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The Role of Port Authorities in Sustainable Development. The General CSR Mindset Framework for Port Authorities.

A look on North-West European Ports.

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Abstract:

Ports are receiving increased pressure from society and stakeholders to become more sustainable. While international organizations are introducing programs and global efforts are made, the Port Authority (PA) can implement its own programs and initiatives in the sustainability trend. While efforts are made in the port sector to become more sustainable, it is important to understand what the motivation behind these efforts are. The motivation for sustainable development by firms can be related to the Corporate Social Responsibility (CSR) mindset of firms. This thesis results into a framework on the CSR mindset of PAs, based on the main findings of several interviews. The interviews are conducted with management or policy advisors of PAs and stakeholders of the port. The CSR mindset ranges from inactive, reactive, active to proactive. The findings of the interviews lead PA motivations which ranges from a reactive towards a proactive mindset. This framework can provide the base for future research to examine the mindset of different types of PAs and in different regions. This will create more accurate policies and regulation on the sustainable development of the port sector.

The views stated in this thesis are those of the author and not necessarily those of Erasmus School of Economics or Erasmus University Rotterdam.

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1 Summary

Climate change creates increasing attention given towards the sustainability trend. There is increased global pressure to reduce the emission of Green House Gasses (GHGs). One of the sectors in which public pressure arises is the port and maritime sector. Around 90% of all goods are traded via the ocean and shipping is expected to increase by 50-250%. Currently, the shipping sector is responsible for 2.4% of global CO₂ emissions and shipping is responsible for 70% to 100% of GHG emissions in the port area. Therefore, it is important that port authorities (PAs) perform climate action.

There are international organizations providing initiatives and programs, so that the port and shipping sector becomes more sustainable. There is also a program organized by several PAs across the world, which is called the World Ports Climate Action Program. These programs and initiatives are implemented on a large and international scale. The PA, however, can have a much more direct impact and can tailor a program which is directed towards its own stakeholders.

Therefore, it is essential for PAs to understand how they should incorporate a sustainable strategy into their business strategy. Sustainable development is based on the Triple Bottom Line principle, which takes the economic, social and ecological dimension as equally important and one dimension cannot receive priority over the other. To incorporate this into an active business strategy of PAs, intensive stakeholder management is needed. This allows the PA to see green market developments and create cost effective policies which result in more sustainable port operations.

The level of activeness by PAs depend on their Corporate Social Responsibility CSR mindset, which can range from inactive, reactive, active to a proactive mindset. The level of activeness in the sustainability trend is also linked to the time perspective of firms. In general, PAs have a more long term perspective, which implies that PAs more active than other businesses in the sustainability trend.

To understand the current CSR mindset of PAs, several interviews are conducted with North-West European PAs and stakeholders. From the main findings of the interviews, a CSR mindset framework of PAs is created. It is found that the mindset of PAs range from an reactive towards a proactive mindset. The level of activeness often differs the type of operation in the port. On port industry, a more proactive approach can be taken, while on shipping and inland transportation a more reactive approach is taken. Furthermore, PAs focus more on their strong cluster in the port, this is likely to gain a competitive advantage over other ports.

The type of CSR mindset is important to understand for stakeholders and policy makers. When the PAs shows a reactive mindset towards certain operation, this indicates that more pressure is needed to increase the efforts made towards sustainability and vice versa. A proactive mindset on certain operations needs more freedom. This is both relevant to local, national and international policy makers.

Future research should be focused on the expansion of the mindset framework. Additional categories could be created which allows policies to be more accurate. Furthermore, research should also be focused on the diversity of ports and regions in which they are situated. Ports can differ in size, commodity, region, accessibility, economic state etc. It is important to understand these differences and their influence on PA mindsets. This can allow for a smoother transition into sustainable development.

2 Introduction

Climate change is one of the main topics considering sustainability in port areas. This is primarily due to the increased global pressure to reduce Green House Gasses (GHG) and the still growing shipping industry (Winnes, Styhre, & Fridell, 2015). In developed countries, shipping emissions present a substantial part of total port emissions. In general shipping is responsible for 70% to 100% of GHG emissions, trucks and trains up to 20% and port operations by use of equipment up to 15% in port areas (Merk, 2014). According to the third International Maritime Organization (IMO) GHG study 2014 (IMO, 2015), the shipping industry will continue to grow in the following years. This indicates the importance of strategies to reduce the emission of GHGs if the industry wants to stay in line with the Paris Agreement, to keep global warming under 2 degrees Celsius, and the Sustainable Development Goals (SDGs) of the United Nations (UN).

In 2014, the International Maritime Organization (IMO) performed the third IMO GHG study 2014 (2015). The study shows that the shipping industry is responsible for 2.4% of global GHG emissions, an average taken over a six-year period (2007-2012). It also predicts that the emission of GHG is expected to grow between 50% and 250% to 2050 if not properly dealt with. The results of the IMO GHG study 2014, but also the previous IMO studies (IMO, 2000, 2009), led to greater awareness and concern of the shipping industry's contribution to climate change. Therefore, several organizations like the International Association of Ports and Harbors (IAPH), the American Association of Port Authorities (AAPA), the European Sea Ports Organization (ESPO), the Association Internationale Villes Ports (AIVP) and the World Association for Waterborne Transport Infrastructure (PIANC) are taking action together with local port authorities by introducing new programs and strategies to reduce the environmental impact of the shipping industry and to mitigate and adapt the global supply chain alongside a changing environment. Some of the major programs today are the World Port Climate Initiative (WPCI), the initial IMO strategy, the World Port Sustainability Program (WPSP) of the IAPH and EcoPorts of the ESPO.

As an example, some major port authorities from Europe and North America collaborated to initiate the World Ports Climate Action Program. They recognize that ports, but also the shipping industry are key to reduce their share of GHG emissions and that they need to collaborate on a large scale in order to deliver on the Paris Agreement (Port Strategy, 2018).

Most of the programs mentioned before are focusing on ports, not taking the whole supply chain into account. At the IAPH Guangzhou World Port Conference 2019, the IMO Secretary General Kitack Kim said: *“Transport is a chain. No link in a chain can really be effective if viewed in isolation. Actions impacting ships will have an impact throughout the entire supply chain”* (GreenPort, 2019). He emphasizes that this needs to happen, especially for SDG number 13; Climate Action. This SDG focusses on taking urgent action to combat climate change and its impacts (UN, 2018).

When looking into the current programs mentioned before, it appears that port authorities and maritime organizations take significant role into climate action. Therefore, it is important to understand what the role of these entities are. This thesis focuses on the mindset of the Port Authority in sustainable development and their involvement in climate action. Altogether, this leads to the main question of this thesis:

“What is the motivation of the Port Authority in sustainable development and climate action?”

3 Research Questions

The main research question is comprehensive and needs multiple sub-questions which lead to understanding and a conclusion on the question. The focus of the main question is on the role of the PA in the current sustainability trend.

To comprehend this, it is important to understand the traditional role and functions of the PA. This enables us to understand how the PA operates and what kind of challenges that can face. The conceptualization of the PA and the port area comes forth in the literature review.

The first sub-question is related to the impact the port area has on climate change and the emission of GHGs. As the port is a central node in the supply chain, it is related to many stakeholders and clients that emit GHGs via water, road and rail transport. This leads to sub-question 1:

“What is the impact of the port operations on climate change?”

The second sub-question leads to a better understanding of why the PA should contribute to climate action, looking at sustainable development in the port. The PA has multiple functions and various stakeholders in the port area. This makes it important to understand in which ways the PA can make contributions in energy transition. Which is the base for sub-question 2:

“How can the Port Authority contribute to sustainable development, in particular climate action?”

The third sub-question relates to the motivation behind the role PA’s are taking in the debate on climate action and in the energy transition. The sustainability trend requires a change in business/management models and a way of thinking in the current society. While there are companies that take an inactive or reactive approach, it is important that there are sustainability leaders in certain markets to proactively take action to reach the goals set by the UN. Therefore, the motivation behind sustainable practices are important to understand and leads to sub-question 3:

“How can the motivation of PAs be defined in sustainable development?”

To examine sub-question 3, interviews are conducted to gain valuable insights on which conclusions and recommendations can be drawn.

4 Literature review

4.1 Conceptualization: Ports and Port Authority

This section provides the definition and explanation of the port, port area and the port authority. These concepts are widely and interchangeably used in port literature; therefore, this section provides a clear understanding of what is meant with each of the subjects in this paper.

4.1.1 Ports and Port Regions

Stopford (2009) defined the port as *“a geographical area where ships are brought alongside land to and discharge cargo, usually a sheltered deep-water area such as a bay or river mouth.”* The port handles various types of cargo, which mainly are dry bulk, liquid bulk and standardized containers. Nijdam & Horst (2018) identifies the definition by Stopford as the first function of the port, which is its transport function. In total there are three functions of the port, the first one, as mentioned, is the port as a transport node, the second function is the port as a location for industrial activities and third function is the port as location for logistics activities (Nijdam & Horst, 2018). These three functions represent the port as it is today. Therefore, further mentioning of the port and/or the port region is referred to the meaning of the port encompasses the three main functions of the port which originates from Notteboom & Winkelmands (2001): *“The port is a land area with maritime and hinterland access that has developed into a logistics and industrial center, playing an important role in global industrial and logistics networks.”* This definition sees the port as a collection of diverse economic activities, which all have an impact on the environment of the port area.

Furthermore, ports are a central node in the global supply chain, since there is a need to exchange cargo from a maritime area to a land area and vice versa. Nijdam & Horst (2018) discusses a paper by De Wit & Van Gent (2001) that found three reasons why ports are necessary as nodes. First, in order to transport cargo over short and long distances, various modes of transport are needed. Therefore, the port is needed to connect various modes of transport. Secondly, the demand for transport is spatially diverse, meaning that the production, processing and consumption is not located in the same place. In this context, ports are needed as facilitators of international trade. The third reason is that ports are needed for is to be a temporary storage of goods. This is needed as barge, train and truck transport cannot handle large quantities of cargo as once compared to a bulk or container vessel (Nijdam & Horst, 2018). These reasons explain why ports are necessary nodes in the supply chain. This implicates that ports widely connected with parties involved in the supply chain.

4.1.2 Port Authority

Within a port, as defined in section 4.1.1, there is a common entity that is responsible for the safe, sustainable and competitive development of the port. This entity is referred to as the port authority (PA), which can have ownership forms from complete private ownership to public ownership. (Van der Lugt, 2018) refers to the PA as a port development company (PDC), indicating that the PA has developed

from an organization in a public and governmental environment to a more market-orientated organization in which it deals with the strategic management and development of the port.

This transformation of the PAs means that PA is not only responsible for the port's basic functions, such as the development, management and the control of the port area, but also managing safety and environmental issues (Van der Lugt, 2018). As recent trends in port literature shows, the environmental aspect of ports as nodes in the supply chain are getting increasingly important.

The next section provides further understanding on the most prominent environmental issue, climate change, and why it receives more attention in academic literature and by the public in recent years. This section is followed by paragraphs that, first show the relation between climate and the port area and then explain sustainable development in ports and why it is necessary.

4.2 Climate change

Climate change is caused by global warming. The warming of the Earth is, mainly, instigated by the emission of GHGs. GHGs roughly work as follows: the sun radiates its sunlight on the Earth's surface, the surface converges the sunlight into heat radiation and reflects it back to space. Between the Earth's surface and space there is an atmosphere that contains gasses which can hold heat. These gasses are called GHG, carbon dioxide, methane and nitrous oxide are the most common and significant GHGs. Carbon dioxide (CO₂), is responsible for 64% of man-made global warming. Furthermore, methane (CH₄), Nitrous Oxide (N₂O) are responsible for 17% and 6%, respectively (European commission, n.d.).

Since the first industrial revolution, mankind is releasing anthropogenic GHGs in substantial amounts. This causes the Earth's land and ocean surface to warm up. According to the Intergovernmental Panel on Climate Change (IPCC) (2018), over a 30 period (1983-2012) the Earth's land and ocean temperature shows a warming of 0, 85 degrees Celsius. The warming of the Earth result in consequences for the climate, which have and will cause impacts on natural and human systems on all continents and oceans (IPCC, 2018). Therefore, it is important to reduce to impact of climate change by decreasing the amount of emitted GHGs.

In 2015, parties involved in the United Nations Framework Convention on Climate Change (UNFCCC) reached an agreement, known as the Paris Agreement, to limit climate change and increase the efforts and actions for a sustainable low carbon future (UNFCCC, n.d.). Currently, 186 parties have signed the Paris Agreement and are actively making efforts to keep global temperature below two degrees Celsius above pre-industrial levels (UN, 2019). These parties in their turn submitted Intended Nationally Determined Contributions (INDCs) which summarizes their proposed climate actions after 2020 (Den Elzen, et al., 2016). Even with the INDCs, limiting the global temperature below 2 degrees Celsius warming compared to pre-industrial levels will remain a societal challenge. However, there are two promising trends. The first trend is that decision makers increasingly recognize that there are socio-economic benefits when taking measures to reduce GHG emissions. This improves the likelihood of

more collective action, which is needed to combat climate change in an effective manner. Second, non-public entities, such as individuals, businesses and religious organizations are increasingly aware of climate change and are making more effort to work against it (Rogelj, et al., 2016). These trends show great potential in further limiting climate change and keep the warming of the Earth below the 2 degrees Celsius threshold set by the Paris agreement.

The next section provides an understanding on the contribution on climate change by the port sector and international shipping.

4.3 Relation between Climate Change, the Port and Global Maritime Shipping

As mentioned in the introduction, shipping is responsible for a substantial part of emissions in port areas. Merk (2014) collected a database of academic papers which show emissions in port-cities of developed and developing countries. In developed countries, shipping emissions can be responsible for 70% to 100% of GHG emissions, trucks and trains up to 20% and port operations by use of equipment up to 15% within port cities. In developing countries, the share of total emissions by the port are often higher, because of less strict regulation on trucks and trains (Merk, 2014).

The global maritime shipping industry provides 90% of international trade and, therefore, is also responsible for 3% of global GHG emissions. While ocean transport is relatively less pollutant than other forms of transport, the magnitude of the industry causes it to be a significant contributor to climate change (Balcombe, et al., 2019). When talking about GHGs, we talk about the pollution of air. The major air pollutants from maritime shipping that contribute to climate change are carbon dioxides (CO₂), sulfur oxides (SO_x), nitrogen oxides (NO_x) and particulate matter (PM) emissions, especially PM leads to health risks for residents in and near the port area. These pollutants reduce the air quality of coastal and urban areas, but also on a global scale. Oceangoing ships are responsibly for around 3% of global CO₂ emissions (Eide, Longva, Hoffman, Endresen, & Dalsøren, 2011), 15 % of global anthropogenic NO and 5-8% of global SO emissions (Viana, et al., 2014). As nearly 70 % of the ship emissions are within a range 400 kilometer from the coast, ships impact not only the global air quality, but also of coastal, port and urban areas (Viana et al., 2014).

Ports are also the location for industrial clusters. A large cluster often found in or around ports is the chemical industry. As an example, the port of Rotterdam's industrial cluster mainly exists of oil refining companies in which it contributed for 18% to the Netherlands' total CO₂ emissions (Samadi, Schneider, & Lechtenbohmer, 2018). These clusters also face the challenge in sustainable development and mainly the energy transition. Together with the PA and the shipping sector, they can cooperate and develop the needs for a sustainable transition.

As mentioned in section 3.1.1, the port is a central node in the supply chain, which indicates that the port has a large potential to act upon climate change. As they connect with various parties in the supply chain, the PA can influence and facilitate actors in the port to become more environmentally friendly.

4.4 Sustainable Port Development & Green Growth

This section provides a literature review about sustainable port development with a focus on green port strategies and climate change. Sustainable development of the port stands central in literature concerning not only the port operations of today, but also that of future operations. Hiranandani (2014) explains port sustainable development as the situation in which the port can meet its needs without endangering its own future. For the PA, sustainability implies that their business strategies need to meet current and future needs, while they protect human and natural resources (Hiranandani, 2014). In literature, sustainable development is based three dimensions, referred to as the Triple Bottom Line (TBL), which are the social, economic and the ecological dimension. In sustainable development, the dimensions of the TBL are seen as equal and mutually interacting dimensions. The importance of each dimension can be different in certain situation, but one pillar will not get priority over the other pillars (de Lange, 2018).

As mentioned before, ports and international shipping are expected to grow in the future. As the development of ports can significantly harm natural resources and ecosystems, they can also contribute positively to social and economic aspects. Therefore, it is important for ports to minimize the harm to their ecological environment, while still have a positive effect on socio-economic factors (Schipper, Vreugdenhil, & de Jong, 2017). Since ports and PAs operate in relative high polluting environment, the ecological pillar is, relatively, given more attention. For PAs it is important to develop the port in a sustainable way, not only to counteract on their impact on ecosystems and the climate, but also for 'license to operate' considerations (Acciario, 2013). As ports receive higher pressure from the various stakeholders, like the public, government and businesses, on their environmental performance and are faced with regulatory and social requirements, they need to operate in a 'greener' way to be able to grow in the future (de Lange, 2018).

In the PIANC Report NO. 150 (2014), sustainable development is extended and uses the TBL framework to indicate that there is a shift in perspective on to concept of sustainable development. The TBL changes the performance measurement from a shareholder perspective to a stakeholder perspective. This refocuses the performance measurement to a broader extent by including everyone affected by the operation of a business (PIANC, 2014). The concept of sustainable development, including the new perspective of corporate performance, offered a basis for the concept of green growth. Green growth implies that as businesses maintain sustainable economic growth, this growth will not compromise climatic and environmental sustainability (Moon, Woo, & Kim, 2018). Conventionally, economic growth and environmental protection are considered to be two different fields that negatively

affect each other in a corporate environment. However, the green growth concept can be used in the port sector and become an economic driver. Ports are central in the global supply and are often connected to cities in coastal areas and river mouths and because of their connectivity with various stakeholders the PAs need a sustainable strategy that allow for the management of their operations and further expansion, even when environmental space is limited (PIANC, 2014). In short, the definition of a green port: “*A Green Port is a port that sees green growth in as a prime economic driver and as key to its commercial and operational activities*” (Moon et al., 2018).

4.5 Green Port Strategy

Research on ports is increasingly focused on ecological issues. This is due to, as mentioned, increased awareness by the public and increased legislation by governments and international organizations. Literature on sustainable development, therefore, has a focus on the ecological issues within the port area. A relatively new concept is the ‘green port’ as explained in section 3.4. This section provides a better understanding of the approach that PAs could make to include the green port concept into their strategy.

First, the green port concept is a result from several ecological issues present in the port and the increased awareness by the public and legislative organizations. Lam & Van De Voorde (2012) lists several studies that show these issues. The major issues are air pollution, health effects on residents and water pollution. While their literature study did see that there is a better understanding of ecological problems in the port, there is no proposed framework to implement the green port concept as a strategy into the PAs their plans.

Lam & Van de Voorde (2012) noticed this gap in current literature and proposed a framework on how to apply the green port within the port sector. Based on their study they provide a framework that originates from a stakeholder’s perspective as is visible in figure 1.



Figure 1: Green and Sustainable Port Framework. Source: Lam & Van de Voorde (2012).

Starting at stakeholder involvement, stakeholders are key to understand and enable the actualization of green port projects, this is because the PA cannot carry these projects by themselves. The PAs need to understand the needs and requirement of the stakeholders to comprehend what kind of green project they can initiate. Furthermore, PAs need to understand market segment and how green port projects can be used as a competitive advantage for companies within a market segment. This is necessary to involve and attract companies into green market developments. As costs are a key determinant for investment, cost benefit analysis is necessary for the feasibility of potential green policies and projects. Finally, port operations go hand in hand with negative social and ecological externalities. Therefore, the green projects and policies should counteract these externalities and avoid unnecessary expansion of the port (Lam & Van de Voorde, 2012).

Lam & Notteboom (2014) further express the importance of stakeholders in the port for the whole port's sustainable development. While are many stakeholders in the ports with many different preferences and needs, they need to collaborate on port projects and technological innovations. PAs are taking a facilitating role in the greening of ports, as they do not have exclusive regulatory power to enforce their policies. PAs therefore use many tools and initiatives in collaboration with public agencies and the private sector (Lam & Van de Voorde, 2012).

As literature indicates, stakeholders of the port are key to implement and effectively exercise green port policies. Ports must consider multiple stakeholders as they initiate green practices such as the government, shareholders, companies in the port area, shipping lines and logistic providers.

4.6 Role of the Port, Port Authority and Maritime Organizations

When reviewing literature about the role of the PA concerning climate change, it appears that there are two major directions of study. One focuses on the impact that climate change has on coastal areas and river mouths where ports are located. As ports are located in these areas, they are more vulnerable for rising sea levels and other natural hazards (Becker, Inoue, Fisher, & Schwegler, 2011). This indicates

the importance of ports mitigating the potential impact of climate change and reduction of anthropogenic GHG emissions. The other direction of literature is focused on the role of the PA in mitigating GHG emissions in the port area, so reducing the pollutants emitted by maritime shipping, industry and hinterland transportation. This paper is primarily focused on the second direction of literature, therefore, this section provides literature related to role of PAs in reducing GHG emissions.

Relatively recently, maritime organizations and PAs introduced specific programs and policies to address the reduction of GHG emissions related to their operations, due to the concern of anthropogenic GHGs on climate change. Maritime organizations, such as the International Association of Ports and Harbors (IAPH), International Maritime Organization (IMO) and the European Sea Ports Organization (ESPO) and seaports launched programs and initiatives that contribute to the reduction of emitted GHGs. Examples of such programs are IAPH's 'Resolution on Clean Air Programs for Ports', the IMO's Marine Environment Protection Committee (MEPC) initial strategy on the reduction of GHG emissions from ships, the World Port Climate Initiative (WPCI) which was introduced in 2008 by the 55 largest ports across the world and the World Port Sustainability Program (WPSP), initiated by the IAPH to build upon the WPCI (Gibbs, Rigot-Muller, Mangan, & Lalwani, 2011) (WPSP, n.d.). These programs and initiatives aim to contribute towards sustainable development for ports and a reduction of pollutant emissions by maritime transport and port operations.

To gain more in depth knowledge on what the goals of these programs are and how they want to reach them, some examples of the programs are given; The Resolution on Clean Air Program of IAPH is there to provide a toolbox for two main sections, for air quality and GHGs. The programs are intended to better the air quality in and around the port and to reduce the emitted GHGs. The toolbox measures and strategies can be found to apply and accomplish these goals (IAPH, 2009). Next, The IMO strategy on the reduction of GHG from ships is focused on three main goals. To reduce the carbon intensity of ships by energy efficiency, to reduce the carbon intensity of international shipping and to get the GHG emissions from shipping to peak soon and then decline afterwards. Here, they take a short, mid and a long-term perspective to promote the decrease of shipping's ecological footprint. This is done, since there are urgent measures that must be taken now, while the future research can lead to other outcomes (IMO, 2018). The final program emphasized is the WPSP. This program is there for ports that want to show global leadership in sustainability by contributing to the UN's sustainable development goals. The program keeps a library of sustainable practices, can function as a think-tank and reports about the sustainability performances in the global port sector. This program shows that not all initiatives have to take measures or provide strategies. This program is there to promote sustainable practices by creating global awareness for projects related to the sustainable development goals (WPSP, n.d.).

While these programs are active on a large and global scale, port authorities can implement them on a smaller scale and more direct way. As the port is a necessity in the global supply chain and the power

of the PA has increased, they can put pressure on large shipping lines, industry in the port and inland transportation to meet new standards concerning their environmental footprint.

Traditionally, the port's performance is measured by its throughput and efficiency, but recently the port's performance is also measured by its green performance (Lirn, Jim Wu, & Chen, 2013). For PAs this is a relatively new and critical challenge which they are facing.

4.7 Climate Action

As discussed in section 4.2, climate change affects day-to-day life and not only people, but also businesses experience the effects. Therefore, it is important for businesses to understand their role in this changing environment and what they are willing to do to adapt or counteract the effects of climate change. When a business performs an action to adapt to these effects, or reduce its ecological footprint, this is called a climate action. As businesses are primarily driven to increase their (financial) performance, it is crucial for business to assess the risk of climate change and to understand what actions they should take to reduce it.

Climate change is a highly complex and difficult process and it is difficult to understand what the effect will be on business operations. Therefore, for businesses it is important to identify and determine the magnitude of risk involved. As businesses are financially driven operations, it is important for them to take climate change into account when it materially affects their business, leaving any social and moral reasons aside. The effect of climate change may result declining performances of the business due to increased investment cost, insurance cost or declining financial measures like growth, return on investments and value (Sussman & Freed, 2008).

The risks involved with climate change that can negatively impact a business is a prime motivation on why companies choose to address issues related to climate change. By taking adaptive actions, companies can reduce the any climate impact on their core operation. So, for businesses it is key to determine the vulnerability by climate change effects and to what extent they are susceptible to that risk. Sussman & Freed (2008) made a framework to determine the vulnerability and the potential risk businesses can experience.

The next section provides a more in-depth literature on why firms perform climate action and to what degree the motivation or mindset firms can be perceived.

4.7.1 Motivation for Climate Action

As the impacts of climate change are already being observed, there are businesses reacting to these impacts and taking steps to adapt to climate change. These are primarily reactive in nature, meaning that businesses are acting on impacts which are already caused by climate change. However, if businesses want to reduce their vulnerability on the long-term, they need to take a different approach. A long-term vision on climate change requires a more proactive motivation, meaning that businesses

need to anticipate any future climate effects that can harm their business. This requires a new way of thinking for management and a more difficult decisions making process (Sussman & Freed, 2008). Section 3.5 provides a framework on how management should create a green port strategy and a new way of thinking. PAs can do this in various ways, but also with different motivations or mindsets.

As mentioned, businesses are affected by climate change in the long run. Slawinski & Bansal (2012) further emphasize the concept of time into whether a business or organization put effort in climate action. Businesses often have a short-term perspective, which limits them in thinking for problems that arise in the long term. Slawinski & Bansal (2012) indicate that there are four levels in which a business can respond to climate change; reactive, defensive, accommodating and proactive. Here, a reactive business resists to social and environmental problems, defensive businesses comply with regulation, accommodating businesses go further than regulations and proactive businesses take a leading role in climate action. Furthermore, they establish that there are two kinds of time perspectives a firm can take, a focused perspective and an integrated perspective. A focused business perspective looks at internal operation, seeking innovative solutions and view climate change as a competitive opportunity. They have a linear time perspective, meaning that they focus on current problems without looking at the long term. An integrated business perspective, however, exhibit a cyclical time perspective. This means that they focus on the relation between the past, present and future to take climate action and put emphasis on the long run.

These papers indicate that the motivations for businesses to engage in climate action deals with the concept of an organization's time perspective. While the actual motivations for businesses to act on climate change are complex. The literature above show that the attitude and way of thinking by a business are crucial to understand what the motivation is to conduct climate action.

In the dissertation by Hengelaar (2017), four types of businesses are distinguished by level of (pro)activeness towards the sustainable transition that is occurring in the present and the future. The label for the incorporation of sustainability is called Corporate Social Responsibility (CSR). In practice, incumbent firms display many kinds of sustainable behavior gathered under the same label of CSR. Therefore, CSR is evaluated rather differently. Hengelaar (2017) identifies 4 types of CSR based on the mindset of incumbent firms. The four types, as described in Hengelaar (2017) are as follows:

- Type 1: Inactive firms

These types of firms are characterized by their ignorance of societal issues and mostly have profit-driven motives. Contributions to solve societal issues are cost drivers and the solution of solving these issues are seen as the responsibility for public entities, individual citizens and consumers, since the firm only incorporates the demands of its customers. This goes together with an ignorance in societal problems and continuing transitions, which limits the long-term perception and vision of the firm.

Therefore, the firm does not have a clear vision of disruptive trends, with special focus on sustainability transitions.

- Type 2: Reactive firms

Reactive firms perform CSR practice to gain legitimacy, they do this in a reactive or defensive manner. Here, CSR is still seen as a liability, but these firms are more responsive to societal issues than the inactive firms. These firms understand that the business need a license to operate and have to work with stakeholders to ensure their license. These firms have a certain external focus that helps them to recognize societal demands. In short, reactive firms respond to the demands of the public based on their perception of what is necessary to be legitimate while minimizing the cost. Larger reactive firms tend to defend their stakes by stressing the need that they need to continue their business for the sake of jobs and a stable supply, limiting the pace of change in the future. Since these firms are mainly reacting, they still have a limited perspective of the future in relation to possible transitions.

- Type 3: Active firms

These firms are different than the type 1 and 2 firms. They see CSR as a way of value creation instead of a liability. They see societal and sustainability issues as opportunities for value creation use their responsibility as business opportunities that arise from transition. The active firms embrace the triple bottom line principle, where they pursue business opportunities and embrace the triple bottom line principle. Here, the firms pursue business opportunities in which financial, but also social and environmental improvements can be made. For these companies, there are still market boundaries in place that limit them to be the frontrunner of radical transitional solutions. The active firms are waiting for radical opportunities to become competitive. Because of this perspective, active firms have a limited vision to be able to overcome barriers before a radical opportunity becomes competitive.

- Type 4: Proactive firms

These firms take up a proactive, transitional, role to have a successful and timely transition. The motivation for these firms is intrinsic value-driven of nature and are based on enlightened self-interest, as there is no future without transition. They see the necessity of ensuring that the economy is sustainable due to the interconnectivity of a globalized world. To achieve this goal, these firms both have an external and internal focus, they constantly change their own operation while working with their stakeholders at the same time. The proactive firm sees that leadership is required from them to initiate the transition to more sustainability. They do this while acknowledging that a multi-stakeholder approach with enough drive is required to arrive at a more sustainable future. Proactive firms therefore see transition as urgent and possibly disruptive in their sector, they see that change is necessary to arrive in a more sustainable future.

		Inactive	Reactive	Active	Proactive
Motives for CSR	Central motive	Profit	Legitimacy	Value creation	Leading transformation
	Liability/opportunity	Cost	Cost/liability	Opportunity	(Long-term) opportunity & responsibility
	Key rationales	Not our responsibility Unnecessary cost/inefficiency	Stakeholder/government demand/compliance Ensure continuity/balanced approach/level playing field	Triple bottom line opportunity: cost saving, revenue growth, improve efficiency. Clear targets & internal translation	System sustainability as goal Embrace radical change Acknowledge interdependence
Role of the firm regarding societal issues	Focus	Internal	External	Internal	Internal & external
	Firms role	Not relevant	Reacting to demands & protecting its stake	Actively using opportunities for the firm	Showing leadership in the transition
	Societal role division	Not more than legal compliance	Government & societal actors are leading	Business is active, but restricted by market boundaries	Business as leader in forming multi-stakeholder coalitions
Transition perception	Disruptiveness	Limited vision	Manageable	Manageable	Potentially high
	Urgency	Limited vision	Sufficient time	Sufficient time	Quick action required
	End state	Limited vision	Potentially less vision/focus	Potentially less vision/focus	Radical change required

Figure 2: The 4 types of CSR mindsets. Source: Hengelaar (2017).

4.8 Energy Transition in the port

As discussed, climate action is needed to combat climate change on a global level. As climate change is caused by the increasing global average temperature, which in turn is caused by anthropogenic GHGs, a transition in energy supply from unsustainable to renewable energy sources is needed. This transition in literature, corporate and public reports and in the media is called the energy transition.

The energy transition provides two major benefits. First, to reduce the ecological impact of energy production, sustainable energy sources are relatively clean, meaning that these sources do not emit as much GHGs as unsustainable resources such as fossil fuels. Second, sustainable energy sources can be applied in a decentralized manner, which indicates that sustainable energy sources can be applied in various ways and lead to more competition in the energy market (Hentschel, Ketter, & Collins, 2018).

The energy transition is one of the major challenges concerning the present and in the future. To be able to realize the goals set in the Paris Agreement the energy transition is critical to accomplish, as this would decrease the amount of CO₂ and other GHGs substantially.

The next section provides possible and concrete ways PAs are dealing with the energy transition. The selected PAs are in West-Europe., this is done because these PAs communicate clear programs and projects to the public. These programs give insights into the current progress and focus of these PAs and how other PAs can approach the energy transition.

4.9 Ways to decarbonization in the port

As ports are a central and essential node in the global supply chain and a location for energy and industry clusters, they have the capability and the influence to contribute to the reduction of the GHG emissions.

Ports are aware that action is needed and therefore made concrete plans to decarbonize and apply concrete sustainability programs to their ports. This section provides some examples of leading western European ports in the energy transition, which communicate their energy transition plans via their media.

The port of Rotterdam enquired the Wuppertal institute to perform two studies. One to focus on the sustainability of the industry in the port area and second to reduce the emissions of sea-going vessels (Stroosma, 2018). The Wuppertal report identifies 4 transition pathways. These pathways are four future scenarios', the first pathway is the "business as usual" scenario in which there are technological and efficiency gains to reduce GHG emissions, but no major breakthroughs. The second pathway is one with major technological advancements. This leads to a reduction of 75% of GHGs, primarily CO2 emissions. The other two pathways lead to a 98 % reduction of GHGs. One pathway is focused on the combination of carbon capture storage (CCS) and biomass and the other is focused on a closed carbon cycle, where fossil fuels are still used, but almost entirely recycled.

The Port of Rotterdam takes a three-step approach to bring the port in line with the Paris Climate Agreement's objectives. This gives a concrete plan to a carbon neutral port. The first step in the energy transition is focused on the existing industry to implement efficiency measures and CCS, meaning capturing and storing CO2 in empty gas fields beneath the North Sea to reduce their ecological footprint. Step 2 is focused on changing the energy system. The industry, involving sea and inland transport and the industrial cluster within the port, is switching to electricity, hydrogen and green hydrogen. The new energy supply needs to come from sustainable sources such as wind and solar energy. Step 3 is the replacement of fossil fuels. There are several fuel sources that can be substituted, such as biomass, recycled materials, green hydrogen and CO2 (Port of Rotterdam, 2019). For each of the steps the PA provides current projects on which the port is working, some examples of these projects are given below:

- Step 1: Efficiency and infrastructure
 - o Heat network
 - o CO2 storage under the North Sea
 - o Steam network
- Step 2: Towards a new energy system
 - o Wind turbines in the port area
 - o North Sea wind power hub
 - o Blue hydrogen
 - o Green hydrogen
 - o Blockchain to accelerate the energy transition
- Step 3: Towards a new raw materials and fuel system

- Waste-to-chemical
- Full recycling of contaminated building materials
- Chlorine waste as new raw material and energy
- Source: Port of Rotterdam, n.d.

These are only some examples of projects that can lead to a zero-emission port in 2050 by the port of Rotterdam.

The Port of Amsterdam also have several ways in complete the energy transition, which they divide into three parts; scaling up sustainable energy production and storage, attracting and facilitating the production of sustainable fuels and circular raw materials and developing the infrastructure necessary for a sustainable transition ((Port of Amsterdam, n.d.) some examples of concrete programs are:

- Scaling up sustainable energy production and storage:
 - Biomass Powerplant
 - Sun in the harbor
 - Weaken medium voltage grid
- Attracting and facilitating the production of sustainable fuels and circular raw materials:
 - Expand biodiesel production
 - Bio Energy Netherlands branch
 - 100MW electrolyser at Tata
- Develop the infrastructure necessary for the sustainable transition:
 - LNG Bunkering
- Source: Port of Amsterdam, n.d.

Finally, the Port of Antwerp provides information on their Energy and environment web page. This information is limited in a concrete action plan, but they do provide a series of concrete projects that help to reduce the pollution of air, water and soil and are as follows:

- Hydrogen fueled tugboat.
- Steam network based on residual heat.
- Shore power.
- Hydro turbines in sea locks.
- Smart noses; to identify chemicals in the air and report them.
- LNG bunkering.
- Building new wind turbines.
- Source: Port of Antwerp, n.d.

These examples display some possibilities towards concrete steps in the energy transition and the reduction of GHGs. The port of Rotterdam and Amsterdam provide three clear steps in the energy

transition in which they focus on energy efficiency and infrastructure, scaling up and renew energy sources, and sustainable fuels and raw materials. Also, from the project of the port of Antwerp it is evident that these topics are also their main concern.

Together these programs and port projects give an understanding of how ports can deal with decarbonization and which steps they can and are taking towards their energy transition goals in 2050.

4.10 Conclusions

In conclusion, the literature review provides important insights into the current sustainability trend in the port and related areas. Globally, the international shipping sector carries around 90% of traded goods, which must go through the port area. Therefore, the port is a central node in which many stakeholders have an impact on each other. This section provides the answers to sub-question one and two, and a general summary of the literature review.

In literature, the port has three core functions. The port is a transport node, industrial cluster and location for logistic activities. This means that the port is involved with a wide range of stakeholders it must deal with. The management of the port area is done by the PA. The PA is an entity in that governs the port. It takes care of the management, development and control of the port area. As sustainable development becomes increasingly important, the PA is also involved in safety and environmental issues in the area.

As the functions of the PA are made clear. It is important to understand the impact of the operations in the port on climate change, as is given in sub-question one:

“What is the impact of the port operations on climate change?”

The importance of the impact by firms can be related to the increased awareness of the public on climate change. This has led to a global sustainability trend where also the port sector takes their responsibility. The primary cause of climate change is the emissions of GHGs, mainly CO₂. On a global scale, the shipping sector is responsible for around 3% of GHG emissions. In the port area, ships are responsible for, relatively, the most amount of GHG emissions, at least 70% of total CO₂ emissions in the transportation of goods. Besides the port as a node in the supply chain and location for logistical activities, the port is also a location for industrial activities. In case of the Netherlands, this area contributes to 18% of total national CO₂ emissions. Therefore, the industrial activities in the port area can be a significant contributor to the local and national CO₂ output.

The second sub-question is focused on how the PA can contribute to sustainable development. This questions focuses on the strategy that PAs can take and is as follows:

“How can the Port Authority contribute to sustainable development?”

From literature it is evident that the emission of GHGs can be mitigated by collaboration between the port, shipping and the industrial cluster. This makes it makes it important that the PA, together with their stakeholders in shipping, (chemical) industry and logistic services, act on climate change.

First, the development of the port and the surrounding area is increasingly focused on a sustainable development for the port in the future. Sustainable development uses the TBL approach for emphasize the importance of social, economic and ecological dimensions. The pressure that arises from the sustainability trend originates primarily from the social and ecological dimension, where the public becomes more aware of the environmental pollution and puts pressure on companies to become more sustainable. As the port is a central node in the supply chain and connected to cities, the port is highly involved with stakeholders. This ranges from public entities such as governments to private corporations. Therefore, PA should look from a stakeholder perspective, which can lead to green growth as a sustainable strategy. This is called the Green Port concept. This concept looks from a stakeholders' perspective which will result into sustainable port operations.

Second, the PA is not the only entity feeling pressure from the public in the maritime world. International maritime organizations are using programs and initiatives to make shipping more sustainable. As these organizations are internationally oriented, they can implement regulations and programs on a larger scale which is useful for level playing field to be equal across the maritime sector. When firms use these programs, or initiate action by themselves to reduce their ecological footprint, it is seen as climate action. Ports can also make use of these programs to stimulate and promote sustainable operations.

So, as PAs have wide range of stakeholders, it should also look from a stakeholders perspective which is indicated in Figure 1, from this point PAs can analyze market developments and look at cost effective policies to arrive to sustainable port operations.

The following provides a summary of CSR mindsets by firms and how PAs are acting in the energy transition.

Firms that perform climate action can do this with several motivations behind the act, which depends on how the firm sees the sustainability trend and the need to counteract climate change in CSR. Slawinski & Bansal (2012) and Hengelaar (2017) both give a typology to firm behavior on climate action. They classify firms into four types for based on their CSR strategy. The motivations are classified into inactive, reactive, active and proactive. It is important to understand the motivation behind climate action, because regulations, policies and programs can be adapted or changed to make to optimize the effort against climate change by the port and its stakeholders.

One of the major efforts in ports and the global supply chain is the energy transition. As ports are a central node where various sources of energy are made and transported, there is a substantial challenge

to become more sustainable in the energy transition. From the given examples, the ports primarily use projects for infrastructure to prepare for sustainable energy sources, new energy sources and the supply of raw materials and sustainable fuel.

Now that sustainability in ports, PAs and maritime organizations is put into perspective, there are some questions left. Understanding that the port is a central node in the global supply chain and has close contacts with its stakeholders, leaves the question what the role should be of the PA is in sustainable development and the energy transition. This can have consequences for how the PA, stakeholders and regulatory entities look at the sustainability trend.

To investigate this question, sub-questions three is used. Sub-question three looks at the motivation of the PA; “*How can the motivation of PAs be defined in sustainable development?*” To examine this question, interviews with PAs and stakeholders are conducted to understand how PAs see the sustainability trend and what they think their role should be. Next, the theoretical framework provides the data analysis method used for the analysis of the conducted interviews.

5 Data analysis

This section provides a theoretical framework to qualitative content analysis. Qualitative Content analysis is widely used as a qualitative research method. There are three distinct approaches: conventional, directed and summative. The main differences are that the conventional approach uses the raw data, such as interview data, to directly derive code categories. The directed approach uses theory and relevant research findings to come to initial codes and the summative approach uses counting and comparisons, primarily of keywords and content which is followed by an interpretation of the underlying context (Hsieh & Shannon, 2005).

This paper focuses in using existing theory on green port literature and CSR mindset types to examine the motivation of the PAs and their stakeholders. Therefore, this paper uses the directed qualitative content analysis to build upon existing theory and apply it to the port sector. The directed method uses a predetermined codebook to analyze the raw data and label it by using the relevant codes. When initial codes appear to be insufficient, new codes are created to categorize the data.

This leads to the use of two methods of coding, which are the deductive and inductive coding method. Deductive coding involves generating concepts, categories and codes from previous research, while inductive coding uses raw data and condenses it into categories and themes through the researcher’s examination and constant comparison (Zang & Wildemuth, 2009).

Inductive coding uses the Constant Comparative Method (CCM). This tool uses comparison in the data during the analysis. This is done, for example, to form categories, establish category boundaries, assigning segments to categories and summarize the content. By using CCM, the researcher can

inductively categorize, code, delineate categories and connect them (Boeije, 2002). Making comparisons is regarded to increase the internal validity of the findings.

These concluded the theory that is used for the data analysis. The following section provides the methodology in which the sub-questions three and four are answered.

6 Data & Methodology

This section examines the third sub-question; “*How can the motivation of PAs be defined in sustainable development?*” by conducting interviews with PAs and some of their stakeholders. The goal of the sub-question is to expose what the motivation is of the PA and stakeholders to perform climate action and be active in the sustainability trend. Several PAs and stakeholders are selected for the interviews to come to relevant insights.

6.1 Interview Strategy

The scope of the research is on North-West European level and is focused on ports and stakeholders in the Netherlands, Belgium and France. As mentioned, the interviews are conducted amongst several PAs and some of their stakeholders. To come to useful insights behind climate action it is important to interview PAs and stakeholders which are active in this field. Several PAs from Europe are selected as they are more active in the sustainability trend and are more accessible. The interviews are conducted in a timeframe between December 2019, January 2020 and February 2020.

Selected interviewees: Port Authorities and stakeholders

From the perspective of the PA, it is important to look at both the type and the size of the port. For example, a container port must deal with more truck traffic than a bulk port and larger ports have more resources, in general, than smaller ports have. Therefore, several PAs are interviewed that provide these differences in characteristics.

The stakeholders that are selected all have a close history with the port area. The stakeholders come from three fields: finance, non-profit organization and a branch association. For sustainable investments, finances are needed which are often provided by a bank. Therefore, the first stakeholder is ABN AMRO, which has a close relation to the maritime industry and is involved with projects in the port of Rotterdam and is active on sustainable financing.

Second, a non-profit organization with a focus on sustainability in the maritime industry is Green Award. Green award uses a certification program for ships and if the ships meet certain standards, it can receive incentives from PAs that have joined the program. This indicates that Green Award stand in close relation with shipowners, shippers, ship operating companies and the PA. They can provide useful insights to what it takes to initiate a sustainability program and what the perception of both PAs and shipowners is to be involved into a sustainability program.

The final stakeholder is the KVNR (Royal Association of Netherlands Shipowners), a branch association of Dutch shipowners. This means that the KVNR represents shipping companies involved in merchant shipping and sea towage. Together, shipping companies make a large stakeholder of the PA and its preferences are collected in the KVNR. This makes the KVNR important to interview, as they can give insight from a shipping companies perspective.

The interviews are conducted in the favorable language of the interviewee or the language that is understandable for both the interviewer and the interviewee. The language in which the interview is conducted is provided in Table 1.

Table 1: the selected port authorities and stakeholders for the interviews.

Port authorities	Port of Rotterdam (Dutch)
	Port of Amsterdam (Dutch)
	North Sea Ports (Dutch)
	Port of Antwerp (Dutch)
	Port of Le Havre (English)
Stakeholders	ABN AMRO (Dutch)
	Green Award (English)
	KVNR (Dutch)

Type of interview: semi-structured

There are three basic types of interviews. These are structured, unstructured and semi-structured interviews. Structured interviews follow a standard and predetermined list of questions, whereas unstructured interviews do not follow the list of questions but are directed by the interviewer. Between these two extremes, is the semi-structured interview. This type of interview is chosen for data collection from the interviewees. Semi-structured interviews are described as an interview in which the interviewer has a list of topics, themes or question prepared to be covered in the interview. In this type of interview the questions can be changed and additional questions can be asked, depending on the answers by the interview (Kajorboon, 2005). This provides more freedom in the way the interview is conducted and can lead to more valuable data on underlying patterns, opposed to using a structured interview. Also, a semi-structured interview provides a basis for comparison and that the relevant topics are discussed, compared to using an unstructured interview (Hengelaar, 2017).

The interview

The interview consists of four parts. The first part is on sustainability in general, the second part is on the motivation behind sustainability, the third part is focused on the actionability of the port or firm and

the fourth part consists of summarizing questions. The interview is based on the operationalization of the four types of motivation mindsets by Hengelaar (2017), which are discussed in section 4.7.1.

The four parts are further explained in the following paragraphs.

The first part is there to understand how sustainability is perceived within the firm and what kind of sustainability challenges there are for the PA or firm to deal with. This part is meant to bring the research object to the topic which stands central in the in the interview; the sustainability trend. The received data from this section is used to analyze how PA and stakeholders see the sustainability trend and understand the challenges the interviewees face.

The second part is focused on the motivation of PA or the stakeholder. This part is related to paragraph 4.7.1 in which the motivation for climate action is directed into four types. Here the motivation of the PA or stakeholder is questioned on how they act in the sustainability trend and in the energy transition. The third part, actionability, is focused on how the PA or stakeholder is interacting with their stakeholders on the sustainability trend. This part is also focused on revealing the type of activeness the interviewee and related firm has. Finally, summarizing questions are asked to reflect and conclude the interview.

In appendix A, the prepared questions are outlined. These questions form the bases of the interview, but the actual questions asked can divert from or be asked with a different use of words depending on the interviewees.

Each of the interviews were semi-structured and based on the questions listed in the list. As the interviewer was free to respond on the answers provided by the interviewee, the interviewer responded on the answers with further questioning on some topics to gain more in-depth knowledge.

As mentioned, the interview is related to Figure 2, on the operationalization of the four types of CSR mindsets by incumbent firms. In Table 2 there are three main categories with various sub-categories, which are connected to several interview questions. some questions overlap several sub-categories.

Table 2: Outline of the interview questions related to the categories of CSR mindset.

Categories Hengelaar (2017)	Sub-categories	Related interview questions
Motives for CSR	- Central motive	- 3, 4,
	- Liability/opportunity	- 5, 8
	- Key rationales	- 4, 5, 8, 6, 9, 11
Role of the firm regarding societal issues	- Focus	- 1, 2
	- Firms role	- 1, 2, 10, 14,
	- Societal role division	- 7, 9, 10, 11, 12, 13, 15, 16
Transition perception	- Disruptiveness	- 17, 18
	- Urgency	- 17, 18
	- End state	- 17, 18

6.1.1 Data analysis tool: Atlas.ti

Qualitative data analysis tool Atlas.ti 8 is used as the primary data analysis tool. The program primary function is to systematically code and to retrieve the coded data. The codebook and the transcriptions of the interviews are uploaded into the program. This allows to code the interviews easily. The functions used in the program are open coding, list coding, group coding and network creation. Open coding and list coding are used to code the transcription in an efficient manner. The used codes appear in a list from which you can select the desirable code, when the codes are not relevant, a new code is made by using open coding. Group coding is used to direct codes to their relevant concepts. Furthermore, the ‘comment’ option is used to provide a description for each of the used codes to understand their meaning. The program also allows for network creation, here the all the nodes (documents, codes, memos, networks, groups, quotations) can be visualized and linked to each other. This allows to clear comparison within and between each concept, category and PA/stakeholder. Additionally, Atlas.ti 8 has a report function. This function allows to make a report of the used codes, with their related quotations.

6.2 Methodology

To analyze the collected data from the interview a directed content analysis is conducted. Qualitative content analysis is a method to systematically code and analyze data for sufficient reliability and validity in the analysis (Hengelaar, 2017). This paper uses a directed content analysis. This is done by developing a codebook based on the green port literature review and operationalization of the types of CSR mindsets provided by Hengelaar (2017) in paragraph 3.7.1. This codebook is then expanded when a new category or code is needed to analyze the transcripts.

Therefore, the transcripts are analyzed by a combination of deductive and inductive is coding. With deductive coding a codebook originates from the theory and the subjects of the interview. As the

interview is partly based on the dissertation by Hengelaar (2017), the subjects of the interview provide a bases for the deductive codebook which is used to analyze the data. This codebook can be found in appendix B. The codes are divided in three categories, as these are the main subjects of the interview. This allows for comparison within each subject among the interviewees to increase the internal validity.

During the coding of the interview, the codebook is expanded via inductive coding to categorize text that could not be categorized with the deductive coding table. The result of coding the interview provides a deductive and inductive codebook which is used for the content analysis.

The coding of the interviews resulted in three code groups; Sustainability in general, Motivation and Actionability. Each of these groups have their own codes as provided in Table 3 and each of these codes have linked quotations from the interviews. These quotations are analyzed by comparing and summarizing them per code, which lead to the main findings per code within each code group.

Table 3: The codebook used to analyze the transcripts of the interviews.

Concept	Sustainability in general	Motivation	Actionability
<i>Codes</i>	<i>Challenges to initiate program</i>	<i>Equal level playing field</i>	<i>Involvement of stakeholders</i>
	CLEAR SUSTAINABILITY PROGRAM	LEVEL OF ACTIVENESS	MARKET BOUNDARY
	- <i>Clear sustainability program: examples</i>	- <i>Level of activeness: proactive</i>	- <i>Market boundary: competitive position</i>
	- <i>Clear sustainability program: focus on</i>	- <i>Level of activeness: active</i>	- <i>Market boundary: contracts</i>
	- <i>Clear sustainability program: year</i>	- <i>Level of activeness: reactive</i>	- <i>Market boundary: finance</i>
	<i>Current progress</i>	- Level of activeness: inactive	- <i>Market boundary: level playing field</i>
	DESCRIPTION OF TREND	- <i>Level of activeness: different per subject</i>	- <i>Market boundary: license to operate</i>
	- <i>Description of trend: disruptive</i>	<i>License to operate</i>	- <i>Market boundary: market developments</i>
	- <i>Description of trend: urgent</i>	<i>Opportunity to become more sustainable</i>	- <i>Market boundary: physical space</i>
	- <i>Description of trend: need for radical change</i>	REASONS TO BECOME ACTIVE	- <i>Market boundary: regulation</i>
	PERCEPTION OF TREND	- <i>Reasons to become active: intrinsic motivation</i>	- <i>Market boundary: resources</i>
	- <i>perception of trend: liability</i>	- <i>Reasons to become active: pressure from labor union</i>	<i>Reaction to a changing business environment</i>
	- <i>perception of trend: opportunity</i>	- <i>Reasons to become active: pressure from society</i>	<i>Ready 2030</i>
	SUSTAINABILITY CHALLENGES	- <i>Reasons to become active: pressure from stakeholders</i>	ROLE OF THE PA
	- <i>sustainability challenges: future</i>	WAY OF DOING BUSINESS	- <i>Role of the PA: industry</i>
	- <i>sustainability challenges: past years</i>	- <i>Way of doing business: changed externally</i>	- <i>Role of the PA: shipping</i>
	- <i>sustainability challenges: solutions</i>	- <i>Way of doing business: changed internally</i>	- <i>Role of the PA: transport</i>
	- <i>sustainability challenges: way of doing business</i>		- <i>Role of the PA: should be</i>
	<i>Sustainable strategy</i>		- <i>Role of the PA: society</i>
			TYPE OF STAKEHOLDERS
			- <i>Type of stakeholders: large</i>
			- <i>Type of stakeholders: small</i>

Note that the codes in capital letters have sub-codes. The codes in capital letters are a category and do not have linked quotations. The sub-codes do have linked quotations.

By using the framework of the operationalization of CSR mindsets by Hengelaar (2017), these general findings are used to create a table for the CSR mindset for PAs based on the interviews. Table 4 displays the code groups of the interview with their sub-categories and related codes. The main findings of the related codes form the base to identify the mindset of PAs related to their climate action strategy.

Table 4: Display of the concepts of CSR mindsets and their related codes per division.

Code groups	Sub-categories	Related codes	
Sustainability in general	<i>Liability/ opportunity</i>	Challenges to initiate program; Description of trend; Perception of trend	
	<i>Disruptiveness</i>	Current progress; Description of trend	
	<i>Urgency</i>	Current progress; Description of trend	
	<i>End state</i>	Current progress; Description of trend; Sustainable strategy; Sustainability challenges; Clear sustainability program	
Motivation	<i>Central motives</i>	License to operate; Reasons to become active; Equal level playing field	
	<i>Key rationales</i>	Equal level playing field; level of activeness; license to operate; Opportunity to become more sustainable; Reasons to become active; Way of doing business	
Actionability	<i>Focus</i>	Involvement of stakeholders; reaction to a changing business environment;	
	<i>Role of the PA</i>	<i>Industry</i>	Involvement of stakeholders; Role of the PA
		<i>Shipping</i>	Involvement of stakeholders; Role of the PA
		<i>Transport</i>	Involvement of stakeholders; Role of the PA
<i>Societal role division</i>	Involvement of stakeholders; Market boundary; Reaction to a changing business environment; Role of the PA; Type of stakeholders		

The interviews lead to an understanding of the CSR mindset by the PA which can be observed to have an inactive, reactive, active or proactive motivation or mindset. This leads towards the conclusion and policy recommendations of this thesis.

7 Results

This section provides the results of the qualitative content analysis. The structure is as follows. For every code group, the related codes are displayed in Table 3. The qualitative content analysis is based on the interviews. The interviews are coded according to the codebook. The main findings in this section result from the quotations linked to codes, which are summarized, compared and condensed for each code category.

7.1 Coding: main findings per category and code

Table 3 provides the complete codebook which is used to analyze the interviews. Each code can be linked to one or more quotations. There are codes from the deductive codebook, which are not linked

to any quotation. This occurred when the transcription of the interview where not relevant to the code, these are made bold in the Table 3. However, this can also provide useful insights into the mindset of the PAs.

Summarizing and comparing the quotations of the codes has led to the general findings summarized in the following section. A summary is made based on the general findings of each code. The codes are provided per code group.

7.1.1 Sustainability in general

7.1.1.1 *Challenges to initiate program*

For the PA it is important to make the port future-proof when taking social responsibility. There are challenges involved with the stakeholders of the port. The port itself is not transferring the commodities or performs industrial activities. Therefore, intensive stakeholder management is needed to collaborate towards a sustainable future. There needs to be a structured dialogue between the PA and their stakeholders, so that the PA understands which direction the market is going, and which investments are needed. For example, it is important to understand which alternative fuels are needed in the port, so it can facilitate its clients. When the PA takes a proactive role, it is important to be prepared to make investments without a return on investment. Furthermore, the PA by itself cannot have to impact that is needed to stimulate stakeholders to be more sustainable, international collaboration is needed to put pressure on the concerning stakeholders, such as shipping companies.

7.1.1.2 *Clear sustainability program*

In general, PAs have a focus on the industry in the port area and the transit of commodities from the sea towards the hinterland and vice versa. Primarily, there is a focus on stakeholder management on all levels, from governments to commercial clients. The port sector is in a discovering face in which their focus is on facilitation, stimulation and support and local regulation to enable and companies to become more sustainable. There is a clear focus to collaborate and create partnerships with stakeholders to act towards sustainable practices. For ports it is also important to identify their strong and weaker cluster to decide on which cluster they want to invest. Strong clusters are more favorable, since there is a competitive advantage. For the weaker clusters, other PAs can provide solutions.

Most PAs and stakeholders have a green or sustainable policy for 8 years or longer, but more recently, the last 4/5 years, it has become more important. This has partly to do with the Paris Agreement and recent developments in sustainability.

There are various projects and examples that PAs have provided. The main subjects that PAs are focusing on are on green hydrogen, the circular economy, shore power, LNG facilities, biofuels, Carbon Capture Storage, updating infrastructure, renewable energy, smart port-city projects and increasing efficiency.

7.1.1.3 Current progress

It is important that the transition goes smoothly, but currently, not enough is done. There are good practices and the sector is doing good, but it is moving too slowly. The awareness of PAs and the public is there and now more and more companies want to become more sustainable. As a PA, you are still dependent on your clients. A distinction must be made between advanced and less advanced ports, because less advanced ports cannot put as much effort in sustainability as advanced ports can. In Europe, most ports are well advanced.

7.1.1.4 Description of trend

Disruptive

In general, the trend is not seen as disruptive. The trend is something that creates opportunities. Existing infrastructure in the port can be modified and used for more sustainable commodities. The transition is considered to move slowly, so there could be disruptive shocks in the future.

Need for radical change

There is a slight difference in describing the need for radical change for the sustainability trend. Radical change is needed in the mindset of people and by actions of international regulatory bodies, such as the IMO, on the one hand. On the other hand, the trend is not seen as radical, because it is moving slowly, and PAs want a smooth transition. Being radical implicates that polluting practices need to be shut down, which means economical loss. This does not have a preference.

Urgency

In general, the trend is seen as urgent, because climate change is happening. There is pressure from industry branches and national governments to be more sustainable. In practice, the trend can also be seen as not urgent, because the transition is moving slow.

7.1.1.5 Perception of trend

Generally, the trend is an opportunity for PAs. Also, companies can make use of these opportunities. PAs can show leadership in sustainability, this can be achieved via the projects and programs that PAs are involved in. There is also an exemplary role for the PA, as they have also a social responsibility, if the PA does not show the intention for the transition, how can the private sector be convinced to do so. The private sector remains a key component in the transition, because they perform the actual operations in the port area.

7.1.1.6 Sustainability challenges

In the past, the main challenges were about the space and territory PAs operate in. The city and use of land provided challenges. Now and in the future, the reduction of GHGs, but also other pollutants are the main challenges for PAs and their stakeholders. PAs focus on the transition of large polluters can

transform to a more sustainable way of production and operation. The PA also needs to provide the facilities and equipment for companies to become more sustainable. Investing in the right projects is key in the transition. This requires good stakeholder management to make sure to port remains fit for purpose.

These challenges can be achieved by altering permits, incentive programs and organizing structured discussions with relevant stakeholders. The way of doing business will rely more on collaborations with partners and open discussion with stakeholders.

7.1.1.7 Sustainable strategy

The main strategy PAs and the stakeholders has a focus on stakeholder management. Stakeholders are key to enter the transition and become more sustainable. An open, intensive structured dialogue or discussion with stakeholders are necessary to identify the key objectives to achieve the goals set by companies and government.

PAs mainly go in the transition in three ways. The first one is to facilitate companies to be able to be more sustainable, the second one is to stimulate companies by incentive programs or other tools to make sustainability more attractive and the third step is to be an advisor and match maker between parties that want to be sustainable.

Furthermore, as PAs cannot not focus on every aspect of sustainability and the energy transition. It is important to identify the components that are important for local business climate.

7.1.2 Motivation

7.1.2.1 Equal level playing field

European ports can be seen as advanced ports, that can pay more attention to sustainability as they are economically healthier compared to less advanced ports. Therefore, an equal level playing field is important, but there is no one size fits all in terms of regulation. PAs are not limited to go beyond regulation, but if the PA is too progressive, it can harm its license to operate. Optimally, every port should have the same progress in terms of sustainability. For shipping, the IMO is considered to be the body that should create an equal level playing field on an international level.

Currently, the level playing is more equal in ports concerning sustainability. Before, there was a strong competition between ports, but recently ports are more integrated when it comes to sustainability. Furthermore, equal level playing field is important in terms of regulation. Differences between national and international regulation cause limitations towards climate action.

7.1.2.2 Level of activeness

There is no mention of PAs or stakeholders being inactive in terms of sustainability. In general, the PAs and stakeholders consider themselves to be active or proactive. There is also a reactive level of

activeness, one interviewee mentioned that there is a reactive or following approach in the weaker clusters of the ports. Often, the PAs acknowledge that there is a different level of activeness on different subjects. PAs focus a more proactive strategy on their strong or important clusters and more active, or reactive strategy on its weaker clusters.

Nonetheless, PAs and stakeholders' initial response is that they are proactive in sustainability. A port can be seen as a trendsetter and example. The PAs indicate that they are proactive or have a proactive policy in certain subjects or strong clusters. A proactive role is often combined with actively engage with stakeholders, create collaborations and financing studies.

7.1.2.3 License to operate

Sustainability used to be on the background when looking at the license to operate for the port. Currently, sustainability, or sustainable growth is essential for license to operate considerations. As a port, there is a need to go with the societal context, where sustainability is more present. On the long term it is important that the port remains fit for purpose and keeps its license to operate.

7.1.2.4 Opportunity to become more sustainable

The trend is seen as an opportunity. The PA can take leadership in the trend on certain projects. As a PA you must show your intention in the transition, because there is a social responsibility.

7.1.2.5 Reasons to become active

PAs and stakeholders relate the activity in sustainable practices to a combination from intrinsic motivation and pressure from society. The awareness of environmental problems has increased with the public, which puts pressure on the port to become more sustainable. In combination with an intrinsic motivation this can lead to an acceleration of sustainable practices. Besides intrinsic motivation and social pressure, there are also reasons arising, although less mentioned, from regulation, stakeholders and labor unions. Labor unions demand more health and safety measures for employees, stakeholders demand more green operations or possibilities and regulation is pressure from the government in which compliance is necessary.

7.1.2.6 Way of doing business

The sustainability trend changed the internal way of doing business at the PAs and stakeholders. Business strategies are focused on sustainability and this trend is giving shape to the business environment. Sustainability has become a central theme in the development plans of the companies.

7.1.3 Actionability

7.1.3.1 Involvement of stakeholders

The role the PA takes in their involvement with stakeholders is focused on the transition of companies within the port area and create new space for initiatives and new kinds of industry. Collaboration and

partnerships are used to shape the transition. Clients are essential to take into account. The PA facilitates and stimulates this via support, assistance, consultation and regulation.

On an international scale, ports can exchange best practices to accelerate the transition in the port sector.

7.1.3.2 Market boundary

The PA and stakeholders are confronted with various market boundaries when engaging with sustainable practices. The mentioned market boundaries that limit the PA from initiating sustainability programs are the competitive position, contracts, finances, level playing field, license to operate, market developments, physical space, regulation and resources.

Competitive position

The competitive position of the port is seen as boundary, since the PA relies on their clients. Investments for sustainable projects have a negative return on investment (ROI) or causes the port to be more expensive for its clients. This harms the competitive position of the port, which reduces the revenue of the port.

Contracts

The PA deals with long term contracts in the port area. This can be a limitation, since the PA cannot force certain practices or make alterations if this is not specified in the contract.

In the logistic sector, there no or short-term contract between logistic providers. This makes it difficult to make long-term sustainable investments.

Finance

Sustainable investments in equipment currently costs more than keeping the current equipment that is used and these investments have a negative ROI. This is perceived as a barrier for sustainable investments.

Level playing field

For ports by itself it is difficult to influence the shipping sector, they need to collaborate on this field, or international regulation is needed to stimulate the shipping sector to use more sustainable equipment.

For shipping, an equal level playing is critical to achieve a sustainable transition, because ships can easily transfer flags to avoid regulation.

License to operate

While there is pressure from the public and stakeholders to become more sustainable, the license to operate can also be seen as a limitation to engage in sustainable practices. When engaging in sustainable

practices, projects or programs, you can exclude companies related to the port area, which can harm the license to operate.

In general, less advanced ports have to look for their license to operate more towards their economic performance rather than their environmental performance. This can be a barrier for sustainable practices.

Market developments

As a port, development in the market are a boundary when they are not aligned with the progress that the port wants. The feedstock supply of new commodities such as new fuel and technologies will be an issue. Another barrier is the relative cheap price of fossil fuels and the investment cost for sustainable development currently also too high.

Physical space

The port is often connected to a city or surrounded by residential areas. For the energy transition new fuels are needed, which have new industrial processes that can potentially have safety issues and need extra space. Also the construction of new sustainable facilities or equipment could lead to issues with the surrounding area. For example, people do not want windmills near their residential area.

Regulation

Regulation can both be seen as a boundary and an accelerator. For certain practices in the port you need permits, these permits can limit the progression that ports want to make.

Furthermore, regulation is often mentioned as a boundary concerning local and international regulation. Regulation is general and can provide difficulties for local projects. Especially for shipping, international regulation is needed for an equal level playing field. When international regulation is not progressive enough, this can limit the progression that could be made in the sustainable transition.

Resources

This is mentioned once. In sustainable development there can be human capital limitations. As a PA, there is a company to operate and a limited number of employees. Therefore, the focus is divided between sustainability and the other aspect of the port.

7.1.3.3 Reaction to a changing business environment

The PA reacts to the business environment, that is now shifting towards sustainability, by incorporating sustainability into the business strategy. There is an internal pressure to help polluters into port area make the transition and to stop the production of polluting products. There is also an external pressure to remain attractive for the clients of the port.

7.1.3.4 Ready 2030

In general, the climate goals of 2030 by the Paris Agreement are perceived as achievable for the port sector. This does depend substantially on the clients of the port and the pace of market developments.

7.1.3.5 Role of the PA

In general, stakeholders indicate that PAs should facilitate the industry, shipping and transport companies to be able to become more sustainable. Ports should have a proactive attitude and leading doing business in a sustainable way.

For shipping, ports should provide the infrastructure for new fuels, sustainable practices and should use port call optimization to increase efficiency. Present

Industry

The main consensus to make the industry more sustainable is to help the large polluters to a more sustainable way of production. This is done via excluding certain industries and obligate the use of sustainable equipment, assisting in the transition of oil and bulk terminals, collaborations with the industry towards a circular economy and a constructive dialogue with the stakeholders in the port area. In general, the PA facilitates, stimulate and supports the industry in the transition.

Shipping

Ports depends on ships and ships depend on ports. The PA facilitates and stimulates clean shipping and the use if clean fuels. This can be done via incentive programs, admission into to port and increased efficiency. There is a role and responsibility for the PA to facilitate ships in the transition.

Transport

Hinterland transport is very complex. The PA is aims to increase efficiency and promote multimodal transport. The PA is more likely to be a facilitator in hinterland transport than leadership in hinterland sustainability.

Society

This got mentioned once. PAs should also create more awareness with citizens and employees on sustainability.

7.1.3.6 Types of stakeholders

For PAs, there is primarily a focus on the transition of large polluters and companies. There is also a focus on smaller companies such as startups that provide new innovations. There is a combination of large entities to make the first steps into the transition and new companies that bring new perspectives for the future.

For small stakeholders it is more difficult to receive a return on investment, but space must be made for new startups and companies with innovative ideas.

This concludes the summary of the quotations of the codes. In the following section the summary of the quotations are condensed and applied to the operationalization of the various types of CSR mindsets.

7.2 CSR mindset of the PA and stakeholder perception.

Table 4 shows the codes that are related to each sub-category in the CSR mindset framework. The summary of the main findings is used to come to a condensed motivation for each sub-category from an inactive, reactive, active to proactive motivation. The results are displayed in Table 5.

Section 4.7.1 provides the CSR framework which is used to set the criteria for the inactive, reactive, active and proactive motivations. The literature from Hengelaar (2017) of the type of mindset and Figure 2 are used to relate to main findings to an inactive, reactive, active or proactive motivation. The typology that is provided for the mindsets set the boundaries for each level of activeness. Comparing the main findings with the typology results into the CSR mindset framework for PAs, based in the interview outcomes.

Note in Table 5 that not each motivation is given by the main findings and is made with a **shade**, this indicates that this motivation did not come forth from the analysis of the quotations from the interview. Nonetheless, to provide a full framework, a motivation is given in line with Figure 2 and in the context of the PA.

Table 5: The main findings of Port Authorities CSR mindset.

		Inactive	Reactive	Active	Proactive
Sustainability in general	Liability/opportunity	Sustainability is seen as a liability.	The PA is dependent on the companies in the port area.	The sustainability trend is seen as an opportunity.	PA in general see an opportunity and social responsibility to be sustainable.
	Disruptiveness	There is partly a limited vision. The PAs do not see the trend as disruptive and recognize that the trend is moving slowly.	The PA sees the trend as manageable. The clients of the port are leading the transition, which moves too slowly.	The trend leads to a shift in the way of doing business, which is moving at a low pace.	The PA sees disruptive shocks in the future and is now taking adequate action to prevent disruptive shocks.
	Urgency	No sense of urgency.	In general, PAs and stakeholders perceive that there is sufficient time for the sustainability trend	PAs and stakeholders see urgency for the trend and sustainability receives increasing attention and action.	PAs do realize in the mindset that the sustainability trend is urgent, and that action is needed.
	End state	Lack of vision and focus on sustainability.	There is potentially less vision or focus by PA. There is no need for radical change. Radical change will be too disruptive and lead to economical loss. The port needs to remain fit for purpose.	There is potentially less vision or focus by PA. The trend is seen as urgent and climate action is taken. Strategy by PAs and stakeholders are beginning to take shape.	PAs and stakeholders set goals and targets for themselves for in the future in which they want a certain reduction in GHGs. There is a combination of exploring how to reach these goals and concrete plans to give shape to the transition.
Motivation	Central	There is no motivation for CSR. Sustainability is seen as a liability.	PAs have a strong focus on the legitimacy of the public. Sustainability has become key in their license to operate.	PAs see the trend as an opportunity to create value, by active stakeholder management, financing studies and collaborations.	There is an intrinsic motivation by the PA, in combination with social responsibility, to show leadership in the transition.
	Key rationales	Only mitigating the harmful effects of port activities. No intrinsic motivation by the PA.	Pressure to be more sustainable does increase from stakeholders/government. The continuity of the port is an important factor to enter the sustainability trend.	The PA perceives the trend as an opportunity. Sustainable growth is important and there are clear targets set within the strategy of the PA and stakeholders.	Strong intrinsic motivation and strategy to become sustainable. The PA understands that intensive stakeholder management is needed by collaboration, creating partnership and support.
Actionability	Focus	Action only within boundaries of (inter)national law. The PA only enforces the law.	PAs has an external focus in the trend to remain attractive to clients and stakeholders. To ensure the license to operate.	There is an internal focus by the PA and stakeholders to change the way of doing business to become more sustainable. Sustainability is incorporated in the internal strategy.	There is both an internal strategy changes towards sustainability and an external approach to, via stakeholder management, help stakeholders in the transition.
	Industry	The PA lets the industry freely operate in the port area and only upholds (inter)national regulation.	The PA excludes certain practices from the port area via policy or regulation. There is a reactive/following approach on weaker clusters.	In general, the PA is focused on facilitating, stimulating and supporting the industry to become more sustainable. There is a primary focus on large companies.	The PA proactively engages with industry stakeholders by creating collaboration and partnerships in the transition, both with incumbent and new innovative firms. There is a focus on strong clusters within the port area.
	Shipping	The PA only looks at the demand of the shipping sector when necessary. The PA is not initiating regulation or sustainable practices.	There is a primary role to facilitate shipping to become more sustainable. This can be done through admission policies.	The PA uses opportunities such as increasing efficiency and incentive programs to stimulate shipping to become more sustainable.	The PA proactively engages with shipping companies and creates collaborations towards the transition. The PA understands the needs of the shipping sector and acts to be a leader to stimulate, facilitate and advise the sector.
	Transport	The PA only facilitates the hinterland transport and does not initiate regulation or sustainable practices.	The PA has a facilitating role in hinterland transport and can promote the use of multimodal transportation.	There is an opportunity to increase efficiency and become more competitive.	The PA shows leadership via intensive collaboration and partnerships with transport and logistic companies. The PA proactively takes steps to help this sector to become more sustainable.
Societal role division	The PA does not more than legal compliance.	PAs are public entities and comply with governmental regulations and see pressure from society.	The PAs are active in facilitating and stimulating companies. There are market boundaries that limit them to become more sustainable. PAs are restricted by their competitiveness, contracts, finance, level playing field, license to operate, market developments, physical space and regulations.	PAs are leaders or want to show leadership in creating multi-stakeholder coalitions by collaborations, initiating projects or partnerships.	

Both the findings of the PA and stakeholders contributed to the motivation of CSR by PAs. The stakeholders themselves see the PA as an entity that should take a certain leadership in sustainability and climate action. Sub-code: Role of the PA: should be, provides how the interviewed stakeholders see the role of the PA. The findings from this code indicates that the PA should show leadership and be active to facilitate sustainability for players which are related to the port area. Facilitating sustainability can implicate a wide range of tools and practices that the PA can be involved in. The interviewees provided several ways the PA can do this, as is shown in Table 6.

Table 6: Tools and practices that the Port Authority can or should use to increase sustainable practices.

<i>Tools used to increase sustainability</i>	Practical application
<i>Facilitation</i>	Clean bunker fuel facilities
	Shore power
	Facilitation of sustainable equipment
	Increase efficiency
<i>Financial aid</i>	Port call optimization
	Investing in startups
<i>Advisory</i>	Advising customers
	Aid in the transition of terminals
<i>Incentive provider</i>	Stimulate clean shipping
	Stimulate the use of renewable energy
<i>Regulation</i>	Obligating the use of more sustainable equipment
	Admission criteria for transport modes to enter the port area
<i>Prohibition</i>	Exclusion of polluting practices
<i>Collaboration</i>	Creating partnerships
	Scaling up pilots
	Projects with industry
<i>Port infrastructure</i>	Electrification
	Use of more sustainable equipment
	Multimodal terminal
<i>Awareness</i>	Create awareness about sustainability by the public

The primary application of the tools in Table 6 are practices that can be done inside the port area. This implicates that the interviewees can have more influence on what will happen in the port area itself than have a significant influence to what happen on sea shipping or hinterland transport. Nonetheless, there are several practices that can provide incentives or put pressure on these way of transportation to increase the use of sustainable equipment or fuels.

7.3 Conclusion

This section provides a conclusion on the results from the interviews. As the results are based on the general findings, a general conclusion can be drawn for the motivation of sustainable development in by the PAs. This conclusion provides an answer to sub-question three. Which is as follows:

How can the motivation of PAs be defined in sustainable development?

The motivation to be involved in the sustainable development trend is related to the CSR mindset by the PA. The typology used for the various motivation firms can have, ranges from inactive, reactive, active to a proactive mindset or motivation. From Table 5, a general conclusion can be drawn for the motivation of the interviewed PAs that are based in North-West Europe.

The three code groups provided practical use for the coding of the interviews and organizing the codes for the data analyses. The framework provided by Hengelaar (2017) provided a typology in which the answers by the PA and stakeholders could be directed too. The observations and findings of the interviews relates to the different forms of motivation in the framework and lead to general conclusions for each of the code groups, which answers the third sub-question.

What can be observed from Table 5 in the spectrum of activeness is that the inactive motivation barely gets mentioned. The interviewees provided a reasoning that indicates that the PAs do not have an inactive mindset on sustainability. However, there is reasoning that provides motivations ranging from reactive to proactive motivations. This indicates that PAs receive the pressure to become more sustainable from different sources. In the following, a description is provided of the various mindset types for PAs, based on the findings of the interviews. The mindsets are ranging from reactive to proactive, as an inactive mindset was not fully provided by the findings.

Reactive mindset of the PA

The reactive mindset by PAs can be observed from the reasoning that the PA is dependent on the companies within the port area and that there is no clear vision on how the port will be shaped in the future. The reason to enter the sustainability originates from the legitimacy of the public, the government and stakeholders. The port must remain fit for purpose in the future and will be shaped by the companies in the port area. This is done, so that the port remains attractive for its clients and stakeholders. The ports primary role is to facilitate sustainability for its clients.

Active mindset of the PA

The PA see the trend as an opportunity to create value or to increase their competitive position. There is a shift in the current way of doing business and that there is a certain urgency to become more sustainable. However, the transition is moving slow as PAs are exploring possible opportunities. There is internal focus by the PA to incorporate sustainability into the business strategy. There is a primary focus to facilitate, stimulate and support sustainable practices.

Proactive mindset of the PA

The PA takes a social responsibility on the sustainability trend and sees the opportunities it can provide. The PA realizes that urgent action is needed and translates this in a sustainable strategy that sets clear targets to achieve. There is both an intrinsic motivation to become a leader in sustainability and the

realization that PA should be a leader. The PA proactively engages in stakeholder management and in creating multi-stakeholder coalitions to give the transition shape. There is a strong focus in the transition of strong clusters within the port and the PA is willing to make investments without a certain return on investment.

This concludes the result section. The next section provides the conclusion research questions, discussion, recommendation and limitations of this paper.

8 Conclusion, discussion, limitations and future recommendations

The introduction of this paper provided the recent importance of the sustainability in the port and maritime sector. Scientific reports and papers are increasingly focused on sustainable development and management in the port area and maritime shipping.

The literature provided a greater understanding of climate change and the contribution by the port and maritime sector. While shipping is relatively the cleanest form of transport compared to road and train transport, it is responsible for around 3% of global GHG emissions, therefore sustainable port development and green growth literature are increasing. The three pillars of sustainable development are economic, social and ecology. While ports are often situated in areas which are of physical risk due to climate change, there is also pressure on the license to operate. Therefore, the green port concepts gains attention in literature.

Both PAs and maritime organization understand the need initiatives and programs to reduce the impact of shipping on the climate. They implement large scale programs to restrict and provide incentives for shipping, transport and industrial companies to reduce their ecological impact. Many of these programs are focused on a large scale. For PAs it, therefore, important how to implement these programs and own initiatives in a direct way on their stakeholders, which is called climate action. This can be considered to part of a company's CSR, in which various types of motivation/mindset can be derived. Literature section 4.7.1 discussed four types CSR mindsets on the level of activeness. This ranges from inactive towards proactive. The operationalization of the CSR mindsets by Hengelaar (2017) is used to create an operationalization of CSR mindsets that can be found in North-Western PAs.

The CSR mindsets of the PAs are ranging from an reactive to proactive mindsets. The inactive mindset did not come forth from the interview findings. This indicates that all of the interviewed PAs are doing something towards sustainability, which is a development in the right direction. However, this ranges from an reactive towards a proactive mindset. While some PAs lean towards a proactive mindset and other PAs a less active mindset, the results indicate that currently, efforts can be made in the mindset to be more proactive on sustainability. The main difference between reactive, active and a proactive mindset is that the reactive PA primarily focus on sustainability for license to operate considerations, which is the main driver. Active PAs understand and see that sustainable development can give the port

competitive advantages, but that there are also boundaries that prevent the PA from engaging with sustainable practices. Furthermore, the proactive PA takes additional steps. This PA wants to become a leader in sustainability and proactively engages with stakeholders to create multi-stakeholder coalitions. The proactive PA should be willing to make investments without receiving a return on them. This shows leadership.

8.1 Discussion

The discussion is used to discuss the main research question of this thesis: “*What is the motivation of the Port Authority in sustainable development and climate action.*” Via literature and the findings from the interviews it becomes clear that the motivation of PAs is complex. PAs are involved in the sustainability trend and have different motivations for different activities that are related to the port area. The public nature of North-West PAs combined with their commercial aspects make this an interesting field of study. The primary findings of the interviews is that PAs have a reactive to proactive motivation which can be different per activity in the port area. This can be related to the wide range of stakeholders in which the PA is involved with.

There is a difference between sustainable development and climate action which is important to understand. Sustainable development is based on the TBL principle in which the economic, social and ecological dimensions are equally important. Whereas climate action is primarily focused on mitigating and reducing the ecological consequences of firm or company operations. This indicates that climate action is solely focused on adapting to climate change or limiting the ecological impact e.g. GHG emissions. When asked about sustainable development in the interviews, the interviewees often relate it to initiatives and programs to reduce the impact of operations to the environment and also to engage with stakeholders via intensive dialogues to push and help them towards climate action. Climate action is seen as an active undertaking by the PA to have a positive impact on the climate. As the ecological dimension is given less attention, there is an increase in sustainable and climate action related efforts to balance to three dimensions.

The energy transition gives a good example of sustainable development and climate action. As pressure arises to use more sustainable energy sources, the PA is focused to facilitate, stimulate and advise stakeholders in the port. here, pressure arises from the social dimension, because of climate change in the ecological dimension. The PA must consider their continuity in the future to remain attractive for their stakeholders, which relates to the economical dimension. This is translated into a sustainable strategy. However, climate action in the energy transition is related to facilitation and stimulation of the use alternative energy sources. PAs can use the tools in Table 6 to perform climate action and create efforts to reduce the impact of port operations.

Furthermore, the findings of the interview analysis are in line with the green port literature. Figure 1: Green and Sustainable Port Framework. Source: Lam & Van de Voorde (2012). starts the green port

strategy from the involvement with stakeholders to come to a sustainable port strategy. The importance of stakeholders returns in Table 5, where the reactive PA receive pressure from their stakeholders and the proactive PA goes beyond stakeholder management to give shape to the transition in the sector, even when the stakeholder is not intrinsically motivated. The PA can tailor its strategy towards stakeholder needs for a more sustainable future. Thus, the sustainable strategy depends on which type of mindset PAs have when interacting with their stakeholders.

Literature by Slawinski & Basal (2012) in section 4.7.1 indicate that the time perspective of the firm influences the level of activeness. This also comes forth in the main findings of Table 5 and in the summary of the codes. PAs can be considered to cyclical time perspective. PAs have to focus on the long term as investments in infrastructure are often long term investments and continuity of the port is important in their strategy. From the findings, the PA can be considered to have a reactive, active or proactive mindset and a number of PAs consider themselves to be leaning towards a proactive mindset.

It appears that PAs with a long term time perspective intend to be more active on sustainability. The results of the CSR mindset framework are in line with the literature. The results show that the PAs barely have an inactive mindset. This is also caused by the ownership form of ports, which is often semi-public in North-West European ports.

Also the type of port is important to understand the level of activeness by PAs. From the interviews, several differences between PAs have an influence on the way they act on sustainable development. These differences include size of the port, available resources, container or commodity port, type of industry, port-city dialogue and hinterland accessibility. For example, smaller ports do not have the human or financial resources available to be proactive on various sustainable practices. Smaller ports seem to focus on the strong clusters with the highest ecological footprint in terms of GHG emissions. This will create the highest impact. On other clusters, they take a following approach by observing practices by other PAs.

Furthermore, a container port deals with more truck and rail transport than a bulk commodity port. Therefore, there can be difference in the sustainable strategy for these types of ports. A container port can put its focus on stimulating and supporting on transport efficiency, multimodal transport and cleaner truck fuels, while a commodity port can be focused on efficiency in barge shipping and the transition of terminals used for fossil commodities towards sustainable commodities. So, it is important to understand that each port is different and has various opportunities to become more sustainable.

In addition, it is important to realize that the PA CSR mindset framework is created within a certain timeframe, over a period 3 months from December 2019 until February 2020. This indicates that the CSR framework of PAs can shift over time as the sustainable strategy is an ongoing process in port management. The mindset of the PA can shift towards more proactive management or towards a more reactive approach. It is important to understand that the level of activeness is a transitional process that

occurs over time. A firm does not suddenly become proactive when it had a reactive or active mindset before. It takes time for a firm to understand, in this case, the sustainability trend and what is expected from them. The realization of a different mindset needs time, also within the firm. When management set a proactive policy, this needs to be understood throughout the firm and this takes time. Therefore, continuing research on the CSR mindset by PAs on different practices in the port area is necessary to better align national, regional and local policies. A reactive mindset on port practices needs more pressure from stakeholders in the port, so that the practices can become more sustainable. When the PA has a proactive mindset on certain practices, policy should focus on creating awareness and willingness to cooperate on the stakeholders. This can be done by engaging with already proactive stakeholders and by incentivizing, stimulating and advising less active stakeholders.

From Table 5, it is also evident that there is a different level of motivation or mindset on different practices by the PA. This causes difficulties to name a PA to be reactive, active or proactive, since there are different mindsets for different functions of the port. Combined with the difference between ports, each PA has a tailored strategy and needs a tailored policy from government entities.

Section 4.9 provided various port projects from three PAs in the Netherlands and Belgium. These projects indicated that ports are primarily focused on the facilitation towards sustainable energy. The facilitation of sustainable equipment is for PAs the primary way of sustainable development. This is also evident from the main findings of the interviews in the CSR mindsets. The primary goal is to facilitate stakeholders to become more sustainable via increased efficiency, infrastructure investments and collaborations. This can be done via intensive stakeholder management to understand what the stakeholders want and how to implement that in port projects.

8.2 Recommendations for future research

Identifying the CSR mindset for different practices in ports can lead to better policies. Pressure needs to increase on the practices where a reactive mindset is used and PAs need more freedom on practices where they have a more proactive mindset. This can result in a smoother and quicker transition. Especially for shipping, policy or regulation should be equal in Europe, and preferably on a global scale, as this is condition number one to create effective policies for shipping.

The interviews are conducted with PAs and stakeholders in the North-West of Europe. These interviewees can be considered to be more active on sustainability than PAs and stakeholders in other parts of the world. Therefore, it is not surprising that the inactive CSR mindset barely gets mentioned. This could be interesting for future research. New research can focus on an expansion of the CSR mindset framework, where an additional level of activeness can be added. Should a proactive mindset be the ultimate goal, or are there more categories which need to be added in the framework? This could give interesting insight on the motivation by PAs.

It could also be interesting to research differences between various parts of the world in PA CSR mindsets. There could be a difference on how sustainability is approached by different countries or on different continents. This could provide useful insight for global policies and regulations by entities such as the IMO.

As mentioned, identifying the CSR mindset of PAs for different port practices needs continued research as the mindset is captured within a certain time frame. A transition in the mindset of the PA can lead to a better approach for stakeholders and policy makers to identify on which port functions or practices extra pressure is needed and where it should be decreased.

Additionally, it could be important to include the main stakeholders of the PA into the CSR mindset framework. PAs primarily play a facilitating role towards their stakeholders. The stakeholders themselves have the actual impact on the environment, therefore, it is important to take their CSR mindset into consideration when developing policies to understand how to interact with the main stakeholders.

8.3 Limitations

The limitations of this thesis are related to the conducted interviews and qualitative analysis of the interview transcripts. First, limitations of the interview are considered. Afterwards limitations of the data analysis are discussed.

The interview can contain two types of biases. The bias can result from the interviewee and the interviewer. Hengelaar (2017) provides several biases in interviews which are related to sustainability and the CSR mindset in firms.

The interviewee biases are the personal perspective bias, elite bias and the social desirability bias. The interviewees personal perception can lead to inferences in the data, as the interviewees have personal perception which can cause them to answer in certain way that is not in line with the PA or stakeholder mindset. The interviewees in this thesis were linked to sustainability within the PA or the stakeholder. It is likely that their personal perception on sustainability and how the firm acts on interferes with how the firm is objectively acting in sustainable development.

The elite bias originates from interviewing managers or the 'elite' of a firm and the perception of the elites might not be represented by firms as a whole. In this case, the interviewees were managers or policy advisors within the PA or stakeholder. This could have led to a bias in the data. It is important to take into account when interpreting the results.

Furthermore, the social desirability bias occurs when answers are influenced by social pressure and this leads to social desirable outcomes. In this case, the PA stands central in the sustainability debate in the maritime sector and is a public or semi-public entity. There is social and stakeholder pressure to be

more sustainable, so admitting in an interview that the organization is not as sustainable as it should be could lead to negative perceptions. This can mean that interviewees provided a socially desirable answer.

Furthermore, the interviewer biases are the question bias and the interpretation bias. The question bias is related to how the questions are formed. The questions can steer the interviewee into a certain direction in which they will frame their answer. To limit this bias, an introduction was given prior to the interview to indicate the goal of the interview and a basic list of question is used for the interviews.

The interpretation bias states that there is a bias in the data when the researcher frames the answers of the interview into his own mindset and perception. In this case the interpretation of the mindset is can be biased. To limit this bias, transcriptions of the interviews and interview coding is used.

In addition, the research is conducted with North-West European PAs and stakeholders. Therefore, the drawn conclusion cannot be externally validated towards other PAs in the world. Also, the variety of stakeholders should be increased to better identify what the stakeholder want from the port. this can create better recommendations for policies.

9 References

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10 Appendix

A

Questions:

On sustainability in general:

1. Which sustainability challenges influenced the port/company the most in the past years? How strongly do/did these challenges dictate the current way of doing business?
2. What kind of sustainability challenges do you see for the upcoming years for the port/company?
3. What are the main reasons at the port authority/company for becoming active on sustainability?
4. Since when is there a sustainability program with a clear execution plan?

On motivation:

5. How would you describe the energy transition for the port/company, more as a liability to the firm or as a business opportunity? Why?
6. What will give the port authority/company the license to operate in the future? The legitimacy of the public or as an opportunity to create value? And has this changed in recent years, or was this always the case?
7. In the news PA's often call for an equal level playing field in the market. How limiting is the level playing field for potential sustainability programs?
8. What is the motivation of the PA to be involved in sustainable challenges?

On actionability:

9. How would you describe your role towards stakeholders?
10. How do you see the level of activeness, from inactive, reactive, active to proactive? How did the PA/company react to a changing business environment? Did the way of doing business change internally?
11. How does the PA (or the firm) involve stakeholders in the debate on sustainability?
12. Do they need to highly involve their stakeholders?
13. And which type of stakeholders, the large players or start with the small enterprises?
14. How do you see the role of the port authority in sustainable development?
 - In shipping industry
 - Industrial cluster
 - Inland transport
15. What challenges for PA's/companies are there to initiate a sustainability program?
16. Which market factors/boundaries limit the PA to take a leading role in climate action/sustainable practices?

17. How high do you see the 1. The disruptiveness 2. Urgency 3. Need for radical change?

Summarizing:

18. Concluding, what role do you think the PA should take in the energy transition? And what is the current progress?

19. Will the port sector be ready for the climate goals in 2030?

B

Table 7: The deductive codebook

<i>Code groups</i>	<i>Sustainability in general</i>	<i>Motivation</i>	<i>Actionability</i>
<i>Codes</i>	<i>Sustainability challenges</i>	<i>Liability</i>	<i>Role towards stakeholders</i>
	<i>Reasons to become active</i>	<i>Opportunity</i>	<i>Reaction to changing business environment</i>
	<i>Clear sustainability program</i>	<i>Level of activeness</i>	<i>Involvement of stakeholders</i>
	<i>Description of the trend</i>	<i>Way of doing business</i>	<i>Type of stakeholders</i>
	<i>Disruptive</i>	<i>License to operate</i>	<i>Role of the PA</i>
	<i>Urgency</i>	<i>Equal level playing field</i>	<i>Challenges to initiate program</i>
	<i>Need for radical change</i>	<i>Motivation to be involved</i>	<i>Market boundaries</i>
			<i>Current progress</i>
			<i>Ready 2030</i>

C

Table 8: Interviewees and their function.

Port of Rotterdam	Program manager	Aernoud Meunier
Port of Amsterdam	Policy advisor	Henri van der Weide
Port of Antwerp	CSR manager	Eric de Deckere
Port of Le Havre	<i>Chef du service Planification de l'Aménagement du Territoire / Mission RDI</i>	Cyril Chedot
North Sea Ports	Energy policy advisor	Thomas Desnijder
Green Award	Certification manager	Keita Shinohara
ABN AMRO	Senior Banker Transport en logistiek	Bart Banning
KNVR	Senior advisor climate and environment	Nick Lurkin

