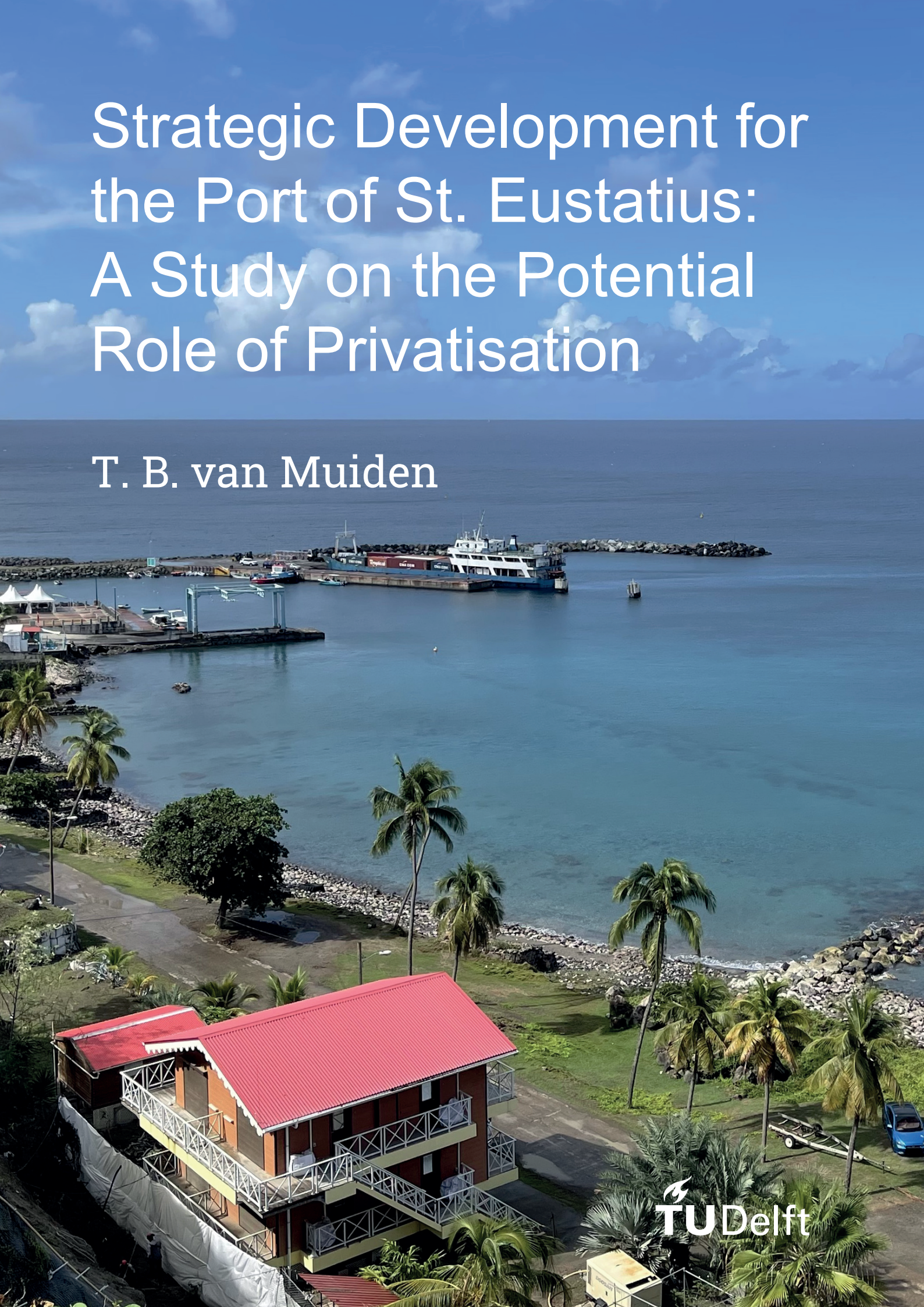
Strategic Development for the Port of St. Eustatius: A Study on the Potential Role of Privatisation

T. B. van Muiden



TU Delft

Strategic Development for the Port of St. Eustatius: A Study on the Potential Role of Privatisation

by

T. B. van Muiden

to obtain the degree of Master of Science
at the Delft University of Technology,
to be defended publicly on Thursday January 11, 2024 at 13:00.

Student number:		
Project duration:	February 6, 2023 – January 11, 2024	
Thesis committee:	Prof. G. P. van Wee,	TU Delft, chair
	Dr. J. A. Annema,	TU Delft, supervisor
	Dr. J. M. Vleugel,	TU Delft, supervisor

TU Delft

Acknowledgment

This thesis marks the end of my studies at the Technical University of Delft. It is with great pleasure that I look back on my time here and the friends I have spent it with. The past year has taught me a lot and my final project has sparked my interest in the maritime industry, especially in the development of ports. Something I would like to learn more about in the future.

I would like to extend my gratitude to my thesis committee for their time and interest in the topic. Bert van Wee for leading the official sessions and for the great overall feedback. Jan Anne Annema, especially for the feedback on my scientific writing, which needed a lot of polishing. Jaap Vleugel for pointing out the different aspects and complexities of such a project. Last but not least, I would like to thank Vishal Oedjaghir for giving me the opportunity to undertake this project. The interesting conversations on the subject and providing me with the information I needed.

I would like to thank my parents for their unconditional support. My brother for helping me whenever I needed it. My friends for their support and (perhaps too many) distractions. All the wonderful people I met during my visit to St Eustatius and especially Scott for the many good conversations.

Thomas van Muiden
Delft, December 2023

Executive summary

St. Eustatius, a small island located in the Lesser Antilles, is a Dutch municipality and has had a rich trading history during the West Indian Company era. However, current circumstances present a clear contrast. The island does not produce locally and must import all essential goods, including food. This dependence is further underscored by its reliance on maritime transport, facilitated primarily by a small port located on the lee side (southwest) of the island. A privately owned oil terminal holds significant influence over the island's economic landscape, as the payments for operating permits account for more than half of the port's income. As the port is part of the St. Eustatius government, this revenue also accounts for half of the government's budget and makes the island financially dependent on the oil terminal.

This thesis aims to investigate opportunities to reduce this financial dependency by examining the transformation of the port into a self-sustaining entity. The opportunities for privatisation to achieve this goal are also examined. The investigation utilises the strategic port planning process to formulate strategies that assess the risks and uncertainties associated with port development. First, a PESTEL analysis is carried out to understand the present state of the port and the island.

Second, a SWOT analysis is performed, based on the findings from the PESTEL, to identify the port's weaknesses and opportunities. Third, a trend analysis is performed to identify shifting global and local landscapes and their potential impact on the port. These analyses collectively contribute to the identification of design objectives to generate different strategies for port development. Three primary design goals, along with several secondary criteria, emerged from this extensive analysis process. The three primary design goals are listed below:

1. The first design objective is to reduce the port's dependence on the oil terminal revenues. Consequently, the focus is on expanding the port's revenue streams by exploring other economic sectors. The strategies put forward to attain this objective involve boosting cargo operations, developing cruise tourism, and providing berthing facilities for recreational vessels in various strategic plans.
2. Due to the island's geographic vulnerability to hurricanes, there is an urgent need to improve the port's resilience to natural disasters, making it the second design goal. Therefore, strategies are being developed to strengthen the infrastructure, ensuring its ability to withstand such climate-related impacts.
3. Additionally, the third design goal focuses on the safety concerns that exist within the current port configuration. The current combination of passenger and cargo operations poses potential hazards by enabling untrained persons to cross active cargo handling areas. The functionality of the storage yard also raises concerns regarding health and safety, primarily due to the composition of its surface material.

Based on the design criteria, four distinct strategies have been formulated, each targeting a specific element of the port development and focusing on enhancing the port's resilience, safety, and revenue diversification.

1. The first strategy focuses on the second and third design objectives, prioritising the strengthening of the port's resilience and safe operations. The suggested measures include repairing the breakwater and surfacing the storage yard. Furthermore, it is recommended that the quay and breakwater be extended to provide accommodation for larger vessels, including emergency ships during natural disasters.
2. The second strategy focuses on the establishment of a new port, with the aim of transforming it into a transshipment hub for the region. This strategic initiative aims to increase transshipment capacity, improve efficiency and reduce the cost of importing goods to the island. Simultaneously, it addresses the third design criterion by separating passenger and cargo operations.
3. The third strategy explores the potential for facilitating the berthing of cruise ships at the quay. This measure aims to boost tourism on the island and increase the revenue streams by imposing port fees on cruise operators.
4. The fourth approach focuses on increasing the number of recreational boats by constructing a marina with essential services such as water, electricity and fuel. This not only addresses the present shortage of facilities for recreational vessels but also aims to enhance capacity to accommodate a greater number of such vessels, thereby increasing revenues.

The individual strategies can be seamlessly integrated into a comprehensive strategic roadmap, with elements of each strategy incorporated sequentially. This phased approach provides a long-term perspective for expanding the port. The initial integration of the first strategy establishes a more resilient port. Following that, the fourth strategy is implemented to accommodate increased recreational vessels. The subsequent phase involves the construction of a new port to separate passenger and cargo operations completely. This transformation allows the

quay to be used for cruise ships, while the redevelopment of the storage yard creates a welcoming tourist arrival area, potentially housing a cruise terminal. This comprehensive approach not only addresses immediate concerns but also lays the groundwork for sustainable and diversified growth in the long term.

Each strategy was evaluated to determine how privatisation could contribute to achieving the defined objectives. An extensive literature review was conducted to evaluate the various reasons for privatisation and determine their applicability to each strategy. The main rationale identified was the conviction that market competition would improve efficiency. In addition, the nuanced rationale behind this effect was thoroughly examined.

The research also explored the different degrees of privatisation of government operations, identifying three distinct models: state-owned enterprise, public-private partnership and full private ownership. These models offer a range of privatisation options, each with its own implications and benefits.

In the context of port management, different models of collaboration between public and private entities have been examined. The current tool port model entails the government taking on the responsibility for both infrastructure and superstructure. On the contrary, the preferred landlord model shifts these responsibilities along with their associated costs to the private party. For each of the strategies, it was assessed how the port model could be potentially changed. It was however identified that in the current conditions, this is almost impossible, mostly due to the high investment costs for the different strategies.

To enable privatisation, the port would need to be transformed into a state-owned enterprise. This presents multiple benefits when compared to the port's present integration into the government. In particular, it would give the port a degree of financial autonomy, allowing it to retain its revenues and accumulate funds for future investments. Additionally, this transformation would position the port to potentially sell parts of its operations to private entities in the future, promoting a more dynamic and market-oriented approach to port management.

The assessment of the applicability of privatisation to the four strategies produced nuanced results.

1. In the instance of the first strategy, which concerns enhancing the port's safety and resilience, privatisation was found to be impractical. The Dutch government has largely funded these improvements, and the current utilisation of the port is too low to attract private investors.
2. The second strategy, focusing on the creation of a new cargo port, offers an opportunity to involve private investors. However, the untested financial potential due to nonexistent freight volumes might discourage private investors from making substantial investments. To address this issue, a public-private partnership (PPP) has been deemed a feasible alternative. In this model, the government could share the risks and contribute to the financing of the new port, thereby reducing risks for private investors and keeping greater control over a critical aspect of the island's infrastructure.
3. The third strategy, involving cruise ship docking, potentially offers an avenue for private investment, given the industry precedent of operator investment in terminal construction. However, the untested commercial viability of this measure remains a concern. As with the second approach, a PPP model could be examined to mitigate risks and encourage private involvement.
4. The fourth strategy, which involves the creation of a marina, was identified as less capital-intensive in its initial phase, making private investment less likely. In the second phase, however, with an established business case and increased capacity, private investors may find the proposition more attractive.

While private investment could improve the port's resilience by broadening revenue sources, the untested business case presents a considerable obstacle, especially given the currently restricted demand. Public-private partnerships are a promising option, as they offer a means of distributing risks and promoting private investment, thus facilitating the development of the port in a financially viable and sustainable manner.

Although definitive conclusions cannot be drawn at this stage, the results provide an indication of the possible outcome. The first strategy is a good place to start developing the port as it is already largely funded by the government and serves as a basis for the other strategies. In combination with the first phase of creating a marina, the demand for more tourists in the form of cruise ships and recreational vessels can be tested.

However, this limits the opportunities for privatisation as the government will provide the investment. Operations can be outsourced, as in the tool port model, but the need for government investment limits adaptation to a landlord model. It is also advisable to make the port a state-owned enterprise to ensure its financial independence and allow it to develop on its own terms rather than being dependent on political opinion. This would also allow for a partial sale if privatisation is considered viable.

Contents

List of Figures

List of Tables

Chapter 1

Introduction

1.1 Context and problem statement

1.1.1 Sint Eustatius

St. Eustatius, commonly known as Statia, is a captivating Caribbean island with a rich history surpassing its small size. The island is located in the northeastern part of the Caribbean Sea, covering an area of merely 21 square kilometres, two-thirds the size of Vlieland. St. Eustatius is a unique entity within the Kingdom of the Netherlands as one of the Special Municipalities. This differentiation indicates that the island is not a constituent of a particular province, but is subject to the administration of the central government. St. Eustatius is renowned for its stunning natural landscapes, diverse marine ecosystems and fascinating history that played an important role in the American Revolutionary War (Schoenmaeckers, 2011).

The historical importance of St. Eustatius is noteworthy, as it flourished as a bustling trading centre during the heyday of the West India Company (WIC) (Glerum, 2021). The island functioned as a vital centre of commerce in the area, alluring merchants from different parts of the world. St. Eustatius hosted a distinctive free port where a diverse range of commodities, such as slaves and weapons, were exchanged (Elder, 2012). This free port was of particular importance during the American Revolution, as it was one of the few places where weapons could be obtained by the revolutionaries. St. Eustatius was at its height during this period, with a flourishing maritime industry, and was one of the wealthiest Caribbean islands, harbouring over 200 ships in its ports on a daily basis. It was during this era that this island was famously known as the "Golden Rock" (Elder, 2012).

However, St. Eustatius' prominence as a trading and maritime hub was short-lived since the British annexed the island four years later, causing its significance to decline. Nowadays, St. Eustatius serves as a site of historical intrigue and breathtaking natural beauty, drawing tourists with its tropical climate, rich cultural heritage, and beautiful landscapes.

1.1.2 Port of St. Eustatius

The port of St. Eustatius was once a bustling centre of activity during the WIC era. However, its current status is quite different. At present, the port is divided into two distinct sections, situated along the southwest coast of the island. This is the leeward side of the island, protecting the port from the waves of the Atlantic Ocean. Tumble-Down-Dick Bay, located on the northern part of the southwest coast, functions as an oil terminal and is owned and managed by the private investment firm Prostar Capital (Prostar Capital, n.d.). In comparison, Gallows Bay, situated further down towards the capital of Oranjestad, operates as a publicly owned port, serving as a critical import hub for vital goods and passenger services (Voorkamp, 2022). Additionally, the ferry to nearby islands departs from this port.

The availability of supplies for St. Eustatius depends on two modes of transport: air and sea. Given the high cost of air freight, the majority of goods are transported by sea (Voorkamp, 2022). Gallows Bay port, in this regard, occupies an essential and unique position as the island's sole provider. The port has a unique role as it mainly deals with the import of essential goods for the island's livelihood, with minimal exports as the island produces very little. It also does not act as a transshipment point for other trade routes, therefore it is not exposed to competition. This is reminiscent of state-owned ports during the Soviet era, where their sole purpose was to serve the state (Notteboom, Pallis, & Rodrigue, 2022).

The Gallows Bay port depends on the tariffs paid by the oil terminal for over half of its income (Voorkamp, 2022). This financial arrangement places the port in an exceptional situation, where its operational sustainability is deeply linked to the oil terminal's existence. Due to its low demand the volume of cargo passing through the port is insufficient for conventional operations and profitability. The port's importance as the main gateway for the supply of goods to the island enhances this unique situation. In a competitive setting, a port with substantial financial dependence on an external source may face difficulties in sustaining itself. However, the island's dependence on the port for critical deliveries emphasises the necessity of ensuring continuous operation despite these financial complexities.

Gallows Bay port's generated revenues are accumulated to the island's entire budget as it is a government institution. Hence, no funds are specifically designated for the port's infrastructure and maintenance investments. The port relies on the Dutch government to provide significant funding to maintain and invest in the port. However, measures are being implemented to address this situation and allow the port to retain its income for future expenditures (Voorkamp, 2022).

In contrast, the oil terminal located in Tumble-Down-Dick Bay offers a sharp contrast to Gallowsbay port. This terminal, referred to as GTI Statia Terminals (hereinafter GTI), is owned and operated by the multinational Prostar Capital (Prostar Capital, n.d.). GTI concentrates on international oil commerce with transshipment capability across the world, as opposed to the local nature of Gallowsbay port. This crucial difference means that GTI must operate profitably in order to be maintained by Prostar Capital.

With more than half of its tax revenue coming from the oil terminal, on which the island is heavily dependent, St. Eustatius is overly reliant on the oil terminal. Furthermore, GTI retains the authority to provide pilot services in the zone where the two ports are located (Voorkamp, 2022). Despite an exemption for ships that anchor in Gallows Bay, certain restrictions still apply.

1.1.3 Aim

As previously emphasised, the island's dependence on its port for the importation of goods underlines the critical importance of ensuring its continued operation for the sustainable livelihood of its inhabitants. To secure the future of the port, it is imperative to develop a comprehensive strategy that can serve as a roadmap for transforming the port into a self-sustaining entity. This study seeks to explore the practicality of privatisation as a prospective option for realising the objectives specified in the strategy. Therefore this thesis will mostly focus on the benefits of and less on its limitations.

The development of a strategic plan is critical in recognising both the opportunities and risks that lie ahead, including the potential consequences of the closure of the oil terminal. There is often a lack of perspective on external changes in the industry, which can expose vulnerabilities and lead to missed opportunities. While there are partial plans for the port's development over the next decade, these are primarily focused on essential maintenance and minor upgrades. For an island so dependent on its port, it is vital to explore and adapt to the changes that the future may bring.

As documented in the Voorkamp (2022), prior research was conducted on the privatisation of the port. The aim of this research was to reduce the government's dependence on the air and sea port. The financial analysis in the report suggested that the business case for the airport was not viable. However, the port showed a viable business case due to the income from the oil terminal. The public entity has already gained some experience with privatisation through the privatisation of the telecommunications provider (EUTEL) and the utility company (STUCO) (Voorkamp, 2022), although the level of success varies. EUTEL is profitable, while STUCO remains dependent on government control as tariffs are strictly regulated by the government (Autoriteit Consument & Markt, 2020a). In order to make an informed decision as to whether privatisation is a viable solution, the potential impacts of this transition are being assessed in line with the strategies identified for the future of the port.

1.1.4 Research gap

Numerous studies on privatisation have examined various sectors, including ports, and compared the outcomes of privatised and non-privatised activities (Black & Roso, 2022; Cullinane & Song, 2002; Dorfman & Harel, 2016; Haarmeyer & Yorke, 1993). These articles have contributed to our understanding of the effects of privatisation, models for its implementation and the rationale behind such decisions (Lazzarini, 2022; OECD, 2019a; Schneider, 2003).

While there is a substantial body of research on privatisation, there is a notable gap when it comes to developing a clear model for assessing whether privatisation is an appropriate option in specific cases. The conventional rationale for privatisation often revolves around well-established factors, as articulated by Kouser, Azid, and Ali (2011, p.35); "underutilization of resources, over and redundant employment, fiscal burden, financial crises, heavy losses and subsidies in order to improve and strengthen competition, public finances, funding to infrastructure, and quality and quantity of services in terms of management". In many cases, where there is an already healthy business with untapped potential, these factors may be sufficient to justify pursuing privatisation.

However, the case of the Port of St Eustatius presents a more complex situation. The port is of vital importance to the island and its financial situation is closely intertwined with that of the government and heavily dependent on the oil terminal. This unique situation creates a gap in the existing literature. There is a lack of research on ports that lack competition and have minimal financial viability, such as the port of St Eustatius. Therefore, it is crucial to explore how the port can be-

come less dependent on the oil terminal as well as the interference of the government. Privatisation is investigated as an option to make the port less dependable in this specific and unique context. This research aims to fill this gap and provide insights into the application of privatisation in exceptional cases such as the port of St. Eustatius.

1.2 Research question

The primary objective of this research is to determine whether privatisation can contribute to the realisation of an effective strategy for the Port of St. Eustatius. This will enable the port to make informed decisions about future challenges and opportunities. This research also addresses the gap in the literature regarding privatisation in the context of small ports with critical functions and limited resources. In order to achieve this objective, the following central research question has been formulated:

To what extent can privatisation contribute to realising the strategic goals of transforming the port of St. Eustatius into a self-sustaining port?

To answer the main research question, multiple subquestions have been formulated (Table 1.1). The subquestions will help in formulating the strategies by defining the different steps that will need to be undertaken and investigating the relevant components for privatisation.

1.3 Scope

The primary focus of this thesis is on the development of the port, but due to its interdependence with the local government and its vital role for the island, these aspects must also be taken into account. Although the research does not directly address the oil terminal, it is crucial to recognise that the terminal's developments are inherently linked to the port, as the port heavily relies on the revenue generated by the terminal's operations. Therefore, the effects that could carry an impact are included in the different analyses. The further implications of the dependency on the oil terminal will be discussed in section 4.3.2. Furthermore, insights from the surrounding region will be included as they may provide valuable perspectives on potential scenarios and emerging opportunities. The research will also take a comprehensive look at the current activities within the port, as these are established elements of the port's operations.

Table 1.1: Research questions

Research question	**Method**
What is the current political, economic, sociological, technological, environmental, and legal situation of the port and on the island?	PESTEL analysis
What are the port's strengths, opportunities, weaknesses and threats?	SWOT analysis
What are trends that will impact the island and the port?	Trend analysis
What strategies can be formulated from the performed analysis?	Preceding RQ & Literature research
What are the benefits and disadvantages of privatisation?	Literature research
How can privatisation contribute to the realisation of the strategies?	Preceding RQ & Literature research

1.4 Relevance

The thesis holds academic and practical significance as it addresses a notable gap in the existing literature by adapting general port development theories, typically applied to large ports, to the context of small ports. The study explores how these theoretical frameworks can be tailored to the unique characteristics of small ports, recognising challenges such as the integration of operations due to the smaller size. In this particular context, the close integration of the public sector and the relatively large oil terminal makes the case even more complex.

The research presents valuable insights by formulating different strategies and assessing the potential value of privatisation, shedding light on the current state and possible future trajectories. In addition, the research evaluates the effectiveness of this approach as a method for studying the development of small ports and the feasibility of privatisation. The Discussion section will analyse the results obtained from the use of this technique.

For the port itself, this research is particularly relevant as it provides a comprehensive overview of the options available. By outlining different potential strategies, the port gains a roadmap for pursuing opportunities and preparing for future developments. This strate-

gic insight can potentially enable the port to diversify its operations and expand its market, attracting more business and increasing its resilience.

For the island as a whole, the port is of paramount importance and serves as a lifeline for the community. Equipping the port with the tools to become more resilient will ensure the security of the primary supply line. In addition, the development of the port has the potential to reduce the costs associated with importing goods and materials, potentially alleviating the high cost of living on the island.

1.5 Report structure

The report is structured as follows. Following an introduction to the port and the island in chapter 1, the methodology used in this report will be explained in chapter 2. chapter 3 will discuss literature on privatisation, including its rationales and processes. Moreover, the report will explain models for collaboration between public and private parties in the port industry. In chapter 4, the necessary analysis will be carried out in order to gain the knowledge needed to formulate the strategies. To achieve this, a PESTEL analysis is carried out to obtain a general understanding of the island and the port. Based on this information, the SWOT analysis is executed, and the various factors identified in the PESTEL analysis analysis are analysed. Moreover, a Trend analysis analysis is carried out, using the SWOT analysis analysis as a guide for trends that may be significant. The strategies are derived in chapter 5 based on the provided information. Firstly, the design criteria are formulated to identify the critical elements to be addressed in the strategies. From these criteria, four strategies have been created to solve the challenges. In section 5.3 the strategies are validated with the help of experts and users. The possible combination of strategy elements is discussed in detail in the strategic roadmap presented in section 5.4. The potential for privatisation is then explored in chapter 6, based on the identified strategies. In chapter 3, each individual strategy is evaluated to determine the potential benefits of privatisation for the implementation of the strategies. In chapter 7 the process is discussed and concluded and further recommendations are given.

Chapter 2

Methodology

2.1 Research approach

This study aims to identify ways to ensure the sustainable functioning of the port. Exploring the possibility of privatising the port is seen as an opportunity to potentially increase its resilience by improving its financial position. Before determining the viability of privatisation, however, it is essential to understand how the port can be strengthened against emerging challenges. The study consists of two main phases. In the first phase, strategies were formulated to investigate opportunities in the port's development, drawing on insights from the Trend analysis and SWOT analysis analyses to understand emerging opportunities and the changing environment. The PESTEL analysis established a fundamental knowledge base for understanding the island and the port, and provided essential information for both the SWOT analysis and strategy formulation. In the second stage, the developed strategies were assessed to determine the extent to which privatisation could facilitate their successful implementation. A visual overview of the whole process can be seen in Figure 2.1.

2.1.1 Strategic port planning process

To explore possible strategies for the port, the Strategic Port Planning Process (SPPP) of Notteboom et al. (2022) was used. Notteboom is a widely cited author in the field of port and maritime economics and management. His recently published book Port Economics, Management and Policy (Notteboom et al., 2022) clearly explains how to undertake the formulation of strategic port planning. The method is designed to assess the risks and uncertainties associated with changes in a port's environment. It is applicable to long-term planning of 10 to 30 years and is therefore well suited to the development of strategies for St. Eustatius.

A range of port planning methods were evaluated, and specific options were excluded for various reasons. The publication by UNCTAD (1978), although frequently referenced, was considered outdated as its publishing date is over three decades old. A more recent publication, The World Bank (2007), focuses primarily on port reform and lacks the specific focus on strategic planning that is essential to this project. The book by Tsinker (2004) shares a similar issue as it predominantly concentrates on the demand and engineering aspects of port planning. Therefore the SPPP was selected since it places significant importance on the development of a strategic plan and associated methodologies and was therefore closely aligned with the needs of the project. The SPPP involves five distinctive stages:

1. Formulate a mission or strategic intent
2. Assess the gap between abilities and ambitions
3. Create resources to fill the gap
4. Strategy formulation and implementation
5. Evaluate the effectiveness of chosen strategies

The first step is to analyse and define the long-term objectives of the port (section 4.2). To achieve this, a thorough assessment of the current situation was carried out using various tools. The PESTLE analysis was used to gain insight into the current situation of the port and its environment. This is a commonly used tool to gain insight into the external business environment (Alanzi, 2018). The analysis provides a comprehensive understanding of the port's competitive environment. Although this method is not specifically optimised for port analysis, it should give a good impression of the port's position in the market. It also forms the basis for the frequently used SWOT analysis, which is used in the second step to gain a deeper insight into the internal and external factors affecting the organisation. This method is also used by Notteboom et al. (2022) to gain an understanding of the port's ambitions and capabilities. The information required for these two analyses is gathered through observation and desk research from sources in the literature and reports from various private parties and government agencies. The results will then be evaluated in collaboration with the port authority, as they will have a good insight into the organisation.

The second step is to assess the ambitions and capabilities of the port. This was done with the help of a SWOT analysis as suggested by Notteboom et al. (2022) (section 4.3). This highlights the competencies of the port but also identifies areas that are lacking and need to be improved. In addition, a trend analysis was carried out using the STEEP method to gain a deeper insight into possible developments that could have an impact on

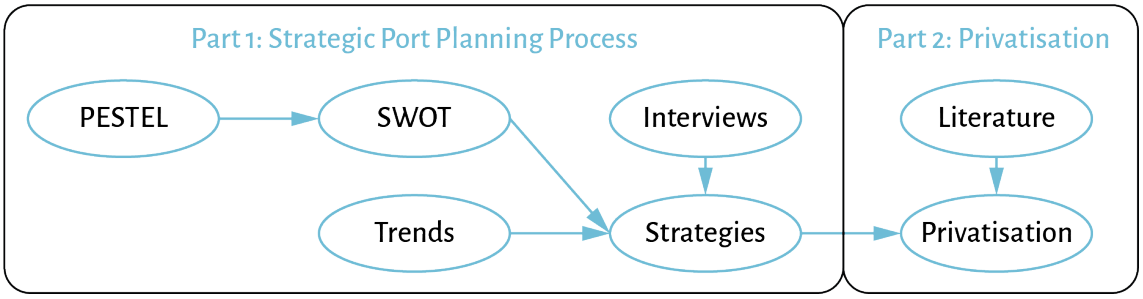


Figure 2.1: Research approach

the port (section 4.4). This is to ensure that the strategies take into account future changes and that no unforeseen situations arise.

Steps three and four have been combined as new core competencies will be added to the strategy and these cannot yet be formulated without looking at the possible strategies. Therefore, the strategies will be defined together with the resources needed to close the gap (section 5.2). This will include the reallocation of resources, the reorganisation of port services, investment in infrastructure and other assets, and the implementation of measures to improve efficiency and sustainability. In the SPPP, the possibility of changing the institutional and governance aspects of the port is also included in this step. In this report, this was performed at a later stage (chapter 6) as the possible strategies will first be validated.

Step five in the process is to evaluate the effectiveness of the chosen strategies. As the aim of this report is to explore the options for the port without actually making any adjustments, this step is not feasible. However, in order to gain insight into whether the developed strategies are in line with the needs and opportunities, they have been validated with the help of different users and experts (section 5.3).

2.1.2 Privatisation

To evaluate the potential contribution of privatisation to the realisation of the strategies, it is crucial to understand the motivations behind the privatisation of government operations and the processes involved. Chapter 3.1 presents an analysis of various rationales for privatisation as outlined in Kouser et al. (2011) and OECD (2019a). Afterwards, each strategy was assessed to determine its consistency with one or more of these rationales.

In order to comprehend the potential implementation of privatisation in the different strategies (chapter 6), an extensive literature review was conducted on different privatisation methods (section 3.1). Moreover, this study entailed an assessment of numerous models of public-private cooperation in the port industry (section 3.2). The OECD (2010) recommends a three-stage procedure for privatising: the separation of government activities into a separate company, the transformation of the company into a private structure, and the determination of the percentage of the company to be sold.

The assessment of the potential contribution of privatization was conducted in two stages. Firstly, the feasibility of privatisation was determined on the basis of different rationales, and secondly, how privatisation could be integrated into specific port strategies was explored.

2.2 Methods

2.2.1 Literature research

This report consists of two main sections, demanding comprehensive research on distinct aspects. The literature review was carried out using the Scopus and Google Scholar databases. The keywords used are outlined in Table 2.1. A filter was applied to papers published within the last ten years. For each search criterion, the abstracts of the first 20 hits were reviewed to assess their relevance. If the necessary information was not available within the established criteria, the date of publication was extended. Likewise, older papers with a high number of citations were also analysed for their relevance.

The first section presents an analysis of privatisation to be able to answer the fifth and sixth research questions. While prior research on privatisation focuses primarily on ports, a comprehensive investigation of associated industries was also conducted. The initial focus was on identifying the methods used for privatisation, but it became clear that the underlying reasons for privatisation were equally critical. As a consequence, the research focus has shifted to examining the justification for privatisation. Within this field, the Organisation for Economic Cooperation and Development (OECD) has published multiple reports on privatisation, detailing

the reasoning and essential actions that governments must undertake to privatise governmental operations (OECD, 2010, 2017, 2019a, 2019b).

In order to determine if privatisation could be a useful strategy for the port of St. Eustatius, it was crucial to first consider future scenarios and formulate potential development strategies, this will also answer the fourth research question. To accomplish this, it was necessary to have a solid grasp of port operations, which was facilitated by Notteboom et al. (2022)'s comprehensive work on Port Economics, Management, and Policy, covering a diverse range of port-related topics. These insights formed the foundation for developing the strategies. Data for the PESTEL and STEEP analyses were collected from a range of sources such as newspapers, technical reports, trend reports, research papers, government reports, and various online publications. This information offered an understanding of the factors impacting the region and the port. Based on this study, the port's strategies were devised.

Table 2.1: Keywords literature review

Research part	Keywords
Method	Port planning, Strategic port planning, Port planning framework, Port reform, SWOT, Trend analysis, PESTEL, STEEP, Semi-structured interview, Informal observations
Background study	Port models, Port operations, Port classifying, Hub ports, Transshipment ports, St. Eustatius, BES-island, Caribbean, tourism, GTI oil terminal, Hurricanes
Privatisation	Reasons for privatisation, Roadmap to privatisation, Port privatisation, Ports post-privatisation, Critical infrastructure, Public-private partnership, Resilient port

2.2.2 PESTEL

The PESTEL analysis was used to answer the first research question, providing an overview of the external factors relevant to the port and the island. PESTEL, which stands for Political, Economic, Sociological, Technological, Environmental, and Legal dimensions, is a widely employed tool for assessing the impacts on an organisation's operational context (The University of Sydney, 2022). Extensive research has been undertaken to evaluate the effects of these factors on both the island and the port, utilizing data from numerous sources, including government and technical reports. This approach often forms the basis of carrying out a SWOT analysis, in which the external factors are examined (Cadle, Paul, & Turner, 2014). For a more detailed explanation of the specific factors used in this analysis, please refer to section 4.2.

2.2.3 SWOT

In order to assess the factors identified in the PESTEL analysis, the SWOT methodology is applied, this will also answer the second research question. SWOT is a prevalent methodology used for examining the business environment and facilitating an organisation's strategic decision-making. This analysis delves into both the internal and external factors, with strengths and weaknesses assessing the internal facets, whilst opportunities and threats focusing on external elements that affect the organisation (van Boeijen, Daalhuizen, & Zijlstra, 2020). In this particular case, SWOT is used to assess the port's potential to capitalise on opportunities and to identify barriers that prevent the port from effectively exploiting these opportunities. To achieve this, the factors identified in the PESTEL analysis that will have an impact on the port are classified into the different SWOT categories.

2.2.4 STEEP (Trend)

To address the third research question, the STEEP methodology was used to examine trends that could affect the port's development. This approach, as outlined by van Dorsser and Taneja (2020), offers a structure to systematically screen for megatrends and key uncertainties to identify long-term trends with a horizon of one to two decades. Given that the port's strategic timetable aligns with this horizon, the application of the STEEP proves effective in identifying trends that could significantly impact the port's operations. STEEP incorporates the following factors Societal, Technological, Economic, Environmental, and Policy perspectives. Van Dorsser and Taneja (2020) case study on the Rotterdam port adds an "E" for "Energy", as this is of particular importance to the port of Rotterdam. This category is also included in the report, as energy plays a pivotal role on the island, notably with regard to the GTI oil terminal. Data for the trend analysis will be obtained from industry and government trend reports, with emphasis on three key areas: the maritime industry, the Caribbean region, and the energy sector. This approach is consistent with the SWOT analysis, which identifies key issues, and ensures a focused examination of trends relevant to the specific dynamics of the port and its operating environment. The findings from this analysis can be found in Section section 4.4.

2.2.5 Interviews

To validate the different strategies developed for research question four, a series of interviews were conducted with both experts and users. The main purpose of these interviews was to ensure that the proposed strategies were in line with user expectations and to assess their practicality with expert knowledge. A total of four interviews were conducted.

One of the interviewees was a regular port user who owns a dive shop and regularly uses the quay for diving expeditions. His interview was aimed to capture an unfiltered opinion, given his firsthand experience and valuable insights into port procedures.

Two additional interviews were conducted with personnel directly involved in port management. The harbour master, who is responsible for the daily operations of the port, provided insights into the operational intricacies of the port. The commercial manager transport, employed by the government to oversee the port, provided insights on its operations and the impact of political factors.

From an external viewpoint, an interview was conducted with the Senior Policy Advisor and Coordinator Harbour Project on Saba. They are responsible for designing and planning a new harbour on Saba, which has similar conditions to St. Eustatius. Their knowledge is valuable in providing external insights on how ports are developed on smaller islands.

A semi-structured interview approach, specifically the focused interview, was used. The questions given were pre-defined, yet they functioned more as prompts than strict guidelines to be followed. This approach allowed for tailoring the queries to suit the specific needs and relevance of the interviewees. The interviews were conducted in a manner that aimed to gain deeper insights into the interviewees' opinions and potentially uncover other relevant factors. As a result, the interviews were made less formal and more an open conversation.

The interviews were transcribed either in full or by transcription of only the responses to questions. This approach was primarily taken to speed up the transcription process and improve the readability of the content. Subsequently, the interviews were utilised to support the strategies, to make adjustments to the strategies and to identify limitations.

2.2.6 Informal observations and conversations

To gain a more thorough understanding of the local community and port operations, a visit was made to the island. Informal observations and conversations were used to gather information about operations and public opinion. This helped in answering the first three research questions and was also valuable for gaining insights to answer the fourth research question. This contributed to addressing the first three research questions and was also valuable in providing insights for addressing the fourth research question. Some of these informal conversations were then supplemented by semi-structured interviews. The informal nature of these conversations allowed for the collection of data that might not have been obtained through formal interviews alone (Swain & King, 2022). This method also facilitated contacts for subsequent interviews, particularly with port users, providing a broader understanding of public opinion on the port.

Chapter 3

Literature review on Privatisation

Understanding the potential advantages of privatisation requires a comprehensive understanding of the concept of privatisation and the mechanisms through which the process unfolds. Section 3.1 provides an overview of privatisation, including its rationale, procedural aspects, corporate structures and also highlights some downsides. Additionally, section 3.2 explores the application of privatisation in the port sector. This section explores the range of services provided by a port and outlines the different ways in which public and private entities cooperate within the port industry.

3.1 Privatisation

Privatisation is defined as "the act of selling an industry, company or service that was owned and controlled by the government, so it becomes privately owned and controlled" (Cambridge Dictionary, 2023). In this process, the government sells its controlling stake in a company or service, allowing private entities to take over management and ownership. The underlying principle of privatisation is that exposure to market competition will lead to economic benefits (Black & Roso, 2022; Cullinane & Song, 2002; Haarmeyer & Yorke, 1993; Høj, Kato, & Pilat, 1995; Malema & Kaelo, 2013).

There are various reasons for privatising an enterprise, which are discussed in Rational for privatisation. There are also different degrees of privatisation, which will be explored in Degrees of privatisation. Within the port industry, different governance models can be used for privatisation, as discussed in Port Administration Models.

Whilst the literature often highlights the benefits of privatisation according to the economic aspects, the reality does not always show these outcomes. In Downside of privatisation a few of the downsides of privatisation will be highlighted. These different aspects of privatisation are crucial to understanding how it is applied to specific industries and the extent to which it affects both the public and private sectors.

3.1.1 Rational for privatisation

The main rationale behind this principle is that market competition exerts pressure and motivates companies to improve efficiency and overall performance. This competition can lead to reduced costs, increased capacity and improved economic viability. State-owned entities, such as ports, may lack the intrinsic motivation to improve efficiency as they are often dependent on government budgets. Political influence on these entities can be detrimental to their commercial competitiveness (Haarmeyer & Yorke, 1993).

The primary objective of privatisation is to expose the privatised company to market competition, thereby increasing the need for efficiency. However, there are several other reasons for privatising an enterprise. According to both Kouser et al. (2011) and OECD (2019a), there are multiple rationales for determining whether privatisation is suitable. While there is some overlap between these rationales, there are also differences, as shown in Table 3.1. In practice, privatisation often focuses on a selection of these factors rather than attempting to satisfy all of them. Kouser et al. (2011) classifies these rationales into different categories to distinguish between them, taking into account different aspects to which privatisation can offer solutions. These categories are:

- Accounting
- Economic
- Political
- Social

Among the various reasons for privatisation, accounting reasons stand out as the most dominant motive for privatising a state-owned enterprise. Changing the management structure can lead to significant improvements in the behaviour and overall performance of the company, resulting in a better performing entity. The economic rationale for privatisation is based on the belief that greater efficiency can be achieved through market competition. In addition, privatisation can reduce the economic burden that a state-owned company can place on the government. Political reasons for privatisation are often driven by politicians with a market-oriented political vision. They believe that private entities can operate more efficiently and therefore advocate privatisation. Social reasons for privatisation highlight the potential benefits of improved efficiency

Table 3.1: Rational for privatisation

Kouser et al. (2011, p.35)	OECD (2019a, p.24)
1. underutilisation of resources 2. over and redundant employment 3. fiscal burden 4. financial crises 5. heavy losses and subsidies in order to improve and strengthen competition 6. public finances 7. funding to infrastructure 8. quality and quantity of services in terms of management	1. rationale for government intervention no longer present (e.g. government intervened because of a market failure and that market failure is no longer present) 2. raising revenue for the national treasury either to reduce debt or to raise expenditure 3. improving economic or sectoral economic performance 4. enhancing the efficiency of the individual state-owned enterprises 5. developing national stock exchanges 6. diversifying corporate ownership and/or attracting outside investment 7. attracting a strategic or foreign investor 8. opening up markets for competition and improving service delivery

in various sectors that directly affect society, such as health and education. Improved efficiency can lead to better service delivery and ultimately benefit the population as a whole.

3.1.2 Conditions for privatisation

The process of privatising a state-owned enterprise (SOE) is a complex undertaking, requiring careful planning and often regulatory adjustments to ensure that the privatised entity continues to perform its intended role effectively. Rushed and ill-informed privatisation processes can lead to the failure of newly privatised enterprises, often due to inadequate analysis and debate, which can result in the benefits to society being overlooked (Lazzarini, 2022).

The privatisation of an SOE should not be taken lightly, as these companies were originally created by the government to fulfil a specific role that could not be performed by a private party. Therefore, the sale of an SOE may not always be in the public interest (OECD, 2010). However, in cases where the SOE has become inefficient under government control, privatisation may be necessary.

The OECD (2010) identifies three critical elements that policymakers should consider before preparing an enterprise for privatisation. The first step is to decide whether the government's activities should be transferred to a separate entity. This decision depends on understanding the underlying reasons for privatisation and why it might be more effective to create a separate entity to handle these activities. It helps to determine whether privatisation is really necessary or whether other management approaches, such as maintaining the status of a state-owned enterprise, could work.

The second step is to carry out an in-depth assessment of the SOE to identify the changes needed both within the company and in the legislation to enable it to function as an independent entity. This stage may involve restructuring the business, raising the question of whether the government should undertake the restructuring to achieve a better sale price, or whether it could be more effectively undertaken by a private investor at a discount. The extent of the government's involvement in the restructuring process will depend on how much of the company it intends to sell. If the government retains partial ownership, it is likely to participate in the restructuring and may have to initiate it before the partial sale.

3.1.3 Degrees of privatisation

The process of privatisation entails the transfer of assets from public control to private control this can however go in gradients and it does not mean that the control by the state needs to be lost (OECD, 2010). There are different methods by which the state can cooperate with private parties which are listed below:

State-owned enterprise

A state-owned enterprise (SOE) is an enterprise that is partly or wholly owned by the government, which allows the government to exercise influence or control over these enterprises. State ownership is usually reserved for enterprises that serve specific public or economic interests and cannot be effectively regulated by laws and regulations alone (Rijksoverheid, n.d.). In such cases, the government may choose to invest in and control the company in order to safeguard larger

national strategic interests. This is particularly important for companies involved in critical infrastructure or that play a key role in the national economy.

Another scenario where state ownership may be considered is in the case of monopolies, where a single company dominates the market (Minesterie van Financiën, 2022). In these cases, state ownership may be justified by the vital importance of such companies. However, it's important to note that state ownership carries financial risks. Firstly, it requires a significant allocation of the state budget to acquire these companies. Secondly, as these companies operate in the market, they are subject to economic forces and fluctuations that may expose the government to financial risks.

Fully privately owned

One option for privatisation is the complete transfer of assets from a public body to a private company. This approach is often used when the business to be privatised is relatively small and not suitable for other privatisation methods. In such cases, these smaller companies are sold to an existing private company that can integrate them into its business (OECD, 2010). This process is called a "trade sale". A similar process can be used for companies that are not financially viable. This approach is used when the company is in need of industrial partners, technological upgrading or corporate restructuring and the public entity cannot provide these necessary interventions.

On the other hand, if the company to be privatised is too large, resulting in concerns about the acquiring company gaining too large a market share, or if the SOE is too dominant in the domestic market, the company may be privatised through an Initial Public Offering (IPO) (OECD, 2010). An IPO allows several companies to take partial ownership of the company. Privatising the company through an IPO is also a way of raising more capital from the sale.

Public-private partnership

A public-private partnership (PPP) is a collaborative relationship between a public body and a private company that share a common goal while pursuing their individual objectives. By aligning their objectives, both parties can work together to achieve mutual benefits and establish a durable form of operation (Panayides, Parola, & Lam, 2015). As a result, risks, costs and benefits are shared between the parties. In such a partnership, a government agency enters into a long-term contractual arrangement with a private entity for the provision of specific services. The private party takes responsibility for delivering the required services, which in the context of the port industry often includes tasks such as building, financing, managing and maintaining the facilities specified in the agreement (Panayides et al., 2015). Public-private partnerships are seen as effective mechanisms for accessing finance, management expertise, skills and know-how while allowing the public sector to retain control (Vining & Boardman, 2008). This approach enables public organisations to achieve efficiencies similar to those of private companies and reduces the burden on public operations while retaining control.

3.1.4 Privatisation of critical infrastructure

Shock events such as natural disasters, industrial accidents, terrorist attacks, and cyber threats reveal the increased vulnerabilities of critical infrastructure systems (OECD, 2017). These incidents demonstrate how the disruption or destruction of such systems can have cascading effects that span across sectors and even national borders. Ensuring the uninterrupted functioning of vital infrastructure has become an indispensable element of policies aimed at managing disaster risks.

In the modern landscape, the ownership and control of critical infrastructure assets have shifted from government through state-owned enterprises to privatisation (OECD, 2019b). Governments and critical infrastructure operators often share the overarching goal of protecting key assets and maintaining their services. However, differing views can emerge on the level of security resilience required, the means to achieve it, and the specific requirements that should apply (OECD, 2017). For governments to keep control of their critical infrastructure it is important to be able to influence the decision-making on how to ensure continued operations. For private enterprises, the government needs to enforce legislation that will ensure this continued operation. However, more often these challenges are solved by creating public-private partnerships by combining the development and implementation of policies within an enterprise therefore a more resilient and secure infrastructure can be created (OECD, 2017).

3.1.5 Downside of privatisation

Private companies are oriented towards profit generation. This focus on profit often leads to increased efficiency, in line with the primary rationale for privatisation. However, this profit-centred approach can also lead to a decrease in accountability towards the public, with the primary goal becoming self-enrichment rather than serving the public interest (Dorfman &

Harel, 2016). This can result in decisions that prioritise individual gain over the public good. This shift has the potential to reduce citizen participation in decision-making, undermining political engagement and shared responsibility (Dorfman & Harel, 2016). This pursuit of self-enrichment leads to a potential misalignment between the interests of the public and those of private entities.

Although government operations may have their faults, it is not always true that private entities perform better. A remarkable instance is the privatisation of major ports in Australia, where the introduction of market forces led to failed competition and significant influence by shipping companies (Taylor & McDonald, 2023). This led to efficiency losses and high prices with narrow profit margins. Notably, the region's most efficient port remains publicly owned, highlighting that privatisation is not always the optimal solution and requires careful evaluation for successful implementation.

Public infrastructure often tends to have monopolistic characteristics due to its substantial social requirements and capital costs (Tan, 2012). This may require the public to subsidise privatised entities in order to attract private investors. However, such dependence on continuous public support could lower the private party's motivation to improve efficiency gains (Tan, 2012). This issue frequently arises in developing nations where financial resources and efficiency enhancements prove inadequate during the privatisation process. The Caribbean, which is still often referred to as a third-world region (Connell, 2009), may face equivalent difficulties when privatising public infrastructure.

3.1.6 Concluding remarks

In this chapter, the underlying rationale for privatisation and the different ownership structures have been explored. The following chapter will provide a more detailed examination of how these unique ownership structures are utilized in port administration models for effective port operations. The insights gathered from these sections will be utilised in chapter 6: Privatisation evaluation to discuss how privatisation and the different models can contribute to the development of the port of St Eustatius.

What are the benefits and disadvantages of privatisation?

The main advantage of privatisation is often attributed to the introduction of market competition, resulting in economic benefits. Despite being the overarching rationale, several underlying reasons exist to support different aspects of why this may be the case. Predominantly the accounting reason is used to create financial benefits for the government. Furthermore, performance improvement is seen as a major benefit of privatisation. Generally, the privatisation process is based on these two main rationales, which are often reinforced by other rationales.

To privatise a government operation, it must first be converted into a state-owned company and restructured to operate in a manner similar to private firms. This allows for the (partial) sale of the business.

There are several methods of implementing privatisation, ranging from complete public ownership to complete private ownership. In between these extremes is the collaborative approach of a public-private partnership, often used for the management of critical infrastructure, to ensure that policies are developed and implemented with the alignment of all stakeholders.

Although there are apparent benefits to privatisation, this process also has its drawbacks. To begin with, the main goal of a private company is to generate profit, which can lead it to overlook the benefits to the public. Moreover, a privatised company does not necessarily outperform a state-owned one, it may occasionally fail and the results may be the opposite of the intended goals. Finally, the privatisation of infrastructure in a monopolistic scenario can lead to high public funding even though it is privatised.

3.2 Port Administration Models

Ports are complex systems with a multitude of functions and roles, which all lead to the providence of different services and activities. To manage this, there are multiple frameworks for organisational structuring and ownership (Bichou & Gray, 2005). Different frameworks have different approaches on how to distinguish between the classifications. The frameworks classify themselves by focusing on a specific layer within the approach, such as; macroeconomic, Institutional/organisational and Geographic & spatial. There are also hybrid models that combine the structures, of which the most cited are the UNCTAD (1992) generations and The World Bank (2007) (Bichou & Gray, 2005). The classification proposed by The World Bank (2007) toolkit will be used in this report as it makes a clear classification between the organisational models and a clear division between public and private ownership. The UNCTAD (1992) approach focuses on the different generations of port development, which is less fitting with the project and was also seen as less suitable as it is over a decade older.

The toolkit of The World Bank (2007) supports policymakers in reforming fundamental port institutions from a public entity to a more privately owned operation. They disingenuous four types of port models concerning the public and private roles in port management. In Figure 3.1 the degree to which the private and/or public domain is responsible has been displayed. Before discussing the models, it is important to understand the different services a port can provide.

The upcoming section explains the port services and port models as described by the The World Bank (2007) and is therefore based on its publication.

3.2.1 Port services

The World Bank (2007) divides the services a port can provide into two groups; core and value-added services. The core services mainly focus on the management of the ship or shore operations. While the value-added services focus on the logistic chain and the value that can be added by performing certain operations. The separation between these services is a bit fluid, as there is no hard constraint as to which services belong to which specific category.

Core services

The core services focus on the operational part of the port and exist out of the following services, see Table 3.2. The marine services focus on everything that is necessary to safely dock a ship and get it back out of the port. Terminal services entail everything that happens at the terminal, of which the majority is the handling and storage of cargo. Repair services focus on the maintenance of the terminal infrastructure and equipment.

Table 3.2: Core services with examples

Marine services
Access and protection
Pilotage
Towage
Vessel traffic management
Fire protection service
Chandlering
Terminal services
Vessel tie-up
Container handling and transfers
Breakbulk cargo handling
Dry and liquid bulk cargo handling
Container stuffing and stripping
Bagging and packaging
Cargo storage, acceptance and delivery
Repair services
Dredging and maintaining channels and basins
Equipment repair and maintenance
Container and chassis repairs
Estate management services
Information management services

Value-added services

Value-added services go further than the essentials needed for port operations. They focus on specialised handling and storage to create an integrated logistic system from the port. Enabling the ports to play a larger role in the supply chain process of shippers. By reducing intermediate costs the shippers are able to widen their reach in different markets. Value-added service can be further divided into different segments, as can be seen in Table 3.3. value-added logistics is split into general logistic services and logistics chain integration services. The first focuses on traditional logistics activities and is an expansion of terminal services. The latter is focused on performing extra operations for specific types of goods. This can be to support manufacturers who do not see these activities as their core business. The usage of value-added facilities is largely dependent on the focus of a port. These services can not be specifically assigned to a type of good or product. They rather arise from the demand for specific goods flows that necessitate added services. As an example in a large container terminal, there can be high demand for a container repair station.

Table 3.3: Value-added services overview (The World Bank, 2007)

value-added services		
value-added logistics		**value-added facilities**
general logistics services	**logistics chain integration services**	parking facilities
loading/unloading	quality control	weighbridges
stripping/stuffing	repacking	customs facilities
bulk storage	customizing	truck maintenance and repair facilities
tank storage	assembly	container repair and maintenance
general warehousing	testing	cleaning facilities
conditioned warehousing	repair	tanking facilities
distribution centers	re-use	trailer renting and leasing
		information and communication
		safety and security services
		offices/wtc
		hotels, restaurants, shops

Private-public responsibility

The different services can be provided by the public entity or (partially) outsourced to private operators. The manner these obligations are outsourced to private parties is determined by the type of service and the assets required. To ensure that the service is available to all users, it is vital to establish public responsibilities as well as critical core functions. The governmental entity will also be in charge of licensing the private operators with the necessary qualifications. It is critical to determine which services can be outsourced and which must remain private when substantial investments are required. Assets that require investments can be divided into three categories;

- basic infrastructure that is needed by all users (e.g. channels and breakwaters)
- operational infrastructure that can be assigned to specific users (e.g. quays and terminals)
- equipment and superstructure that are associated with a specific users

Depending on the assets, the financial responsibility will be with the public entity or the private operator. The investment in large infrastructure required by all users will likely be carried out by the public sector. Specific infrastructure for users can be financed by the public entity and then leased to a private party. The private operator primarily pays for equipment and superstructure.

3.2.2 Port Models

The World Bank (2007) distinguishes the four-port models based on their characteristics of public, private, or mixed ownership and operations. These distinctions are made based on the infrastructure, including the land and the ownership of the superstructure and equipment. Furthermore, a distinction is made between the party that employs the personnel and the party that is responsible for the management of the port.

Public service port

In the public service port model, a public authority is the owner and operator of the port. They carry the responsibility for the operation and maintenance of all assets. Mostly, it also provides all the services required at the port, including cargo handling activities. The labour force is also directly employed by the port authority. In some cases, a part of the handling activities are performed by a separate public entity that answers to the same public authority. This can cause conflicts between the different private parties as interests are not aligned, creating a conflict for the management authority.

The strength of the model is that only one actor is responsible for all the development of superstructure and cargo handling meaning that there is alignment between them. However, doing everything yourself has some limitations. There is no option to have private operators take over part of the operations. Private operators are often more focused on competition leading to a more market-oriented focus and a larger incentive to innovate. This is often caused by the dependency on the government and their interference leading to wasteful use of resources and under-investment. The lack of pressure to perform at a higher level leads to an overall lower performance of the operation.

Tool port

The port authority owns and controls the port in the tool port model. They are responsible for developing and maintaining the infrastructure, as well as overseeing a portion of the superstructure. This arrangement

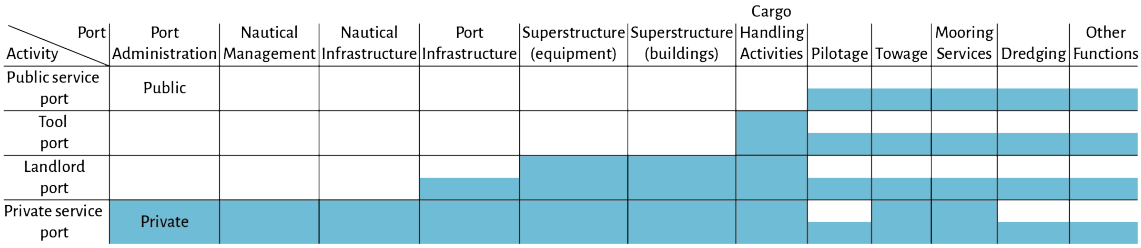


Figure 3.1: Public-Private roles in port management (The World Bank, 2007)

offers a significant advantage by avoiding unnecessary duplication of infrastructure and equipment. Additionally, the port authority operates all the superstructures using its own staff.

Private cargo operators work on the vessels, while the shipping agents contract the apron and the quay. Although the port authority manages the cargo handling machinery, the cargo handlers interact with the cargo or ship owners, which creates challenges in handling contracts. The cargo handlers do not have control over all aspects of the operation, leading to issues of not having control over providing the agreed services.

The port authority also provides the land and superstructure for cargo handling companies. These companies primarily have variable costs, while the port authority absorbs the fixed costs. However, these businesses are often small and fragmented, which hinders their ability to capitalize on opportunities and become efficient handlers. Consequently, they mostly function as labour pools, preventing them from expanding into capable firms.

Similar to a public service port, the high degree of public influence in the port tool model diminishes the drive for innovation, resulting in underinvestment in infrastructure and superstructure.

Landlord port

The landlord model has the highest mix of public-private cooperation. The public port authority is responsible for regulations within the port and has a landlord function. They lease the land to private operators who are responsible for all port operations. The land is leased for a set price per square meter determined by initial construction costs and often comes with basic infrastructure. The private operators are responsible for all equipment and superstructure they require. This includes among other things the equipment for terminal operations, storage and offices. The labour is also employed by the private operators, although in some cases there is a port-wide labour pool exist from which private operators can get their personnel.

The private party responsible for the complete operation of the cargo handling has large advantages. Being required to invest in their own superstructure makes them more focused on fluctuations in the market and adapt to these changes. This makes sure that the availability of surfaces is more in line with the demand from customers. The private operators are also more motivated to invest in the port as they are under long-term contracts and they can not easily move their superstructure to another location.

The market competition between different private operators can lead to overcapacity as they try to compete. This can also come with the misjudging of the needed capacity expansions over time, leading to private operators having higher financial risks.

Private service port

The private service port model is the most extreme form of privatisation within the port industry. The land, infrastructure and superstructure are privately owned. The government has almost zero involvement in the port business. In some cases also the regulatory responsibility is conveyed to the private sector. Giving away regulatory control can have some negative impacts on the port business. They will not be able to set long-term goals for the development of the business to create economic growth. Selling the ports can also create monopolies within the industries as a single private party can operate multiple ports. To combat this an overall regulatory body for ports can be created. Furthermore, the risk with this model is the repurposing of land for other non-port-related purposes, making it almost impossible to ever reclaim this land for port purposes. Furthermore, it can also result in speculation with land prices especially if the land is located close to a city.

The strengths of this model are that the private party is flexible in deciding which infrastructure they deem necessary. Furthermore, they can better focus on market development and expand their scope on port- and non-port-related businesses. The removal of political interference also makes the port more flexible in its operations and focus on market demand.

3.2.3 Concluding remarks

The division of port services, according to the The World Bank (2007), consists of two segments: core services and value-added services. Core services include aspects related to ship arrivals, loading/unloading, and the operational management of infrastructure which are necessary for the port to be operational. Meanwhile, value-added services aim to enhance the port user experience and focus on specialized handling and storage to create an integrated logistics system. Depending on the necessary assets and their significance, the public sector can either provide these services or outsource to a private operator. In the case of outsourcing, it is essential that all port users have access to these services.

The World Bank (2007) identifies four different models for organising public-private cooperation within the port, ranging from full public ownership to full private ownership. The two intermediate models are the tool-port and the landlord-port models. In the tool port model, there is a high level of public influence as the public party is responsible for the construction of all infrastructure and superstructure. In the landlord model, the private party constructs all superstructure while infrastructure investment is split according to the specific case. The landlord model is usually favoured as it significantly lessens the expenses of the public party and secures long-term commitment from the private party.

The theory's application will be explored in various sections. The method of incorporation of these services and models into the port of St Eustatius will be highlighted in 4.1 Application of theory. Additionally, the inclusion of supplementary services will be examined in the 5.2 Strategies. The possible transformation of St. Eustatius' port model will be discussed in 6 Privatisation evaluation.

Chapter 4

Analysis of the port & island

In this chapter, an analysis of the port and the island will be carried out. First, the port model will be evaluated based on the literature review presented in section 3.2. Subsequently, the analysis required for the strategic port planning framework will be addressed. The analysis will begin with the PESTEL analysis to gain insights into the current situation, which will then be used to perform the SWOT analysis, which will highlight potential opportunities. Finally, the Trend analysis will be conducted to gain insights into the evolving surroundings.

4.1 Application of theory

The port services as outlined by The World Bank (2007) in subsection 3.2.1, categorises port services as either core or value-added. Core services are vital for a port's operations and, in the case of St. Eustatius Port, most such services are accessible, though repair and information management services require further improvement. Repair and maintenance of the port are overdue, and information on port operations is almost nonexistent, as highlighted in section 4.2. According to The World Bank (2007), numerous value-added services can be implemented, and though some are already accessible at the port of St. Eustatius, there exists a considerable opportunity for the expansion of these services. Depending on the kind of services these can be performed by a public or private party.

The port models as described by The World Bank (2007) in subsection 3.2.2 make very clear distinctions between the different models in their theory. In practice, however, these distinctions are not as clear as described in the literature, reality often shows a more complex situation. In the case of St. Eustatius, the clear distinctions are convoluted by the complex relationship between the port and the oil terminal. Secondly, the port's small size also means that more functions are agglomerated or not present. The port authority is responsible for all the infrastructure and security. Furthermore, it only owns a small amount of equipment existing of two forklifts which are used for moving goods around the warehouse. It also does not provide any other ancillary services. The truck used to move the containers on dollies of the boats is owned by a private operator which is also responsible for signing the contracts with the ship and cargo owners. According to this method of operation, the port seems to operate according to the tool port model.

As described in section 3.2.2 the tool port model does have some drawbacks compared to other models. Mostly contractual between cargo handlers and the ship or cargo owners. It also does not incentivise the operators to invest in their equipment and operations resulting in underinvestment and lack of innovation (Voorkamp, 2022). The tool port model is however a good transition model when switching to other forms of governance in case investment risks are high. As the government is responsible for the high infrastructure and superstructure investment the risks to operators are relatively low (Munim, Saeed, & Larsen, 2019).

Whilst for the port it is relatively clear that it fits under the tool port model the case for the oil terminal is different. The terminal is fully privately owned and they foresee in all their own superstructure. The permission for pilotage is also granted to the oil terminal, enabling them to foresee in their own needs. For the delivery of goods, they do make use of the port. The port authority is responsible for the correct and safe operations within the allocated waters. This makes the port model for the oil terminal more of a landlord model. As the terminal mostly foresees its own necessities, the port authority provides the land on a lease and is responsible for the regulations. This creates a kind of hybrid model that has both the advantages and disadvantages of both models.

4.2 PESTEL analysis

The PESTEL analysis has been applied to gain insight into the current conditions of the port and the island, serving as a foundation for the forthcoming SWOT analysis. PESTEL, which stands for Political, Economic, Sociological, Technological, Environmental, and Legal factors, is used to evaluate the various elements that influence the environment in which an organisation or industry operates (The University of Sydney, 2022). This chapter provides an examination of the elements that affect the island and the port.

The findings are presented in a summarized form in this section, with more detailed explanations of the various aspects related to the island available in Appendix A.1, and those related to the port available in Appendix A.2.

Specific indicators have been identified for each of the PESTEL factors based on a review of the literature. Although no relevant studies were found on the use of the PESTEL method in analyzing internal port organizations, Sánchez-Cambronero, González-Cancelas, and Serrano (2020) lists a set of indicators for evaluating port sustainability which were deemed applicable to the current analysis. However, these indicators focused mainly on ports and thus were inadequate for analysing the island comprehensively. To expand the range of indicators, generic indicators from a broader business analysis conducted by indeed (2022) were incorporated. A few of the indicators identified by indeed (2022) were unsuitable for the present island analysis and were therefore excluded from the assessment.

4.2.1 Findings island

St. Eustatius, a unique island in the Kingdom of the Netherlands, has gone through significant political changes that have revamped its governance and stability. These changes include its transition to a special municipality, a status shared with neighbouring islands, and the delegation of provincial functions under the direct authority of the national government (NOS, 2010). The political complexity and remote location of the island may lead to challenges.

Tax policies possess their own intricacies, including import duties and dual taxation issues, particularly when obtaining goods from other Dutch territories (Belastingdienst Caribisch Nederland, n.d.). Collaborative endeavours among neighbouring islands demonstrate a readiness to work jointly despite the complexities of the political environment(Openbaar Lichaam St. Eustatius, 2021a, 2021b).

Table 4.1: PESTEL Indicators

indeed (2022)	Sánchez-Cambronero et al. (2020)
Political	
Trade barriers	Infrastructure
Tax policies	Service
Political stability	
International relations	
Economical	
Economic growth	Economic situation
Interest rates	Investments
Employment rates	
Foreign exchange rates	
Supply and demand	
Cost of raw materials	
Inflation rates	
Consumer spending power	
Social	
Cultural trends	Employment
Population growth rates	Training
Education levels	Staffing structure
Income levels	Health and safety
Age distribution	
Health consciousness	
Lifestyles	
Career attitudes	
Technological	
Technology	Information technology
Technological infrastructure	Innovation in the port system
Emerging technologies	
Automation	
Research	
Environmental	
Weather	Environmental management
Scarcity of raw materials	Environmental qualities
Pollution	Waste management
Climate change	Eco-efficiency
Waste disposal	
Agriculture	
Sustainability practices	
Legal	
Health and safety	Institutional
Equal opportunities	Economical
International trade	Social
Labour laws	Environmental
Environmental laws	

The economy of the island, which is closely linked to the GTI oil terminal, experiences fluctuations in GDP (CBS, 2021a). Nevertheless, the purchasing power of its residents is increasing (CBS, 2021d). St. Eustatius

Table 4.2: PESTEL analysis overview

	Island	Port
Political	· Complex political landscape · High influence of Dutch government	· Port infrastructure does not suffice · No direct trade barriers · plans are already partially in place · No services for vessels are provided
Economical	· Everything needs to be imported · High costs of raw materials	· Dependency on GTI for revenue · No allocation of budget for future investment · Low connectivity
Social	· Small population · Low educated · High unemployment	· Small port staff · Unpaved storage yard leads to accidents and bad for health · Danger of mixed cargo and passenger traffic
Technological	· High costs of internet	· No historic data · Mostly old machinery · Inefficient (un)loading practice
Environmental	· Hurricane prone · Focus on sustainability and environmental conservation	· Anchoring zones damage corals · Swell uncomfortable for yachts · During Brown Seas port unsuitable for cargo activities.
Legal	· Complex combination of old Antillean, Dutch and European laws · Voluntarily adheres to Environmental Impact Assessment	· Operations of GTI are not monitored · I&W responsible for management of surrounding sea

is heavily reliant on imports, leading to trade imbalances and rising transportation expenses (Spies, Soons, Thodé, Verhey, & Weekers, 2015). Limited infrastructure and spatial constraints pose logistical challenges for handling raw materials.

The population of the island has seen a steady decline (CBS, 2020). The oil terminal and public administration are the primary sources of employment (CBS, 2021b). However, there is a persistently high rate of unemployment (CBS, 2021c). This can be attributed in part to a large portion of the workforce possessing limited education (CBS, 2018).

Technologically, the island has reliable internet infrastructure. However, the cost of accessing the internet remains relatively steep (Autoriteit Consument & Markt, 2020b). Environmental conservation is a primary concern, with safeguarded natural reserves and marine parks, as the island heavily depends on its natural beauty for tourism (Schoenmaeckers, 2011). Attempts at implementing solar energy aim to offer sustainable power, albeit with challenges related to shifting between energy sources being observed (Schelleman & van Weijsten, 2016).

The island's legal framework is multifaceted, incorporating Antillean laws before 2010 alongside Dutch and European influences (Peeters, n.d.). In conclusion, St Eustatius is confronted with a multifaceted political, legal, and social situation that limits its economic development and undermines its competitive advantage and technological advancement. Nevertheless, the island's preservation of its environment and deep appreciation for its history remain noteworthy.

4.2.2 Findings port

The analysis of the Port of St. Eustatius indicates a range of intricate elements that affect its functionality and potential for development. In the political sphere, attempts have been made to increase collaboration with adjacent islands, some of which were successful (Slagt, 2023). However, particular initiatives encountered hindrances. The port faces considerable challenges, as the RoRo dock requires maintenance and there are restrictions on vessel capacity (Kateman & Bos, 2010; Oedjaghir, de Rooij, & Voorkamp, 2022). Access routes through historically important areas raise additional concerns. While plans for improving and expanding the port have been explored, many remain unimplemented. Furthermore, the port's offerings to incoming vessels, especially smaller recreational crafts, are limited.

The port's economic viability is heavily dependent on the GTI oil terminal, and without this source of income, it would face financial difficulties (Voorkamp, 2022). Furthermore, there is a lack of adequate funds for infrastructure improvements, and the reliance on Dutch government grants for financing presents timing challenges. The low level of connectivity underscores the economic limitations (UNCTAD, 2021).

On the social side, the port has a staff of approximately seven people for day-to-day functioning, with extra security personnel from the airport (Voorkamp, 2022). Loading and unloading processes, known as "stevedoring operations," are outsourced to external entities, referred to as "agents." Passengers, particularly those utilising the ferry and local dive centre, must pass through active cargo handling operations, requiring careful coordination to ensure safety within the port area.

From a technological standpoint, manual processes still dominate the port's operations, despite certain initiatives to digitise cargo flow tracking (van Nek, 2023). Outdated equipment, particularly for bulk handling, further underlines the technological challenges.

From an environmental perspective, the port's operations have an impact on the marine ecosystem, with concerns about damage to coral from anchoring oil tankers (White, Esteban, & MacRae, 2007). Weather conditions occasionally hamper port activities and negatively affect the experience of yachts visiting the island (Harterink, 2023; Kateman & Bos, 2010).

Legally, the port operates under the jurisdiction of the Wet maritime beheer BES, but limited control over maritime traffic and pilotage by the oil terminal creates regulatory gaps (van Bets, van Tatenhove, & Lamers, 2016). There are also concerns about the effectiveness of oversight of the activities of the oil terminal, given its importance to the island's economy (ter Haar & Hagoort, 2021).

In conclusion, the port of St Eustatius faces a number of challenges, including economic dependence on the oil terminal, infrastructure and connectivity constraints and regulatory gaps. Addressing these issues will be crucial for the long-term viability of the port and its contribution to the economic and social well-being of the island.

4.2.3 Concluding remarks

The PESTEL analysis has provided an in-depth examination of the current circumstances on the island and their impact on the port. The analysis lays a foundation of understanding that can be used to assess the Strengths, Weaknesses, Opportunities and Threats outlined in the SWOT analysis.

What is the current political, economic, sociological, technological, environmental, and legal situation of the port and on the island?

The remote location of St. Eustatius and its economic dependencies contribute to a complex and challenging landscape. The island's economy heavily relies on the oil terminal, which is one of the largest employers and a significant source of tax revenue. A similar interdependence is evident in the port, where the tax collection of the oil terminal is closely linked to the finances of the port. However, the port is constrained by its capacity to keep a substantial part of the revenue, as its finances are directly integrated into the government budget.

The island's economic complexity is contributing to high levels of poverty and unemployment, exacerbated by the high cost of living resulting from the need to import almost all goods. These interrelated factors underscore the complexities of St. Eustatius's current situation.

The island regards its environment and heritage as paramount due to its distinctiveness and its position as a key tourist attraction. However, the presence of the oil terminal has a significant impact on these aspects and may pose challenges to environmental and heritage conservation.

4.3 SWOT analysis

To gain insights into the current position of the port and where there is room for creating new opportunities a SWOT analysis will be performed (van Boeijen et al., 2020). SWOT is an acronym for Strengths, Weaknesses, Opportunities and Threats. The first two indicators refer to internal factors and the second two towards external factors. To perform the SWOT analysis the indicators found for the different factors in the PESTEL analysis, together with information gathered from informal conversations will be used.

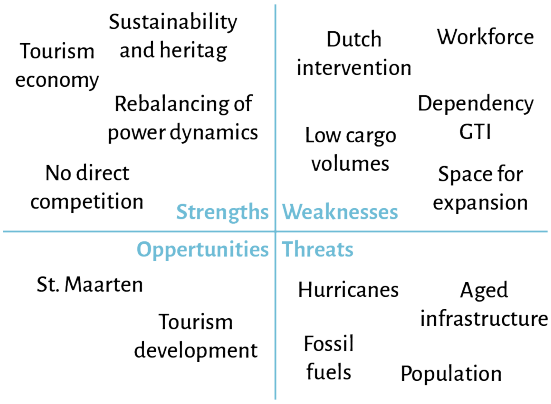


Figure 4.1: SWOT overview

4.3.1 Strengths

No direct competition

The airport and harbour serve as the only entrance points for both people and goods arriving on the island. Although air travel, particularly with stopovers in St. Maarten, is prevalent among passengers coming from distant locations, a ferry service to St. Maarten is more commonly used for inter-island travel due to its reduced cost.

The main transportation mode for goods is by sea, due to the high cost of air transport. Therefore, the port occupies a distinct position on the island as the sole method for both imports and exports. This lack of competition creates a monopoly over the island's trade in goods. Being a monopoly it guarantees a flow of traffic as no alternative methods are available.

The port's monopoly status imposes the critical responsibility of serving as the island's lifeline, necessitating uninterrupted operations regardless of the costs. The port is essential to meet the needs of the island and long-term closure is therefore not an option.

However, monopolies can drive unregulated price increases for the products or services they provide (Depoorter, 1999). In the case of St. Eustatius, the port is owned by the government which allows for price regulation. This governmental ownership proves advantageous for good governance, as it allows for a delicate balance to be maintained between keeping prices affordable and ensuring the overall health and functionality of the system.

Sustainability and heritage

Preservation of the island's natural surroundings and its waters is crucial to its status as a major tourist attraction (Glerum, 2021). The island has distinctive flora and fauna, with numerous endemic species and rare plants. The St. Eustatius National Parks (STENAPA) organization has overall responsibility for managing the 33 square kilometres of nature and sea in and around the island and oversees the conservation and management of both the island's national park and underwater environments (Appendix A.1.5: Environmental management).

Despite their dedication to preserving the environment, the presence of the oil terminal and ships anchoring near coral reefs creates a complicated situation (Schoenmaeckers, 2011). Maintaining a delicate equilibrium between preserving the island's natural beauty and the operational importance of the oil terminal is an ongoing challenge.

In addition to its natural wealth, the island boasts significant historical artefacts, mainly related to the slave trade, that have left lasting imprints on the cultural landscape (Glerum, 2021). Historically significant as these artefacts are, the main focus of the tourism department remains the promotion of the island's natural attractions.

Rebalancing of power dynamics

Small Caribbean islands, such as St. Eustatius, frequently seek opportunities to increase government revenues, access technology and acquire knowledge. Large multinational companies are attracted to these opportunities, often benefiting from tax advantages. However, this combination of large corporations and small governments can lead to a skewed balance of power (Mol, Mol, & van Vliet, 2004). On St. Eustatius, this power dynamic was evident when NuStar Energy owned the oil terminal. The corporation exerted substantial influence on the island through its private schools, housing projects, and community initiatives. While these contributions had positive aspects, the local government had limited influence over the company's decisions, resulting in NuStar operating with an expired environmental permit for several years, underscoring the power imbalance (van Bets et al., 2016).

The power dynamics shifted in 2010 when the BES islands transitioned from the Dutch Antilles to special municipalities within the Netherlands, changing the influence of entities such as NuStar on St Eustatius (Appendix A.1.1: Political stability). Due to this transfer, NuStar's influence decreased as it fell under the jurisdiction of the Dutch government (van Bets et al., 2016). The Ministry of Infrastructure and Environment (I&E) assumed responsibility for the oil terminal and enforcement of relevant laws and regulations. Consequently, NuStar initiated legal actions against several Dutch government ministries. This included a lawsuit concerning a dispute over soil pollution responsibility and another lawsuit against the Ministry of Finance regarding a proposed tax increase (van Bets et al., 2016). Before gaining municipality status, St. Eustatius was unlikely to pursue legal action against a multinational corporation due to high costs and dependency.

Following the island's transition, the Dutch government has taken on the responsibility of providing information and financial support to the local government. Financial aid offered by the Dutch government has contributed to the implementation of various projects, such as the establishment of a ferry service between neighbouring islands and investments in renewable energy (Appendix A.1.5: Sustainability practice). Furthermore, the Dutch government has pledged to support the construction of the port's storage yard. This support is essential for implementing these investments and enhancing living standards on the island.

Tourism economy

Tourism serves as a crucial economic pillar for numerous Caribbean islands and is a major source of revenue. Despite being comparatively smaller, tourism plays an important role in the economy of St. Eustatius (Kateman & Bos, 2010). Regrettably, the unavailability of dependable data makes it impossible to accurately quantify the number of tourists who visit the island each year. The COVID-19 pandemic has had a considerable impact, leading to a significant decrease in the number of air travellers to the island (CBS, 2022c). Despite a gradual increase in the number of travellers since the start of the pandemic, the economy has yet to fully recover.

4.3.2 Weaknesses

Dutch intervention

When St. Eustatius was designated as a municipality of the Netherlands, the Dutch government took over jurisdiction of the island (Appendix A.1.1: Political stability). This transition reduced the independence and decision-making ability of the local government, which was further worsened by the appointment of a government commissioner in 2018. The appointment of a Dutch government official as a government commissioner was aimed at monitoring the performance of the local government.

Although this move limited the island's autonomy, it also had certain advantages. The introduction of the government commissioner was instrumental in reducing corruption on the island, with a notable emphasis on promoting integer government, with some success. To enhance the foundation of an integer government, the Dutch government must continue to provide their support (Koelewijn, Clarinda, & Virginia, 2022).

Low cargo volumes

The port of St. Eustatius has relatively low cargo throughput due to the limited demand on the island (Appendix A.1.2: Supply and demand). This low demand poses a challenge to the port's profitability, which primarily comes from cargo/quay charges and port fees paid by the ships utilising the port facilities. The inefficiency of port operations, especially concerning bulk cargo, is worsened by the port's limited utilization (Appendix A.2.2: Cost of raw materials). The unloading of bulk vessels can take an entire day, leading to disruptions throughout the day, and the transportation of bulky cargo is challenging as trucks pass through the town's tourist area.

Table 4.3: Sea-web vessel port calls St. Eustatius 2022 (Royal Haskoning DHV & S&P Global, 2022)

Vessel type	Nº vessels	Calls
DECK-CARGO SHIP	1	28
GENERAL CARGO	1	28
LANDING CRAFT	1	3
RORO CARGO	1	5
RORO CARGO/FERRY	1	55
SUPPLY SHIP (O.R.S.V.)	5	84
TANKER	75	367
TUG/SUPPLY SHIP (O.R.S.V.)	1	152
Total		722

Analyzing the port calls made in 2022, aside from ferries and tugboats (due to unavailable data), shows that the number of cargo vessels that visited St. Eustatius was somewhat limited (see Table 4.3). Tankers primarily head to the oil terminal, leaving around 200 cargo vessels arriving at the port to deliver goods during 2022. The data indicates that the same ships frequently visit the port, resulting in an average of less than one ship per day, occasionally increasing to two or three ships

due to scheduling. This calculation excludes ferries and tugs arriving for crew changes.

The infrequent visits contribute to the port's low usage, posing a challenge for profitability. While variable costs are less affected, the majority of expenses are fixed costs related to staff and infrastructure depreciation (Voorkamp, 2022). These fixed costs persist regardless of ship frequency, making it crucial to explore opportunities that could enhance trade volumes and offset these expenses. However, the challenge lies in the limited demand growth on the island.

Space for expansion

The port's current location is subject to severe geographical constraints that limit its expansion. The presence of cliffs almost entirely surrounding the landside area makes expansion in this direction virtually impossible. Additionally, the port has no natural protection on the waterside, therefore any expansion of the quay or landmass will need significant investment in the construction or expansion of the breakwater. The upkeep of the port and its access route has prompted consideration of a new port further up the coast, as outlined in existing plans (van Achteren, 2022). Despite the considerable cost, these plans tackle numerous issues simultaneously, including those associated with the access road (Appendix A.2.1: Infrastructure).

The proposed plans for the new port not only offer the possibility of additional expansion but also have the potential to unlock new economic opportunities. Nonetheless, this solution presents risks and requires increased freight volumes as well as the exploration of new opportunities for the existing port to make it a more profitable business. The potential benefits, associated risks and economic feasibility of such an undertaking need to be carefully assessed.

Dependency GTI

The oil terminal operated by GTI plays a crucial role in generating revenue for both the port and the municipality. GTI's payments to operate are a major part of the port's budget and account for more than half of its earnings (Appendix A.2.2: Economic situation). The port's operational budget heavily depends on this revenue stream. In its absence, there would be a deficit, leading to higher import prices or greater reliance on government subsidies. This interdependence also extends to the government, as around 60% of its budget is derived from port revenue (Appendix A.1.1: Tax policies).

The trend towards reducing fossil fuel usage raises concerns about the oil terminal's longevity. Fossil fuel usage is expected to grow until mid-2030, followed by a plateau and reduction (4.4.5 Fossil resource usage). This long-term trend suggests that the oil terminal's operation may become unviable at some point, leading to its closure. The potential closure of the oil terminal presents significant challenges for the island. Financially, it could result in a major loss for both the government budget and the port, given their dependence on the oil terminal's revenue. Socially, the closure could lead to a substantial increase in unemployment, considering that the oil terminal is the largest employer on the island. The closure of the oil terminal may cause a ripple effect on population dynamics, leading to an outflow of residents seeking employment opportunities elsewhere. Given these potential challenges, it is crucial to explore alternative opportunities to diversify the island's economy. This is especially important for mitigating the adverse effects that the closure of the oil terminal could have on both the island's financial stability and social aspects.

As one of the main employers on the island, the oil terminal wields significant influence over both the local government and the population. As previously noted (4.3.1: Rebalancing of power dynamics), the power dynamics between a large corporation and a small government can be imbalanced. Nevertheless, the effects on the local population can be even more far-reaching. Previously, NuStar, the predecessor to GTI, used its employees to lobby local authorities to negotiate a delay in port fee increases, demonstrating the potential influence on local elections through employee relations (van Bets et al., 2016). Employees affiliated with the oil terminal may support its expansion, whereas those without such affiliations may have greater concerns about its impact on the local environment. Additionally, the oil terminal poses significant environmental consequences, leading to the destruction of coral reefs from oil tanker anchorage in non-designated marine park areas (Appendix A.2.6: Environmental). This negatively affects the island's tourist appeal and may lead to economic losses in the tourism sector.

Workforce

The island's small resident population has led to a restricted workforce, with minimal expansion in both the island's population and its labour force over the years. Despite this, there is still an unemployment rate of 6.3%, of which only 1.6 percentage points represent individuals actively seeking employment (Appendix A.1.3: Unemployment). In addition, a significant proportion of the population on the island holds a low level of education, which could lead to difficulties when seeking growth. Challenges could arise when attempting to recruit personnel or acquire the necessary specialized skills. The lack of technical knowledge already presents a challenge in registering incoming

goods (Appendix A.2.4: Information technology). This highlights the obstacles that could arise from having a workforce that is small and less educated when considering plans to develop and expand.

4.3.3 Opportunities

St. Maarten

The cargo volume at St. Maarten's port in Philipsburg is significantly higher than that at St. Eustatius's port, with Philipsburg handling around 75 thousand TEUs while St. Eustatius manages approximately 1870 TEUs (van Achteren, 2022). Although Philipsburg is larger, it faces congestion issues and is currently operating at maximum capacity, as indicated in interviews conducted by van Achteren (2022). Furthermore, the limited space available for expansion in the port area is a cause for concern regarding its future growth.

Philipsburg, the biggest port in the region, has acted as a feeder for the neighbouring islands, with the majority of cargo vessels departing from there. Nevertheless, the challenges to the port's growth present an opportunity for competition, as van Achteren (2022) suggests. If achieved, St. Eustatius could potentially function as a feeder hub in the region. However, this could also facilitate cooperation between islands and strengthen international relations by undertaking these developments in a collaborative effort (Appendix A.1.1: International relations).

Additionally, St. Eustatius has greater expansion opportunities compared to Philipsburg, creating the potential for the development of a larger and more efficient port (Appendix A.2.1: Infrastructure). This expansion could resolve the congestion concerns encountered by Philipsburg and create fresh opportunities for growth and innovation. By upgrading its port facilities, St. Eustatius could establish itself as a transshipment services hub and solidify its role as a feeder location in the region. This strategic move could make a significant contribution to the island's economic development and regional importance.

Tourism development

Tourism has significant potential as a revenue source for both the government and residents of the island. Although the tourist industry is currently modest, there are opportunities for expansion (Appendix A.2.1: Infrastructure). Residents have expressed a positive attitude towards tourism growth, stressing the importance of sustainable development to preserve the island's ecosystem and culture (Kateman & Bos, 2010) (Appendix A.1.5: Sustainability practice). However, there is some opposition to cruise tourism, there is a widely shared view that ship sizes should be limited to 500 passengers. The island's emphasis on controlled and sustainable tourism growth is a major strength, given its untapped potential. Striking a balance in this sector is crucial to managing growth responsibly, as public opinion suggests.

Several cruise companies have included the island in their itineraries for 2024 (Table 4.4). Notably, a significant portion of these cruise ships surpass the maximum allowed passenger capacity approved by the local community. With limited berthing availability, these vessels must anchor offshore. Consequently, shuttle services will be needed to transport passengers between the ship and the island, likely resulting in a reduced number of disembarking passengers visiting the island due to operational constraints.

Recreational vessels offer an added prospect for St. Eustatius. This activity currently takes place on a small scale, with around two boats arriving daily during peak season. These predominantly consist of sailing yachts and catamarans up to 50 feet in length (personal communication, van Nek, 2023). Nevertheless, these vessels usually have brief stays for various reasons.

Table 4.4: Cruise ship itinerary 2024 (Cruise Compete, 2023; The Cruise Web, 2023)

Vessel name	Capacity	Nº visits 2024
Seven Seas Mariner	696	1
Seven Seas Grandeur	746	3
Seven Seas Splendor	746	2
SeaDream I	112	2
Total		8

One significant challenge is the non-ideal berthing conditions in St. Eustatius (Appendix A.2.5: Weather). The port does not have the necessary infrastructure to allow recreational vessels to dock on the quay, therefore they have to moor on buoys in the vicinity of the port. Even though these buoys offer some protection as they are located on the leeward side of the island, they are still exposed to the consistent southwesterly swell (van Achteren, 2022). The waves from the swell directly strike the leeward side, which leads to considerable movement of the recreational vessels. As a consequence, the onboard conditions can be highly uncomfortable, causing many yachts to depart within a few days for the more sheltered harbour of neighbouring St. Kitts (personal communication, Harterink, 2023).

Another contributing factor to the short stays is the limited availability of services (Appendix A.2.1: Service). The absence of refuelling and water replenishment facilities, as well as the difficult accessibility of shops located in the upper town, makes it difficult for ves-

sels to meet their basic needs. Moreover, the lack of berthing facilities necessitates all supplies to be shuttled to the yachts via small tender boats. Addressing these challenges may have the potential to increase the stay of recreational vessels, providing an opportunity for growth in the tourist sector.

4.3.4 Threats

Hurricanes

St. Eustatius is located in a region that is prone to hurricanes, as described in Appendix A.1.5: Weather. The island faces the challenge of hurricanes regularly, with at least one category three or higher hurricane occurring almost every decade (NORA, n.d.). In 2017, two particularly severe hurricanes struck the island, resulting in significant impacts on its natural environment. Extensive damage to vegetation and a reduction in endangered species were among the consequences of the hurricane impact (van den Burg & Madden, 2021). The global rise in temperatures is expected to increase the occurrence and severity of hurricanes in the Caribbean region, intensifying the risk of rainfall events and their associated impacts (Vosper, Mitchell, & Emanuel, 2020).

The hurricanes of 2017 caused damage to the port's infrastructure. The breakwater was damaged due to rocks being washed away, and significant coastal erosion occurred, although not solely due to the hurricanes (Oedjaghir et al., 2022; van der Leer et al., 2018). The Dutch government has pledged financial support for the repair and improvement of the port, but the funds allocated appear to be inadequate (Oedjaghir et al., 2022). This deficiency poses a risk to the port's ability to function, highlighting the necessity for thorough actions to reinforce its ability to withstand hurricanes and other environmental disasters.

Aged infrastructure

The port's infrastructure, although aged, is mainly functional, with the quay displaying some indicators of wear and tear (Appendix A.2.1: Infrastructure). Despite sustaining some damage, the quay is predicted to overcome its intended lifespan and remain operational for at least 25 extra years, with minor repairs required to maintain its condition (Oedjaghir et al., 2022).

Nevertheless, certain segments of the port pose difficulties. The unpaved container area has resulted in incidents (Appendix A.2.3: Health and safety). There are proposals to pave the area, but they have not been put into effect yet. Furthermore, the RoRo dock does not meet current demands, and although there have been plans to upgrade it, there has been no progress (Appendix A.2.1: Infrastructure). The ageing infrastructure presents the possibility of operational constraints at the port in the long run, underscoring the vital need to tackle these challenges for the continued efficiency and functionality of the port.

Fossil fuels

The financial stability of the island and the port's operational profitability depend heavily on the revenues generated by the oil terminal. Nevertheless, the fossil fuel market is intrinsically unstable, as demonstrated by the oil terminal undergoing six changes in ownership during the past four decades (Appendix A.2.2: Ownership). Recent trends in the energy sector, in particular the drive to reduce dependence on fossil fuels, further highlight the potential challenges ahead (4.4.5: Fossil resource usage).

The challenges facing the use of fossil fuels are evident in the Caribbean, where it has been difficult to find new operators for existing plants, highlighting the wider difficulties in sustaining such operations ((NOS, 2022)). The volatility of the fossil fuel industry and uncertainties surrounding the future of the oil terminal raise the risk of its eventual closure. Although it may not arise as an immediate issue, it is essential to take into account alternate sources of revenue and strategies to mitigate the impact on the island's financial stability, recognising the potential long-term implications for both the port and the island (Appendix A.1.1: Tax policies).

Population

The small population of the island, combined with the lack of substantial population growth, poses a challenge to maintaining a workforce of sufficient size (Appendix A.1.3: Population growth). In the absence of an inflow of external workers, the existing population becomes the primary source of labour. Although a significant portion of the population is involved in port-related work at the oil terminal (Appendix A.2.3: Employment), the limited growth rate of the population indicates the possibility of a limited expansion of the labour force.

While the concentration of skilled workers in the oil terminal sector is advantageous, the lack of workforce growth may pose a challenge in distributing labour resources. This could potentially result in a shortage of skilled workers for port operations, a situation not easily rectified due to the limited pool of available talent on the island. Addressing these workforce dynamics is crucial to the expansion and effective functioning of the port.

4.3.5 Concluding remarks

The SWOT analysis examined the elements identified in the PESTEL analysis to uncover the weaknesses and threats and establish the strengths and opportunities. This analytical process is crucial in developing solutions to address the identified limitations and leverage the strengths of both the port and the island. Furthermore, this analysis provides a guide to focus attention on in the Trend analysis, thereby providing greater insight into the likely evolution of these factors. Such strategic approaches are crucial for anticipating future challenges and opportunities.

What are the port's strengths, opportunities, weaknesses and threats?

Several factors demonstrate a strengthened position for both the port and the island. Notably, the island's increased influence on the oil terminal stems from a reconfiguration of power dynamics. Although the tourism sector continues to face challenges in recovering from the pandemic, its proactive approach through sustainability and heritage projects is a positive signal. Furthermore, the unique circumstances surrounding the port guarantee its continued usage, justifying the necessary investment.

Nevertheless, challenges exist, specifically with the port's limited usage leading to increased costs. Expansion opportunities are limited and potential growth is hampered by staffing and land constraints. Additionally, the port's dependence on revenue from the oil terminal amplifies its vulnerability. Despite the Dutch government intervening due to a long-standing issue of corruption and bad governance, there are still opportunities for improvement.
A focused effort to attract more tourists could strengthen the island's economic pillar, potentially benefiting the port by attracting additional cruise operators. The congestion at St. Maarten's port provides a chance to construct additional transshipment infrastructure on the island, thus enhancing port usage whilst decreasing reliance on oil terminal revenues.

Unfortunately, the port suffers from underinvestment, a problem exacerbated by an inhospitable environment prone to severe weather events such as hurricanes. Therefore, the ageing infrastructure, worsened by underinvestment, can lead to operational constraints. The port's reliance on the oil terminal and the fluctuating fossil fuel market, combined with the increasing focus on environmentally friendly alternatives, presents a substantial risk to its revenue. This highlights the crucial need to broaden its income streams.

Whilst the port presents various potential opportunities, it also poses significant limitations that require attention.

4.4 Trend analysis

The STEEP classification serves as a framework for the trend analysis (van Dorsser & Taneja, 2020). This classification systematically assesses six critical factors: Societal, Technological, Economic, Environmental and Political. An additional dimension, Energy, will be included due to its pronounced importance for the island's energy security and its potential implications for the future of the oil terminal. The trends under review will be considered in regional, global and maritime contexts, with particular attention to those that could have a discernible impact on the island.

4.4.1 Societal

Decline in Caribbean's share of global tourism

Related to:

- 4.3.1: Tourism economy
- 4.3.3: Tourism development

The examination of societal trends focuses primarily on the region's tourism industry, which is a major source of income for most islands. A notable trend since the 1990s has been the decline in the Caribbean's share of global tourism. While this trend may appear unfavourable at first glance, it is important to note that the total number of tourists has been increasing steadily over the past three decades. Between 1995 and 2014, the number of tourists more than doubled, rising from 12 million to 26 million (Srinivasan, Ötker, Ramakrishnan, & Alleyne, 2017). Notably, much of this growth favoured countries that had opened their borders to tourism for the first time, such as Cuba. Despite a significant decline in 2020 due to the pandemic, the region still has positive growth prospects for the coming decade (WTTC, 2022). However, it's important to note that the Caribbean is comparatively expensive as a holiday destination compared to other regions of the world, which could limit its growth potential.

Income and unemployment related to tourist arrivals

Related to:

- 4.3.4: Population
- 4.3.2: Workforce

Factors influencing tourism growth are not only directly related to what the island has to offer but also to other factors such as income and employment on the island. The conditions in the destination country have a strong influence on the attractiveness of the destination for tourists. Countries with lower income and higher unemployment lead to a decline in tourism attractiveness (Srinivasan et al., 2017). On the other hand, tourism is also a major contributor to the growth of the Caribbean islands and helps to reduce the volatility of growth. In addition, it often impacts the economy not only in the tourism industry but also in related industries such as agriculture, transportation, communications, construction and entertainment.

4.4.2 Technological

Switch from RoRo to container vessels

A significant trend within the shipping industry's technological development concerns the employment of RoRo vessels. In Europe, a notable shift is occurring, with a transition away from RoRo vessels and towards container vessels (Hermansson, 2016). Several factors contribute to this transition, including the older age of most RoRo vessels and the existing EU regulations regarding sulphur emissions that these vessels are unlikely to meet in the future. Moreover, the construction of new RoRo ships has declined due to the enhanced efficiency and flexibility of container vessels. This trend may differ in the Caribbean region. On the one hand, it is feasible that comparable emissions standards will be enforced in the Caribbean, leading to a decrease in the usage of RoRo ships. Alternatively, looser regulations in the Caribbean could result in the persistence of older RoRo ships from Europe, which may lead to a rise in their use.

High energy cost reduce competitive advantage

Related to:

- 4.3.4: Fossil fuels
- 4.3.1: Rebalancing of power dynamics

In the context of technological innovation, the islands encounter specific challenges, whereby basic infrastructure costs are often higher compared to the mainland. The Caribbean experiences a notably high cost of energy, which significantly impacts the competitive advantages of the islands. This is mainly attributed to the islands' dependence on petroleum-based fuels for energy generation, which have a tendency to be more expensive and susceptible to price fluctuations than alternative fuels (Srinivasan et al., 2017). Furthermore, numerous islands face challenges in relation to providing a consistent energy supply to households and businesses. Factors such as limited generation capacity, outdated power systems, isolated grids, and lack of technical expertise according to Srinivasan et al. (2017). This leads to an unreliable energy provision, resulting in frequent power outages. As a consequence, private businesses frequently turn to investing in private generators to guarantee uninterrupted operations. These increased energy expenses trickle down through the

economy, driving up the price of goods and services and eroding the islands' competitive advantage.

4.4.3 Economical

Slowdown in tourism development

Related to:

- 4.3.1: Tourism economy
- 4.3.3: Tourism development

After independence, several Caribbean nations underwent rapid economic and social development, with their purchasing power gradually approaching that of advanced economies. Nevertheless, this trend has plateaued over the previous two decades and has even reversed in some cases, with many Caribbean nations' purchasing power now trailing other developing countries (Srinivasan et al., 2017). There is no single cause for the downturn in economic development in the Caribbean; instead, it is a result of multiple contributing factors. As identified by Srinivasan et al. (2017), an underlying reason for this economic decline is the feedback loop between natural disasters and economic fragility in the region. The tourism industry plays a critical role in driving economic development in the Caribbean, with many islands heavily, and often solely, reliant on tourism as their main source of income. However, this sector has experienced only slight year-on-year expansion (Srinivasan et al., 2017), which has constrained the overall economic development of the islands. The rising incidence of natural disasters in the area (section 4.4.4: Environmental) exacerbates this issue by jeopardising the islands' attractiveness to tourists. Accounts of destruction and harm caused by these disasters can discourage visitors, compromising the allure of the islands as tourist destinations. This in combination with the high prices in the Caribbean is a large part of the reason that the global tourist market share of the Caribbean has decreased since the 90s (Srinivasan et al., 2017).

Record high prices for fossil fuels

Related to:

- 4.3.4: Fossil fuels

The Caribbean region heavily depends on fossil fuels for the majority of its energy supply. However, the recent energy crisis has led to the world experiencing unprecedentedly high energy prices (IEA, 2022b). This crisis occurred due to a combination of factors, which included the end of the COVID-19 pandemic and the conflict in Ukraine. The post-pandemic economic rebound resulted in supply chain disruptions caused by overdue maintenance and reduced production during the pandemic (IEA, 2022a). Moreover, the incursion in Ukraine resulted in EU penalties imposed on Russia, the world's largest exporter of fossil fuels. With Russian exports disrupted, Europe sourced fossil fuels from alternative providers, thereby increasing prices due to increased demand and market forces. The conflict in Ukraine is anticipated to have a long-term effect on the international energy supply chain, as numerous nations restrict the export of Russian fossil fuels. This situation is likely to result in ongoing price variations, particularly in diesel prices, as the biggest producer in this segment was Russia (IEA, 2022b). The Caribbean faces notable challenges due to its heavy reliance on diesel for the majority of its generators. This dependence leaves the region vulnerable to both price increases and supply disruptions.

Growth in renewable energy

Related to:

- 4.3.4: Fossil fuels

Based on the IEA (2022b), the report predicts a significant milestone in the consumption of fossil fuels under the current policies. It is anticipated that the oil demand will reach a plateau around the mid-2030s. This shift is primarily due to the persistently high cost of fossil fuels caused by global conflicts, which is making alternative energy sources increasingly appealing as their relative affordability rises. The report predicts a considerable increase in the implementation of renewable energy sources. Additionally, efforts to improve the efficiency of existing production processes are predicted to reduce reliance on fossil fuels. According to IEA (2022b), there will be a 20% reduction in total demand for fossil fuels throughout Europe. Furthermore, it is projected that investments in renewable energy resources for the purpose of electricity production will match or even exceed the growth in demand for electricity. This is expected to result in a further reduction in the reliance on fossil fuels and, in numerous regions, a decrease in the average price of electricity as the share of renewables increases.

Maturity of containerisation

Related to:

- 4.3.2: Low cargo volumes

Containerisation has become the leading approach to transporting goods in many regions of the world. This is particularly true in North America and Europe, where the majority of goods are containerised. Industrial sectors have conformed to this standard, such as the paper industry, which has adjusted paper roll dimensions to accommodate containers instead of utilising bulk transportation methodologies (Hermansson,

2016). However, in Latin America, Africa, South Asia, and the Middle East, a noteworthy volume of goods is not yet containerised, indicating significant potential for growth in container use (Guerrero & Rodrigue, 2014).

Redistribution of major transshipment hubs

Related to:

- 4.3.1: No direct competition
- 4.3.2: Space for expansion
- 4.3.3: St. Maarten

In the Caribbean, there is a considerable movement in container hubs, prioritising ports with greater efficiency, stimulated by economic advancement in South America. The region's growth has led to a rise in imports and exports, thereby creating brand new opportunities for the advancement of enhanced ports(Guerrero & Rodrigue, 2014). Historically, small city-states in close proximity to developing countries have frequently transformed into major transshipment hubs thanks to their positive relationships with those respective countries (Guerrero & Rodrigue, 2014). The existence of preferential shipping routes has also significantly impacted which states develop into major transshipment hubs. Due to the transfer of significant amounts of cargo from North America to the Caribbean, the preferred trade route has now been redirected to Panama and other Caribbean territories (Guerrero & Rodrigue, 2014).

Expansion of state-owned multinationals

Related to:

- 4.3.1: No direct competition
- 4.3.1: Rebalancing of power dynamics

State-owned multinationals (SOMNCs) from EU countries are expected to play an increasingly important role in international trade. Their expansion can be attributed to several key factors according to NIC (2021). First, EU member states are known for their robust engagement in global trade, and this trend is expected to continue. In addition, the substantial state support that SOMNCs receive often tilts the global competitive landscape in their favour, giving them a distinct advantage in terms of resources and stability. These companies also use government support to gain and maintain first-mover advantages in emerging markets, making them formidable competitors. The resulting impact on private companies is tangible, leading them to lobby their respective governments to intervene and level the playing field. This trend can play an important role in state-owned multinationals having a global impact on international trade by giving them advantages over non-state enterprises.

4.4.4 Environmental

Hurricanes

Related to:

- 4.3.4: Hurricanes

The Caribbean is particularly vulnerable to hurricanes, with 15 of the world's 25 most vulnerable countries located there (Srinivasan et al., 2017). The continuing rise in global temperatures is expected to lead to more frequent and severe weather events, including hurricanes. Coastal regions will be particularly vulnerable to the impacts of such events. As global temperatures continue to rise, sea level rise and more frequent storms pose a significant threat to the habitability of these regions (Fang, Cheng, Incecik, & Carnie, 2013). This trend could lead to increased levels of destruction and mortality from severe weather events. In addition, rising sea levels and increased storm activity are likely to contribute to increased erosion, including beach erosion. This erosion has the potential to reduce the attractiveness of the region to tourists (Simpson et al., 2010). The combination of increased hurricane frequency and sea-level rise underscores the importance of effective adaptation and mitigation strategies to protect both the environment and the livelihoods of the inhabitants of the Caribbean.

Food and water security

Related to:

- 4.3.4: Hurricanes

Global warming has notable implications for both food and water security, as highlighted in the (NIC, 2021). Rising sea levels and frequent storm surges increase the likelihood of saltwater intrusion into soil and water systems, which pose a substantial threat to coastal regions. This intrusion jeopardises both the availability of fresh drinking water, as wells may dry up and the supply of water for agricultural purposes (Water Resources Mission Area, 2019). Regions that rely heavily on rainwater for agricultural activities face increased vulnerability to climate change. Shifting weather patterns and prolonged droughts, which are the result of global warming, pose an increasingly difficult challenge to sustaining agricultural production in these areas. Furthermore, fisheries, which provide a vital source of food for many people around the world, face significant threats. Overfishing has depleted many marine ecosystems, and climate change exacerbates this issue through the depletion of oxygen, rapid warming, and ocean acidification (NIC, 2021). The combined effects of these threats make it even more difficult for

these ecosystems to recover. Tackling these challenges is paramount to ensuring a sustainable and secure future for our planet's food and water resources.

Decarbonisation in the shipping industry

The shipping sector, renowned for its significant carbon emissions, is under pressure to reduce its environmental impact. The International Maritime Organization (IMO) has formulated a strategy to address this issue (International Maritime Organisation, n.d.). The aim is to attain a 40% decrease in carbon emissions from the shipping industry by 2030 relative to the 2008 benchmarks. To measure progress towards this target, ships are required to calculate two key scores. The Energy Efficiency Existing Ship Index (EEXI) rates the energy efficiency of individual vessels. The data derived from the EEXI calculation is then used to determine the annual operational Carbon Intensity Indicator (CII). The CII measures the amount of greenhouse gases emitted per unit of cargo per distance travelled. Based on their CII performance, ships are rated from A to E. Vessels with an E rating for a year must submit a corrective action plan to minimize emissions. Likewise, those with a D rating for three continuous years must develop a similar plan. These ratings and the requirement for corrective action plans aim to encourage and enforce emissions reduction efforts within the shipping industry.

4.4.5 Energy

Fossil resource usage

Related to:

- 4.3.4: Fossil fuels

Although global fossil fuel use has been predicted to plateau by mid-2030 (IEA, 2022b), significant growth in consumption is expected between now and then. Overall fossil fuel demand is estimated to increase by about 40/% (Fang et al., 2013). Significant investment is anticipated in oil and gas operations by 2030, exceeding a 50% increase from previous years (IEA, 2022b). Gas usage was projected to increase by 60% according to Fang et al. (2013). However, the war in Russia may have affected this prediction, as suggested by IEA (2022b), which predicts a decrease in gas consumption. As a result, gas is no longer considered the main transitional energy source on the path to sustainability, due to concerns about the reliability of its supply. This emphasises the intricate dynamics of the fossil fuel sector as it makes its way towards more sustainable energy sources.

Renewable energy options

Related to:

- 4.3.4: Fossil fuels
- 4.3.1: Rebalancing of power dynamics

Offshore renewables, which include wind, wave, tidal and ocean current energy, are emerging as a promising frontier in the transition to sustainable energy solutions (IEA, 2022b). Solar energy is projected to remain the dominant alternative, with growth estimates of 8-11 times current production levels by 2050 (BURUNCIUC, 2022). Wind power is the second most common method of sustainable energy generation. The Eastern Caribbean, in particular, benefits from very favourable wind conditions for wind power generation (Wright, 2001), creating opportunities for the establishment of wind farms. In addition, offshore wind farms are expected to be built in the Caribbean and along the east coast of North America in the future (IEA, 2022b). It's important to note, however, that the scale of these developments is expected to be insignificant compared to those in Europe and China. Solar power is therefore expected to be the primary method of energy generation, mainly due to the abundance of sunlight in the Caribbean (Masson, Ehrhardt, & Lizzio, 2020). The expansion of sustainable energy in the Caribbean not only meets sustainability goals but also has the potential to reduce the region's dependence on fossil fuels, promoting a greener and more resilient future.

Green hydrogen

Chile is making significant advancements in the renewable energy sector, particularly in the production of green hydrogen (World Economic Forum, 2023). These pioneering efforts are creating a transformative impact within Chile and also hold substantial implications for the wider Latin American region. The impact of Chile's initiatives underscores the huge potential for green hydrogen adoption across Latin America, which shares similar natural advantages such as abundant solar radiation and favourable wind patterns. Green hydrogen has the ability to considerably lessen carbon emissions, enhance energy security and stimulate economic growth (IEA, 2021). With Chile leading the way, other Latin American countries are also starting to investigate their potential for green hydrogen, in line with international efforts to create a cleaner and more sustainable energy system.

4.4.6 Policy

Outflow of skilled workers

Related to:

- 4.3.2: Workforce

· 4.3.4: Population

The persistent emigration of highly skilled workers to wealthier countries exacerbates the challenges faced by several Caribbean countries, leading to a reduction in the local labour force and human capital. This phenomenon is especially evident among youths aged 20 to 25, who actively seek opportunities abroad (Srinivasan et al., 2017). The departure of highly qualified professionals results in a shortage of skilled workers locally and also drains the country's pool of talent, leaving knowledge gaps that may necessitate expensive external recruitment to fill the void, assuming they are even attainable. Additionally, many expatriate workers who find better opportunities abroad send remittances to support their families back home (Srinivasan et al., 2017). The Caribbean region experiences a high volume of remittances. On one hand, this may diminish the drive for individuals to participate actively in the labour force, as a certain level of income is secure. Nevertheless, it also has the potential for positive impacts, enabling the local populace to invest in different areas, like education (Srinivasan et al., 2017). The continued emigration of skilled workers and the consequential surge of remittances pose a multifaceted economic challenge to several Caribbean nations, as they strive to retain their human resources in the domestic labour market.

4.4.7 Concluding remarks

The trends that have been analysed shall be integrated into the strategies developed in section 5.2, in conjunction with the outcomes derived from the SWOT analysis.

What are trends that will impact the island and the port?

Several trends have been identified with a possible impact on the port. Within the societal domain, the important factors were the decline of global tourism and the impact of income and unemployment on tourist arrivals. For St. Eustatius, the tourism industry is seen as an opportunity to diversify the economic situation of the island. However, the identified trends show an unfavourable situation for the island. With the Caribbean becoming less attractive for tourists due to its high prices and the high level of unemployment on the island the prospect does not look very favourable. However, it is worth mentioning that the tourist industry on the island is so underdeveloped compared to other islands in the region that there possibly still lie opportunities ahead.

From a technological perspective, the island's high energy cost and low reliability make competing with larger islands in the region more difficult. The increased cost for companies to operate results in the reduction of their competitive advantage. Especially for larger operations such as ports where energy consumption is high, this could carry a heavy impact. Furthermore, a switch in type of vessels can be seen from RoRo to container vessels. To unload these vessels a crane is necessary. A crane is not available in the current port, therefore this could lead to the need to invest in a crane and possibly a new port as the existing port can not foresee this.

On an economic level, a lot of factors carry an influence within different segments. Within the energy industry, a lot has changed since the pandemic and war in Europe. This has led to record high prices for fossil fuels and a quicker development of renewable alternatives. Both these factors have a particular influence on the GTI oil terminal on which the port is highly dependable for its revenue. The high prices mean that the trade in oil is still a very active market making the oil terminal more likely to stay operational. On the other hand, the quick development of renewable alternatives will lead to the closure of the terminal in the long run if no switch is made. Therefore it is important for the island to diversify in its revenue.

Within the maritime sector, a large switch can be seen in transshipments hubs and the evolution of containerisation within the industry. Within Latin America, there is still potential for growth in containerisation as goods are still transported as bulk. In the Caribbean, a shift can also be seen towards container ports that offer greater efficiency. Both these factors show that there is still room within the port industry to grow and develop in the region, opening up opportunities for creating a new efficient hub on St. Eustatius. Furthermore, the expansion of state-owned multinationals within the global trade creates a favourable competitive landscape for these companies. The port of St. Eustatius being a state-owned company could benefit from this advantage to create a new transshipment hub.

The environmental trends show an increase in harsher weather events in the Caribbean. An increase in these events could cause more damage to infrastructure on the island. Furthermore, the risk of food and water security highlights the importance of having a resilient port to provide in case of emergency. Therefore a robust port infrastructure is of vital importance to guarantee safe and continuous operations. From an environmental aspect, the marine sector focuses on pushing more environmentally friendly ships to reduce the carbon footprint of the industry, therefore it could be possible that St. Eustatius will need to adapt to more modern vessels.

Within the trends of energy, a large switch can be seen from the usage of fossil fuels to renewable alternatives. An end in the growth of fossil fuel usage is predicted and its reduction is foreseen. Within the Caribbean, there is still a large potential for the adaptation of renewable energy infrastructure, which should lead to a price reduction in energy costs, reducing the cost of business on the islands. The production of alternative energy resources is also heavily in development within Latin America, this could have large future implications for the GTI oil terminal when fossil fuel usage is reduced.

The Caribbean experiences a high outflow of skilled workers, a similar situation exists for St. Eustatius. Building out the port and tourist industry could tighten the attractiveness of the island and result in a reduction in the outflow of skilled workers as more jobs become available.

All in all the trends do not seem very favourable for the island and the port in the current situation. However, these trends are often very global and leave room for interpretation for specific scenarios. Similarly, the island can adapt to these trends to become more resilient in the future. Overall the port needs to diversify its operations so revenue is guaranteed for different scenarios and its existence is guaranteed.

Chapter 5

Strategy formulation

5.1 Design criteria

To identify the crucial elements of the various strategies, a list of design criteria was derived from the PESTEL analysis, SWOT analysis and Trend analysis. This list incorporates the key issues highlighted in the analyses and formulates the criteria to be addressed by the different strategies.

5.1.1 Primary criteria

Financial diversification

Derived from:

- 4.3.1 SWOT analysis: Tourism economy
- 4.3.2 SWOT analysis: Dependency GTI
- 4.3.3 SWOT analysis: Tourism development
- 4.3.4 SWOT analysis: Fossil fuels
- 4.4.3 Trend analysis: Slowdown in tourism development
- 4.4.1 Trend analysis: Decline in Caribbean's share of global tourism
- 4.4.3 Trend analysis: Growth in renewable energy
- 4.4.5 Trend analysis: Fossil resource usage
- 4.4.5 Trend analysis: Green hydrogen

In the current situation, the financial situation of the port heavily depends on the revenue generated from the GTI oil terminal. However, the uncertain nature of the fossil fuel trade, as outlined in the Trend analysis, together with the uncertainty surrounding the continued operation of the terminal on the island, could pose significant challenges. The closure of the terminal has the potential to render the port unprofitable and significantly reduce the government's budget, because of the oil terminal's significant contribution. Furthermore, shutting down the terminal could result in a significant increase in unemployment, which could lead to a significant outflow of workers. This, in turn, may lead to a decrease in demand for imported goods, further diminishing the port's activity.

A viable means of minimising these risks is to diversify the port's revenue streams. Tourism represents a promising alternative, particularly in the context of the island's underdeveloped status, while many other Caribbean islands have successfully exploited its potential. Despite indications that the tourism sector is declining, the island still holds untapped potential due to its limited development in this sector. Furthermore the offering of ancillary services could also offer additional streams of income by diversifying the operations of the port. It is also important to explore other sectors to diversify revenue streams, as reliance on a single source of revenue could leave the island vulnerable to economic shocks.

Resistant infrastructure

Derived from:

- 4.3.4 SWOT analysis: Hurricanes
- 4.4.4 Trend analysis: Food and water security
- A.2.4 PESTEL analysis: Innovation in the port

The Caribbean islands are particularly vulnerable to hurricanes and other environmental disasters. It is of paramount importance to maintain the port's operation during such emergencies in order to facilitate the delivery of essential supplies, including medicines, food and water, which are critical to sustaining life on the island. Therefore, the port's infrastructure must be adequately prepared to withstand these hurricanes and other environmental disasters, thereby increasing its resilience to stay operational in the event of such emergencies.

Safer operations

Derived from:

- A.2.3 PESTEL analysis: Hurricanes
- A.2.3 PESTEL analysis: Health and safety

The PESTEL analysis reveals that the port's operations are not completely secure, having encountered minor accidents. The implementation of significant upgrades in infrastructure to secure safe operations is therefore deemed necessary to mitigate risks. Moreover, with passenger and cargo operations occurring simultaneously within the port, hazardous situations may arise, making it crucial to exercise caution. Resolving this operational interference would not only create a safer environment but also reduce operational challenges.

5.1.2 Secondary criteria

Efficiency gains

Derived from:

- 4.3.2 SWOT analysis: Low cargo volumes
- 4.3.3 SWOT analysis: St. Maarten
- 4.4.3 Trend analysis: Maturity of containerisation

The existing operations of the port have demonstrated notable inefficiencies, underscoring the potential for substantial benefits through operational improvements, particularly from an economic perspective.

Delays occur and ships are faced with longer dwell times, leading some vessels to bypass the port in order to avoid losing slots at other destinations. Increased efficiency can be achieved through strategic investment in both infrastructure and superstructure. The implementation of modern equipment can significantly reduce unloading times. Investing in port infrastructure can significantly reduce the likelihood of operational problems caused by outdated equipment or inadequate structures. In the case of ferry operations, efficiency gains would lead to faster turnaround times, resulting in accelerated services and reduced operating times, thereby minimising costs.

The resulting efficiencies would not only reduce workloads, leading to lower operating costs but also offer the promise of improved economic performance. Cost reductions may enhance the port's capacity to accommodate increased traffic, thereby promoting profitability and competitiveness.

Improved facilities

Derived from:

- 4.3.1 SWOT analysis: No direct competition
- 4.3.3 SWOT analysis: Tourism development
- A.2.5 PESTEL analysis: Weather

The lack of adequate facilities for visiting vessels is a significant barrier to realising the full potential of the tourism industry. Many islands in the region depend heavily on tourism revenue. In order to maximize profits, attract additional tourists, and increase their length of stay, it is crucial to address the current limitations.

Improving mooring facilities is of great importance for recreational vessels, as the existing facilities are inadequate. The island's appeal can be improved through the creation of additional protected areas or marinas. In addition, the offering of services such as gas, water, and food to recreational vessels will create a more accommodating environment. This aligns with the wider objective of promoting sustainable tourism practices on the island.

In the field of cruise tourism, there are deficiencies that go beyond the inability to accommodate cruise ships. The immigration facilities, which cannot accommodate larger numbers of visitors, and the lack of additional waiting areas, exacerbate the discomfort that tourists experience while waiting. This creates an unattractive environment for tourists which will impact the willingness of cruise operators to visit the island.

Efforts aimed at enhancing the arrival experience for tourists have the potential to increase visitor numbers and prolong their stay, which could result in increased spending on the island. Additionally, a positive reputation in the tourism industry may attract more vessels, thereby amplifying the overall economic impact of tourism.

Expansion opportunities

Derived from:

- 4.3.2 SWOT analysis: Space for expansion
- 4.4.3 Trend analysis: Redistribution of major transshipment hubs

The existing port is constrained in its expansion possibilities by its current location, enclosed between cliffs and the sea. This geographical constraint significantly limits the opportunities for future growth. Although the current constraints may not be an immediate obstacle, they could become a challenge as port operations expand.

One notable constraint is the limited space available for passenger facility improvements, particularly given the area occupied by the storage yard. Addressing this issue will require strategic redevelopment of the area. In addition, on the waterfront, expansion opportunities are constrained by the need for a breakwater, which increases the costs associated with development. A possible way of optimising this investment could be a dual use of the breakwater, such as adapting it for use as a secondary quay. This innovative approach has the potential to provide additional benefits, mitigate the challenges posed by spatial constraints and maximise the return on the necessary investment.

Environmental management

Derived from:

- 4.3.1 SWOT analysis: Sustainability and heritage
- 4.4.2 Trend analysis: Switch from RoRo to container vessels

- 4.4.2 Trend analysis: High energy cost reduce competitive advantage
- 4.4.3 Trend analysis: Record high prices for fossil fuels
- 4.4.4 Trend analysis: Decarbonisation in the shipping industry
- 4.4.5 Trend analysis: Renewable energy options

The focus on the environment on the island is not only driven by public opinion, but also has significant economic implications. The high cost of energy due to reliance on fossil fuels for electricity generation is affecting the competitive advantage of many businesses, including the port. Switching to more sustainable energy alternatives could lower costs, thus increasing the overall competitiveness of the industry.

Additionally, sustainable practices are becoming increasingly important in the shipping industry, including the use of alternative fuels and newer vessels. This shift in approach is relevant to the development of ports, as they need to adapt to changes in vessel types. The switch from RoRo vessels to container ships highlights the importance of staying on top of evolving trends in the maritime sector.

Aligning the port's operations with sustainable practices and adapting to changes in vessel technology can contribute to environmental conservation, as well as positioning the port as future proof. This could have positive economic outcomes and enhance the port's resilience in a changing market.

Reduce unemployment

Derived from:

- 4.3.2 SWOT analysis: Workforce
- 4.3.4 SWOT analysis: Population
- 4.4.1 Trend analysis: Income and unemployment related to tourist arrivals
- 4.4.6 Trend analysis: Outflow of skilled workers

The island has a particularly high level of unemployment, a factor that detracts from its attractiveness to tourists. Given the potential importance of tourism as an important source of income for the island, tackling unemployment is of particular importance. Creating new employment opportunities in the port is a strategic measure that goes beyond simply reducing unemployment; it has the potential to increase the overall attractiveness of the island to tourists.

The multiple benefits of reducing unemployment go beyond the immediate financial benefits to individuals. The resulting increase in the purchasing power of the local population will have a positive impact on the economy. In the long term, this increase in purchasing power could translate into increased imports of goods through the port, contributing to its financial situation. Consequently, the creation of employment opportunities within the port not only addresses the immediate challenge of unemployment but also creates a trickle-down effect that increases the economic resilience and attractiveness of the island as a tourist destination.

Access road

- 4.3.2 SWOT analysis: Space for expansion
- A.2.1 PESTEL analysis: Infrastructure

The current access road is unsuitable for the transportation of goods due to its location through the most touristic part of the island. Removing this flow of traffic could greatly improve the attractiveness of the island. Helping the island to become a more attractive tourist destination.

5.2 Strategies

Following the primary criteria, the focus was on financial diversification, creating resilient infrastructure and facilitating safer operations. Four strategies were derived from these objectives based on the PESTEL analysis, SWOT analysis, and Trend analysis as well as informal discussions. Each strategy addresses a specific aspect of port development

Each strategy addresses one or more of the primary criteria. The first strategy primarily addresses the criterion of creating a more resilient infrastructure through necessary upgrades to the existing port infrastructure. The second strategy incorporates all criteria by proposing the construction of a new port. Relocating cargo operations to a new site with the potential for increased capacity offers the prospect of diversifying revenue streams and ensuring safe operations. Additionally, the new port will be constructed with enhanced resilience. The third strategy primarily aims to diversify the revenue stream by facilitating the docking of cruise ships. This involves investing in the required infrastructure to enable such docking, thereby contributing to the creation of a resilient infrastructure. The fourth strategy, while also diversifying the revenue stream, shifts the focus to recreational vessels. Similar infrastructure investments are made to increase resilience, including the separation of passenger and cargo traffic.

The scope of these strategies varies based on the stated objectives and the means by which they are to be achieved. The strategies are not mutually exclusive and often share common components or build on each other.

5.2.1 Strategy 1: Resilience

The first strategy revolves around adapting the existing port facilities into a more resilient infrastructure (Design criteria: Resistant infrastructure), incorporating the consolidated plans as outlined in the report by Oedjaghir et al. (2022). While the current port generally satisfies demand, there are instances when multiple boats require docking simultaneously, which is impossible in the current configuration. To address this issue, this strategy proposes the implementation of the already formulated plans by Oedjaghir et al. (2022) to extend the quay and potentially widen the RoRo dock. Such modifications would enable the docking of multiple or larger vessels. For larger vessels with a deeper draft, dredging activities will need to be undertaken as the current depth does not suffice. To be able to dock ships safely to the extended quay would necessitate extending the breakwater to provide protection against waves and the swell.

The docking of support ships is a stipulation set by the Ministry of Infrastructure and Water Management as a prerequisite for obtaining funding (Oedjaghir et al., 2022). These vessels exceed the current dimensions supported by the quay. Consequently, the extension of the quay and breakwater including the execution of dredging operations are therefore imperative measures.

To enhance resilience against hurricanes, certain facilities within the port require upgrading. The breakwater, for instance, already helps mitigate the impact of hurricanes on the quay. However, the report by Oedjaghir et al. (2022) suggests that repairs and potential heightening of the breakwater are necessary to fortify it against future hurricanes. Additionally, it is advisable to pave the storage yard. This measure serves multiple purposes, including the prevention of surface subsidence, improved safety, and increased capacity (Design criteria: Safer operations, Efficiency gains). Currently, the uneven ground in the unpaved storage yard prohibits the stacking of containers. By paving the storage yard, stacking containers would become feasible, as there is a solid foundation. This will also lead to safer conditions as it reduces the chance of containers falling over. For health reasons, this would also be advisable as there will be less dust in the air creating better conditions for the personnel.

Food and water security, identified as a significant trend by NIC (2021), holds paramount importance for the island of St. Eustatius due to its heavy reliance on imports for nearly all goods. Expanding the capacity to accommodate multiple ships for docking would facilitate more frequent deliveries of food and water. Moreover, enabling the docking of support ships during hurricane situations would ensure the uninterrupted provision of essential goods. Additionally, the paving of the storage yard would allow for increased container stockpiling, thereby creating the possibility for a buffer of food and water on the island. These measures collectively would contribute to enhancing food and water security on the island.

Currently, most cargo destined for the port of St. Eustatius transits through the port of St. Maarten. This reliance is partially attributed to the relatively small number of containers and the prevalent use of the RoRo system. In St. Maarten's port, containers intended for RoRo boats must be loaded onto chassis before being transferred to the ship. The utilization of RoRo vessels is primarily due to the absence of a crane at the port of St. Eustatius. Making it impossible to unload containers if a ship does not have its own crane. Consequently, the need for vessels to stop at the port of St. Maarten incurs additional costs. Primarily driven by the extra operations that need to be performed at the

port of St. Maarten. By extending the length of the quay and installing a crane, it would be possible for ships to travel directly to St. Eustatius without the intermediate stopover in St. Maarten (Design criteria: Efficiency gains). This development could potentially reduce the cost of goods on the island. The feasibility of this proposal hinges on the current state of the infrastructure, as the quay was not originally designed to support a crane and whether the financial and operational expertise will allow the exploitation of a crane. The option of a less infrastructure intrusive option such as a reach stacker was also investigated. Whilst a reach stacker is most often used for moving containers in a storage yard in some cases it is also used to directly unload ships (Hyster Company, 2020). However, the current dimensions of the quay could not facilitate a reach stacker as the dimensions are too small, making it impossible to turn.

Certain limitations exist within this strategy, primarily pertaining to expansion possibilities (Design criteria: Expansion opportunities). While there is potential for extending the quay and breakwater on the waterside, the associated costs are significant. The land side presents substantial constraints as the port area is confined between the water and the island's cliffs, rendering expansion impossible. Consequently, there will be limitations on the port's cargo-handling capacity, regardless of the number of ships it can accommodate. Additionally, the access road poses limitations (Design criteria: Access road). It traverses a densely populated area with multiple bends that pose challenges for trucks. This situation leads to disturbances in the lower part of town, which is also the most touristic part. Therefore, an increase in truck traffic would likely be unwelcome. The report by Kateman and Bos (2010) proposes a new road as a potential solution. However, the implementation of such a road would entail considerable expenses, but potentially become a necessity if the port is expanded and cargo volumes increase.

5.2.2 Strategy 2: Cargo

The second strategy focuses on the creation of a new port, as proposed by van Achteren (2022). The development of such a port, boasting greater capacity, has the potential to transform St. Eustatius from a gateway port into a regional hub. This transformation would not only facilitate the import and export of local goods but also position the port as an intermediary for cargo transit from neighbouring islands. Consequently, rather than relying on the port of St. Maarten for the transshipment of goods to RoRo vessels, the port of St. Eustatius would start to compete. Such a transition could yield numerous advantages for the island.

First of all, the congestion at the port of St. Maarten would not exert any influence on the delivery of goods destined for St. Eustatius (Design criteria: Efficiency gains). This assures a more streamlined and punctual delivery process, thereby mitigating the risk of product spoilage resulting from delayed deliveries (personal communication, Keijzer, 2023). Additionally, this streamlined logistics approach would also reduce the occurrence of double taxation, a situation that can arise when importing from St. Maarten or the Netherlands, as described in Tax policies (Design criteria: Financial diversification).

Secondly, the construction of a new port equipped with a dedicated superstructure for container handling could yield cost savings (Design criteria: Efficiency gains). Such a facility would alleviate the need for ships to transit through St. Maarten for container transfer onto RoRo vessels, thereby reducing the associated transfer and handling costs. This approach aligns with prevailing trends, notably the anticipated growth in containerisation within the region (Maturity of containerisation). Furthermore, a shift is occurring in Europe where fewer RoRo vessels are being utilized in favour of container vessels, a trend that may extend to the Caribbean (Switch from RoRo to container vessels). Therefore, having the appropriate infrastructure in place to accommodate these transportation trends is a future proof option.

In contrast, there remains the prospect that decommissioned ships from Europe could be repurposed in the Caribbean, as these older vessels are cheaper to acquire and can operate within the region's lower emission standards. Nevertheless, it is essential to emphasize that investing in appropriate infrastructure would still yield advantages, as the majority of RoRo vessels can still be unloaded using cranes.

Thirdly, an expansion of the port facilities in St. Eustatius would offer more berthing space for multiple ships (Design criteria: Efficiency gains). This alleviates the risk of congestion if numerous vessels arrive simultaneously, a situation that could result in ships bypassing the port of St. Eustatius, otherwise they would have to forfeit their scheduled slot at the next port. Having more quays available for ships would also enable loading and unloading operations simultaneously for multiple vessels, enhancing the overall flow of goods. In its role as a hub, the ability to accommodate multiple ships and perform the operations simultaneously translates into shorter intervals between vessel arrivals and departures, reducing container dwell times and, consequently, shorter lead times (Menon, 2023).

Fourthly, the economics of scale associated with a larger port have the potential to drive down the average cost per container (Design criteria: Efficiency gains).

The hub function could lead to increased container throughput, effectively spreading fixed costs across a larger volume. This often leads to the investment in larger and more modern infrastructure, which inherently results in higher efficiency levels. Consequently, lower costs are realized through reduced machinery operation times and personnel requirements per ship. These efficiency gains translate into cost savings, creating a competitive advantage compared to other ports that cannot achieve the same level of operational efficiency (Kim, Trimi, & Lee, 2022).

Finally, facilitating the arrival of larger vessels represents an additional opportunity for cost reduction, as these vessels also benefit from economies of scale (Design criteria: Efficiency gains). The principle of economies of scale highlights the efficiency gained from using larger equipment. In this instance, this would entail that the greater the cargo capacity of a ship, the lower the per-container cost. However, it is important to acknowledge the constraints inherent in accommodating larger vessels.

While larger vessels may offer cost advantages, the port infrastructure and superstructure require significant investment (Bhonsle, 2022). This involves investing in specialised equipment, such as larger terminal facilities and more advanced information technologies, to handle increased cargo volumes. Therefore, finding the right balance in terms of vessel size is crucial. The benefits of economies of scale need to be carefully considered in light of the expenses and complexities related to accommodating bigger vessels.

The report from Kateman and Bos (2010) has examined the potential site for constructing a new port. A thorough analysis identified a location that minimises negative effects on the environment, local living conditions, and especially the preservation of historical artefacts. While the chosen site may not be ideal, it is the only feasible option given the requirements. The location for the site must be on the leeward side of the island, free from cliffs that may limit future expansion and must not infringe upon the town or airport flight path. Additionally, it must be designed to safeguard the integrity of any historical landmarks. The chosen site is illustrated in Figure 5.1.

There are two main disadvantages associated with this chosen site. Firstly, the land is privately owned and will have to be purchased from its current owner. Secondly, the shipping lane will intersect with the mooring area of the oil terminal. A possible solution could be to relocate the designated mooring areas to mitigate this problem.

Figure 5.1: New port location (Kateman & Bos, 2010)

The potential configuration of the port has been examined in the report authored by van Achteren (2022). The proposed design envisions the integration of a combined quay and RoRo docks, along with a separate RoRo dock shielded from waves by a breakwater. The quay has been designed to accommodate the size of ships that now go to St. Maarten and that may be diverted to St. Eustatius as the port develops into a hub.

However, it is important to note that this design, whilst suitable for the current scenario and expected traffic from St Maarten, may not take into account emerging trends. The trend towards containerisation, where fewer RoRo vessels are used in favour of more container ships (Switch from RoRo to container vessels), raises concerns about the suitability of the design. In the current design, only one container ship can be unloaded at a time. If the trend towards container vessels persists, there is a chance that this could cause congestion. Therefore, it might be preferable to consider the construction of a second quay or to retain the option for future expansion in line with evolving industry trends and the potential growth in cargo volumes as St Eustatius transitions to a hub.

The report by van Achteren (2022) does not provide details on the port's superstructure considerations. It is assumed that with the expected arrival of container ships at the new port, the use of a crane will be essential for unloading the ships. While some vessels may have their own cranes, the usage leads to extra costs. Additionally, having a crane on the quay would assist ship unloading, even in the absence of an onboard crane. The necessary number of cranes is determined by applying Equation 5.1, which has been outlined in (Ligteringen, 2022).

$$c_b = P \cdot f_{teu} \cdot N_{cb} \cdot n_{hy} \cdot m_b \tag{5.1}$$

where:

c_b = average annual productivity per berth [TEU/yr]
P = net production per crane [moves/hr]
f_{teu} = TEU factor [-]
N_{cb} = number of cranes per berth [-]
n_{hy} = number of operational hours per year [hrs/yr]
m_b = berth occupancy factor [-]

As outlined in the study by van Achteren (2022), the anticipated transshipment volume for the new port is estimated to reach approximately 10,000 TEUs annually. Consequently, the annual productivity of the berth must surpass this figure. To determine the net production per crane, a value of 25, as estimated by Ligteringen (2022), has been used. This figure accounts for downtime due to crane maintenance and other operational requirements. The TEU factor, as established by van Achteren (2022) at 1.7, is determined by the current division between 20-foot and 40-foot containers. The calculation was performed on the assumption of one crane. The number of operational hours per year matches the current average operating schedule, which means that the port is only open for cargo on weekdays for 10 hours per day. Considering a berth occupancy factor of 35%, in accordance with the estimate provided by Ligteringen (2022), the result is an annual productivity of 26,775 TEUs per year. This exceeds the assumed port productivity by more than double, indicating that a single crane should suffice. However, it is worth noting that if a different type of crane, such as a portal crane, is employed to reduce costs or accommodate bulk goods unloading, this figure may need to be adjusted.

The proposed storage yard by van Achteren (2022) is designed to be constructed in multiple stages. Initially, it will serve only the local demand, estimated at 2800 TEU (van Achteren, 2022). As previously mentioned, this demand is projected to grow to 10,000 TEUs once the port becomes a transshipment hub. According to calculations conducted by van Achteren (2022) based on the principles outlined by Ligteringen (2022) and verified by the author, it is estimated that for the initial phase, a storage yard of approximately 5000 square meters is required. This calculation is based on the use of chassis as the storage method and allows for the storage of approximately 55 chassis. For the second phase expansion, it is assumed that a reach stacker will be used to enable the stacking of containers, thereby reducing the storage yard's footprint for the larger demand. The calculations result in an area of approximately 17000 m^2 which would enable the storage of 275 containers. If chassis were utilised for the same purpose, an area of 20000 m^2 would be required. For the second stage expansion, it is envisaged that the introduction of reach stackers will enable the stacking of containers, thereby reducing the footprint of the storage yard. The calculations performed by van Achteren (2022), which have been verified by the author of this report, indicate that an area of approximately 17,000 square meters would be sufficient to accommodate the storage of 275 containers using this method. If chassis were to be used to meet the same demand, an area of 20,000 square meters would be required.

The relocation of the port provides a substantial improvement to the accessibility of the access road (Design criteria: Access road). Given its new location, the creation of an entirely new access route becomes necessary. The new port location is situated at a significant distance from the town's existing tourist-oriented area. Therefore, the new access route will bypass this section of the town entirely and eliminate the need for lorries to navigate through the busy and restricted downtown area. This development ensures improved accessibility for trucks and results in a substantial reduction in disruptions for both local residents and tourists.

In addition, the full removal of freight operations from the old port will effectively separate passenger and freight traffic (Design criteria: Safer operations). Passenger operations can continue to operate in the old port, ensuring a safer environment by eliminating scenarios where passenger traffic shares the quay with cargo unloading activities. This segregation enhances safety by preventing the operation of heavy machinery in close proximity to pedestrian traffic, thereby considerably decreasing the likelihood of accidents. Additionally, this transformation opens up opportunities for alternative uses of the old port, including its potential appeal to recreational vessels and other activities.

The construction of a new and larger port facility will require an increase in the workforce to handle the additional cargo (Design criteria: Reduce unemployment). While this workforce expansion may not grow linearly with cargo growth, as efficiency gains may offset some of the labour, there will still be a significant need for more workers to handle the increased cargo flow. This will be particularly the case for specialised positions such as crane and reach stacker operators. However, this expansion of the workforce can be challenging as it requires the recruitment and training of personnel with the necessary skills and certifications to operate the specialised equipment safely. It is therefore essential to invest in training and certification programmes to ensure that the workforce can meet the operational needs of the port. Meeting the demand for competent personnel may require initiatives such as training local

residents or recruiting qualified personnel from nearby islands, especially as there is a persistent outflow of skilled workers. The availability of adequately trained and certified personnel is critical to the successful and safe operation of the port. Failure to meet this requirement could have a negative impact on the functionality and efficient operation of the port.

In addition, there is potential for more employment opportunities through the emergence of ancillary services (Design criteria: Financial diversification), particularly in the area of container handling and related activities. These include the essential processes of container stripping and stuffing, where cargo is transferred between containers to facilitate distribution to different destinations. As the demand for cargo transshipment services grows, the number of these operations will increase, leading to an increased need for additional personnel. Furthermore, the expansion of the port offers opportunities to diversify into other ancillary services such as container maintenance, cleaning and ship replenishment. Each of these services would require its own workforce, contributing to an overall increase in employment opportunities as the port grows (Design criteria: Reduce unemployment). This expansion not only benefits the port itself but also has the potential to stimulate economic activity in the surrounding area, creating employment opportunities and supporting the growth of related businesses and services.

The ability of the new port facilities to accommodate larger vessels is likely to incentivise shippers to opt for these larger ships. Whereas in the old port, ships were mainly docked under their own power, this may not be feasible for the larger ships. Therefore, the provision of tug assistance and pilotage services may be required to facilitate the berthing of these larger vessels. Currently, the rights for pilotage and tugboat services are held by the oil terminal, as it was not previously necessary for the old port to manage these services. In order to accommodate the needs of larger vessels, a cooperative agreement with the terminal would need to be established to determine who will provide these essential services. If the port authority were to regain control of these services, this could result in additional revenue streams for the port. In addition, control of these services would ensure that the necessary equipment and personnel are available in the event that the oil terminal ceases operations.

The addition of a new port as a transshipment hub could also present a significant opportunity for generating additional revenue. This diversification of the island's financial assets would considerably reduce its reliance on the income derived from the oil terminal (Design criteria: Financial diversification). Currently, nearly half of the port's revenue stems from payments made by the oil terminal. Without this source of income, the existing port would lack the required financial resources. Hence, the addition of a new port, capable of generating sufficient revenue to sustain itself, could prove to be a valuable asset for the island.

Nonetheless, while the oil terminal remains operational, it can play a supporting role in the functioning of the new port. Firstly, the personnel employed at the oil terminal possess valuable expertise in managing such an operation, which could prove beneficial in establishing the new port's operational systems. Secondly, they could provide ancillary services, such as bunkering, thereby enhancing the overall attractiveness of the port.

5.2.3 Strategy 3: Cruise Tourism

The third strategy revolves around enhancing St. Eustatius's appeal to tourists, primarily by focusing on attracting more cruise ships (Design criteria: Financial diversification). This could give a boost to the local tourist economy. The island's residents are receptive to increased tourism, albeit with a stipulation regarding the maximum number of 500 passengers per ship (Opportunities: Tourism). When combined with the aforementioned strategies, there exist multiple possibilities for enabling the visitation of cruise ships to the island.

In the current scenario, two cruise liners have included St. Eustatius in their itinerary with a total of eight visits planned for 2024. However, these cruise ships cannot dock at the quay during weekdays, as it is predominantly occupied by cargo operations, which have priority (Design criteria: Improved facilities). Although the quay is relatively free during weekends, the size and draft limitations of these cruise vessels prevent them from berthing there. As a result, these cruise ships are compelled to anchor offshore and utilize shuttle services to transport passengers to the island. This additional complexity in the disembarkation process serves as a significant barrier to visitation, leading to resulting in a reduction in the number of tourists able to disembark and visit the island.

Allowing cruise ships to dock at the quay, particularly on days when no freight ships are scheduled to arrive (typically weekends), would significantly improve the prospects for tourist visits. The extension of the quay and the introduction of a breakwater, as outlined in Strategy 1: Resilience, can potentially make this feasible. Whilst some cruise lines already include the island in their route other lines have also shown interest in incorporating St. Eustatius as a destination once docking becomes available (Oedjaghir, 2023).

Moreover, the capacity to accommodate cruise ships

will be an additional source of revenue for the port, as these ships will have to pay fees for berthing and usage of the quay (Design criteria: Financial diversification). Consequently, this would increase the utilisation percentage of the port at a relatively modest additional cost. The costs would mainly be in the need for additional staff, such as security. Nevertheless, it is imperative that cruise lines are willing to adapt their schedules to the available docking times.

In order to attract and retain tourists, it's essential that the facilities for passenger arrival and activities are not only available but also operate efficiently and quickly, as emphasised by (Notteboom et al., 2022) (Design criteria: Efficiency gains Improved facilities). Unfortunately, the current port does not provide the necessary facilities for cruise ships. In addition, transport options on the island are limited, further complicating the tourist experience. Addressing these infrastructure and service gaps will be essential in making St. Eustatius a more attractive destination for cruise ship tourists.

The absence of a dedicated terminal building for cruise ship passengers represents a significant gap in the current port infrastructure. Passengers disembarking from cruise ships are left exposed to the elements, standing in the sun and dust of the storage yard before they can proceed through immigration. This lack of adequate facilities can have a negative impact on the tourist experience.

In addition, the lack of a clear separation between cargo and passenger flows is not only inconvenient but also potentially unsafe (Design criteria: Safer operations). The need for passengers to pass through the cargo area, even when operations are not in progress, can be a safety hazard and detract from the overall appeal of the destination. To enhance the attractiveness of St. Eustatius as a cruise ship stopover, addressing these infrastructure shortcomings and providing dedicated passenger facilities are critical steps.

In order to make the port more attractive to cruise liners and potentially attract more of them, these existing problems must be addressed. Given the limited space on the quay for the construction of gangways, the only practical option is to allow passengers to disembark directly onto the quay. However, the construction of a dedicated and separate walkway from the quay to the immigration area, bypassing the storage yard, can significantly reduce the likelihood of accidents and improve safety. Furthermore, the implementation of a dedicated walkway would also facilitate the safer operation of the ferry, which faces a similar issue with passengers walking across the quay during cargo handling operations.

In addition, upgrading the immigration facilities is essential to improve the overall passenger experience. The current immigration facility, a converted container, is particularly small and inadequate to efficiently process cruise ship passengers. The construction of a new terminal building with ample space for immigration operations and a comfortable waiting area would be a significant improvement, making the process of visiting the island smoother and more appealing to cruise ship passengers. However, it's important to recognise that building a large terminal that can comfortably accommodate both immigration and passengers is challenging due to the space limitations of the storage yard. Given these constraints, a smaller upgrade focused on creating an indoor waiting area and providing more space for immigration operations can still be a significant improvement.

In combination with Strategy 2: Cargo, the utilization of the old port would become available. All cargo-related operations would be relocated to the new port, leaving the old port primarily used by the ferry. Consequently, this would create ample space within the old port that could be repurposed (Design criteria: Expansion opportunities). However, it's important to note that without the extension of the quay and breakwater, the old port would not be able to accommodate larger cruise ships. Nevertheless, this development would allow recreational vessels to berth at the quay, providing them with improved access to the island, as they currently face similar challenges to larger cruise ships in terms of docking restrictions caused by cargo operations. The potential for recreational vessels to use the old harbour is an exciting prospect and will be further explored in Strategy 4: Yacht Tourism, where more detailed options for this strategy will be investigated.

The removal of cargo operations from the old port could significantly improve the overall visitor experience for cruise ship passengers who shuttle back and forth from the vessels. With the elimination of the potential danger of accidents between passengers and cargo operations, the area could be transformed into a more visitor-friendly environment (Design criteria: Improved facilities, Safer operations). In particular, the boarding area on the quay could be enhanced to better accommodate tendering vessels. This could involve adapting the quay's design to more closely align with the requirements of the tendering vessels, ensuring a smoother and more convenient boarding and disembarking process for passengers.

Furthermore, the removal of cargo operations and the subsequent availability of the storage yard space present exciting opportunities for redevelopment (Design criteria: Expansion opportunities). These oppor-

tunities include the construction of a new passenger terminal building that would significantly improve the arrival experience for cruise ship passengers. Such a terminal could provide a comfortable waiting area both before and after immigration clearance, giving passengers a more pleasant experience while awaiting transport to explore the island or board tender vessels. The redevelopment of the area could also be used to create additional tourist attractions, particularly given its proximity to the historic part of the town. By developing more engaging and appealing experiences for tourists, St. Eustatius can make itself a more attractive destination, potentially increasing tourist spending and contributing to the local economy.

The combination of Strategy 1: Resilience and Strategy 2: Cargo presents a combination that removes most of the limitations and challenges associated with each of the combined two strategies. This combination provides a combination that brings together the best aspects of both strategies and offers several benefits.

Firstly, the extension of the quay and breakwater, as outlined in Strategy 1: Resilience, significantly increases the port's capacity to accommodate larger cruise ships. This in turn will make St. Eustatius a more attractive destination for cruise ships, especially as the need for shuttle services will be eliminated. Potentially increasing their interest in visiting the island.

Secondly, the availability of the storage yard in Strategy 2: Cargo provides valuable space for the construction of a well-equipped cruise terminal that can efficiently and comfortably cater to the needs of passengers (Design criteria: Improved facilities). In addition, this newly gained space could be used to develop tourist attractions in the lower touristic part of town, further enhancing the island's appeal to visitors. A possible redesign of the quay can create a more accessible and potentially multi-functional space for cruise guests, expanding its use beyond port operations to recreational purposes.

While the combination of the two strategies offers many advantages, it's important to recognise that there would still be limitations in terms of cruise ship berthing capacity. Even with ample space for a new terminal and other facilities, it is likely that only one large cruise ship, or possibly two smaller ones, would be able to berth at a time due to the constraints of the existing quay.

In addition, the landward side of the quay is too shallow for cruise ship berthing, limiting the option to dock cruise ships on this side. However, if there is a growing demand for additional docking facilities to accommodate more cruise ships, it may be worth exploring the possibility of constructing a second quay between the existing quay and the breakwater (Design criteria: Expansion opportunities). It's important to note that this space may be limited and may not fully comply with construction guidelines as outlined by Ligteringen (2022). Nevertheless, a feasibility study could be carried out to ascertain the option to dock ships under specific conditions. In particular, the option to dock smaller cruise ships if there is significant demand for such an extension. This approach would require careful planning and assessment of the suitability of the site and the impact on port operations.

The arrival of cruise ships and the ability to berth provides an opportunity to offer various ancillary services, some of which may be required by cruise operators, such as shore power and water availability (Notteboom et al., 2022). There is also potential to provide additional services such as restocking and maintenance for cruise ships. Given that the port was originally designed for cargo operations, it's possible to dedicate part of the storage yard to these services, which would also generate additional revenue for the new cargo port (Design criteria: Financial diversification).

However, mixing cargo and passenger traffic can present challenges. Firstly, if goods are transported by lorry between the two ports, the lorries would have to pass through the historic tourist part of the town, which is likely to become busier with the arrival of cruise ships. To overcome this, it could be considered to maintain the RoRo dock at the old port and use RoRo vessels for transport between the two ports. However, this may not be feasible if several cruise ships are in the port at the same time.

Another issue is the movement of cargo from the repurposed storage yard to the ships, which could lead to a mix of cargo and passenger flows on the quay (Design criteria: Safer operations). To mitigate this, cargo stowage could be scheduled at specific times when there are no passengers, such as at night. Alternatively, the possibility of building gangways on the quay without obstructing the movement of goods could be investigated.

A more comprehensive solution to these challenges would be to load cruise ships directly from specialised cargo vessels that would dock alongside. Quit similar to the method used for bunkering vessels which could be offered as an additional ancillary service, as long as the oil terminal remains operational. The cargo vessels would then shuttle between the cargo and cruise ports without using the road infrastructure and eliminating the mixing of cargo and passenger traffic on the quay. This approach offers a more streamlined and efficient process for servicing cruise ships while maintaining the safety of the passenger traffic.

5.2.4 Strategy 4: Yacht Tourism

The fourth strategy focuses on the attraction of a different kind of tourism for the island. While Strategy 3: Cruise Tourism focuses on large groups of tourists from cruises, this strategy focuses on tourists coming by recreational vessels. These visit the island by recreational vessels such as motor or sailing yachts a smaller high-end and often less intrusive form of tourism. Creating an opportunity for these vessels to visit St. Eustatius could be an opportunity for further diversifying the operations of the port and island (Design criteria: Financial diversification).

Recreational vessels, particularly yacht tourism, represent a promising opportunity for the development of the island's tourism industry. This segment of the tourism industry tends to generate significant revenues, which are often allocated to marine-related activities in the destinations they visit (Sevinç & Güzel, 2017). The natural environment plays a central role in attracting these tourists, highlighting the importance of its well-being in attracting this form of tourism. Yacht tourists tend to stay longer than cruise tourists and spend more time and money on the island (van Nek, 2023). It therefore represents a lucrative industry for diversifying the island's income streams and creating an attractive destination for yachts (Design criteria: Financial diversification). However, the current infrastructure does not cater for this market, as outlined in Tourism development. Improving these facilities could be a strategic means of attracting more tourism.

The current port infrastructure lacks support for yachts and other recreational vessels to dock at the quay. Instead, they are required to dock at moorings further from the coast. This setup lacks essential facilities such as access to fuel, water and provisions for the boats (Design criteria: Improved facilities). In addition, obtaining provisions can be a challenge, as most shops are located in the higher part of the town, making them less accessible by foot from the port.

In the report by Oedjaghir et al. (2022), a preliminary sketch is provided that outlines the creation of several berthing places within the inner harbour. The plan involves extending the breakwater and the old blue jetty to create a protected area of calm water where recreational vessels can dock and small commercial vessels can berth. Such a development could significantly improve the infrastructure for yachts and other boats, making it more convenient and attractive for them to visit and use the port facilities of St Eustatius.

The creation of a marina within the inner harbour would have several beneficial outcomes. Firstly, it would facilitate the creation of a new berth for the ferry. This would enable the creation of a separate area for the passengers, with a direct connection to immigration. This would result in faster turnaround times for the ferry as the weighting times would be reduced (Design criteria: Efficiency gains). In addition, this arrangement would significantly reduce the risk of accidents by eliminating the need for passengers to cross the quay during cargo operations, thus ensuring a safe separation between cargo and passengers.

Secondly, the provision of a separate entrance to the marina would improve the overall experience for visiting recreational vessels. These vessels would enjoy direct access to the island without having to go through immigration procedures each time they disembark. The same benefit would extend to the local dive centre, as their clients would no longer have to go through immigration for each dive excursion. In addition, the marina's dock would be designed to meet the needs of recreational vessels. In the current scenario, there is a significant height difference of 1.5 metres between the boat and the quay, which passengers have to overcome without the use of stairs. Aligning the height of the dock with that of the vessel would significantly improve the boarding experience in terms of comfort and convenience.

Finally, allowing recreational vessels to dock would open up opportunities for the provision of additional ancillary services (Design criteria: Improved facilities). These services, associated with berths, include facilities such as access to water and electricity, as well as refuelling services, which would also be available to small commercial vessels. In addition to the increased port fees collected from both commercial and recreational vessels for berthing rights, the provision of ancillary services would generate additional revenue for the port.

When constructing a marina dock, there are two main methods commonly used (ShoreMaster, n.d.). One option is to create a fixed dock, which is fixed to the bottom, often supported by piles set into the seabed, with a deck on top. The other option is a floating system, where the deck rests on drums that float in the water, often anchored to the seabed by piles. While a floating system may be slightly less stable than a fixed dock, it offers several advantages. A key advantage is that floating docks can adjust their height as the water depth changes, ensuring that the dock remains at the correct height for boats. These systems are also more resilient during storms and less prone to damage because they can move with the waves (ShoreMaster, n.d.). It's even possible to dismantle floating dock systems and store them on land in the event of severe weather. Given St. Eustatius' susceptibility to rough weather conditions, especially during the hurricane season, it would be ad-

visable to use a floating system to construct docks in the marina.

Figure 5.2: Breakwater design Harterink (2023)

While the initial idea for a marina is promising, it is limited in size (Design criteria: Expansion opportunities). During discussions with Harterink (2023), an idea was put forward to explore the creation of a larger marina. The concept is to construct a new breakwater on the remains of an existing one about 200 metres further up the coast. From this point, a new breakwater would be built perpendicular to the island, extending into the sea and curving towards the existing breakwater, leaving an opening for ships to enter (Figure 5.2). This extension would significantly increase the capacity to accommodate recreational vessels. It would also enable the development of this part of the cost for more touristic activities as the demand will increase.

The construction of the new breakwater is expected to be cheaper compared to the costs of extending the original breakwater. The design of the new breakwater could accommodate a process where lorries drive over the newly constructed breakwater and unload rocks at the end to gradually extend the breakwater. Furthermore, the size of rock required for this construction is readily available on the island, reducing the costs (Oedjaghir, 2023). This proposed extension has the potential to create a more spacious and accommodating harbour for recreational and small commercial vessels.

In the plan proposed by Harterink (2023), the entrance to the marina is aligned with the prevailing direction of the swell, allowing waves from the swell to enter the marina directly. To overcome this challenge, several alternative breakwater designs are proposed here, although it's worth noting that other designs may also be viable.

Figure 5.3: Breakwater design 1

One solution is to construct a second breakwater (Figure 5.3) slightly inside the marina at the entrance, effectively blocking incoming waves. However, this configuration may cause difficulties for larger vessels as they would have to make a turn to access the quay, which is not recommended in breakwater design Ligteringen (2022). In addition, the construction of an separate breakwater would be more expensive, especially as it has to be constructed by boat.

Another approach would be to move the harbour entrance to the north side of the marina (Figure 5.4). This adjustment would involve extending the existing breakwater and shortening the new breakwater to create an entrance for vessels. This configuration reduces the need for an additional breakwater at the entrance and allows larger vessels to enter the marina. However, the extension of the existing breakwater would result in slightly less manoeuvring space for vessels attempting to enter.

It's important to note that when designing a breakwater, it is recommended to provide ample manoeuvring space immediately after the breakwater, rather than creating a narrow channel, as per the guidelines outlined by Ligteringen (2022). Extending the existing breakwater is likely to be a more costly undertaking than building a new breakwater, given the

deeper water and the need for increased hurricane resistance, which requires a higher standard of construction. On the contrary, the new breakwater can be built with smaller rocks and can be constructed from the shore, making it a potentially more cost-effective option.

Figure 5.4: Breakwater design 2

A third proposed solution is to build a shorter new breakwater around the marina, ending at the same height as the quay (Figure 5.5). In this design, the existing breakwater would be extended slightly beyond the quay to cover the marina entrance. This approach limits the extension of the existing breakwater and reduces the associated costs compared to the previous option (Figure 5.4). The new breakwater would also be shorter than the first option (Figure 5.3), potentially making it a more cost-effective choice.

However, this design has its limitations, mainly in that it restricts the size of vessels that can berth at the quay, as they cannot extend beyond it without blocking the entrance to the marina. It's also worth noting that there will be a slight reduction in capacity due to the shorter new breakwater. However, this reduction is not expected to be very significant as the other design options would require the same space to be kept free for manoeuvring.

The implementation of this strategy, which aims to attract more recreational vessels through the creation of a marina, is based on the developments outlined in Strategy 1: Resilience, the construction of the quay and breakwater, to enclose the marina. The second phase of development also builds on the developments of the first strategy, mainly on the assumption that it will be used in the first phase.

Figure 5.5: Breakwater design 3

Moreover, it is possible to combine this strategy with the other two strategies presented in Strategy 2: Cargo and Strategy 3: Cruise Tourism. Combining these strategies could create an even more attractive destination for visiting recreational vessels. In combination with Strategy 2: Cargo, the port would be free of all cargo operations, meaning that the quay would no longer be used for such purposes (Design criteria: Safer operations). This would allow larger vessels, which may not fit into the marina due to their size, to berth at the quay. It could potentially accommodate a number of yachts at the same time along its length. However, the interest of larger yachts in visiting St Eustatius would need to be assessed. In addition, the vacant storage yard could be repurposed for other activities, possibly including new tourist attractions and services such as supermarkets, which would enhance the overall appeal of the marina.

Similar to Strategy 3: Cruise Tourism, it would be possible to allow larger yachts to berth at the quay on days when there are no cargo operations. This would provide an additional revenue stream without incurring significant additional costs, as the port would be open anyway (Design criteria: Financial diversification). By extending the quay and creating an additional quay on the breakwater, the port could cater for both cruise ships and private yachts. In addition, revenue streams would be diversified by offering similar ancillary ser-

vices to yachts.

The creation of a new marina would reduce the port's dependence on income from the oil terminal by capitalising on the potential of tourism. This plan can be developed in stages and integrated with the proposed expansion outlined in Strategy 1: Resilience. This could significantly increase tourist arrivals by recreational vessels and open up new tourism-related opportunities on the island.

5.2.5 Costs

Although detailed cost analysis is not included in the strategies due to insufficient data, a preliminary estimate and comparison of the different expected costs per strategy is performed.

Three cost estimates were retrieved from available reports:

- The cost estimate for the extension of the breakwater by (van der Leer et al., 2018) estimated that an extension of 100 metres would cost 13.5 million.
- The new cargo port according to the design of (van Achteren, 2022) will cost at least 36.8 million. This is only for the land reclamation, the dredged material and the breakwater, and does not include the infrastructure for the access road, the necessary buildings and the superstructure.
- The report by (Kateman & Bos, 2010) includes an option for marina development and estimates this to be 2.2 million. However, this development almost solely includes the construction of docks without any protection from waves.
  The (Kateman & Bos, 2010) report includes an option for marina development and estimates this at 2.2 million. However, this development consists almost entirely of the construction of docks without any wave protection.

Based on these estimates, rough calculations could be made for the different strategies. However, it should be noted that these are preliminary estimates and that they are relatively outdated, especially the report by (Kateman & Bos, 2010).

No calculations were made regarding the cost of extending the quay in any of the reports. The extension of the quay will be similar in length to the breakwater. Although the materials required for the construction will be lower, the construction process is more complex. Therefore, it is assumed that the cost will be similar.

The first strategy involves constructing a breakwater and quay, with the major costs being associated with these two elements. The cost of the breakwater is known, and an estimation has been made for the quay. Although the cost of paving the storage yard and widening the RoRo dock is unknown, it is expected to be significantly less than that of the breakwater and quay. The total cost of the first strategy is estimated to be somewhat more than €26 million.

The second strategy involves the construction of a new port. According to the report by (van Achteren, 2022), the construction costs are estimated at €36.8 million. Kateman and Bos (2010) has also provided cost estimates for relocating the port to the same site. They estimated that the road would cost €2.5 million and the facilities would cost €1.5 million. The cost of the superstructure is unknown but is expected to be relatively small compared to the other investments. Therefore, the total cost is expected to be slightly over €40.8 million.

Table 5.1: Investment cost estimation [millions of €]

Strategy	Infrastructure	Cost
1	Breakwater	13.5
	Quay	13.5
	Paving storage yard	-
	widening RoRo	-
Sum		27+
2	Cargo port	36.8
	Entrance road	2.5
	Facilities	1.5
	Superstructure	-
Sum		40.8+
3	Breakwater	13.5
	Quay	13.5
	Passenger terminal	-
	2^{nd} berth	-
Sum		27++
4.1	Breakwater	13.5
	Quay	13.5
	Blue jetty	6.1
	Docks	2.2
Sum		35.3
4.2	New breakwater	27
	Docks	6.6
Sum		33.6

The third strategy partially relies on the same investments as the first strategy and, therefore, incurs the same costs for these investments. However, the investments in the storage yard are different as a new passenger terminal will be built, which is likely to be more expensive than only paving the yard. Additionally, bollards and a new access path for the second berth will be constructed, which will also most likely be more expensive than widening the RoRo dock. These invest-

ments will make the third strategy considerably more expensive than the first.

The fourth strategy comprises two phases. The first phase involves extending the breakwater and quay, for which the costs have already been estimated. Additionally, the blue jetty will require an extension of approximately 45 meters. As the blue jetty shares many similarities with the quay, similar building costs can be used for a rough estimation. The expected cost for the blue jetty is €6.1 million. This is most likely a slight overestimate, as the blue jetty will not need to be constructed to accommodate large ships. The overall cost will therefore be around €35.3 million.

The second phase will require the construction of a new breakwater and additional docks. Approximately three times more docks can be built than in the first strategy, tripling the expenditure for the docks. The new breakwater will be about 250 metres long. The method of building this breakwater is cheaper than extending the existing one, as it can be built from the shore using smaller rocks. As it is more than twice the length of the extended breakwater but cheaper to build, the cost is estimated to be twice as high at around €27 million. This brings the total cost to around €33.6 million. This is in addition to the cost of the first phase.

Comparing the costs of the different strategies, it is clear that the first strategy will be the cheapest to construct. It is also the basis for most of the other strategies. If these investments are made, the additional costs for strategies 3 and 4.1 will also be greatly reduced. This is also highlighted in the Strategic roadmap as it is presented as the first step to be implemented.

The construction of a new port in strategy 2 will be the most expensive to build. This was to be expected, as everything has to be built from scratch with no existing infrastructure. The main benefits of the construction are the separation of passenger and cargo traffic and the possible additional revenue from the arrival of more cargo ships. The question is whether these benefits can be balanced against the additional costs.

The wave protection for strategy 4 is quite expensive for both phases. Comparatively, the extension of the blue jetty is slightly cheaper in terms of the number of docks than the construction of a new breakwater. It could also be considered not to extend the blue jetty and to construct the breakwater, which would reduce the total cost for phases 1 and 2, but this would involve very high initial investment costs.

5.2.6 Concluding remarks

These strategies offer valuable insights into the future development of the port and present opportunities that may lie ahead. In the following chapter, an assessment will be carried out in collaboration with experts to determine whether these strategies are in line with existing expectations or whether there are any overlooked insights.

Given the significant costs associated with the effective implementation of these strategies, it is essential to identify the potential contributions of the private sector, which will be explored in chapter 6. The aim is to ensure that the involvement of the private sector will facilitate the implementation of these strategies while avoiding a significant burden on public finances. This chapter will examine the extent to which this collaboration can be advantageous.

What strategies can be formulated from the performed analysis?

From the SWOT and trend analysis, four distinct strategies were formulated, each focusing on a different aspect of port development and identifying infrastructure needs.

The first strategy focuses primarily on addressing current infrastructure deficiencies and seeking opportunities to improve operational efficiency. Expanding the quay and the RoRo dock are identified as potential measures to accommodate more and larger vessels. In order to increase unloading efficiency, an investigation was conducted into the feasibility of implementing a crane. However, it seems that this would be an unsuitable addition. Improving safety is of utmost importance, hence the crucial importance of paving the storage yard to reduce risks. It is also imperative that the breakwater be reinforced and extended to bolster port resilience. Nevertheless, restrictions regarding expansion must be taken into account, most notably on the land side, as the port is restricted by cliffs which limit potential growth.

The second strategy involves the creation of a new port dedicated to transshipment services, to increase the flow of goods through the port and potentially reduce import costs. This plan would also facilitate the handling of larger vessels which would necessitate larger infrastructure, including land size considerations for storage yard expansion. One major benefit of this strategy is the separation of passenger and freight traffic, which will improve safety both in the port and on the access road.

The third strategy focuses on enabling cruise ships to visit the port. This would necessitate the same infrastructure developments as proposed in the first strategy. However, challenges arise regarding the feasibility, primarily due to the lack of services to handle large volumes of passengers and the potential safety risks associated with mixing passenger and cargo operations. Combining this strategy with the second strategy provides a solution to passenger-related issues and enables the construction of a passenger terminal.
The fourth strategy looks into creating a marina so recreational vessels can visit the island. Opportunities were identified and further expansion possibilities were highlighted. Developing this marina is an effective way of progressively developing the port and attracting more visitors to the island.

These strategies offer a view of potential opportunities for port development and provide insights into potential future developments, outlining the actions required to realise these opportunities.

The costs associated with these investments have been estimated based on reports and run into tens of millions of euros. There are still large unknowns for certain values and the accuracy of the estimates is subject to uncertainty. The investments in the first strategy form the basis for most of the other strategies, except for strategy 2, the construction of a new port, which is estimated to be the most expensive strategy.

5.3 Strategy validation

To evaluate the feasibility and practicality of the proposed strategies for the port of St. Eustatius, a validation process will be initiated. This process aims to gather insights by engaging experts from various relevant fields. Interviews will be conducted with stakeholders directly associated with the port, as well as independent experts who can provide impartial perspectives.

Engaging stakeholders with a direct link to the port will yield valuable insights into the practical implications and potential challenges related to the proposed developments. Key stakeholders that were interviewed were the St. Eustatius Port Authority personal and users of the port. Additionally, involving independent experts will facilitate an unbiased assessment of the feasibility and potential impact of the envisioned changes. Outreach was made to the Port of Saba which is constructing a new port and an interview was conduct on the expansion plans.

Through this validation process, the port of St. Eustatius can gain valuable feedback and recommendations from experts in the field. This will ensure that the proposed strategies align with the requirements and capabilities of the port.

5.3.1 Strategy 1

Strategy 1: Resilience revolves around the expansion of the port, as proposed in the report by Oedjaghir et al. (2022). This expansion primarily involves the extension of the breakwater and quay, as well as the widening of the RoRo dock. In addition, measures to improve the port's hurricane resistance are an important part of this strategy. These measures include paving the storage yard and carrying out necessary repairs to the existing section of the breakwater.

However, some aspects of this plan have been considered redundant. The widening of the RoRo ramp has been deemed unnecessary by van Nek (2023) and Oedjaghir (2023) as the current demand does not approach the operational capacity of the port. According to van Nek (2023), the quay and RoRo dock are only used for cargo operations about 25% of the time, with approximately 5-10% of this cargo destined for the oil terminal. Therefore, the port's reliance on goods imported for the terminal is not great, but its closure would have far-reaching implications for the island, potentially leading to a significant reduction in cargo volumes. Furthermore, van Nek (2023) does not foresee any significant growth in cargo volumes in the coming years and even predicts a slight decrease in imports.

Regarding the extension of the quay, Oedjaghir (2023) does not see an urgent need for it in terms of cargo imports. However, it could be beneficial in certain situations, particularly for accommodating larger vessels that could be used for transshipment operations. However, the likelihood of shipping companies being interested in such operations is considered low (Oedjaghir, 2023), especially given that transshipment is only viable if there is demand and a compelling reason to make deliveries to the island, as the detour is often not cost effective.

The need for a crane at the quay was not explicitly mentioned in the interviews. However, based on the current operational system's capabilities for loading and unloading ships, it can be assumed that the addition of a crane is not a priority. It may become a requirement for unloading transshipment vessels, although this is not expected to be a viable use case scenario for the current port.

Resurfacing the storage yard is widely seen as a welcome investment given the current problematic conditions. During heavy rainfall, chassis tend to sink into the ground and get stuck. In such cases, it is impossible for a lorry or terminal tractor to access the chassis (van Nek, 2023). Instead, a forklift must be used to lift the chassis, allowing the truck to attach. In addition, paving the storage yard is crucial for safety reasons (Oedjaghir, 2023). However, paving is not considered necessary for increasing storage capacity, as the current capacity is considered sufficient (Oedjaghir, 2023). Also, the primary storage method of placing containers on chassis does not allow for stacking. In addition, the necessary machinery to stack containers is not available as the available forklifts are too light (van Nek, 2023).

Although the breakwater has survived several hurricanes and is still largely intact, some damage has accumulated over time. The breakwater has slowly eroded and flattened due to the harsh weather conditions, resulting that the part further from to the coast are lower than the rest (Oedjaghir, 2023). Whether the breakwater needs to be repaired due to its changing condition remains to be investigated.

5.3.2 Strategy 2

Strategy 2: Cargo proposes the establishment of a new dedicated cargo port with the aim of increasing cargo volumes and potentially becoming a transshipment hub. The reasoning behind this strategy is to capture some of the cargo that currently goes to St. Maarten, thereby transforming St. Eustatius into a transshipment hub. This approach would also separate passenger and cargo operations, thereby increasing safety.

Although current cargo volumes do not require the construction of a new port, the plan is designed with the intention of developing into a local transshipment hub. The port of St. Maarten is experiencing congestion due to the high volume of cargo. While this congestion does not directly affect St. Eustatius, it presents an opportunity to tap into van Nek (2023). However, Oedjaghir (2023) notes that local demand in St Eustatius is relatively low, and this is a critical factor for a port to become a hub. High local demand helps to offset the costs associated with operating the port, as fixed and variable costs remain largely the same.

However, creating a new port does have a number of benefits that could possibly outweigh the increased costs. The most important is the segregation of passenger and cargo flows (Oedjaghir, 2023). This creates easier and safer operations for both operations. There is no chance anymore of passengers getting accidentally injured by cargo traffic and therefore the cargo operators need to be at a higher level of alertness. Removing this danger would remove this need and enable them to focus on other safety aspects, creating an overall safer port.

Another benefit would be the direct import to the island bypassing costs and time loss that occurs due to all the cargo needing to be handled in St. Maarten. According to Keijzer (2023) this is especially a problem for cold goods. When stowing operations happen in St. Maarten the reefer containers are left open and goods that need to be cooled are left out in the sun causing in some cases a large batch of food to spoil and need to be thrown away. However other solutions could also solve this problem.

5.3.3 Strategy 3

Strategy 3: Cruise Tourism proposes the idea of allowing cruise ships to dock at the quay in order to stimulate tourist activity on the island. This strategy incorporates elements of Strategy 1: Resilience and Strategy 2: Cargo, emphasising the need to separate cargo and passenger operations, while creating better facilities for tourists, including waiting areas and immigration processing.

However, according to van Nek (2023), cruise tourism may not be as financially lucrative for the island as originally expected. Most cruise ships offer all-inclusive packages, which means that passengers eat on board rather than in local restaurants. While the arrival of cruise ships benefits the port's income, it may not contribute significantly to the island's economy (Meeuwsen & Johnson, 2023), as food and many activities are available on board. As a result, many passengers tend to return to their cruise ships for both lunch and dinner, resulting in limited spending in local establishments (Harterink, 2023). In addition, for cruise tourism to be successful, the island must provide attractive activities for tourists. Although the island has a rich history, there are not many activities available on the island. Unfortunately, the lack of beaches and challenging terrain, especially for the older demographic, hinders the island's potential to attract cruise visitors. However, if the island can become more attractive to cruise operators, this could provide growth opportunities for the port.

Strategy 1: Resilience proposes extending the quay and breakwater and deepening the water to accommodate larger cruise ships. However, van Nek (2023), raises several issues and challenges with this strategy. Firstly, it's noted that most cruise ships are longer than the proposed quay extension, meaning that only smaller ships could potentially dock. This limitation could restrict the types and sizes of cruise ships that could visit the island. Secondly, there is a significant safety concern about mixing passenger and cargo operations in the same port area. Cruise passenger and cargo operations have different requirements and safety protocols, and addressing this issue is critical to ensuring the safety of all port activities. Finally, van Nek (2023) mentions that cruise operators have specific requirements and standards that ports must meet in order to be considered a destination. These requirements can be extensive and may include facilities, services and security measures that would need to be implemented or upgraded in order to attract cruise operators to St Eustatius.

In order to implement the plan outlined in Strategy 1: Resilience and accommodate cruise ships, the port would need to adopt a time-slot system, a practice common in larger ports. This system is essential to accommodate the strict schedules and itineraries of cruise ships (Oedjaghir, 2023). The existing first-come, first-served approach would prove inadequate in this context. The use of time slots is crucial for the effective management of mixed port activities, as cargo ships would not be able to unload while a cruise ship is at berth. By adopting a time-slot system, the port can efficiently plan and allocate specific timeframes for cruise ship arrivals and departures, ensuring a smooth and organised operation that meets the precise timing requirements of cruise tourism.

Should cruise operators show an interest in including St. Eustatius in their itineraries and using the quay for docking, this could open up various opportunities for the port. Serving cruise ships has the potential to generate additional cargo flows, which in turn could require expanded storage facilities within the port (van Nek, 2023). To meet these growing storage needs, the port may need to consider the use of a reachstacker, to effi-

ciently stack and store containers.

The developments proposed in Strategy 2: Cargo may become necessary if St. Eustatius experiences a significant increase in the number of cruise ships wishing to visit. A substantial increase in tourism and cruise ship arrivals would naturally lead to an increased demand for cargo imports (Oedjaghir, 2023). If this increased demand exceeds the capacity of the existing port, investment in new port infrastructure could be a justifiable undertaking. Such an investment would not only free up the capacity of the old port but also create the potential for expansion through the construction of additional berthing facilities. The use of dolphins constructed near the breakwater can facilitate additional berthing facilities, which can then be connected to the port via the breakwater itself (Oedjaghir, 2023).

5.3.4 Strategy 4

Strategy 4: Yacht Tourism focuses on facilitating the visit of pleasure vessels to the island and the ability to dock in the port. This is proposed through the creation of a marina, divided into two phases to accommodate growing demand. In the first phase, a small marina will be created by extending the quay and the blue jetty. This will create a sheltered area suitable for the construction of docks and the accommodation of recreational and small commercial vessels. In the second phase, a new breakwater will be constructed further up the coast in conjunction with an extension to the existing breakwater. This will result in a larger protected area with more space for dock construction.

Yacht tourism is regarded as a promising opportunity for the island, as highlighted in interviews with experts such as Oedjaghir (2023), van Nek (2023) and Harterink (2023). Notably, Saba also recognises the potential of yachting tourism as a means of attracting more visitors. They have already begun preparations for the construction of a new marina (Meeuwsen & Johnson, 2023). This future marina will be specifically designed to cater for pleasure craft and smaller commercial vessels, similar to the concept presented in Strategy 4: Yacht Tourism.

The consensus among the interviewees is that there are significant benefits to separating cargo and passenger operations. Even in cases of relatively low incoming cargo traffic, such as in Saba, separation is considered a compelling reason to build a new port dedicated to cargo operations Meeuwsen and Johnson (2023). In addition, Harterink (2023) points out the considerable benefits of this separation for his diving guests, who no longer have to go through immigration every time they go diving. For the ferry service, as Oedjaghir (2023) points out, this change would also be highly beneficial, reducing risks and allowing for faster turnaround times.

The development plan for the new port in Saba also includes a phased process to provide additional space for ships. In the first phase, the harbour is designed to accommodate 33 vessels of up to 40 metres in length (Meeuwsen & Johnson, 2023). In the second phase, about 20 additional slips for smaller vessels could be created. While the first stage of Strategy 4: Yacht Tourism can only accommodate smaller vessels, in combination with Strategy 2: Cargo it could become possible to berth vessels of this size and possibly even larger ones.

The ancillary services proposed in Strategy 4: Yacht Tourism are very similar to those proposed for Saba's new port, with one notable exception being the absence of a dedicated fuel station in Saba due to safety concerns (Meeuwsen & Johnson, 2023). Instead, Saba is considering the use of fuel trucks to meet this need. Other services such as the provision of electricity, water and possibly internet connectivity are being considered for the harbour. St Eustatius could seize the opportunity to offer dedicated fueling services and potentially differentiate itself. However, it must carefully consider the safety and logistical considerations that led Saba to forgo a dedicated fuel station.

5.3.5 Costs

The costs for the different strategies have not been validated with experts due to their late addition. The costs are based on estimates made in previous reports. Unknown factors have been derived from rough estimates based on the results of these reports. The resulting costs are in the tens of millions of euros per strategy. The first strategy is the most affordable and forms the basis for most of the other strategies. Lowering the additional investment required for the other strategies. The exception is the construction of the new freight port, which is also the most expansive strategy. The most cost-effective strategy will have to be determined at a later phase of the project.

The financing of these projects is expected to be complex. The current Dutch government has earmarked €11.1 million for port development, mainly for improvements to the breakwater and the storage yard. However, this budget is not sufficient to implement the proposed strategies. Additional funding will be required and potential sources include government support and private partnerships, as discussed in Privatisation evaluation.

5.3.6 Concluding remarks

Based on the information gathered from the interviews, it is clear that the proposed strategies are generally feasible and in line with the preferences of local users and the port authority. Although some elements are considered less vital or not presently applicable due to demand limitations, the general agreement among the experts is that these strategies are in line with their views.

The first strategy highlights that the extensions are not immediately necessary due to demand constraints, with the upgrading and resurfacing of the storage yard considered more important. The second strategy encounters a similar demand issue but with the potential to become a hub, the cargo movements can be increased. As for the third strategy, cruise ships are deemed less financially promising, and the proposed expansion may not be adequate to accommodate larger vessels. However, the introduction of cruise ships may result in increased levels of freight. The fourth strategy, which centres around the marina for recreational vessels, is the most promising opportunity for the port. This plan is seen as highly valuable for the island and is in line with the project initiated on Saba.

The significant costs associated with all of the strategies highlight the need for external financial support, as the island's current financial situation may not be sufficient to implement any of the proposed strategies. Acquiring financial support could take the form of additional government funding or private sector involvement. This underlines the importance of exploring potential avenues for external funding.

Although questions remain regarding the demand for future expansion, these strategies provide significant insights into potential future developments. In the following chapter, an assessment will be carried out to establish how privatisation can contribute to the realisation of these strategies. The examination will investigate multiple approaches to incorporating private enterprises into the development procedure.

5.4 Strategic roadmap

As noted earlier, the strategies outlined are not mutually exclusive and can be partially integrated into a comprehensive strategic roadmap. The integration of these strategies is already partially discussed in the various sections devoted to each strategy. This chapter provides an overview of all the strategies and identifies the elements that can be combined.

In the first phase (Figure 5.6), most of the proposals presented in Strategy 1: Resilience will be incorporated. This includes the extension of the quay and dredging to accommodate larger ships, anticipating future developments. The extension of the quay will also require a corresponding extension of the breakwater to mitigate waves. At the same time, repairs to the breakwater are essential to improve its resistance to hurricanes. In addition, the storage yard will be paved for safety and passenger convenience, creating a more pleasant waiting area for ferry passengers.

Figure 5.6: Impression phase 1

The second step will be the partial realisation of a marina (Figure 5.7), as proposed in Strategy 4: Yacht Tourism. This will involve extending the blue jetty to form an enclosed area within the inner harbour. Within this area, docks for recreational vessels will be created. This development will also facilitate the reconfiguration of the ferry berth. Creating a direct link to the immigration services, resulting in the separation of cargo and passenger operations. At the same time, the feasibility of upgrading the immigration building can be investigated, to create a more comfortable experience.

Figure 5.7: Impression phase 2

In the third phase (Figure 5.8), the marina will be expanded according to demand. This will involve the construction of a new breakwater perpendicular to the coast, which will curve towards the quay. Within this extended area, additional docks can be built to accommodate larger vessels with reduced draft restrictions.

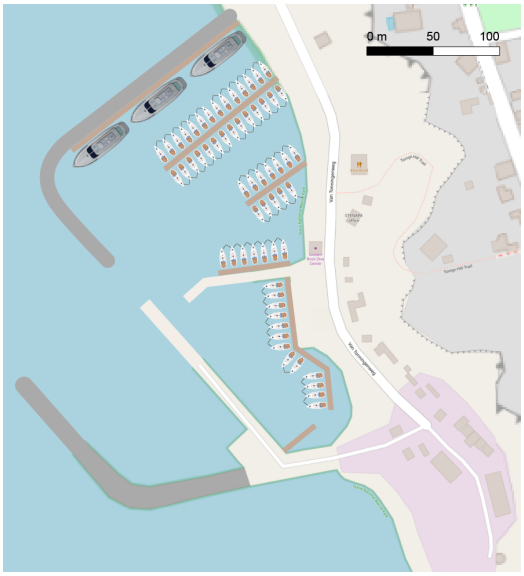


Figure 5.8: Impression phase 3

Step four involves the construction of a new port, as described in Strategy 2: Cargo. This new port would completely separate cargo and passenger flows, creating a more welcoming environment for passengers in the old port. The construction of the new port could position the island as a transshipment hub for the region,

generating additional port activity. Located higher up the coast, the new port would facilitate larger vessels and more ancillary services.

The relocation of cargo services in Stage Four would free up space in the old port for redevelopment (Figure 5.9), in line with the vision outlined in Strategy 3: Cruise Tourism. In addition, the relocation of cargo services will allow cruise ships to berth in the old harbour. A cruise terminal can be developed in the former storage yard to accommodate a larger number of tourists. In addition, to attract more cruise ships, additional berths could be created next to the breakwater. The construction of bollards and a walkway would allow passengers to walk over the existing breakwater to land, giving the breakwater a dual purpose.

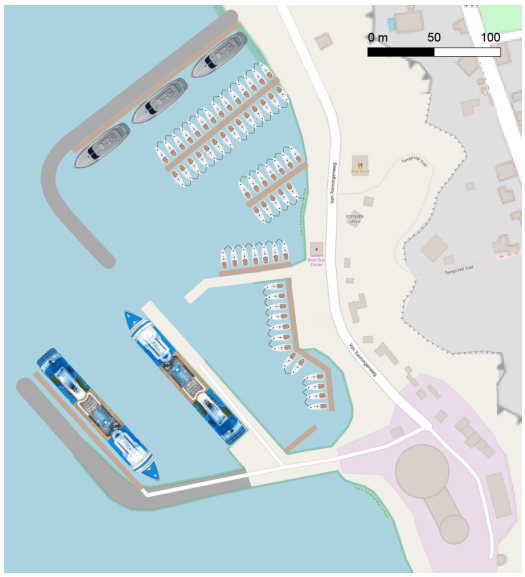


Figure 5.9: Impression phase 5

Chapter 6

Privatisation evaluation

This chapter aims to evaluate the need for privatisation in relation to different strategies for the port. Each of these strategies will be examined in light of the research carried out in section 3.1: Privatisation and section 3.2: Port Administration Models, to identify the most appropriate port model and the potential benefits of privatisation.

As mentioned before, the most commonly cited rationale for privatisation is the introduction of market competition into the entity to be privatised, with the expectation of economic benefits. However, the applicability of this rationale in the specific case of the St. Eustatius port is rendered irrelevant by the absence of any possibility of market competition, given the existence of a single port.

Furthermore, it is assumed that the existing landlord model applied to the GTI oil terminal will remain unchanged. This assumption is partly due to the complexity of changing these structures with a private entity. But mostly because it is in line with the prevailing preference for the landlord model, as the optimal method of cooperation between public and private actors in port management (section 3.2: Port Administration Models). However, an adaption to the service provided, such as pilotage, may be applicable for operation under the port authority in the case this is advantageous.

6.1 Transformation to SOE

Before privatisation can take place, the creation of a state-owned enterprise with a dedicated port authority to oversee its management is a crucial first step. There are several reasons why the establishment of a state-owned enterprise would be beneficial for the operation of the port. Firstly, it is a prerequisite for eventual privatisation, as it enables the state to divest part of the enterprise. In addition, this separation of the enterprise from government control offers several advantages, including reduced dependence on and influence by the government.

From a financial perspective, it entails that the revenues generated by the port are retained by the port itself, rather than being channelled into the state budget. This allows the port to accumulate funds for future investment and expansion, which is currently lacking. Infrastructure funding is a key rationale for privatisation, as identified by Kouser et al. (2011). This would be particularly interesting in the current case, as the oil terminal pays high fees to the port for the right to operate. However, the extent to which the port can retain its revenues depends on the agreements made by the government upon creating the state-owned enterprise. It could also be expected that the port would pay some kind of dividend to the government, as it needs the money to fill the gaps in its budget.

From a policy perspective, the port's increased autonomy from the current political landscape will allow for better strategic planning. Currently, the port relies heavily on government contributions for financial investments, making it vulnerable to changing political priorities. Therefore, if political opinion is not aligned with the development of the port, there is a high probability that funding will not be provided. This is particularly problematic as the political landscape changes more frequently than a port's strategy, as these processes take significantly longer than the time between elections. The complex political landscape on the island does not help either. Achieving independence from such political fluctuations would facilitate the implementation of long-term strategies that are more closely aligned with the port's development needs (personal communication, Oedjaghir, 2023). Allowing for a more stable development of the port, and thus possibly improving the efficiency of the individual SOEs OECD (2019a).

Furthermore, this transfer would reduce the government's responsibility for the operation of the port. St. Eustatius, as a special municipality, already carries out many governmental functions that are not normally the responsibility of a municipality of its size. The transfer of port management responsibilities would reduce the burden on the government and potentially lead to an improvement in the quality and quantity of services in terms of management as suggested by the rationals of Kouser et al. (2011).

For most strategies, the initial development will likely continue in the form of a toolport model. This is mainly due to unfavourable financial conditions, which do not

Table 6.1: Caption

Strategy	Privatisation	Administrative model
1	No opportunity for privatisation as the plans are already largely funded by the government. To enable privatisation in the future transformation to SOE should be performed.	No adaption of the port model is possible due to the government investment, therefore stays tool port.
2	Opportunity for private investors exists, however, limited demand could make it difficult to attract private parties. Creating a public-private partnership could reduce financial risk for private investors.	If financial viability allows, private parties have the opportunity to invest and adaption to the landlord model is possible.
3	Opportunity for private investment by cruise lines. If investment costs are deemed too high a public-private partnership could be established.	The investment of cruise liners will enable a shift towards the landlord model over time.
4	The first phase will need to be publicly funded, the second phase enables the opportunity for private investment and operations	The first phase has no option to adapt the model, in the second phase there is the ability to transform into a landlord model.

attract private investors due to insufficient demand. Consequently, the new infrastructure investments required for the various strategies are likely to be financed by the government or the state-owned company in case of asset transfer. However, in some cases, operations may be outsourced to smaller private companies.

6.2 Strategy opportunities

6.2.1 Strategy 1

The first strategy focuses on improving the current infrastructure and operations. This includes the extension of the quay and breakwater and the resurfacing of the storage yard. These plans have been approved and part of the funding for this project has already been secured through a government grant. It's important to note that these infrastructure investments are not expected to significantly increase the port's revenues or affect its operations.

Although the port is underutilised, one of the rationales cited by Kouser et al. (2011), privatisation of the port is unlikely to stimulate greater utilisation given the limited demand. Moreover, there is little potential for adaptation of the port model, as the government still provides both the infrastructure and the superstructure, in line with the existing toolport model. In addition, no significant changes in operations are expected.

6.2.2 Strategy 2

Strategy two is focused on establishing a new cargo port. This project involves the development of a completely new infrastructure and superstructure, providing an opening for private investment. The development of a new port presents a chance to examine how privatisation can be incorporated into the port model, notably through a private partnership.

Initially, creating a new cargo port may not be financially feasible due to limited demand. Therefore, the construction of the necessary infrastructure and superstructure would likely rely on government funding. The port's operations, however, could be outsourced to a private entity, resulting in a toolport model similar to the current port. As cargo flows grow and the port develops into a hub, the financial possibilities become more tempting and potentially profitable. At this stage, there may be an option to sell the superstructure to a private entity, potentially transforming the port into a landlord model.

However, it is crucial to evaluate whether adopting a landlord model would be advisable, as the government is likely to retain a controlling interest. The port is of significant importance for delivering goods to the island, and therefore, it is a crucial asset. Adopting a landlord model would entrust all cargo handling to a private company, with no competition due to the island's limited size. Therefore, it is crucial to establish robust contractual agreements to regulate costs and guarantee reliability.

To fund the initial construction of the port, a public-

private partnership (PPP) could be established. This strategy would engage the private sector from the beginning of the development process and provide financial benefits as the private sector contributes to the construction of the port. Additionally, the private entity could offer valuable expertise in the construction and operation of such a port.

In both the toolport and landlord models, ancillary services may be managed by both public and private entities. Currently, ancillary services, such as container stripping, are provided by third parties in the existing St. Eustatius port. As the port expands, private entities can extend these services to encompass those mentioned in section 3.2 Port Administration Models Table 3.3. Tug services also have the potential to be tendered as vessel traffic increases, leading to the removal of GTI's existing monopoly and the promotion of market competition.

The identification of the most appropriate model for implementation is highly dependent on the financial feasibility of port operations. Private entities are more likely to invest if the business case proves to be favourable. In order to make a well-informed decision, it is essential to carry out a comprehensive analysis of the expected cargo flows and the resulting revenue projections.

6.2.3 Strategy 3

The criteria for implementing the third strategy are very similar to those for the first strategy. The expansion of the quay and breakwater is crucial to cater to bigger cruise ships arriving at the port. These initial investments are expected to be mainly financed by the government, as they are also of great importance for cargo operations. Due to the unattractive business case for this initiative, involving a private party is unlikely. The arrival of cruise ships could potentially expand ancillary services through activities such as restocking cruise ships, creating new opportunities for the private sector. This development does not, however, require a change in the port model.

Private investment in cruise terminals is a frequent occurrence, with various stakeholders such as cruise lines, specialised cruise terminal operators, port companies and real estate and infrastructure managers often expressing interest in financing, building and operating terminals (Pallis, Parola, Satta, & Notteboom, 2018). While St. Eustatius has not yet developed as a cruise tourism destination, it may be worthwhile to consider whether third parties would be interested in establishing a cruise terminal. When combined with the second strategy, there is potential for redevelopment of the storage yard, creating opportunities for investment by private operators.

To reduce risks for potential private investors, creating a public-private partnership could be an appealing option, where the port authority also participates in the investment, making it a more attractive proposition. This collaboration could also lead to a change in the port model, as the infrastructure and superstructure would be partially financed by the private party, potentially moving towards a landlord model and reducing the financial burden on the port authority.

In the absence of interest from private entities, the combination with the second strategy may still facilitate the redevelopment of the storage area, albeit financed by the port authority. This provides a chance to establish value-added facilities for tourist activities, including shops and restaurants, similar to the initiatives presented on Saba (Meeuwsen & Johnson, 2023). These additional services can then be outsourced to private parties.

6.2.4 Strategy 4

Strategy four entails developing a marina for recreational craft, with a two-stage approach. In the initial stage, a small marina will be built in the inner harbour, incorporating a limited number of docks for recreational vessels. Private investors may be discouraged from participating in this first phase due to the untested business case. However, as the marina attracts more recreational vessels, its operation could become an enticing prospect for a private party. Moreover, a private party can manage the ancillary services such as water, electricity, fuel and supplies, similar to the existing port model.

Subsequently, phase two involves a significant expansion of the marina, including the extension of the existing breakwater and the construction of a new breakwater from the shore. Within this extended area, additional docks can be created. The initial success of the first phase could be used to demonstrate the economic viability of recreational vessels visiting the island. As a result, private entities may demonstrate an interest in both constructing and operating the extended marina. However, the significant costs associated with the construction of the breakwater may make it less attractive for private investment. Hence, it is worthwhile to consider the prospect of the port authority financing the breakwater construction whilst a private entity manages the marina construction. This agreement can be established using a public-private partnership model in which the expenses are divided between the parties while the private enterprise still oversees the operations.

6.2.5 Concluding remarks

How can privatisation contribute to the realisation of the strategies?

While the strategies present opportunities for privatisation and public-private partnerships, the feasibility of these initiatives ultimately depends on the business case. To implement most of the strategies, the port authority must first lead the initial infrastructure investments and subsequently identify a private partner to manage operations. The primary upfront expenditure is significant and would presumably require financial support from the Dutch government.

There is significant potential for private organisations to get involved, however, only if concrete and persuasive business cases are established for the different approaches. Undertaking primary investments via the port authority could function as a manner to demonstrate the viability of these business cases. As the port experiences growth, it may generate interest from private investors to undertake operational aspects or to invest in future expansions, gradually moving the port towards greater self-sufficiency.

Additionally, the discussion on the importance of essential infrastructure continues, especially in the context of cargo operations, where the uninterrupted continuation of these activities is of paramount importance. Therefore, the port authority ought to establish rigorous guidelines for private entities or adopt the public-private partnership approach to strengthen their influence and guarantee the reliability of essential infrastructure.

Chapter 7

Discussion, Conclusion & Recommendations

7.1 Conclusion

The objective of this research was to assess the potential benefits of privatisation for the Port of St. Eustatius by formulating a strategy to create a self-sustaining port. The first step was to conduct a literature review on privatisation and to examine how public-private relationships work within the port industry. In order to determine the viability of privatisation, a thorough investigation of the port's future options was considered essential. As a result, various strategies were explored through a comprehensive analysis of the current state of the port. This included a PESTEL, SWOT and trend analysis, which led to the formulation of design criteria aimed at strengthening and diversifying the port.

The literature review highlighted various rationales for privatisation, with the overarching notion that market competition improves efficiency. While efficiency gains were a central theme, the research identified several underlying reasons that support the potential for privatisation to improve government operations. Against these rationales, the opportunity for privatisation was tested in the formulated strategies.

The degree of privatisation in enterprises encompasses three primary business models: state-owned enterprise, public-private partnership and full private ownership. For the Port of St. Eustatius, the state-owned enterprise model emerged as the initial preferred solution. This model facilitates a clear separation of budgets between the port and the island, allowing the port to retain revenues for future investments. Subsequent strategies can then determine whether the involvement of a private party is beneficial for strategy development. Accordingly, the administrative model for the port can evolve from the current tool port to the landlord model often preferred in port operations. In this model, the public authority retains regulatory responsibility while private entities undertake investment and operations.

Before the impact of privatisation could be assessed, strategies had to be formulated. Utilising PESTEL, SWOT, and trend analyses, design criteria were established. The design focused on three primary objectives:

- Diversify the financial resources beyond government funding and revenue from the oil terminal
- Enhance the port's resilience to natural disasters
- Improve safety operations by reducing the risk of accidents and segregating passenger and cargo operations

Derived from these criteria, four strategies were developed, each addressing different aspects to meet the defined goals. These strategies collectively present a comprehensive plan for the port, exploring various opportunities to achieve greater self-sufficiency. The four strategies focus on the following key areas:

1. Enhancing port resilience to ensure future-proofing against natural disasters and upgrading existing infrastructure
2. Exploring the opportunity to establish a new cargo port, transforming the port into a regional transshipment hub and increasing the flow of goods
3. Analyzing the potential of increased cruise tourism as a new revenue stream by enabling cruise ships to dock at the quay
4. Making the port more appealing to recreational vessels by providing docking facilities in the marina and offering necessary services

For each of the strategies, an assessment was conducted to determine the potential role of privatisation and its transformative impact on the port model.

For the first strategy, it was determined that privatisation was not an alternative. Limited port usage would not generate a sufficiently attractive business case for a private party to invest in the necessary infrastructure and superstructure.

In contrast, the second strategy presents a more promising opportunity for partial privatisation. A public-private partnership can be established for the initial investment in the creation of a new port. Given the high investment costs and the need to retain control over critical infrastructure, it is less likely that a fully private solution will be adopted. The significant partic-

ipation of the public party results in reduced feasibility for converting the port into a landlord model with this strategy.

The third strategy is comparable to the first strategy in that it involves significant initial investment, which is more likely to be financed by the public party. Nonetheless, there exist opportunities to attract private investors, particularly in the cruise industry, where operators often invest in terminal construction. Once more, a public-private partnership presents itself as the most appropriate solution due to the high investment costs and an unproven business case, it also provides some security for the investment of the private party.

The fourth strategy comprises two stages, where the first stage is highly reliant on infrastructure investment from the first strategy. As privatisation is not considered a likely possibility in the first stage, it relies heavily on public investment. As the business case becomes more established in the second stage, there will be opportunities for attracting private investors. However, significant capital investments are required, which may need to be funded by the public sector.

Although a definitive solution is currently lacking, preliminary conclusions can be drawn based on the present research. To answer the primary research question - To what extent can privatization contribute to realizing the strategic goals of transforming the port of St. Eustatius into a self-sustaining entity? - requires an assessment of its two parts. To achieve a more self-sufficient port, it is necessary to reduce reliance on the oil terminal for revenue. This can be done by diversifying income streams. The port's capacity for cargo operations is currently limited, but revenue could potentially be increased by establishing a new transshipment hub. However, this strategy is the costliest and potentially the most challenging, making it currently the least advisable course of action.

The island's tourism industry is underdeveloped but has the potential for growth by attracting recreational vessels. This demographic is a substantial tourist group for many islands in the region. Assuming the initial strategy of upgrading the existing port infrastructure proceeds, the additional investment required for constructing docks for recreational vessels is comparatively modest. Implementing this strategy will help to assess the demand for berthing facilities for recreational vessels in St. Eustatius. Subsequently, the need for expansion can be assessed.

Attracting cruise tourism could diversify port revenue. The first strategy would facilitate the docking of cruise ships, allowing for testing of the potential of this form of tourism. While this research mainly focuses on the positive aspects of port diversification, it only briefly discusses the negative implications of the validation. The potential negative impact of large groups of tourists on the island has not been thoroughly investigated and should still be investigated.

To conclude on the best strategy, at this stage, it would be advisable to invest in the first strategy and use this to test whether attracting more tourists in the form of cruise ships and recreational vessels is a worthwhile endeavour. Investing in a transshipment hub may not be beneficial for a long time, as demand on the island is currently lacking.

Although private investment opportunities exist for the different strategies, their feasibility largely depends on the business case. The required investments for these strategies are significant. Therefore, public-private partnerships emerge as a favourable alternative, splitting the significant investment and leaving the public sector with greater control. However, even in such a collaboration, finding a private party willing to invest is difficult, especially as there is no proven business case. Limiting the opportunities to adopt privatisation in the current port.

To develop the port, it is important to financially separate it from the government so that it can keep its revenue for development. Therefore, creating a state-owned enterprise would be beneficial for future developments. This would enable partial sale to private parties in the future if it becomes profitable.

The limited possibility of privatisation would also result in the inability to change the administrative model from a tool port to a landlord model. Currently, outsourcing operations in a tool port model appears to be the most viable administrative model due to the high investment costs. In later stages, interested private parties may present themselves and the port model can be adapted accordingly.

In the current state, the investments for development will therefore still need to be provided by the government with the option of outsourcing the operational aspect of the port to a private party in line with the tool port model.

7.2 Discussion

Practical relevance

The research carried out on the port is of practical importance for several reasons. The strategies identified represent viable options for the government, providing a comprehensive view of potential development trajectories. These insights enable the government to set objectives and effectively initiate the implementation of the strategies. It also provides a valuable tool for

anticipating and addressing obstacles that may arise during the development process. While it's recognised that not all obstacles can be predicted, the analysis acts as a guide for the government, allowing it to preemptively incorporate known obstacles and mitigate the risk of fundamental problems.

The analysis also highlights potential challenges and offers potential solutions. Recognising the obstacles that may arise provides the government with valuable foresight, improving its ability to navigate and troubleshoot potential problems. While it's impossible to anticipate every obstacle, the analysis provides a guide for identifying, addressing and mitigating challenges.

In addition, the project limitations identified in the PESTEL analysis provide critical guidance for the overall project. Many of these constraints are rooted in the broader context of the island and carry an impact on the port. Analysing these constraints is a key step in formulating effective solutions. By addressing these constraints, the government can develop a more robust and adaptive approach to the project, increasing the likelihood of successful and sustainable development for the port.

Research relevance

In the research context, the structural analysis of privatisation in the context of port development provides valuable insights into the potential benefits of privatisation for small ports. The methodology used incorporates general market theory and applies it specifically to small ports with monopolistic features. Using generic analysis tools to identify possible strategies ensures an open focus on opportunities for redevelopment. These strategies were then used to apply the general theorem of market function and port governance models to see how this could benefit development. This provides a structured and systematic approach to addressing this type of complex issue.

For small islands with similar conditions, this method could be used as a first step in the development process to generate different strategic directions. It guides them to proactively explore opportunities and formulate strategies to achieve their development goals. Although this method does not provide definitive answers on the best development approach, it creates a basis for defining goals and ambitions. The method used employs multiple analysis tools commonly used in general business analysis. Therefore, it can also be applied to other business and government operations.

The privatisation of a government operation is not a common occurrence. For this process, it is crucial that the underlying reasoning is sound. To ensure a well-informed process, it is important to consider the various reasons for applying privatisation and analyse the opportunities and limitations of different strategies. Ensuring that these steps are taken will lead to a well-considered decision and substantiation of the reasoning.

For this thesis, the systematic approach proved effective in highlighting the underlying complexities of port development in this particular case. Incorporating factors that relate not only to the port but also to its surroundings, particularly the dynamics of the island, created a deeper understanding of the development requirements. However, defining the scope of the project becomes complex due to this approach. Incorporating external factors may result in a large amount of information, some of which may not be relevant to generating development strategies. Therefore, it is important to clearly delimitate the factors that should be considered and exclude less important ones to reduce the amount of analysis required.

The strategies resulting from this method align with its intended goals and are consistent with expectations and surrounding developments. However, a more systematic approach to the design criteria and creation of strategies could be employed to ensure all options are examined. One possibility is to follow the strategic port planning process more closely. This method provides a detailed analysis of the current capabilities and ambitions, with a closer focus on leveraging the strengths of the port. However, the underdevelopment of the port of St. Eustatius has limited its abilities and ambitions, resulting in a wider search area for developing strategies and creating greater complexity in finding relevant alternatives. A more systematic approach to strategy creation could lead to even better outcomes.

Approach

The methodology chosen for this report is relatively well suited to the objectives pursued. However, there are some discrepancies between the design of the method and its actual implementation in the report. The strategic port planning process, while versatile and applicable to large port operations, typically includes an implementation phase. In this report, the implementation step was not pursued and instead, a more theoretical analysis of the proposed strategies was undertaken. While this approach proved effective for the current research, it deviates from the original aim of the method, which was to gain a deeper understanding of the organisation and highlight the specificity of the process.

Due to time and information constraints, it proved diffi-

cult to achieve the depth of insight that the method intended, resulting in some aspects being less developed than originally intended. A notable example is the lack of economic analysis of the strategies. Understanding the costs and benefits associated with these strategies is crucial to determining the most appropriate development alternative. Although these analyses are complex, their importance for project development cannot be underestimated. In addition, such calculations are essential for attracting private parties, as potential investors need to be reassured that their investment will be profitable.

Despite these limitations, the methodology adopted provided valuable insights into the potential development of the port. Recognising the limitations and areas for improvement, future research and development could incorporate a more comprehensive economic analysis to ensure a more thorough understanding of the financial implications associated with the proposed strategies.

Privatistion

The primary objective of this report was to assess the potential benefits of privatisation for the Port of St Eustatius. While the analysis of privatisation for different strategies has been carried out, the conclusions drawn are not as definitive as expected. The viability of privatisation depends highly on the business case, which requires an economic analysis to determine its feasibility. The significant costs associated with investment make private involvement more complicated, particularly given the island's low level of economic development.

The analysis of the benefits of privatisation is based on a literature review and interviews. However, due to time constraints, interviews with experts on privatisation were not conducted. Although the conclusions drawn from the analysis appear logical, validation through expert insight would have provided valuable perspectives on the complexities of the process and potential opportunities.

Research complexity

Subsection Approach underlines the challenges involved in conducting an economic analysis. The task is complicated not only by the intricacies of the calculation itself but also by the difficulties of data collection. In the context of this study, obtaining financial information proved to be particularly challenging. Although a cost-benefit analysis had recently been carried out for the port, access to this document was restricted due to contractual restrictions. These contractual restrictions hampered the research, highlighting the resource constraints faced by the understaffed public body, which was unable to handle contractual arrangements for access to documents. These challenges also highlight wider political issues that contribute to the overall political complexity of the island.

The island's high level of bureaucracy, influenced in part by the Dutch government's anti-corruption efforts, creates an environment that appears resistant to change. The research observed a seemingly rigid government structure with a reluctance to embrace non-traditional approaches. The political and cultural landscape, while complex, was somewhat marginalised in this research due to its complexity.

Apart from financial information, data on cargo volumes proved almost non-existent. The way the port operates lacks a consistent system, and sometimes no system at all. The seeming absence of a consistent drive by the local population to improve conditions suggests that innovation is often pushed from external sources. However, such external influences may be resisted by the local population, who may perceive them as an intrusion into their lives. Navigating this delicate balance presents a challenge in moving forward.

Understanding the political and cultural complexities will be essential for effective progress. A deeper insight into the political situation could provide valuable perspectives on how to navigate this complicated landscape. Recognising and addressing these complexities will be crucial in developing strategies that not only address the economic aspects of port development but also take into account the cultural and political nuances of the island.

7.3 Recommendations

Design details

The strategies proposed in the report include various infrastructure developments, yet some lack specific details. For example, specific information such as the number of docks that can be realised or the required extension length of the breakwater is missing. In order for the government to make a more informed decision on which strategy to implement, it is essential to have a more detailed and refined plan.

Without a comprehensive and detailed plan for each strategy, it will be difficult to accurately calculate the investment costs. Therefore, it is essential to further refine the design of the proposed strategies to include more specific design details. This refinement will not only contribute to a clearer understanding of the feasibility and practicality of each strategy but will also enable a more accurate estimation of the associated investment costs.

Financial analysis

As highlighted in the Discussion section, the financial implications are of vital importance to both the development of the port and the assessment of privatisation. However, this report lacks explicit calculations of the financial implications and no cost estimates have been provided for any of the potential strategies. While a rough assumption can be made about the relative costs of different strategies based on infrastructure investment, precise calculations are not possible.

Given the importance of informed decision-making, it is strongly recommended that a comprehensive financial analysis of the proposed investments be carried out. This should include a detailed estimate of the costs associated with each strategy. Such calculations are crucial for making informed decisions and are also essential for developing compelling business cases to attract private investors. It is therefore advisable to carry out a thorough financial analysis, outlining both the investment required and the potential returns, in order to inform the decision-making process.

Privatisation evaluation

Incorporating financial analysis into the privatisation assessment of the different strategies would provide a more comprehensive understanding of the benefits of privatisation. This can help to identify the aspects that are likely to be attractive to private investment and to identify those components which would need to be financed by the government. Such insights can help convince potential investors to participate in the development of the strategies.

In addition, seeking expert assessments of the privatisation of the different strategies, particularly concerning the financial dimension, could provide valuable insights. The involvement of experts with legal expertise could further improve the analysis by exploring the precise steps required for port privatisation. While the legal complexities of legislation have not been included in this report, their inclusion would contribute to a clearer understanding of the potential for privatisation. This comprehensive approach, including financial analysis and expert opinion, would enrich the assessment of privatisation and provide a more robust basis for decision-making.

References

Alanzi, S. (2018). *Pestle analysis introduction*. University of Salford.

Algemene Rekenkamer. (2021). *Resultaten verantwoordingsonderzoek 2021 Ministerie van Binnenlandse Zaken en Koninkrijksrelaties*. Ministerie van Binnenlandse Zaken en Koninkrijksrelaties. Retrieved from https://www.rekenkamer.nl/publicaties/rapporten/2022/05/18/resultaten-verantwoordingsonderzoek-2021-ministerie-van-binnenlandse-zaken-en-koninkrijksrelaties

Autoriteit Consument & Markt. (2020a). *Decision setting the maximum electricity distribution tariffs with effect from January 1st, 2021 for: St. Eustatius Utility Company N.V.* Retrieved from https://www.acm.nl/sites/default/files/documents/distribution-tariffs-stuco-electricity-2021.pdf

Autoriteit Consument & Markt. (2020b). *Kostenbeoordeling vast internet Saba en Sint Eustatius*. Retrieved from https://www.acm.nl/sites/default/files/documents/2020-05/kostenbeoordeling-vast-internet-saba-en-sint-eustatius.pdf

Belastingdienst Caribisch Nederland. (n.d.). *Invoerbelastingen bij invoer van goederen in Caribisch Nederland*. Retrieved 12-10-2023, from https://www.belastingdienst-cn.nl/onderwerpen/invoerbelastingen-particulieren

Bhonsle, J. (2022). *Advantages and disadvantages of bigger vessels for port and terminal operators*. Marine Insight. Retrieved from https://www.marineinsight.com/maritime-law/advantages-and-disadvantages-of-bigger-vessels-for-port-and-terminal-operators/#Disadvantages

Bichou, K., & Gray, R. (2005). A critical review of conventional terminology for classifying seaports. *Transportation Research Part A: Policy and Practice*, *39*(1), 75–92.

Black, J., & Roso, V. (2022). Container ports post-privatisation–analysis of the roles of the public and private sectors at port botany, sydney. *Case Studies on Transport Policy*, *10*(2), 1438–1452.

BURUNCIUC, L. (2022). *Clean energy in the Caribbean: a triple win*. Retrieved from https://blogs.worldbank.org/latinamerica/clean-energy-caribbean-triple-win

Cadle, J., Paul, D., & Turner, P. (2014). *Business analysis techniques: 99 essential tools for success (second edition)*. BCS Learning & Development Ltd.

Cambridge Dictionary. (2023). *Privatisation*. Retrieved 25 October 2023, from https://dictionary.cambridge.org/us/dictionary/english/privatization?q=privatisation

CBS. (n.d.). *Opleidingsniveau*. Retrieved 28-02-2023, from https://www.cbs.nl/nl-nl/nieuws/2019/33/verschil-levensverwachting-hoog-en-laagopgeleid-groeit/opleidingsniveau

CBS. (2018). *1 op 3 Sabanen hoogopgeleid*. Retrieved from https://www.cbs.nl/nl-nl/nieuws/2018/15/1-op-3-sabanen-hoogopgeleid

CBS. (2020). *Population forecast, Caribbean Netherlands 2020-2050*. Retrieved from https://www.cbs.nl/en-gb/background/2020/41/population-forecast-caribbean-netherlands-2020-2050

CBS. (2021a). *GDP up on Bonaire in 2019, down on St Eustatius and Saba*. Retrieved from https://www.cbs.nl/en-gb/news/2021/43/gdp-up-on-bonaire-in-2019-down-on-st-eustatius-and-saba

CBS. (2021b). *Groei werkzame beroepsbevolking op Caribisch Nederland stokt in 2020*. Retrieved from https://www.cbs.nl/nl-nl/nieuws/2021/28/groei-werkzame-beroepsbevolking-op-caribisch-nederland-stokt-in-2020

CBS. (2021c). *Onbenut arbeidspotentieel Caribisch Nederland omvat 3,4 duizend mensen*. Retrieved from https://www.cbs.nl/nl-nl/nieuws/2021/50/onbenut-arbeidspotentieel-caribisch-nederland-omvat-3-4-duizend-mensen

CBS. (2021d). *Trends in the Caribbean Netherlands 2021*. Retrieved from https://longreads.cbs.nl/ticn2021/st-eustatius/
CBS. (2022a). *Caribbean Netherlands; import and export values per island*. Retrieved from https://www.cbs.nl/en-gb/figures/detail/82658ENG#shortTableDescription
CBS. (2022b). *Eerste onderzoek brede welvaart Caribisch Nederland toont wisselend beeld*. Retrieved 28-10-2023, from https://www.cbs.nl/nl-nl/nieuws/2022/48/eerste-onderzoek-brede-welvaart-caribisch-nederland-toont-wisselend-beeld
CBS. (2022c). *Toerisme Caribisch Nederland deels hersteld in 2021*. Retrieved from https://www.cbs.nl/nl-nl/nieuws/2022/12/toerisme-caribisch-nederland-deels-hersteld-in-2021
CBS. (2022d). *Trends in the Caribbean Netherlands 2022*. Retrieved from https://longreads.cbs.nl/the-caribbean-netherlands-in-numbers-2022/
CBS. (2023). *Werklozen*. Retrieved 28-10-2023, from https://www.cbs.nl/nl-nl/visualisaties/dashboard-arbeidsmarkt/werklozen
Connell, J. (2009). Third world. In *International encyclopedia of human geography* (p. 237-246). Elsevier. Retrieved from https://www.sciencedirect.com/science/article/pii/B9780080449104001267 doi: https://doi.org/10.1016/B978-008044910-4.00126-7
Cruise Compete. (2023). *Sint Eustatius Cruises*. Retrieved 15-10-2023, from https://www.cruisecompete.com/vacations/visits/sint_eustatius/1
Cullinane, K., & Song, D.-W. (2002). Port privatization policy and practice. *Transport Reviews, 22*(1), 55-75. Retrieved from https://doi.org/10.1080/01441640110042138 doi: 10.1080/01441640110042138
De Hoge Raad der Nederlanden. (n.d.). *Rechtspraak op de eilanden: Aruba, Curaçao, Sint Maarten en Bonaire, Sint Eustatius en Saba*. Retrieved 29 September 2023, from https://www.hogeraad.nl/over-ons/rechtspraak-eilanden/
Depoorter, B. W. (1999). Regulation of natural monopoly. *Encyclopedia of Law and Economics, Part V-Regulation of contracts*.
Dorfman, A., & Harel, A. (2016). Against privatisation as such. *Oxford Journal of Legal Studies, 36*(2), 400–427.
Elder, S. (2012). Sint eustatius, a caribbean shangri-la. *The Washinton Post*. Retrieved from https://www.washingtonpost.com/lifestyle/travel/sint-eustatius-a-caribbean-shangri-la/2012/10/18/b32c3a56-0e5c-11e2-bb5e-492c0d30bff6_story.html
European Central Bank. (n.d.). *Benefits of price stability*. Retrieved 28-02-2023, from https://www.ecb.europa.eu/mopo/intro/benefits/html/index.en.html
European Commission. (n.d.). *Overseas Countries and Territories*. Retrieved 29 September 2023, from https://international-partnerships.ec.europa.eu/countries/overseas-countries-and-territories_en#oct-eu-cooperation
European Commission. (2021). *Sint Eustatius Territorial Multiannual Indicative Programme (MIP)*. Retrieved from https://international-partnerships.ec.europa.eu/system/files/2021-12/mip-2021-c2021-9164-oct-annex-8-st-eustatius_en.pdf
Expertisecentrum Europees Recht. (n.d.). *Buitenlands en veiligheidsbeleid: Sancties*. Ministerie van Buitenlandse Zaken. Retrieved 02-03-2023, from https://ecer.minbuza.nl/ecer/dossiers/buitenlands-en-veiligheidsbeleid/sancties.html
Fang, I., Cheng, F., Incecik, A., & Carnie, P. (2013). *Global marine trends 2030* (Tech. Rep.). Lloyd's Register.
Glerum, J. (2021). *Heritage on statia: The relevance of the remnants of slavery for the tourism strategy (master thesis)*. Wageningen University & Research. Retrieved from https://edepot.wur.nl/557320
GTI Statia. (n.d.). *About us*. Retrieved 03-03-2023, from https://gtistatia.com/?blogcategory=Press+Release
Guerrero, D., & Rodrigue, J.-P. (2014). The waves of containerization: shifts in global maritime transportation. *Journal of Transport Geography, 34*, 151-164. Retrieved from https://www.sciencedirect.com/science/article/pii/S0966692313002408 doi: https://doi.org/10.1016/j.jtrangeo.2013.12.003
Haarmeyer, D., & Yorke, P. (1993). *Port privatization: an international perspective* (Tech. Rep.). Citeseer.
Harterink, M. (2023, August 8). *Personal communication; Interview with Mike Harterink (owner of local dive centre Scubaqua)*.
Hermansson, F. (2016). *10 global trends affecting supply and demand in the container shipping industry*. Retrieved from https://blog.greencarrier.com/10-global-trends-affecting-supply-and-demand-in-the-container-shipping-industry/
Høj, J., Kato, T., & Pilat, D. (1995). Deregulation and privatisation in the service sector. *OECD Economic Studies, 25*, 37 - 74.

Hyster Company. (2020). *Beneath the Surface: Barge Handling With Hyster ®Reachstackers.* Retrieved 11-10-2023, from https://blog.hyster.eu/beneath-the-surface-barge-handling-with-hyster-reachstacker/

IEA. (2021). *Hydrogen in Latin America.* Retrieved from https://www.iea.org/reports/hydrogen-in-latin-america

IEA. (2022a). *Global Energy Crisis.* Retrieved from https://www.iea.org/topics/global-energy-crisis

IEA. (2022b). *World Energy Outlook 2022.* Retrieved from https://www.iea.org/reports/world-energy-outlook-2022 (License: CC BY 4.0 (report); CC BY NC SA 4.0 (Annex A))

indeed. (2022). *What is a PESTLE analysis? factors, examples and uses.* Retrieved 2023-02-27, from https://www.indeed.com/career-advice/career-development/what-is-the-pestle-analysis

International Maritime Organisation. (n.d.). *EEXI and CII - ship carbon intensity and rating system.* Retrieved 10 Oktober 2023, from https://www.imo.org/en/MediaCentre/HotTopics/Pages/EEXI-CII-FAQ.aspx

Kateman, I., & Bos, C. (2010). *Accessibility study harbour Statia: Feasibility study improvement harbour accessibility St. Eustatius* (Tech. Rep.). Royal Haskoning DHV.

Keijzer, S. (2023, August 16). *Personal communication; Sebastiaan Keijzer (Owner High 5 Supermarket).*

Kim, Y.-J., Trimi, S., & Lee, S.-G. (2022). Analysis of the operational efficiency of international logistics hub ports. *International Journal of Business and Social Science*, *13*(3). doi: 10.30845/ijbss.v13n3a2

Kleijn, T., Blaas, M., & Borst, S. (2022). *Bedreigd: Nederlands koraal.* BNNVARA. Retrieved from https://www.bnnvara.nl/zembla/artikelen/bedreigd-nederlands-koraal

Koek, E., & Mensche, D. (2017). '*Wat Sint-Maarten met Irma kreeg, lijken wij nu te krijgen*'. Retrieved from https://caribischnetwerk.ntr.nl/2017/09/19/wat-sint-maarten-met-irma-kreeg-lijken-wij-nu-te-krijgen/

Koelewijn, M., Clarinda, M., & Virginia, L. (2022, Augustus). *Inspectieonderzoek: Opvolging aanbevelingen corruptiebestrijding op Bonaire, Sint Eustatius en Saba.* Raad voor de rechtshandhaving. Retrieved from https://open.overheid.nl/documenten/ronl-7bdd6f4a869ddc4bd3e07b9629cc0f18ca74ba49/pdf

Kouser, R., Azid, T., & Ali, K. (2011). Reasons for privatization and consequent role of government: comprehensive study based on early evidence. *International Journal of Contemporary Business Studies*, *2*(10).

Lazzarini, S. G. (2022). A roadmap to privatization (and its alternatives). In *The right privatization: Why private firms in public initiatives need capable governments* (p. 165–186). Cambridge University Press. doi: 10.1017/9781009024167.009

Ligteringen, H. (2022). *Ports and terminals.* Delft Academic Press.

Malema, B. W., & Kaelo, G. (2013). Privatisation as a vehicle for economic development: an appraisal. *Botswana Notes and Records*, *45*, 86–95.

Masson, M., Ehrhardt, D., & Lizzio, V. (2020). *Sustainable Energy Paths for the Caribbean.* Retrieved from https://blogs.worldbank.org/latinamerica/clean-energy-caribbean-triple-win

McClellan, K. (2009). Evaluating the effectiveness of marine no-take reserves in st. eustatius, netherlands antilles.

Meeuwsen, Z., & Johnson, N. (2023, August 17). *Personal communication; Interview with Nicole Johnson (Senior Policy Advisor Public Entity Saba) & Zelda Meeuwsen (Coordinator Saba Harbor Project Public Entity Saba).*

Menon, H. (2023). *What are trans-shipment and trans-shipment ports?* Retrieved from https://www.marineinsight.com/maritime-law/what-are-trans-shipment-and-trans-shipment-ports/

Minesterie van Finaciën. (2016). *Onderzoeksrapport naar de governance rondom Saba Statia Cable System B.V.* Retrieved from https://open.overheid.nl/documenten/ronl-4368fba6-2b80-4392-bbb9-fe15c4d29365/pdf

Minesterie van Financiën. (2022). *Jaarverslag beheer staatsdeelnemingen 2021.* Retrieved from https://open.overheid.nl/documenten/ronl-09c0e618aff4ce3d679dccde2b4ef0df8be55a83/pdf

Mol, A. P. J., Mol, J. H., & van Vliet, B. (2004). *Suriname schoon genoeg? hulpbronnengebruik en milieubescherming in een klein amazoneland.* Uitgeverij Jan van Arkel.

Montesquieu Instituut. (n.d.). *BES-eilanden.* Retrieved 29 September 2023, from https://www.denederlandsegrondwet.nl/id/vimch046nrdp/bes_eilanden

Munim, Z. H., Saeed, N., & Larsen, O. I. (2019). 'tool port'to 'landlord port': a game theory approach to analyse gains from governance model transformation. *Maritime Policy & Management*, *46*(1), 43–60.

NIC. (2021). *Global trends 2040.* Retrieved from https://www.dni.gov/files/ODNI/documents/assessments/GlobalTrends_2040.pdf

NORA. (n.d.). *Historical hurricane trakcs.* Retrieved 07-06-2023, from https://coast.noaa.gov/

hurricanes/#map=4/32/-80
NOS. (2010). *Antillen: wat er verandert.* Retrieved from https://nos.nl/artikel/190167-antillen-wat-er-verandert
NOS. (2022). *Curaçao komt met nieuwe kandidaat om oude raffinaderij te exploiteren.* Retrieved from https://nos.nl/artikel/2433436-curacao-komt-met-nieuwe-kandidaat-om-oude-raffinaderij-te-exploiteren
Notteboom, T., Pallis, A., & Rodrigue, J.-P. (2022). *Port economics, management and policy*. Routledge. doi: 10.4324/9780429318184
OECD. (2010). *Privatisation in the 21st century: Summary of recent experiences*. Retrieved from https://www.oecd.org/daf/ca/corporategovernanceofstate-ownedenterprises/43449100.pdf
OECD. (2017). Good governance for critical infrastructure security and resilience. *High Level Risk Forum*. Retrieved from https://one.oecd.org/document/GOV/PGC/HLRF(2017)6/en/pdf
OECD. (2019a). *Good governance for critical infrastructure resilience*. Retrieved from https://www.oecd-ilibrary.org/content/publication/ea4eff68-en doi: https://doi.org/https://doi.org/10.1787/ea4eff68-en
OECD. (2019b). *Good governance for critical infrastructure security and resilience*. Paris, France: OECD Reviews of Risk Management Policies. doi: https://doi.org/10.1787/02f0e5a0-en
Oedjaghir, V. (2023, August 9). *Personal communication; Interview with Vishal Oedjaghir (Commercial manager transport Public Entity of St. Eustatius)*.
Oedjaghir, V., de Rooij, F., & Voorkamp, T. (2022). *Scope analysis of St. Eustatius harbour development* (Tech. Rep.). Public Entity St. Eustatius.
Openbaar Lichaam St. Eustatius. (2021a). *Inaugural makana ferry service marks historic moment.* Retrieved from https://www.statiagovernment.com/key-topics/harbor/news/2021/11/29/inaugural-makana-ferry-service-marks-historic-moment
Openbaar Lichaam St. Eustatius. (2021b). *Tender for affordable maritime connectivity Saba & St. Eustatius.* Retrieved from https://www.statiagovernment.com/news-and-tenders/news/2021/07/02/tender-for-affordable-maritime-connectivity-saba--st.-eustatius
Pallis, A. A., Parola, F., Satta, G., & Notteboom, T. E. (2018). Private entry in cruise terminal operations in the mediterranean sea. *Maritime Economics & Logistics*, *20*, 1–28.
Panayides, P. M., Parola, F., & Lam, J. S. L. (2015). The effect of institutional factors on public-private partnership success in ports. *Transportation Research Part A: Policy and Practice*, *71*, 110 – 127. doi: 10.1016/j.tra.2014.11.006
Peeters, T. (n.d.). *Guide to Doing Business in St. Eustatius: Legal System*. VANEPS. Retrieved 02-03-2023, from https://www.doingbusinessdutchcaribbean.com/st-eustatius/introduction-eux/legal-system-eux/
Prostar Capital. (n.d.). *GTI Statia*. Retrieved 4 December 2023, from https://prostarcapital.com/portfolio/gti-statia/
Public Entity of St. Eustatius. (n.d.). *Employment.* Retrieved 03-03-2023, from https://www.statiagovernment.com/key-topics/labor/employment
Rijksoverheid. (n.d.). *Wat zijn staatsdeelnemingen.* Retrieved 24 October 2023, from https://www.rijksoverheid.nl/onderwerpen/staatsdeelnemingen/wat-zijn-staatsdeelnemingen
Rijksoverheid. (2022). *Inrichtingen-en activiteitenbesluit BES.* Retrieved from https://www.internetconsultatie.nl/inrichtingen_en_activiteitenbesluit_bes/document/7052
Royal Haskoning DHV, & S&P Global. (2022). *Sea-web^{TM} vessel call data St. Eustatius 2013-2022* (Tech. Rep.).
Sánchez-Cambronero, A., González-Cancelas, N., & Serrano, B. M. (2020). Analysis of port sustainability using the PPSC methodology (PESTEL, Porter, SWOT, CAME). *World Scientific News*(146), 121–138.
Schelleman, F., & van Weijsten, B. (2016). *Renewable Energy Future for the Dutch Caribbean Islands Bonaire, St. Eustatius and Saba*. Retrieved from https://zoek.officielebekendmakingen.nl/blg-776649.pdf
Schneider, F. (2003). Privatisation in oecd countries: theoretical reasons and results obtained. *CESifo DICE Report*, *1*(3), 24–29.
Schoenmaeckers, B. (2011). *St eustatius: A diamond in the rough.* Retrieved from http://www.changemagazine.nl/doc/biodiversity/st-eustatius.pdf
Sevinç, F., & Güzel, T. (2017). Sustainable yacht tourism practices. *Management & Marketing Journal*, *15*(1), 61-76.
ShoreMaster. (n.d.). *Fixed docks versus floating docks: Which is better?* Retrieved 19-10-2023, from https://www.shoremaster.com/about-shoremaster/news-events/articles/fixed-docks-versus-floating-docks-which-is-better/
Simpson, M. C., Scott, D., Harrison, M., Sim, R., Silver, N., O'Keeffe, E., … McSharry, P. (2010). Quantification and

magnitude of losses and damages resulting from the impacts of climate change: Modelling the transformational impacts and costs of sea level rise in the caribbean (key points and summary for policy makers document). *United Nations Development Programme (UNDP)*.

Slagt, R. (2023). '*De ferry is van levensbelang voor de Bovenwindse Eilanden*'. Retrieved from https://www.nrc.nl/nieuws/2023/09/07/de-ferry-is-van-levensbelang-voor-bovenwindse-eilanden-a4173823?t=1695987149

Smit, T. (2018). *Het nieuwe belastingregime op Bonaire, Sint Eustatius en Saba (BES eilanden)*. Retrieved 2023-02-28, from https://www.taxci.nl/nieuws/het-nieuwe-belastingregime-op-bonaire-sint-eustatius-en-saba-bes-eilanden

Spies, J. W. E., Soons, A. H. A., Thodé, G. A. E., Verhey, L. F. M., & Weekers, F. H. H. (2015). *Vijf jaar verbonden: Bonaire Sint Eustatius Saba en Europees Nederland: rapport van de commissie evaluatie uitwerking van de nieuwe staatkundige structuur Caribisch Nederland*.

Srinivasan, K., Ötker, I., Ramakrishnan, U., & Alleyne, T. S. C. (2017). *Unleashing growth and strengthening resilience in the caribbean*. USA: International Monetary Fund. Retrieved from https://www.elibrary.imf.org/view/book/9781484315194/9781484315194.xml doi: 10.5089/9781484315194.071

Swain, J., & King, B. (2022). Using informal conversations in qualitative research. *International Journal of Qualitative Methods*, *21*, 16094069221085056. doi: 10.1177/16094069221085056

Tan, J. (2012). The pitfalls of water privatization: failure and reform in malaysia. *World Development*, *40*(12), 2552–2563.

Taylor, G., & McDonald, M. (2023). In practice and in principle: 'free market' discourses and container port reform in australia. *Competition & Change*. doi: 10.1177/10245294231181967

ter Haar, B., & Hagoort, D. (2021). Kleinschaligheid vergt ondersteuning: Naar een betere borging van vitale publieke voorzieningen op Caribisch Nederland. *Ministerie van Binnenlandse Zaken en Koninkrijksrelaties*.

The Cruise Web. (2023). *Cruises from/to Oranjestad, Sint Eustatius*. Retrieved 15-10-2023, from https://cruiseweb.com/ports/departs-oranjestad-sint-eustatius

The University of Sydney. (2022). *Marketing: PESTLE analysis*. Retrieved 2023-02-27, from https://libguides.library.usyd.edu.au/c.php?g=508107&p=5994242

The World Bank. (2007). *Port reform toolkit ppiaf, world bank, 2nd edition*. doi: 10.1596/978-0-8213-6607-3

The World Bank. (2023). *Metadata Glossary IS.SHP.GCNW.XQ*. Retrieved from https://databank.worldbank.org/metadataglossary/world-development-indicators/series/IS.SHP.GCNW.XQ

Tsinker, G. P. (2004). *Port engineering: planning, construction, maintenance, and security*. John Wiley & Sons, Inc.

UNCTAD. (1978). *Port development: a handbook for planners in developing countries*. New York: UN,. Retrieved from http://digitallibrary.un.org/record/61748

UNCTAD. (1992, Jan). Development and improvement of ports: the principles of modern port management and organization. , iv, 80 p. :. Retrieved from http://digitallibrary.un.org/record/138430 (Includes bibliographical references.)

UNCTAD. (2021). *Review of Maritime Transport 2021*. United Nations Publications.

U.S. Securities and Exchange Commission. (2001). *Statia Terminals International N.V. and Statia Terminals Canada, Incorporated Annual Report on Form 10-K*. Retrieved from https://www.sec.gov/Archives/edgar/data/1029101/0000889812-97-001149.txt

van Achteren, M. (2022). *Feasibility study of a new harbour on the island of St. Eustatius*. Delft University of Technology. Retrieved from http://resolver.tudelft.nl/uuid:077874d8-6ce1-44bc-a080-5e1f518a6e3d

van Bets, L. K. J., van Tatenhove, J. P. M., & Lamers, M. A. J. (2016). A power analysis of a transforming marine community around oil transshipment at st. eustatius. *Ocean & Coastal Management*, *132*, 59–69.

van Boeijen, A., Daalhuizen, J., & Zijlstra, J. (2020). *Delft design guide: Perspectives, models, approaches, methods*. BIS Publishers.

van den Burg, M., & Madden, H. (2021). *Hurricane impact on Statia*. DCNA. Retrieved from https://dcnanature.org/hurricane-impact/

van der Leer, N. A., Bodde, W., Marquering, L., Peters, R. B. M., de Wit, L., & Ridderinkhof, W. (2018). *Port development St. Eustatius Harbour: Design report* (Tech. Rep.). Witteveen+Bos.

van Dorsser, C., & Taneja, P. (2020). An integrated three-layered foresight framework. *foresight*.

van Nek, J. (2023, August 1). *Personal communication; Interview with Johnny van Nek (Harbour Master St. Eustatius)*.

Vining, A. R., & Boardman, A. E. (2008). The potential role of public–private partnerships in the upgrade of port infrastructure: normative and positive considerations. *Maritime Policy & Management*, *35*(6), 551-569. doi: 10.1080/03088830802469451

Voorkamp, T. (2022). *Privatization/commercialization air- and seaport St. Eustatius* (Tech. Rep.). Public Entity St. Eustatius.

Vosper, E. L., Mitchell, D. M., & Emanuel, K. (2020). Extreme hurricane rainfall affecting the Caribbean mitigated by the Paris Agreement goals. *Environmental Research Letters*, *15*(10), 104053.

Water Resources Mission Area. (2019). *Saltwater intrusion*. Retrieved from https://www.usgs.gov/mission-areas/water-resources/science/saltwater-intrusion#publications

Wet geldstelsel BES art. 1b. (2012). Retrieved 28-02-2023, from https://wetten.overheid.nl/BWBR0028551/2012-07-01

White, J., Esteban, N., & MacRae, D. (2007). Tanker anchoring impact study and recommendations st eustatius marine park. *STENAPA, Gallows Bay*, 1–29.

World Economic Forum. (2023). *How Chile is becoming a leader in renewable energy*. Retrieved from https://www.weforum.org/agenda/2023/01/how-chile-is-becoming-a-leader-in-renewable-energy/

Wright, R. M. (2001). Wind energy development in the caribbean. *Renewable Energy*, *24*(3), 439-444. Retrieved from https://www.sciencedirect.com/science/article/pii/S096014810100026X doi: https://doi.org/10.1016/S0960-1481(01)00026-X

WTTC. (2022). *Travel & tourism in the Caribbean: Prospects for growth*. Retrieved from https://wttc.org/Portals/0/Documents/Reports/2022/Travel-and-tourism-in-the-caribbean.pdf

Appendix A

PESTEL analysis

A.1 Island

A.1.1 Political

Political stability

The political stability of the island has experienced significant transformations. In 2010, constitutional amendments were enacted in the Dutch Antilles, leading to its dissolution. Consequently, Curaçao and St. Maarten gained independence as sovereign nations within the kingdom of the Netherlands. On the other hand, St. Eustatius, along with the other two BES-islands of Bonaire and Saba, transitioned to a status as a special municipality within the Netherlands. Unlike conventional municipalities, these special municipalities are not integrated into any province but operate under the direct authority of the national government. Consequently, tasks typically managed by a province are delegated to these municipalities (NOS, 2010). Additionally, in cases where municipal capacities prove insufficient for certain tasks, the national government steps in to provide support or assume responsibility.

The higher level of governance required to execute provincial tasks can introduce complexities. The national government may perceive challenges arising in these small islands as less pressing, which could potentially impact project timelines. An illustrative instance occurred in Bonaire, where the island proposed a sustainable energy plan. However, it encountered a prolonged period of government inaction, eventually resulting in a rejection of the proposal (Kleijn, Blaas, & Borst, 2022).

Moreover, issues emerged in the governance of St. Eustatius, necessitating intervention by the national government. Consequently, the Dutch government appointed a government commissioner to oversee St. Eustatius' administration in 2018 [1]. Initially intended to be a two-year mandate, the commissioner's tenure has been extended until 2024/25 (Algemene Rekenkamer, 2021).

Tax policies

Despite being a special municipality within the Kingdom of the Netherlands, these islands predominantly govern themselves under their own legal framework (Smit, 2018). This autonomy extends to fiscal legislation on the islands. Although they are responsible for tax collection, they receive assistance from the Belastingdienst Caribisch Nederland (BCN), a branch of the Dutch Tax and Customs Administration. Notably, a significant part of the municipality's income, almost 60% (Oedjaghir, 2023), is derived from the GTI oil terminal, leading to a distinct financial dependence on the terminal and an asymmetrical dependency. The island also imposes its own import tax known as the Algemene bestedingsbelasting (ABB), requiring a 6% tax payment on all imported products (Belastingdienst Caribisch Nederland, n.d.). This taxation system can sometimes create complexities where import taxes are paid multiple times. For instance, when goods are procured from St. Maarten, which is a separate country within the Kingdom of the Netherlands with different tax regulations, the importer in St. Maarten must pay import taxes upon the arrival of the goods. Subsequently, when these goods are shipped to St. Eustatius, import tax is once again levied, with no possibility of obtaining a refund for the import taxes paid in St. Maarten, resulting in double taxation (Keijzer, 2023).

A similar scenario arises for imports from the European Union as St. Eustatius is not a part of the EU. In certain instances, it is feasible to request a refund for taxes paid in the Netherlands. However, this necessitates an ex-

[1] Kamerstukken II, 2018, 34877, nr. 1.

port document, which may not always be provided by companies, as they are not obligated to do so (Keijzer, 2023).

International relations

St. Eustatius is closely located to Saba, St. Maarten, and St. Kitts and Nevis. These islands engage in collaborative efforts across various domains and periodically send delegations to learn from one another. One such collaboration is the ferry service connecting these islands, operational since 2022. This initiative was made possible through a grant provided by the Ministry of Infrastructure and Water Management for a two-year trial of this inter-island connection (Openbaar Lichaam St. Eustatius, 2021b). The ferry service substantially reduces travel costs between the islands compared to air travel and introduces new direct routes previously unavailable. The commitment to cooperation among the different islands shows the willingness to develop collaboration between the islands (Openbaar Lichaam St. Eustatius, 2021a) and the eagerness to learn from one another.

The aforementioned points give a small insight into the complex political landscape on the island. The need for collaboration with the other islands on one hand and the complex relationship with the Netherlands. The high degree of Dutch influence is also often seen as not welcome and leads to an unstable political system (Spies et al., 2015).

A.1.2 Economical

Economic growth

Over the past decade, St. Eustatius has experienced fluctuations in its Gross Domestic Product (GDP), characterised in particular by a steady decline in recent years (CBS, 2021a). This decline can be attributed to the significant influence of the GTI on the island's GDP, which makes it highly vulnerable to fluctuations in the oil market. However, it is important to stress that this dependence does not seem to have a discernible impact on national income, as GTI is entirely foreign-owned.

At the same time, the purchasing power of the inhabitants of St. Eustatius has shown a steady upward trend (CBS, 2021d). On average, this indicates an increase in the disposable income of the island's inhabitants. However, the overall decline in the island's economy due to the shrinking GDP may raise concerns about the island's long-term economic development and its potential impact on purchasing power.

Supply and demand

The island's limited local production results in a scarcity of locally sourced food and materials, thereby requiring the importation of most goods. This dependence on imports is clearly reflected in the monetary figures associated with the island's import and export activities (CBS, 2022a). As a result, there is a significant imbalance in the flow of financial resources, which requires compensatory measures, such as government subsidies, to maintain economic balance.

Furthermore, the imbalance between the quantities of imported and exported goods (Spies et al., 2015) has a direct impact on the price of goods on the island. As a result of this imbalance, a significant number of shipping containers return empty, which means that the transport costs for these empty containers have to be included in the total shipping costs. It is also worth noting that import and export statistics show a downward trend in 2022, indicating an overall economic downturn for the island.

Inflation rates

After the transition to a special municipality, another important change took place on the first day of 2011: the currency was changed from the Antillean guilder to the US dollar (*Wet geldstelsel BES art. 1b*, 2012). This changeover to the US dollar, which is known for its remarkable stability, has helped to mitigate unforeseen fluctuations in inflation, which has a positive impact on the economy (European Central Bank, n.d.).

In summary, St. Eustatius faces significant economic challenges, including heavy dependence on imports, and logistical complexities at the port, resulting in high costs for, among other things, raw materials. These factors affect the island's economic opportunities and limit its ability to develop sustainability.

A.1.3 Social

Population growth

At the beginning of 2022, St. Eustatius had a population of 3242 inhabitants (CBS, 2022d). This represents a decrease of 470 inhabitants compared to a decade earlier. In particular, there was a significant decrease of 700 inhabitants in 2015, which was not due to a sudden influx of emigration, but rather to an administrative error. In that year, a clean-up of the population register revealed that many people no longer resided on the island. Despite the prevailing trend of population decline, the CBS (2020) anticipates a change in the coming decades. It projects a growth trajectory, with the population expected to reach around 3900 inhabitants by 2050.

Employment

In 2020, the working population of St. Eustatius, consisting of individuals aged 15 to 75, totalled 1720 people, indicating minimal growth in comparison to preceding years. Although sources on sector-specific employment data may exhibit variances, it is clear that the island's largest employers are the oil terminal (European Commission, 2021) and the Public Entity of St. Eustatius (Public Entity of St. Eustatius, n.d.). Moreover, the public administration, construction industry and hospitality are significant sectors of employment (CBS, 2021b).

Unemployment

In 2020, the working-age population of St. Eustatius faced a 6,3% unemployment rate, with 1,6% actively seeking work (CBS, 2021c). This is nearly double when compared to the Netherlands (CBS, 2023). Additionally, 5,8% of the workforce desired increased working hours, with three-quarters of these individuals possessing low educational levels.

Education level

Over half of the population on St. Eustatius has a low level of education, as illustrated in Table A.1. This classification includes those who have completed education up to vmbo, the third year of havo/vwo, or mbo-1 (CBS, n.d.). In contrast, the percentages of the populace with moderate and high educational achievement are relatively similar. The middle education category encompasses those who have completed havo/vwo or mbo levels 2 to 4. Meanwhile, highly educated individuals are those with a completed educational background in hbo or wo.

Table A.1: Highest achieved education level (CBS, 2018)

Education level	Percentage
Low	60.3
Middle	18.8
High	20.4

In summary, St. Eustatius has a small population, predominantly with lower levels of education, and faces a notable problem of high unemployment. These factors result in challenging living standards, with approximately 28% of the population living in poverty (CBS, 2022b).

A.1.4 Technological

Technological infrastructure

Internet access is available across St. Eustatius via a dependable fixed connection with adequate capacity. The connection was established in 2012 when a network cable was laid to connect St. Eustatius and Saba to St. Maarten. Funded by the Dutch government, this cable project was assigned to the non-profit government-owned entity Saba Statia Cable System B.V. (SSCS) (Autoriteit Consument & Markt, 2020b). SSCS is accountable for constructing, managing, maintaining, repairing, and operating the cable, with the aim of offering quicker and more reliable internet connections to the islands (Minesterie van Finaciën, 2016).

Despite the improved infrastructure, internet connectivity remains relatively expensive for users. This cost is attributable not only to the initial investment in the cable to St. Maarten but also to ongoing expenses related to securing capacity on the link between St. Maarten and Miami (Autoriteit Consument & Markt, 2020b).

A.1.5 Environmental

Weather

Situated in the Caribbean, St Eustatius has a tropical climate with a rainy season from June to November. The area is prone to hurricanes, and with the increase in global temperatures, the number of such weather events is expected to rise (Vosper et al., 2020). In 2017, the island suffered damage from significant hurricanes, including Irma and Maria, which occurred within two weeks of each other (Koek & Mensche, 2017). The hurricanes caused harm to houses, the environment, and vital infrastructure, which includes the island's electricity and water supply systems.

Environmental management

The natural environment of the island plays a vital role in attracting tourists. Therefore, there is a strong emphasis on preserving the environment. The local government designates considerable portions of the island as natural reserves (Schoenmaeckers, 2011). Furthermore, protected marine parks cover a significant area of the seabed and waters above, where fishing activities are strictly prohibited (McClellan, 2009). These protected areas undergo continuous monitoring and management by STENAPA, the nature park organization responsible for the island. STENAPA is accountable for the maintenance of hiking trails and mooring lines. Furthermore, they have the power to impose sanctions in the event of violations.

Sustainability practice

Since 2016, the St. Eustatius Energy Company (STUCO) has been running a solar installation to partially supply the island with green energy (Schelleman & van Weijsten, 2016). This solar facility has a Lithium-ion storage system, which enables it to store excess energy and compensate for fluctuations in demand. In optimal weather conditions, the system produces enough energy in the daytime to satisfy the island's daytime energy requirements. Presently, this solar facility satisfies approximately 33% of the island's energy needs. The remaining demand, is still reliant on diesel generators, especially at night (CBS, 2022d). However, there have been occasional problems with the system's transition from battery power to generator operation, resulting in sporadic blackouts.

Despite St. Eustatius being located in a region susceptible to severe weather conditions, the island places a significant emphasis on sustainability and environmental conservation. Preserving the island's natural beauty is considered a fundamental pillar for tourism, and as such, the protection and sustainability of its natural resources are held in high regard.

A.1.6 Legal

Legal system

The legal system on the island is primarily based on the pre-2010 system inherited from the former Netherlands Antilles and is gradually being adapted to Dutch law (Peeters, n.d.). Residents of the island are constitutionally entitled to vote in the Dutch House of Representatives and the European Parliament (Montesquieu Instituut, n.d.). St. Eustatius does not have its own local court but shares a court system with the neighbouring islands of Saba and Bonaire, which is located on Bonaire itself. Cases requiring appeal to the Supreme Court are dealt with in The Hague, Netherlands (De Hoge Raad der Nederlanden, n.d.).

Environmental laws

While the environment bears significant importance for St. Eustatius, major infrastructure projects are not strictly obligated to conduct an Environmental Impact Assessment (milieueffectrapport, MER) (Rijksoverheid, 2022). A MER is conducted to evaluate and comprehend the possible ecological consequences of a proposed project or development. Nevertheless, the BES islands, including St. Eustatius, often produce such reports voluntarily either to comply with local legislation or because they deem it vital to assess their projects' potential impact on the local environment.

International trade

As part of the Netherlands, St. Eustatius is also considered part of the European Union (EU). It holds the status of Overseas Countries and Territories (OCT) within the EU. This classification provides St. Eustatius with unrestricted admission to European markets and exempts it from import or export fees (European Commission, n.d.). Moreover, the island is eligible for EU grants and can apply for funding from various EU funds.

St. Eustatius functions within a legal framework that is a complex combination of old Antillean laws, Dutch legislation and European influences. While not all environmental regulations are obligatory, the island regularly voluntarily adheres to them, emphasising its commitment to environmental protection.

A.2 Port

A.2.1 Political

Trade Barriers

There are no inherent trade restrictions that prohibit St. Eustatius from doing business with other countries. However, it is critical to note that the island is subject to the regulations and sanctions imposed by the European Union (EU), which are consequently integrated into Dutch national laws (Expertisecentrum Europees Recht, n.d.). As a result, St. Eustatius is indirectly subject to these EU sanctions and trade policies. Therefore, although no specific trade barriers may exist at the local level, EU sanctions and legislation must be complied with.

International relations

Efforts have been made to strengthen cooperation between the neighbouring islands, with a notable success being the establishment of the Makana ferry service in 2021. The ferry operates regular routes connecting St. Maarten, Saba, St. Eustatius and St. Kitts and Nevis several times a week. By providing a substantially more inexpensive alternative to air travel, the ferry service has effectively reduced the cost of travel by more than half. Consequently, the demand for this service has been continuously rising. The Dutch government is currently reviewing the budget for operating this service as the trial period comes to an end (Slagt, 2023).

Another example of collaboration involves the Curaçao Port Authority (CPA), which has made multiple attempts to establish cooperation with the port of St. Eustatius. Unfortunately, these initiatives have encountered various obstacles. In 2006, CPA attempted to

offer tugboat services and restructure the port organization by becoming a shareholder. However, their efforts were hindered by the former owner of the oil terminal who held the rights to provide tugboat services (Voorkamp, 2022). A comparable endeavour was undertaken in 2016, involving a similar proposal that incorporated management expertise from CPA to assist in the collaborative process. Despite the fact that the hindrance posed by GTI's tugboat service was no longer a challenge (Voorkamp, 2022), the proposals ultimately failed to come to fruition, potentially due to the appointment of a government commissioner by the Dutch state.

Infrastructure

The port infrastructure on St Eustatius is deteriorating and underdeveloped. In particular, the RoRo dock has suffered damage over time and is in need of maintenance, mainly due to the sub-optimal slope of the ramp (Kateman & Bos, 2010). While the pier remains in reasonable condition, the limitations of the RoRo dock are a cause for concern. It can only accommodate one vessel at a time, leading to delays and instances of vessels bypassing St Eustatius and having to return later to avoid losing their slot in the next port (Oedjaghir et al., 2022).

The access route to the port remains a pressing concern due to the issues outlined in A.1.2: Cost of raw materials. The current route passes through the historic Lower Town, which is not only home to many hotels but is also targeted for future tourism development, including plans for more hotels and attractions. Unfortunately, this route lacks sidewalks and in some sections, trucks are forced to drive on the opposite side of the road to avoid obstacles (Kateman & Bos, 2010). Potential alternative road solutions have been studied by Kateman and Bos (2010), but none have yet been implemented.

Various plans have been studied to meet the port's expansion and improvement needs. van der Leer et al. (2018) formulated a plan to future-proof the existing harbour, which included strengthening the breakwater to improve hurricane resistance. These plans were further detailed in Oedjaghir et al. (2022), which also outlined the concreting of the storage yard for health and safety reasons, with a budget allocated for this purpose. In addition, a report by van Achteren (2022) explored the design of a new port and evaluated potential locations, building on the ideas presented by Kateman and Bos (2010).

Service

The port currently provides limited services to incoming vessels. Large cargo vessels have access to cargo handlers responsible for loading, unloading and stocking of containers. However, smaller recreational craft do not have access to dedicated services and are not permitted to berth at the quay. As a result, they have to moor at designated lines off the coast and arrange shuttle services. In addition, there are no fuel and water facilities and provisioning is a challenge as food has to be shuttled to the boats.

A.2.2 Economical

Ownership

The port of St Eustatius is owned by the municipality, which places responsibility for its day-to-day operations in the hands of government commissioners. However, the intricacies of cargo handling within the port are managed through outsourcing arrangements with cargo handlers. These cargo handlers are responsible for the critical tasks of loading and unloading ships and ensuring the smooth flow of goods through the port.

Notably, the oil terminal operating on the island is distinct from the port itself. The oil terminal is owned by a foreign company and has changed hands several times since it was first built four decades ago. This change of ownership has occurred approximately every one to two decades, often accompanied by a corresponding change of name, as detailed in Table A.2. Over the years, the terminal has been owned by several large international companies with significant interests in the oil trade.

Table A.2: Oil terminal ownership (U.S. Securities and Exchange Commission, 2001)

Year	Company name	Owner
1982	Statia Terminals N.V.	Netherlands Antilles Corp.
1984	Statia Terminals, Inc.	CBI Industries, Inc.
1996	Statia Terminals, Inc.	Praxair, Inc.
1996	Statia Terminals, Inc.	Castle Harlan, Inc.
2005	Statia Oil Terminal	NuStar Terminals N.V.
2019	GTI Statia Terminals N.V.	Prostar Capital

Economic situation

The port of St Eustatius has recorded profits in the last four years (Voorkamp, 2022). However, it's important to note that almost half of the port's revenue is derived from the GTI oil terminal. Excluding GTI revenues, the port would have been operating at a deficit for the past five years, with an estimated loss of almost one million

US dollars in 2022. This heavy reliance on GTI's contributions underscores the port's heavy dependence on the oil terminal, and its viability largely depends on this source of income. Without GTI's support, the port would likely require financial assistance from the Dutch government to remain operational.

Investments

As the port is part of the municipality, all revenues generated go to the municipal budget without any allocation for future infrastructure investment. As a result, there are insufficient funds available to make critical improvements to enhance the efficiency and safety of port operations. Relying on grants from the Dutch government becomes essential to finance these crucial investments. However, this heavy reliance on the Dutch government creates challenges. The timing of securing funding may not coincide with the port's immediate needs due to fluctuations in the political landscape. This mismatch reduces the port's chances of receiving the necessary funding when it is most needed.

Connectivity

To measure the level of connectivity between nations, UNCTAD, in partnership with MDS Transmodal, publishes the Liner Shipping Connectivity Index (LSCI) (UNCTAD, 2021). This index measures a country's degree of integration into global shipping networks and provides insight into its overall level of connectivity. The LSCI is benchmarked against China's connectivity in the first quarter of 2006, which serves as a reference point with a fixed value of 100. It is based on an assessment of six critical factors, as detailed in The World Bank (2023), which include:

- number of ships
- container-carrying capacity
- maximum vessel size
- number of services
- number of country pairs with a direct connection
- number of companies that deploy container ships in a country's ports

The LSCI value for the combined islands of Bonaire, St. Eustatius and Saba has consistently hovered around 5, with a slight variance within the range of ± 1. In stark contrast, St. Maarten has a significantly higher LSCI value of 10, with a variance of ± 2. This substantial disparity underscores the significantly lower level of connectivity observed in the BES islands. Regrettably, the BES islands are among the 25 least connected economies and territories in the world, and this situation has shown minimal signs of improvement over the last 15 years (UNCTAD, 2021).

In conclusion, the port of St. Eustatius, while municipally owned, heavily depends on the GTI oil terminal for financial stability. This reliance, coupled with limited funds for infrastructure upgrades and low connectivity levels, poses significant challenges. To thrive, the port must diversify its revenue sources, secure funding for essential improvements, and enhance its global shipping network connectivity. These steps are essential for its long-term viability and regional economic impact.

Cost of raw materials

Due to the limited availability of goods and raw materials on the island, the majority of raw materials have to be imported (Spies et al., 2015). The port of St. Eustatius, which is not specifically designed for bulk cargo handling, presents difficulties in the management of these raw materials. The lack of cranes necessitates the use of bulldozers to unload ships carrying sand and gravel. In addition, there is insufficient space in the yard for the storage of raw materials, which means that all bulk cargo has to be transported immediately upon arrival to their respective customers (Kateman & Bos, 2010).

As a result, when a ship arrives, bulldozers directly load the goods onto trucks, which are then transported immediately to the buyer's designated location. This operational procedure results in a continuous stream of trucks passing through the lower part of the city, which is also the most touristy part (Kateman & Bos, 2010). This activity can continue throughout the day and in some cases over the weekend, creating a dangerous situation in the most tourist-oriented part of the city. This is particularly worrying given the lack of sidewalks to protect pedestrians and the relatively high speeds at which the lorries travel.

A.2.3 Social

Employment

As mentioned in the social aspect of the island (section A.1.3), GTI is one of the largest employers on the island. They primarily oversee their own operations, using the port only for cargo handling and crew disembarkation from the tugboat. The Port of St Eustatius itself is quite small, with only seven staff (Table A.3) directly responsible for daily operations. Additionally, there is a shared security team with the airport, with roughly 20% of the 32 employees working at the port (Voorkamp, 2022). Furthermore, external entities, known as "agents," are responsible for the stevedoring operations of ships, managing the entire loading and unloading processes.

Table A.3: Port staff (Kateman & Bos, 2010)

Function	staff
General manager	1
Administration	2
Port operations	2
Boat crew	2
Security	7

Health and safety

The GTI oil terminal claims to have had no incidents or accidents and to be in full compliance with all laws and regulations (GTI Statia, n.d.). However, it should be noted that the current configuration of the port, particularly the unpaved storage yard, presents several safety issues. An incident involving a tipped container was partly attributed to the uneven and unpaved surface of the storage area. This incident highlights the importance of surfacing this area to prevent accidents. In addition, the lack of proper surfacing contributes to health concerns as it allows dust to be stirred up by both wind and operating machinery, potentially affecting lung health through airborne particles.

Another issue arises with the mixing of cargo and passenger traffic. The port serves as the only point of entry for cargo to the island and is also primarily used by the ferry and the local dive centre for passenger embarkation and disembarkation. This situation results in passengers having to navigate through active container handling operations involving cranes and trucks, creating potential safety hazards. As a result, cargo operators have to be extra cautious due to the presence of passengers on the quay who may lack the necessary knowledge and safety equipment. In addition, this arrangement is inconvenient for the dive centre's guests, who need to be aware of cargo movements during their experience.

A.2.4 Technological

Information technology

The majority of systems used in the port still rely on analogue methods and paper records to record cargo and passenger transactions. This reliance on manual processes is partly due to the lack of familiarity of some staff with digital systems. As a result, there is no active digital record of the annual container volumes arriving on the island. Discussions with the harbour master revealed that each previous harbour master had developed their own method of monitoring cargo volumes, but these methods were not digitised or passed on to their successors (J. van Nek, personal conversation, August 1, 2023). As a result, there is no historical digital record of cargo volumes. The current harbour master has implemented a simple digital system to track cargo flows, which addresses this issue to some extent.

Innovation in the port

Much of the machinery at the port is displaying signs of wear and tear. This can be attributed to both the age of the machinery and the corrosive effects of the harsh sea environment. Additionally, the forklifts utilised by the agents have also undergone significant wear and tear, mainly due to their frequent use in the storage yard. The truck used for moving the container chassis is also moderately aged. Furthermore, the port authority has recently obtained a new terminal tractor which has been scarcely used thus far. The handling agents responsible for loading and unloading have their own vehicles and appear unwilling to pay for the use of the new tractor.

The use of chassis to move containers within the yard and to the quay is considered inefficient due to the space required for both the vessels and the yard. While container unloading is generally a quick process, bulk handling is a time-consuming challenge. For example, unloading bulk materials such as sand using a loading shovel can be lengthy, especially as only one such shovel is available. Similarly, using forklifts to move individual pallets results in a slower unloading process, worsened by the fact that there are only two forklifts in operation. This is in contrast to container unloading, which can accommodate a large number of pallets and is therefore more efficient.

The port continues to operate in a relatively simple manner, lacking advanced digital systems to streamline ship loading and unloading operations. In addition, the equipment used for these operations is outdated and the use of chassis for container handling is relatively inefficient.

A.2.5 Environmental

Environmental Management

Despite St. Eustatius' careful preservation of its natural marine environment, a special area where oil tankers anchor near the oil terminal does not enjoy the same level of coral protection. In this area, ships are allowed to drop anchor freely. However, corals are still present in these areas and are vulnerable to damage from the anchor and its chain. The process of dragging the anchor across the seabed can result in coral breakage, damage to the reef structure and sedimentation (White et al., 2007).

This type of damage has several negative effects on corals, ultimately leading to their slow destruction or

impaired ability to regenerate. For instance, broken coral is more susceptible to disease, increasing the likelihood of mortality. Structural damage to the reef reduces biodiversity by providing fewer habitats for organisms. In addition, sedimentation reduces the amount of sunlight reaching the seabed, hindering coral growth and making them more susceptible to disease (White et al., 2007).

Weather

Both the port and the oil terminal on St Eustatius are on the lee side of the island, which means they are normally sheltered from strong winds. However, once or twice a month a weather phenomenon known as 'brown seas' occurs. This phenomenon creates significant swell and high waves, making it almost impossible to use the harbour (Kateman & Bos, 2010). Brown seas can last up to a week, although they are usually limited to a day or two. During periods of brown seas, the port is largely closed, with exceptions made when necessary for essential shipping needs.

In addition, the prevailing south-westerly swell creates large rolling waves that can be uncomfortable for visiting yachts. This unfavourable wave pattern creates an unpleasant experience for those on board and discourages yachts from choosing St. Eustatius as a destination. As a result, even when yachts do visit the island, their stay is usually short (Harterink, 2023).

The environment of the island is of great importance due to its role as a major tourist attraction. However, environmental concerns arise from the anchoring of oil tankers in unprotected areas, which poses a threat to the marine ecosystem. Additionally, natural conditions, such as high waves caused by swells, periodically render the port unsuitable for cargo activities. These conditions also generate unfavourable circumstances for yachts, leading to an unpleasant experience for passengers.

A.2.6 Legal

Institutional

The port of St. Eustatius operates under the jurisdiction of the Wet maritime beheer BES, which is in place to safeguard the waters, given their significant economic importance to the island. Since April 2015, I&W has been responsible for the management of the waters around the BES islands. Permitting, monitoring and enforcement of environmental regulations, including those relating to the oil terminal, is the responsibility of Rijkswaterstaat (van Bets et al., 2016). However, the port authority on St. Eustatius has limited control over maritime traffic around the island, and there is inadequate oversight on pilotage by the oil terminal, leaving the quality and quantity of these services unregulated (ter Haar & Hagoort, 2021). The oil terminal holds full responsibility for pilotage, and the Ministry of I&W lacks direct oversight over these operations. As a result, ter Haar and Hagoort (2021) considers the laws governing pilotage (Loodsenwet BES) to be outdated.

Environmental

In addition to the damage caused to the reefs by oil tankers, there are inherent risks in the operation of the oil terminal. While these operations pose safety and environmental risks, there is little oversight by the public entity of St. Eustatius (ter Haar & Hagoort, 2021). The terminal is granted considerable autonomy in its activities without effective monitoring or control by the port authority. For example, pilotage services are largely self-regulated with limited supervision and input by the port authority.

The island heavily depends on the oil terminal. Although legislation pertaining to the terminal has been transferred to the Dutch Department of I&W and Rijkswaterstaat, insufficient tools and resources exist to effectively monitor it. Therefore, the terminal operates with limited supervision and oversight.

Appendix B

Interview Johnny van Nek

Interview with Johnny van Nek, Harbour Master St. Eustatius, conducted on 01-08-23. (Transcription removed for privacy reasons)

Appendix C

Interview Mike Harterink

Interview with Mike Harterink, owner of local dive centre Scubaqua St. Eustatius, conducted on 08-08-23. (Transcription removed for privacy reasons)

Appendix D

Interview Vishal Oedjaghir

Interview with Vishal Oedjaghir, Commercial manager transport Public Entity of St. Eustatius, conducted on 09-08-23. (Transcription removed for privacy reasons)

Appendix E

Interview Nicole Johnson & Zelda Meeuwsen

Nicole Johnson (Senior Policy Advisor Public Entity Saba) and Zelda Meeuwsen (Coordinator Harbor Project Public Entity Saba), conducted on 17-08-23. (Transcription removed for privacy reasons)