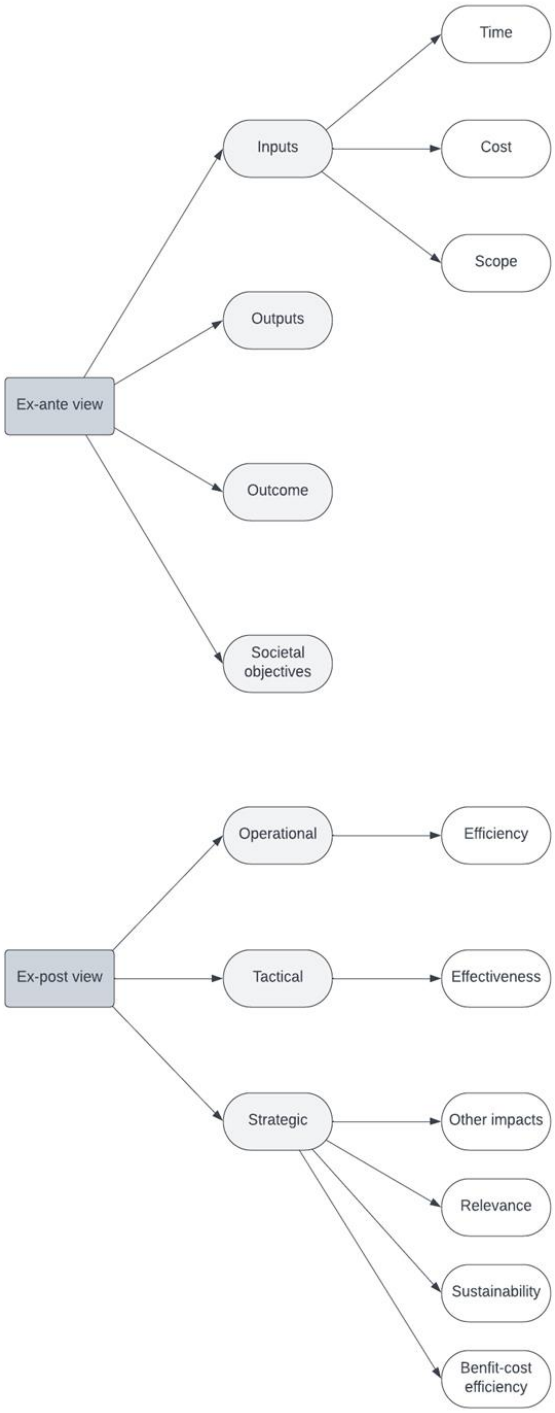
→ Wat zijn de belangrijkste belemmeringen en hoe kunnen deze overwonnen worden?

- Bepaalde evaluatiecriteria moeilijk/onmogelijk (sustainability / benefit-cost efficiency)te bepalen zijn

  → Hoe ga je hier in ex post evaluaties idealiter mee om?
- Er veel gerefereerd wordt naar brede welvaart die megaprojecten zouden opleveren

  → Hoe kan brede welvaart worden gemeten in ex post evaluaties?

Appendix H: Deductive code tree Evaluation framework (Volden, 2018)



Appendix I: Deductive code tree: Sub-questions

Appendix J: Consent Form

Interview consent form

Toestemmingsformulier interview onderzoek masterscriptie
Voor het onderzoeksproject: Maarten van Dommele (MSc Thesis, 2023/2024)
Titel: How to better understand megaproject evaluations
Studie: MSc Environmental and Infrastructure Planning

Ten eerste wil ik u heel erg bedanken dat u bereid bent om de tijd te nemen voor dit interview. Mijn onderzoek heeft als doel om het succes of falen van megaprojecten beter te begrijpen. Hiervoor onderzoek ik de verschillende evaluatiemomenten die afgenomen worden omtrent megaprojecten. Het doel van dit interview is om informatie te verkrijgen over wat het project heeft opgeleverd, nu een aantal jaar na realisatie. Het interview zal zoals afgesproken maximaal 60 minuten duren.

Graag vraag ik u akkoord te gaan met de volgende punten:

- Ik heb de gelegenheid gehad om dit onderzoek te bespreken, en ik ben tevreden met de antwoorden die ik heb gekregen.
- Ik begrijp dat deelname aan dit onderzoek vrijwillig is en dat ik het recht heb om me terug te trekken uit het onderzoek tot het moment dat het onderzoek is gepubliceerd, en dat ik het recht heb om individuele vragen in het onderzoek niet te beantwoorden.
- Ik begrijp dat mijn deelname aan dit onderzoek vertrouwelijk is. Zonder mijn toestemming zal er geen materiaal gebruikt worden wat op mijn identiteit kan duiden.
- Ik begrijp dat deze data gebruikt zou kunnen worden in artikelen, boeken, gepubliceerd- en ongepubliceerd werk en presentaties.

Hierbij verklaar ik dat (gelieve JA of NEE dik te drukken of te omcirkelen)

Ik toestemming geef om de audio van dit interview op te nemen	JA / NEE
Ik zou graag anoniem willen blijven in dit onderzoek	JA / NEE
INDIEN NEE	
Mijn voornaam kan worden gebruikt in dit onderzoek	JA / NEE
OF	
Een pseudoniem (bijv. Respondent X) kan worden gebruikt in dit onderzoek	JA / NEE

"Ik stem ermee in om deel te nemen aan dit individuele interview en erken ontvangst van een kopie van dit toestemmingsformulier en de informatiebrief van het onderzoeksproject."

Handtekening deelnemer: Datum:

"Ik ga akkoord met de voorwaarden zoals uiteengezet in de informatiebrief en ik zorg ervoor dat er tijdens dit onderzoek geen schade wordt toegebracht aan enige deelnemer."

Handtekening onderzoeker: Datum: