



# **THE IMPLEMENTATION OF SUSTAINABILITY STRATEGIES IN PORTS** **CONTEXTUAL CHALLENGES CONFRONTING PORT MANAGING BODIES**

**Magali Geerts**



## **THE IMPLEMENTATION OF SUSTAINABILITY STRATEGIES IN PORTS**



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MAGALI GEERTS



*"Coming together is a beginning, staying together is progress,  
and working together is success."*

- Henry Ford (1863-1947)



## FOREWORD

In 2018, our organisation set up the World Ports Sustainability Program (WPSP) as a platform to help ports worldwide contribute to the Sustainable Development Goals (SDGs) of the United Nations. The UN SDGs follow the 2030 Agenda for Sustainable Development that was adopted by world leaders in 2015. There are seventeen goals in total, which form an integrated package. The UN SDGs are based on the ‘Triple Bottom Line’ (economic-social-environment) principle that Magali Geerts presents in this PhD dissertation as one of the best markers and concepts of operationalising sustainability and sustainable development.

Two years after the start of the programme, in April 2020, we published the World Ports Sustainability Report, which was a first attempt to track the sustainability performance of the global port sector. It was a daunting task, as the port sector is notorious for its lack of comparable data, something which is also recognised in this dissertation. As a basis, we analysed the sustainability projects that individual port authorities submitted to the online WPSP portfolio, which at that time contained 120 projects from 71 ports, covering 38 countries and five continents. The conclusions of the report correspond with some of the findings that Magali Geerts came across in her research.

First, it appears that ports focus their sustainability efforts especially on community outreach and port-city dialogue. This is hardly surprising, given that ports are granted and maintain their license to operate and grow by their local communities. Climate and energy and resilient infrastructure also score relatively high, no doubt driven by societal, political and commercial pressures to embrace decarbonisation and digitalisation. Governance and ethics and safety and security would appear to be underdeveloped areas in need of more attention.

The other main conclusion is also a call to action. The WPSP portfolio mainly contains sustainability projects from European ports, followed at some distance by ports from Asia and America. On the other hand, Oceania is punching above its weight, but Africa is hardly present at all. There is therefore an urgent need to bring all ports up to speed. That is not just a matter of outreach and communication, but above all of training and coaching. That is clearly the next step for us to take if we are serious about our ambition to develop global leadership of the ports industry in contributing to the Sustainable Development Goals of the United Nations.

The PhD research of Magali Geerts will help this process as it provides insight in the behaviour of port authorities or ‘port management bodies’ as they are referred to in the dissertation. The role of port authorities is indeed essential as they are ‘hybrid’ organisations, with both a commercial and societal vocation. This makes them in principle well-placed to raise the sustainability performance of their ports, involving both business and societal stakeholders. The solid empirical foundations of this dissertation enabled the author to identify institutional and other factors that may limit port authorities in practice from assuming their responsibility as community builders.

The governance of ports is one of these factors. Compared to fully privatised and hybrid structures, government-controlled port authorities would recognise less the value-added of the Triple Bottom Line principle. This conclusion may appear counter-intuitive, but it does make sense. The pressure from shareholders and stakeholders on a corporatised or privatised port authority to perform sustainably tends to be higher and those port authorities will also value sustainability higher as a competitiveness factor. It may explain why we find more

examples of integrated sustainability strategies in Europe and Oceania, where relatively more corporatised and privatised port authorities are present. The conclusion furthermore forms a strong additional argument as to why port management reform schemes should aim at creating independent port authorities. It will not just increase their ability to invest and influence in the logistics chain, it will also improve their sustainability performance.

Management leadership is another factor. Magali Geerts correctly points out that to get sustainability initiatives embedded in the general strategy and vision of port authorities, support of general management is vital. Read in combination with the institutional environment we can identify an extreme variant in which port authority CEOs – especially of larger ports – make sustainability the pinnacle of their personal agenda. Whilst positive as such, it may become counterproductive if that personal ambition would stand in the way of the close cooperation between ports that is needed to achieve results in many areas of sustainability. Decarbonisation of shipping is a case in point. It makes no sense for a port authority to invest in shore-side electricity or introduce strict emission rules if neighbouring ports don't do so.

Understanding these and other factors is of great practical value to port managers, policymakers and sector organisations such as ours. That is the strength of this PhD dissertation which is anything but an ivory tower product. I warmly congratulate Magali Geerts on this accomplishment and highly recommend reading – and acting upon – her work.

Patrick Verhoeven

Managing Director, International Association of Ports and Harbors (IAPH)

## ACKNOWLEDGEMENTS

After graduating from VUB five years ago, my first intention was to leave university and look for a job. I never thought that I would ever be writing acknowledgments for a PhD dissertation, let alone during a global pandemic. But then again, who knew that I would even obtain a PhD at a university in the far reaches of the city of Brussels. Joking apart, the work that I present today would not have been possible without some remarkable persons who have helped me along the way and made my journey both memorable and pleasurable.

First of all, I want to express my heartfelt gratitude to my supervisor Prof. dr. Michaël Dooms for his exceptional level of moral and intellectual guidance not only on an academic level but also during the time things got bumpy in my personal life. His constructive but primarily always positively formulated advice motivated, inspired and simultaneously challenged me – often because of the never-ceasing flow of ideas. He taught me the principle of ‘balancing’ in life.

I would also like to thank the members of my examination jury, Prof. dr. Elvira Haezendonck, Prof. dr. ir. Eric de Deckere, Prof. dr. Rosa Mari Darbra, Prof. dr. Alexandre Thys and Prof. dr. Diane Breesch for devoting their precious time and effort to evaluating this dissertation. In particular, I would like to thank Prof. dr. Elvira Haezendonck who shared her academic knowledge and working spirit with me, as well as her sometimes much-needed pep talks. Furthermore, I am very grateful to Prof. dr. ir. Eric de Deckere for his professional interest in my research and, as former CSR manager of the Port of Antwerp, his assistance with many of the analyses conducted. As a real ‘Aentwaerpenoar’, I am proud to be able to present the outcome of the Port of Antwerp’s support in this dissertation.

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Finally, I am thankful for the sincere interest, support and patience of my family and friends during my journey. Above all, along my path defined by successes and setbacks, highlights and some lows, my parents, Kathleen and Daniël, and my brother, Michaël, showed an unrelenting support for which I will always be grateful.

Magali Geerts, May 2020

## PUBLICATIONS AND CONFERENCE PRESENTATIONS

### Chapter 2

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### Chapter 3

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### Chapter 4

Geerts, M., Doms, M. & Stas, L. (2020). Determinants of sustainability reporting in the present institutional context: the case of port managing bodies. Accepted for presentation at the *International Association of Maritime Economics (IAME) annual conference 2020* (Hong Kong).

### Chapter 5

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Note: The original reference styles of the journals in which the chapters are published are maintained through the PhD dissertation.

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## ACRONYMS

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|       |                                                              |
|-------|--------------------------------------------------------------|
| AHP   | Analytic Hierarchy Process                                   |
| AIC   | Akaike Information Criterion                                 |
| AIVP  | Association Internationale Ville et Ports                    |
| B2B   | Business-to-Business                                         |
| B2C   | Business-to-Consumer                                         |
| BoD   | Board of Directors                                           |
| CAS   | Complex Adaptive Systems                                     |
| COP21 | 21 <sup>st</sup> Conference of the Parties                   |
| CSR   | Corporate Social Responsibility                              |
| EC    | European Commission                                          |
| ECSA  | European Community Shipowners' Associations                  |
| ESI   | Environmental Ship Index                                     |
| ESPO  | European Seaports Organization                               |
| EU    | European Union                                               |
| FTE   | Full-Time Equivalents                                        |
| GDPR  | General Data Protection Regulation                           |
| GRI   | Global Reporting Initiative                                  |
| GT    | Gross Tonnage                                                |
| IAPH  | International Association of Ports and Harbors               |
| IMO   | International Maritime Organization                          |
| ISL   | Institute of Shipping Economics and Logistics                |
| ISO   | International Organization for Standardization               |
| KPI   | Key Performance Indicator                                    |
| LNG   | Liquefied Natural Gas                                        |
| NEC   | National Emission Ceiling                                    |
| OPS   | Onshore Power Supply                                         |
| PERS  | Port Environmental Review System                             |
| PIANC | Permanent International Commission for Navigation Congresses |
| PM    | Particulate Matter                                           |
| PMB   | Port Managing Body                                           |
| QFD   | Quality Function Deployment                                  |
| SDG   | Sustainability Development Goal                              |
| SECA  | Sulfur Emission Control Area                                 |
| SME   | Small- and Medium-sized Enterprise                           |
| SOE   | State-Owned Enterprise                                       |
| SR    | Sustainability Report                                        |

|       |                                  |
|-------|----------------------------------|
| SSS   | Short Sea Shipping               |
| TBL   | Triple Bottom Line               |
| TEN-T | Trans-European Transport Network |
| UN    | United Nations                   |
| VIF   | Variance Inflation Factor        |



Contemporary port cluster management and development, typically the primary responsibility of Port Managing Bodies (hereafter PMB)<sup>1</sup>, are influenced by continuous and dynamic economic, social and environmental challenges. More specifically, given the specific position of ports in the transportation chain, they shape and impact the sustainability performance of the respective larger maritime logistics and industrial ecosystems they form a part of, and vice versa (Ashrafi et al., 2019). PMBs' choices in terms of strategic objectives to be pursued not only have an influence on their own day-to-day business but also on the stakeholders being a part of the local and global sphere in which the port operates. In this kind of business environment, successful PMBs' strategies are highly dependent on the integration and balancing of strategic economic, environmental and social objectives related to challenges for which PMBs are held accountable by their stakeholders. The perspective of the sustainability debate is no longer *whether* to act in accordance with Triple Bottom Line (people, planet, profit/prosperity) thinking, but rather *how*.

In response to increased overall awareness pertaining to the topic of sustainability and to concerns expressed by stakeholders, PMBs have acknowledged the general need and their potential to improve their sustainability performance by making tangible commitments to increase their sustainability efforts (Bergqvist & Monios, 2019; Carpenter & Lozano, 2020). As a result, PMBs have engaged in various sustainability initiatives to monitor and tackle the plethora of issues linked to the three domains of the Triple Bottom Line: social, environmental and economic (Ashrafi et al. 2019; Oh, Lee & Seo, 2018). These sustainability initiatives vary widely in terms of their level of embeddedness within or relationship with core business activities, ranging from informing and building general awareness to initiatives that influence their business models and stakeholder relationships on a more structural level. Further to this, similar initiatives can be implemented in different ways depending on the PMBs' internal and external context variables, such as, inter alia, ownership and autonomy, organizational size, geographic location and dominant stakeholders.

This PhD dissertation focuses on two specific sustainability practices that are inextricably linked to the core business activities of PMBs and have been slowly but gradually adopted in the port industry. Nonetheless, they are not (yet) widely implemented industry standard practices, as a 'one approach fits all' cannot be applied:

- 1) The practice of applying environmentally differentiated port pricing schemes (or 'green port dues')
- 2) The practice of sustainability reporting

The choice of investigating these two practices in particular is based on several well-considered arguments. First, both practices are considered as being part of the CSR portfolio of a PMB and are based on the principle of 'going beyond compliance'. More specifically, both practices are generally not developed as a result of measures enacted by governments, but as

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<sup>1</sup> The term Port Managing Body will be used in this PhD dissertation as port governance models have developed from predominantly being fully government-controlled organisms to more hybrid structures, with some port managing bodies even having been partly or fully privatized. As the underlying business model has shifted over the years, the range of activities and responsibilities has also expanded, and can no longer be exclusively limited to those of a strict 'authority'. Hence, as some institutional stakeholders (e.g. the European Commission) have changed their generic terminology in order to acknowledge this variety, the same approach has been adopted here.

a result of increased awareness for the need for change concerning the present focus of doing business, i.e. sole attention for the financial or economic dimension of the business, towards a more integrated perspective in which the importance of environmental, social and governance aspects are also acknowledged. The theoretical idea behind - and practical development of - both practices relies upon the voluntary efforts of PMBs.

Second, the area of research of the sustainability impact of ports, and thus the relevance of both sustainability practices in particular, has also gained importance among policymakers in recent years. The European Commission (EC), for example, commissioned a study in 2016 on the economic and environmental impact of environmentally differentiated port pricing (COGEA, 2016) and has already issued a Directive on disclosure of non-financial information by large companies, Directive 2014/95/EU (EC, 2014), while continuing to work on a general cross-industry regulative framework for all organizations.

Third, and of high importance, is the inextricable link of these practices with the core business activities of the PMB. The fact that these initiatives are not stand-alone practices, but instead have a direct influence upon core strategy aspects and stakeholders puts extra pressure and emphasis on their correct implementation and execution. Environmentally differentiated port pricing influences the tariff setting structure of a PMB, resulting in a direct trade-off between economic/commercial and environmental objectives. In parallel, sustainability reporting is considered a crucial element within the context of strategy formulation, as the report contains KPIs (key performance indicators) that are important in light of identifying the past, present and future sustainability performance situation of the port. In addition, sound implementation of both of these practices requires substantial internal and external stakeholder collaboration and is expected to have a direct impact in terms of signaling the sustainability commitment of PMBs towards both internal and external stakeholders.

Last, as the initiatives are recently developed practices (with early adopters implementing these practices from around 2010), in-depth research with the objective of obtaining a general overview of the current adoption of these practices on both an individual organizational level as well as an international industry-wide level, has been limited. This emphasizes the need for an investigation of the linkages and causal relationships between the characteristics of both implementing and non-implementing PMBs, as well as the underlying drivers of sustainability performance. Based on an in-depth investigation of both practices, this research will identify the current state and potential future path towards a higher level of sustainability commitment for PMBs.

Stated differently, this is an investigation of the practical rationale (the 'what'), the underlying motives (and barriers) for adoption (the 'why'), and the implementation guidance (the 'how') of these practices, i.e. opening the 'black box' on these practices within an industry which historically, due to its contested nature and in spite their dominant public ownership, is relatively closed in terms of disclosure around aspects of its core business.

Given that sustainability is in the first place a global, more generic concept, it is important to consider, in parallel to the internal organizational dynamics, the complexity of the surrounding context in which a PMB operates. For a better understanding of the interaction between organizational characteristics and managerial decision-making (internal factors) on the one hand, and contextual pressures and latent forces (external factors) on the other, the theoretical backdrop of this dissertation relies primarily on Institutional Theory.

Applying Institutional Theory principles allows one to “downplay rational managerial action and focus on how the social context influences organizational participants to behave relatively unconsciously in ways that are ‘normal’ to ‘fit in’ and appear ‘appropriate’ within the contexts in which they operate” (Bebbington, Higgins & Frame, 2009, p.592).

In addition, we also integrate the basic principles of stakeholder management in order to capture and highlight the importance of stakeholder inclusion in the creation of true value for the relevant stakeholders, and the port itself, when engaging in the sustainability practices that are researched.

This PhD dissertation consists of four main chapters, each chapter being approached from another angle in terms of subject, applied research techniques, degree of conceptualization and focal points (Figure 1.1). The four chapters are preceded by this introduction and followed by an overarching concluding chapter, containing a reassessment of all previous chapters and supported by additional data. Specific research implications and managerial and policy recommendations will be provided, as well as some exploratory future research ideas, highlighting the value of the research not only for scientists, but also practitioners and policymakers.

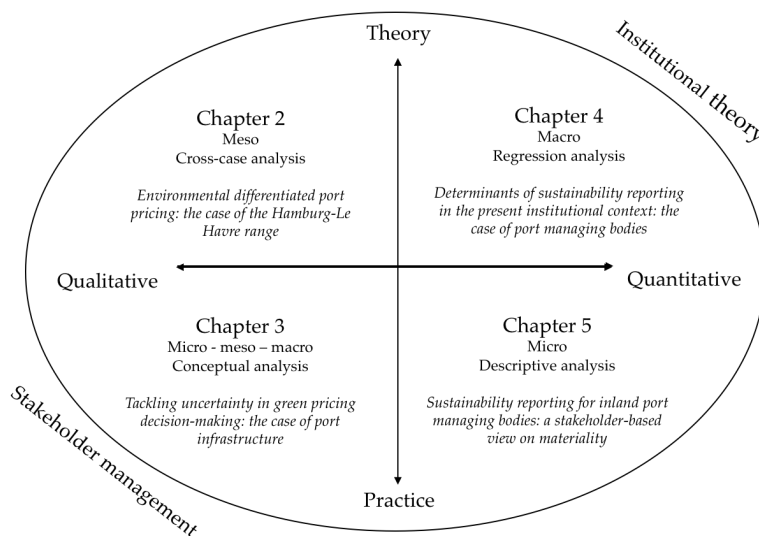


Figure 1.1 - Research design of the dissertation

Part I, consisting of Chapters 2 and 3, addresses the practice of environmentally differentiated port pricing. Chapter 2 presents a multiple cross-case study analysis based on desk research and in-depth interviews with seven PMBs of the Hamburg-Le Havre range. We investigate how PMBs respond to the challenge of 'greening' the industry, in particular the motives and rationale behind the set-up of the Environmental Ship Index (ESI) as the basis for their environmentally differentiated pricing schemes and the related consequences for the existing business model. Furthermore, by articulating the underlying institutional pressures that

PMBs are subject to, a clear and complete picture of the factors influencing the adoption and the concrete implementation of the practice is also obtained.

Based on the large variety observed among port profiles, substantial differences linked to the operational decisions and practical implementation of the practice among the PMBs can be identified. To this end, Chapter 3 further elaborates on these findings and provides a learning environment by means of a practice-oriented, transparent and user-friendly toolbox. This toolbox, which is based on the proprietary creation of a port profiles' matrix, has the potential to support PMBs and their stakeholders, irrespective of their status in terms of the adoption of the practice, in the discussions on the appropriate implementation of the practice, thus either facilitating decision-making and providing direction for the primary set-up, or leading to current validation (or not) of a particular implemented environmentally differentiated port pricing scheme.

Part II (Chapters 4 and 5) elaborates on the practice of sustainability reporting by PMBs. The methodology applied in these chapters is survey-based. In Chapter 4, we investigate the dynamics of internal (organizational characteristics) and external (institutional environment) factors that would positively/negatively influence the practice of sustainability reporting by PMBs, while making use of a regression and non-parametric analysis based on a global sample of 97 ports. The broad nature of the research, as well as the approach of combining the obtained regression results with Institutional Theory insights, has seen limited application in current literature. Consequently, the scope of this research in all its dimensions endeavors to maximally reveal the driving factors stimulating or hampering the adoption of sustainability reporting in the port sector.

Chapter 5 addresses the need for a better understanding of the perspectives of different stakeholder groups at the level of the general concept of sustainability (reporting) and the related methodological aspects, such as the Triple Bottom Line principle, materiality, boundary setting, as well as the need for stakeholder inclusion. Since existing research is often documented from the perspective of a post-implementation phase of the practice, an ex-ante exploratory perspective is, in this particular case, applied by putting the focus on a PMB that is yet to begin the development of a sustainability report. With the elaboration of this case study, we aim to provide knowledge by means of validating a longlist of material issues and related boundaries, as well as by means of identifying expectations and needs of stakeholders, thus stimulating the wider industry to initiate the process of reporting.

Finally, in an overarching conclusion (Part III, Chapter 6), the insights acquired in the previous chapters are combined with the objective to highlight the most important policy and managerial implications and to offer recommendations that are of interest to academics and policymakers alike. To conclude, the outcomes of this dissertation complement the existing literature on the adoption of sustainability initiatives both for the port sector and in general, while also providing some interesting future research paths. From a policy and managerial perspective, the outcomes can be used as basis for stimulating the adoption of more core-business-related sustainability initiatives.

All chapters entail different contributions to the scientific and practical knowledge on the subjects at hand, as illustrated in Table 1.1. In general, Chapters 2 and 4 present larger, more inductive stories with a theoretical angle as a basis. Chapters 3 and 5 take a more practical approach, presenting a number of actionable, ready-to-implement insights.

Table 1.1 - Structure of the dissertation and contribution of each chapter

|         | Structure                                                                                                                            | Research design                                                                                                                                   | Contribution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------|--------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PART I  | <b>Chapter 2:</b><br>Environmentally differentiated port pricing: the case of the Hamburg-Le Havre range                             | <i>Exploratory:</i> multiple cross-case study analysis of the practice of environmentally differentiated port pricing by 7 PMBs                   | <ul style="list-style-type: none"> <li>- A cross-case study of the rationale, motives and conditions of the implementation of environmentally differentiated port pricing schemes by PMBs</li> <li>- Literature review on the aspects that influence a PMB's environmental strategy and the PMB's pricing scheme strategy in particular</li> <li>- Critical reflection of the Environmental Ship Index as an environmentally differentiated port pricing scheme</li> <li>- Institutional Theory as a theoretical lens</li> <li>- Development of a template that is of value during the evaluation of sustainability practices in general</li> </ul> |
|         | <b>Chapter 3:</b><br>Tackling uncertainty in green pricing decision-making: the case of port infrastructure                          | <i>Conceptual:</i> development of a toolbox as an expedient for the implementation of the practice of environmentally differentiated port pricing | <ul style="list-style-type: none"> <li>- Development of a conceptual matrix for the identification of port profiles in the context of the practice</li> <li>- Development of a conceptual toolbox, in the form of a decision-tree, as a decision-aid tool during the process of choosing the effective format and implementation method for the practice of environmentally differentiated port pricing</li> <li>- Elaborated case studies including practitioner validation to prove the robustness and validity of the toolbox</li> <li>- Potential generic replicability of the methodology for other sustainability practices</li> </ul>        |
| PART II | <b>Chapter 4:</b><br>Determinants of sustainability reporting in the present institutional context: the case of port managing bodies | <i>Exploratory:</i> regression and non-parametric analysis based on survey data of a sample of 97 PMBs                                            | <ul style="list-style-type: none"> <li>- Survey on a global level</li> <li>- Identification of determinants / significant organizational characteristics of PMBs influencing the practice of sustainability reporting, by means of a regression analysis</li> <li>- Associations between determinants of sustainability reporting and the forces of Institutional Theory</li> </ul>                                                                                                                                                                                                                                                                 |
|         | <b>Chapter 5:</b><br>Sustainability reporting for inland port managing bodies: a stakeholder-based view on materiality               | <i>Exploratory:</i> descriptive analysis based on survey data from three important stakeholder groups (personnel, clients and broader society)    | <ul style="list-style-type: none"> <li>- Focus on a case study that had not yet begun to develop a sustainability report (ex-ante implementation phase)</li> <li>- First materiality analysis for an inland port</li> <li>- A multi-stakeholder perspective on the motives, format and content of a sustainability report</li> <li>- Discussion on the boundary-setting dilemma, i.e. determining the extent to which the responsibility of the PMB reaches</li> </ul>                                                                                                                                                                              |

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## **PART I**



## **CHAPTER 2**

### **ENVIRONMENTALLY DIFFERENTIATED PORT PRICING: THE CASE OF THE HAMBURG-LE HAVRE RANGE**

Geerts, M., Langenus, M., & Dooms, M. (2017). Environmental differentiated port pricing: the case of the Hamburg-Le Havre range. *International Journal of Transport Economics*, 44(4), 517-544.



**Abstract:** Contested industries have fallen under increased scrutiny of the public eye when it comes to their environmental performance. In particular, the transport industry is still considered as a major polluter. Therefore, stakeholders put pressure on the industry to work on their environmental footprint. Shippers assess whether their supply chain as a whole can be increasingly 'greened', given increasing environmental awareness from both customers (in B2B settings) and consumers (in B2C settings). Ports, as important nodes in transport networks, seek to respond to these pressures. However, the variety they exhibit in terms of geographical location, economic and political situation, governance structures and administrative heritage would suggest different preferences towards environmental initiatives. This chapter discusses the results of a multiple case study analysis, based on desk research and in-depth interviews with seven port managing bodies (PMBs) within the Hamburg-Le Havre range. The main goal was to investigate how PMBs respond to the challenge of 'greening' the shipping industry, in particular on the motives and rationale behind the set-up of pricing schemes, and what kind of institutional arrangements are instilled. From an Institutional Theory perspective, a high degree of isomorphism is observed in the Hamburg-Le Havre range, as these ports primarily focus on Environmental Ship Index (ESI) based bonus schemes for environmentally differentiated port infrastructure pricing. Managerial and policy implications/recommendations, based on the empirical results of the cross-case study, are formulated in order to increase the efficiency and effectiveness of the use of environmentally differentiated charging schemes.

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**Keywords:** port pricing; environmental charging; incentive schemes; corporate social responsibility; institutional theory; environmental management; Hamburg-Le Havre range.

## 2.1 INTRODUCTION

Similar to other large industrial operations generating substantial externalities, ports are now facing up to the environmental challenge and are actively seeking procedures to demonstrate their environmental responsibilities and their running of a safe and successful commercial operation (Bjerkan and Seter, 2019; Puig et al., 2015). In 2012, international shipping accounted for almost 800 million tonnes of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O, equivalent to 2.2% of global greenhouse gas emissions that year (International Maritime Organization (IMO), 2015). Furthermore, these levels were expected to increase dramatically, with growth estimations ranging between 50% and 250% by 2050 (European Commission, 2015). However, since the publication of these results, the IMO has been actively engaged in a global approach to combatting climate change and its impacts. It has already adopted mandatory measures to reduce greenhouse gas emissions from international shipping (under the IMO's pollution prevention treaty) and in 2018 it developed the 'IMO Initial Strategy'. This strategy envisages levels of ambition for the international shipping sector, in particular, among other things, a reduction of the total annual greenhouse gas emissions by at least 50% by 2050 (compared to 2008). In order to achieve this overall ambition, the IMO points out the need for technological innovation and the global introduction of alternative fuels and/or energy sources for international shipping. Furthermore, the IMO Initial Strategy also refers to the plans-of-action agreed upon during the 21<sup>st</sup> Conference of the Parties (COP21), confirming that the outlined pathway is consistent with the Paris Agreement temperature goals (IMO, 2020).

While in-port emissions account for a comparatively small percentage of total emissions from shipping, on the local level these emissions are significant and concentrated in and around the port area, and relate to ship operations while berthing (Dalsoren et al., 2009; Tzannatos, 2010; Whall et al., 2002). Port industry trade associations, such as the European Seaports Organization (ESPO) and the International Association of Ports and Harbors (IAPH), have thus identified controlling air pollution in ports as an important policy area (ESPO, 2003; IAPH, 2007; Tzannatos, 2010).

Recently, supply chain actors have increasingly begun to transfer the pressure from their end consumers throughout the supply chains. For multinational enterprises relying on global supply chains, their green image in terms of transport is dependent on the 'weakest link' in the supply chain, i.e. the node with the poorest environmental performance. Therefore, all supply chain stakeholders, including ports and shipping lines, may benefit from both vertically and horizontally coordinated initiatives towards more sustainable environmental performance (Ferretti et al., 2016), as, for example, research from the container industry has shown that air emissions on major routes have remained stable or increased in recent years (Acciaro and McKinnon, 2015). Ports are crucial nodes within the supply chain, considering that they account for the handling of 80% of world trade (Becker et al., 2013; Denktas-Sakar and Karatas-Cetin, 2012). Yet the quite unique governance structures, combined with the competitive situation of PMBs, make it difficult to exert influence on the environmental impact of supply chain activities in a port cluster over which they do not have full regulatory authority or control. It could be expected that PMBs may be naturally concerned about the environmental footprint of their port, given the public nature. Yet, recent evolutions in the industry have turned these organizations to increasingly act as private actors, such as the Port of Rotterdam since 2004, leading to a more hybrid character and various degrees of ambivalence (van der Lugt et al., 2013; Verhoeven, 2010a; 2010b). Therefore, contractual but foremost collaborative arrangements are sought in order to deliver value to customers as well as stimulate environmentally responsible behavior (e.g. through concession agreements with

environmentally oriented objectives). Some initiatives have emerged through collaboration with stakeholders such as, among others, onshore power supply (OPS), clean trucking initiatives, green multimodal connections towards the port hinterland, etc. (Lam and Van De Voorde, 2013).

The European Commission (EC) is convinced that ports and PMBs are able to provide incentives to the shipping industry in order to encourage it to perform its maritime operations in a more environmentally friendly way (ESPO, 2014). One of the applied incentives is environmentally differentiated port infrastructure pricing, with reference to environmental performance, meaning that shipping lines are able to reduce their total port dues if the ships comply with certain conditions of environmental friendliness. Although the literature shows that the domain of ports' environmentally friendly behavior and research on the variety of tools available to PMBs are of increasing interest (Acciaro, 2015; Lam and Notteboom, 2014), only one paper to our knowledge (Bergqvist and Egels-Zandén, 2012) approaches this topic from the specific point of view of environmentally differentiated pricing structures. The paper examines how the concept of environmental charging schemes can also be used for internalization of external costs related to hinterland transport.

For this chapter, environmental charging/incentive schemes and their characteristics initiated in the seaports of the Hamburg-Le Havre range have been analyzed through a multiple case study approach in order to establish clarity in terms of the rationale and implications of the implementation of such schemes. In other words, we investigated the 'what' (characteristics of the port and implemented incentive scheme(s)), the 'why' (motivational drivers) and the 'how' (means of implementation) behind the implementation of the sustainability initiative of 'environmentally differentiated charging schemes'. The next section provides a literature review on the aspects that influence a PMB's environmental strategy and - more specifically - the PMB's pricing schemes. Furthermore, an Institutional Theory lens has been adopted to obtain insights as to how environmentally differentiated charging schemes have developed and spread throughout the industry, in order to develop conclusions, strategic and policy recommendations for increased micro-, meso- and /or macro-impacts. Institutional Theory has been applied in several studies to observe the diffusion of corporate social responsibility (CSR) practices and to understand its cross-national variations (Blasco and Zolner, 2010; Brammer et al., 2012; Gjölborg, 2009; Jackson and Apostolakou, 2010). In Section 2.3, the methodology adopted is described, after which the actual cross-case analysis is presented in the subsequent section (Section 2.4). Section 2.5 includes a discussion of the results, and Section 2.6 elaborates on some relevant strategic and policy implications and recommendations. Finally, in Section 2.7, conclusions, limitations and recommendations for future research are provided.

## 2.2 LITERATURE REVIEW

### 2.2.1 *Port governance*

Devolution has influenced the governance structure of PMBs over recent decades (Brooks, 2004; Juhel, 2001), leading to increasing managerial autonomy for PMBs, ranging from fully privatized variants (e.g. Portonave in Brazil) to fully public organizations (e.g. Valenciaport) (Talley, 2009; Verhoeven, 2010b). In general, nowadays, most PMBs are hybrid organizations, as they pursue private-organization-like goals (commercial and financial interests) while simultaneously regulating the behavior of private companies active within the boundaries of the port area (land and basic seaport infrastructures such as docks, quay walls, roads) as a

public body through various legal and financial instruments, of which pricing is one (Acciaro, 2013; Baird, 2000; Brooks, 2004; Juhel, 2001).

The mixture of public and private characteristics of PMBs embodies at the same time a regulatory concern regarding competition, as it is unclear to what extent antitrust rules apply, since these rules are only in force for businesses associated with economic activities. In other words, are ports to be considered as 'private' or 'public' bodies when it comes to pricing? Today, all distortions of competition under e.g. European Union (EU) competition laws are dealt with on a case-by-case basis. Moreover, in a number of cases the issue is handled by the national competition authority (OECD, 2011a). The European Parliament is attempting to agree on new legislative measures, under the form of a Regulation, in order to establish a framework on financial transparency for ports and market access for port services, and with the aim of protecting port operators against legal uncertainties and unfair competition (European Parliament, 2016).

Regardless of the wide range of variations exhibited in terms of ownership and degree of autonomy, a PMB's activities can be divided into four basic functions: landlord, operator, regulator and community manager (Baird, 2000; Brooks, 2004; Verhoeven, 2010b). The latter of these refers to the changing identity of port communities (Verhoeven 2010b) and the need for PMBs to better manage stakeholder relationships (Acciaro, 2015; Doods, 2010). Today, port development is increasingly dependent on approval from both customers and users on the one hand, and the local communities and the public opinion on the other (Acciaro, 2015; Doods, 2010). According to the industry itself, on a European level, the Green Guide of ESPO (2012) states that ports can only secure their 'license to operate' and future development if they devote enough attention to sustainability, especially environmental protection.

Financial capability<sup>2</sup>, according to Verhoeven (2010a), is also one of the essential factors defining a port's governance structure, apart from the degree of autonomy. Verhoeven (2010a) states that in practice, financial capability influences a PMB's trade-off between occupying a mere conservative position and/or fulfilling a more entrepreneurial role. Moreover, it is regarded as one of the decisive factors in ascertaining the level of port performance. In line with this thought, we argue that the elements defining financial capability will also play an important role in the extent to which a PMB is willing, or even able, to achieve a high level of environmental performance. The same is valid for the issue of autonomy of management, and, more particularly, the autonomy in price setting at the individual port level, as a higher degree of autonomous decision-making might also increase the financial capability to introduce, for example, incentive schemes rewarding users' superior environmental performance (see also *infra*, Section 2.2.3).

### 2.2.2 Port environmental management

In modern society, most large industry domains are confronted with diverse environmental challenges. For the port industry, new and evolving legislation places extra pressure on the attempts of PMBs to strike a balance between facing their environmental responsibilities and the associated responses, and at the same time running a commercial operation (Wooldridge

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<sup>2</sup> "Financial capability combines an organization's *ability to act* with their *opportunity to act*" (p.3). In other words, the concept of financial capability links the domains of economics, psychology, and sociology. For a PMB to be financially capable, it should not only be financially literate, i.e. have a feeling of financial responsibility, but it must also have access to sufficient financial resources that allow the PMB to act in its best financial interest (Sherraden, 2013).

et al., 1999). According to a study carried out by the OECD (2011b), the negative environmental impacts related to port areas can be divided into three categories: (i) issues related to port activity, (ii) issues caused at sea by ships, and (iii) emissions from intermodal transport. Evidently, only the first category falls more or less under the direct responsibility of the PMB, as it is restricted to the port area (both land and water surface) and its immediate vicinity.

Several studies, such as, among others, those of the IAPH Committee on Port and Ship Safety (1989), Comtois and Slack (2007), Darbra et al. (2009) and ESPO (2013), have focused on methods to identify, or have identified, the environmental issues with the highest priority. For the purpose of this research, a focus is placed on those issues identified by ESPO through the 2013 Ecoports survey, i.e. noise, air quality, waste, dredging, relationship with local community, energy consumption, dust, port development (water), port development (land). The extent to which these issues are prioritized in the different ports depends on a port's physical characteristics, commercial activities and the proximity to urban areas (ESPO, 2012; Wooldridge et al., 1999). Given the diversity of environmental issues to be considered, and the inherent geographical and functional differences between ports, implications are to be expected regarding the type and the focus of the integration of environmental parameters in port infrastructure pricing schemes.

Due to this variety of environmental conditions, the port sector has a hard time developing a harmonized approach to the demands of environmental protection (Wooldridge et al., 1999). The lack of data availability and reliability, and differences in methodologies applied in collecting the data (Darbra et al., 2009), further increase the level of complexity of determining harmonized industry-level information, and of developing harmonized industry-level products and services. PMBs and other port-related organizations acknowledged that only concerted efforts could make a difference in terms of environmental protection. Therefore, many associations (e.g. IAPH, European Community Shipowners' Associations (ECSA), etc.) have prioritized this issue upon their agendas. Also, new initiatives like indexes and certifications that could be applied on a global scale have arisen in the last few years (e.g. ESI<sup>3</sup>, Green Award<sup>4</sup>, etc.), most of them as a result of collaboration between different PMBs.

However, to be able to manage the environment, be it as an industry or an individual port, monitoring and mapping strategies are needed, and for their creation, an improved understanding of the environmental framework of the port (Darbra et al., 2009; Wooldridge et al., 1999). It is not only insights into the status quo of the port area that are needed, but also insights into linkages, causes, trends and evolutions. This implies that it is of crucial importance that an environmental monitoring system is based on historical and present information, and that a scientifically sound approach is applied to provide baseline data, to set targets, and to develop an ongoing program in order to ensure a successful execution of the environmental responsibilities (Wooldridge et al., 1999). PMBs should implement a proactive approach regarding their environmental initiatives in order to be able to anticipate possible future challenges (Adams et al., 2009; McKinnon et al., 2015). Hence, various difficulties in terms of monitoring are to be expected given the merely economic nature of the instrument (i.e. pricing schemes) when considering the environmental impact and the causality thereof.

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<sup>3</sup> Information about the Environmental Ship Index (ESI) and participating ports can be found at <https://www.environmentalshipindex.org>.

<sup>4</sup> Information about the Green Award and participating ports can be found at <https://www.greenaward.org>.

### 2.2.3 *Port pricing*

The well-known diversity of the port sector (degree of freedom, financial capability, geographical location, etc.) is also rooted in its daily financing and pricing practices (Haralambides et al., 2001). Although the general ideas behind scaling factors used for price differentiation, such as gross tonnage (GT), are shared between PMBs (Wilmsmeier, 2012), no common regulation exists regarding the practical implementation of port charges for port users in the EU (Institute of Shipping Economics and Logistics (ISL), 2006). In other words, at least in the EU, each PMB is individually responsible for its pricing structure and free to determine the absolute level of the charges, albeit subject to various degrees of autonomy in decision-making procedures and regulations, often imposed by national or regional legislation. For example, some publicly owned ports are able to rely on state aid, unlike ports with a more commercial identity that are forced to work within an environment where charges need to be designed with full cost recovery in mind (Strandenes and Marlow, 2000). Achieving a fairly high degree of cost recovery for the costs for which the PMB bears responsibility is an important management objective. Moreover, this principle is essential if port prices need to reflect the costs of negative external effects, i.e. include marginal social costs (Haralambides et al., 2001).

More recently, in light of climate change, substantial attention has been devoted to the environmental objective, and environmental incentives have permeated the traditional pricing structure of many PMBs, e.g. environmentally differentiated port infrastructure charges (Acciaro, 2013). However, given that port dues reflect only a relatively small share of overall door-to-door transport costs of maritime traffic (Strandenes and Marlow, 2000; Wilmsmeier, 2012), one could expect that an environmentally differentiated pricing incentive might be too weak to drastically alter shipping lines' behavior. In this context, the incentive should be seen as one of many steps in a process of encouraging behavior favoring a greener economy at the local and user level (Wilmsmeier, 2012).

Another area that should be investigated is that of market-based pricing, as PMBs seek to possess comparative advantage vis-à-vis ports located in the same region or range. Higher levels of efficiency and minimization of costs are necessary in order to be able to lower a PMB's charges (Acciaro, 2013; Baird, 2000). Therefore, we intend to explore whether this element is also present in the strategy of environmentally differentiated port pricing.

### 2.2.4 *Port corporate social responsibility*

In response to the increased scrutiny of society at large of the environmental impacts of transport, PMBs have started to develop green CSR strategies (Acciaro, 2013). In the context of our research, the costs linked to a damaged reputation are believed to be higher than the costs of green port dues (Bergqvist and Egels-Zandén, 2012). Environmentally differentiated charging can thus be seen as a sort of marketing strategy for ports to portray themselves as green nodes in global supply chains. As Acciaro (2013, p.213) rightfully states, seaports are not only embedded in a "*local normative and social context, but at the same time need to maintain an international focus*". Given the multiple stakeholders involved, a balance between economic and environmental objectives needs to be sought. Therefore, insights into whether the economic or the environmental criteria prevail in the context of port pricing strategies, and how stakeholders are included in the decision-making, remains an issue to be explored.

Although it would be expected that the public or 'hybrid' nature of most PMBs (Brooks, 2004; Verhoeven, 2010a), combined with the voluntary nature of corporate responsibility (Carroll, 1999), would make CSR practices more of an expected objective for PMBs to invest in, setting an example to society (Acciaro, 2013; Dentchev and Haezendonck, 2015), it seems to be not quite so self-evident. As PMBs differ in their governance structures, they likewise vary tremendously regarding their degree of adoption of CSR initiatives (Acciaro, 2013), i.e. world regions differ in terms of challenges to address (Schulte et al., 2016). In sum, the rationale for the adoption of green charging needs to be investigated closely, i.e. do PMBs adopt green pricing as a proactive or a reactive approach, or merely as a way to comply with societal expectations, i.e. a more 'accommodative' approach?

#### 2.2.5 Institutional Theory

Institutional Theory has been applied in several studies to observe and analyze the diffusion and variations of CSR initiatives in different countries (Blasco and Zolner, 2010; Brammer et al., 2012; Gjölborg, 2009; Jackson and Apostolakou, 2010). Institutional Theory considers, as defined by Scott (2005, p.460):

*"The processes by which structures, including schemas, rules, norms and routines become established as authoritative guidelines for social behavior. It inquires into how these elements are created, diffused, adopted and then adapted over time and space: and how they may fall into decline and disuse."*

Institutional Theory has, to our knowledge, been applied once by Acciaro (2015) as a framework to describe the adoption of CSR practices in the port sector. As the author rightfully states, Institutional Theory is a fitting theoretical lens to describe the distribution of CSR practices in the ports industry, since the theory unravels how acceptable social behaviors are instilled in and dispersed throughout a network, an industry, or a geographical area. Translated to the purpose of this chapter, Institutional Theory could explain why PMBs adopt certain green initiatives and, more specifically, environmentally differentiated charging. The phenomena of legitimacy and isomorphism are key concepts within Institutional Theory, and are defined respectively by why and how different organizations adopt similar practices. Legitimacy, and its implications for organizational success and survival, acts as the trigger for the adoption of similar behavior or practices by its competitors or other comparable organizations, as the organization wishes to conform to social expectations (Acciaro, 2015; DiMaggio and Powell, 1983; Lu and Koufteros, 2014; Zucker, 1987). DiMaggio and Powell (1983) and other recent studies (Heugens and Lander, 2009; Lu and Koufteros, 2014; Scott, 2005) have defined four types of isomorphism: coercive, mimetic, normative and competitive.

Coercive isomorphism is the instilling of practices by organizations resulting from formal and informal pressure from governments, or even from other stakeholders that influence an organization, such as powerful customers (Acciaro, 2015; Lu and Koufteros, 2014). In the case of the port industry, such stakeholders include shipping lines, terminal operators, cargo interests, transport service providers and shippers. The recent trend of 'greening' the supply chain exerts heavy coercive pressures on every node of the chain, as one actor has an influence on the reputation of other involved actors. Implementing the necessary CSR strategies will help ports to stay competitive in this new framework (Acciaro, 2015). The IMO international standards and defined NO<sub>x</sub> areas are examples of coercive pressures levied by governmental institutions.

Mimetic isomorphism relates to the adoption of similar practices that have been applied by successful actors within an industry (Lu and Koufteros, 2014). PMBs adopt highly similar CSR practices (Acciaro, 2015), although their previously stated governance structure differs. This is due to the fact that (i) within their different local contexts, ports are in reality faced by very similar general environmental and social issues, (ii) ports benchmark in order to overcome the uncertainty and bounded rationality, especially because certain ports (usually smaller or medium-sized ports) do not possess the slack resources to investigate which practices would be most efficient or effective (Lu and Koufteros, 2014). If the absence of environmental monitoring systems is significant, mimetic isomorphism is expected to be more prevalent. Such mimetic pressure has for example led to the institutionalization of the landlord model (Acciaro, 2015).

The means by which corporations obtain their pool of professional skills and build up their level of specialization through consultants, experts or advisors is associated with normative isomorphism (Acciaro, 2015; DiMaggio and Powell, 1983). The rationale is that the experts are trained through the same programs and that only a limited set of consultants exists, which logically leads to similar advice and thus the instilling of similar practices (Acciaro, 2015).

The final type is competitive isomorphism, which relates to the need to continuously improve the level of operational efficiency (Acciaro, 2015; DiMaggio and Powell, 1983). As competition becomes fiercer, organizations seek to adopt practices that lead to superior performance. Many CSR strategies can be used to accomplish this goal, e.g. the use of Liquefied Natural Gas (LNG) as fuel for port operations and ships (Acciaro, 2015).

For the case studies at hand, we investigate whether the decisions of the PMBs regarding environmental charging were indeed the subject of one or other form of isomorphism.

## 2.3 METHODOLOGY

For the purpose of this chapter, a multiple case study analysis has been conducted, including primary data obtained from seven PMBs (Port of Amsterdam, Antwerp, Bremen, Hamburg, Le Havre, Rotterdam, Zeebrugge). The case study method allows the addressal of a wide range of 'how' and 'why' questions about contemporary phenomena in a real-life context (Yin, 2009). It is particularly useful when organizational and managerial processes, including decision-making, need to be studied in a more in-depth manner. Also, it allows one to capture and encompass more of the elements of complex social problems than other research methods (Yin, 2009). As the topic of environmentally differentiated pricing, in particular choice, motives, decision-making processes and (inter-)organizational arrangements, is a complex phenomenon, as evidenced by the literature review, we believe this research method fits the objectives of the research. With regard to the number of cases needed to conduct comparative case-based research, we are within the boundaries of the principles put forward by Eisenhardt (1989), i.e. between four and ten case studies.

The Hamburg-Le Havre range has been selected for an analysis of the phenomenon of green charging and pricing schemes. According to traffic volume, this set of ports is the most significant range on the European continent, containing a number of both larger and smaller/medium-sized ports in fierce competition within various traffic segments. Furthermore, all the ports in this range are located within the North-West European region, one of the most densely populated areas in the world, and thus historically subject to

important stakeholder pressure and conflict, as evidenced by the delays encountered during the realization of several port expansion projects since the 1990s as a result of environmental issues.

The data were collected in the period between June 2015 and December 2015. First, during the month of June 2015, an exploratory interview took place with three experts from one of the major ports in the Hamburg-Le Havre range about the results of a web-based survey and desk research. Based on this interview and the literature review, a semi-structured questionnaire was constructed, consisting of 13 major questions to obtain information on:

- A short description of the economic, social, political and environmental context of the port;
- Detailed structures of charging schemes applied at the port, with particular attention paid to infrastructure charging schemes aimed at reducing external environmental costs; this included the rebates on port dues based on existing indexes or other metrics developed by PMBs;
- The motives and rationale behind the set-up of the scheme, as well as the internal decision-making process (e.g. the level of stakeholder inclusion);
- Specific details on the financial dimension of the scheme, as well the administrative and organizational impact on the PMB;
- Data and insights on the effectiveness of the charging scheme in terms of reduction of environmental impacts (e.g. air quality, water quality, congestion, noise, etc.);
- Perceived impacts of the charging scheme upon stakeholders.

Secondly, face-to-face meetings with seven PMBs were conducted in the period September 2015 – December 2015. Interviews were typically attended by two to four experts from the PMB, involving experts from the environmental, commercial, finance, strategy, harbor master and, if existing, the CSR department, given the multidisciplinary nature of the issue. This also confirmed the observations of the literature review in terms of the potentially conflicting objectives within the PMB, as we did not explicitly ask for a multidisciplinary set-up at the outset. Interviews were not tape-recorded, given the sensitive and confidential nature of some information (e.g. on commercial strategies), and to create a climate of maximum trust between interviewers and respondents. Following the interviews, which generally lasted between 1.5 and 2 hours, reports were written with an average length of about 3,000 words, based on the integration and triangulation of interview notes, previous desk research, and documents provided by the respondents. These reports were then shared with the respective respondents to be complemented by additional quantitative and qualitative information. Telephone and e-mail follow-ups were performed to obtain additional insights and clarification in the case of missing or unclear information.

## 2.4 CASE STUDIES

### 2.4.1 *Cross-case study*

Based on the literature review, our investigation/attention during the interviews was focused on receiving the necessary responses on the following elements:

Port governance:

- The impact of the degree of autonomy of the PMB on the operation of a pricing scheme;
- The influence of financial capability.

Port environmental management:

- Diversity of environmental issues and the link to the pricing scheme;
- Monitoring of the pricing scheme;
- Bureaucratic and transaction costs and full-time equivalents (FTE) involved in the operation of the scheme and its monitoring.

Port charging and pricing:

- The integration of both market and environmental objectives in the pricing scheme.

Port CSR:

- Green pricing as a marketing/image tool;
- Motives of adoption of environmentally differentiated pricing schemes;
- Inclusion of stakeholders in the decision-making around green pricing schemes;
- Balance between economic (market, financial) and environmental objectives.

Institutional Theory:

- Impact of the institutional environment on adopted strategies (various forms of isomorphism).

The data and insights collected through the interviews were subsumed into seven large aspects that allow for a comprehensive picture and comparison. Table 2.1 summarizes the findings of the seven case study ports. The symbols used in Table 2.1 are the following:

|     |                    |
|-----|--------------------|
| ++  | Very present       |
| +   | Moderately present |
| 0   | Not present        |
| /   | Not applicable     |
| N/A | Not available      |

Table 2.1 – Cross-case analysis

| Table 2.1 – Cross-case analysis |                                     |                                                       |                                                              |                                                        |                                                                                                                                               |                                                                                                                                                          |                                                                                                                                                                 |                                                                                                                                          |
|---------------------------------|-------------------------------------|-------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | Hamburg – Le Havre port range       | ANTWERP                                               | ZEEBRUGGE                                                    | ROTTERDAM                                              | AMSTERDAM                                                                                                                                     | LE HAVRE                                                                                                                                                 | HAMBURG                                                                                                                                                         | BREMEN / BREMERHAVEN                                                                                                                     |
| CHARACTERISTICS                 | Type of port                        | River                                                 | Coastal                                                      | Coastal/river                                          | River                                                                                                                                         | Coastal/river                                                                                                                                            | River                                                                                                                                                           | Coastal/river                                                                                                                            |
|                                 | Located in or near large urban area | YES                                                   | NO                                                           | YES                                                    | YES                                                                                                                                           | Limited interference                                                                                                                                     | YES                                                                                                                                                             | YES                                                                                                                                      |
|                                 | Located in SECA area                | YES                                                   | YES                                                          | YES                                                    | YES                                                                                                                                           | YES                                                                                                                                                      | YES                                                                                                                                                             | YES                                                                                                                                      |
|                                 | Ownership / governance model        | Municipality / Autonomous company                     | Municipality / Autonomous company                            | Municipality & state / Autonomous company              | Municipality / Autonomous company with a separate department for the harbor master                                                            | State-owned establishments                                                                                                                               | Municipality (City-state of Hamburg)                                                                                                                            | Municipality (City of Bremen)                                                                                                            |
|                                 | Total revenue (€ - 2014)            | 338,406,000                                           | 69,436,143                                                   | 660,000,000                                            | 142,400,000                                                                                                                                   | 173,210,000                                                                                                                                              | 176,202,531                                                                                                                                                     | 27,417,000                                                                                                                               |
|                                 | Total cargo (tonnes - 2014)         | 199,012,082                                           | 45,000,000                                                   | 444,700,000                                            | 79,800,000                                                                                                                                    | 67,592,820                                                                                                                                               | 145,700,000                                                                                                                                                     | 78,200,000                                                                                                                               |
|                                 | Dominant cargo                      | - Containers<br>- Liquid bulk<br>- Conventional goods | - LNG<br>- Short sea RoRo<br>- LoLo containers               | - Containers<br>- Dry bulk<br>- Liquid bulk            | - Liquid bulk<br>- Dry bulk<br>- Cruise                                                                                                       | - Liquid bulk<br>- Containers                                                                                                                            | Containers                                                                                                                                                      | Bulk<br>- Container<br>- General cargo<br>- Cars                                                                                         |
|                                 | Presence of industry                | ++                                                    | 0                                                            | ++                                                     | +                                                                                                                                             | +                                                                                                                                                        | ++                                                                                                                                                              | ++                                                                                                                                       |
|                                 | Dominant industry                   | Petrochemical                                         | /                                                            | Petrochemical + Bio based                              | Energy (coal & gas)                                                                                                                           | Energy                                                                                                                                                   | /                                                                                                                                                               | Offshore wind                                                                                                                            |
|                                 | Relevant environmental aspects      | - Air quality<br>- Waste                              | - Air quality<br>- Noise<br>- Land use & nature conservation | - Air quality + odor<br>- Noise<br>- Nature<br>- Waste | - Air quality + odor<br>- Waste<br>- Efficient energy-use                                                                                     | - Land use & nature conservation<br>- Water quality<br>- Air quality<br>- Waste<br>- Noise                                                               | - Air quality<br>- Noise<br>- Nature<br>- Waste                                                                                                                 | - Air quality<br>- Noise<br>- Nature<br>- Sediments<br>- CO <sub>2</sub> saving                                                          |
| Focus strategy                  | Air quality                         | Waste                                                 | - Air quality<br>- Noise                                     | Air quality                                            | Land use & nature conservation                                                                                                                | N/A                                                                                                                                                      | Air quality                                                                                                                                                     |                                                                                                                                          |
| ENVIRONMENTAL STRATEGY          | Autonomous tariff setting           | YES                                                   | YES                                                          | YES                                                    | YES                                                                                                                                           | YES (budget is fixed, but system behind division of it is autonomous decided)                                                                            | Responsibility lies with the Supervisory Board                                                                                                                  | YES                                                                                                                                      |
|                                 | Environmental Ship Index (ESI)      | YES (10%, if score ≥ 31 points)                       | YES (10%, if score ≥ 30 points)                              | YES (10%, if < 31 points)                              | YES (variable % depending on gross tonnage -> 1 <sup>st</sup> reduction if score ≥ 20 points, 2 <sup>nd</sup> reduction if score ≥ 31 points) | YES, but only applied to the top 10 shipping lines with a maximum rebate of 10% (score ≥ 31 points)                                                      | YES (differentiated discounts based on ESI scores)                                                                                                              | YES (15%, if score ≥ 40 points)<br>The rebates are applied per call and only 25 ships with the best ESI score will receive the discount. |
|                                 | Green Award                         | NO                                                    | NO                                                           | YES                                                    | YES                                                                                                                                           | NO                                                                                                                                                       | YES (3% discount on port dues for product and chemical tankers, crude oil, LNG carriers)<br>YES (Blue Angel Award)                                              | NO                                                                                                                                       |
|                                 | Additional environmental schemes    | YES (incentive scheme on fine particles)              | NO                                                           | YES (20%, if LNG fuel / large catalysts)               | NO                                                                                                                                            | - Rebate on concession fees regarding container traffic, if modal shift objective is realized<br>- Rebate related to transshipment of containers via SSS | 2% rebate / port power discount scheme 15% discount on the GT portion of port fees / LNG fuel scheme 15% rebate on port fees - Blue Angel Award and LNG Scheme) | Incentives for LNG-ships (1st year 30%, 2nd year 25%, 3rd year 15%)<br>Ships with dual fuel half of the rebate.                          |

|                          |                                                                         |                                                                                                                                                                                                                                                                        |                                                                                                            |                                                                                                              |                                                                                                                                                                                  |                                                                                                                                                          |                                               |                                                                                                         |
|--------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------------------------|
| DECISION-MAKING PROCESS  | Start date of use                                                       | ESI: 2011<br>Other: 2015                                                                                                                                                                                                                                               | 2012                                                                                                       | ESI: 2011<br>Green Award: 2013                                                                               | ESI: 2011<br>Green Award sea-going ships: 2003<br>Green Award Inland vessels: 2015                                                                                               | 2012                                                                                                                                                     | ESI: 2011<br>Green award: 2014<br>Other: 2015 | ESI: 2012<br>LNG: 2016                                                                                  |
|                          | Part of the ESI working group                                           | YES                                                                                                                                                                                                                                                                    | YES                                                                                                        | YES                                                                                                          | YES                                                                                                                                                                              | YES                                                                                                                                                      | YES                                           | YES                                                                                                     |
|                          | Focus on certain market segment                                         | NO                                                                                                                                                                                                                                                                     | YES (focus on short sea shipping)                                                                          | NO                                                                                                           | NO                                                                                                                                                                               | YES (focus on car carriers & containers)                                                                                                                 | NO                                            | N/A                                                                                                     |
|                          | Motivation implementation                                               | – European level: World Ports Climate Conference 2008<br>– National level: action plan on fine particles and NO <sub>x</sub> in the Port of Antwerp and the city Antwerp - 2008<br>– Pressure stakeholders<br>– Promotion of port<br>– Neighboring ports were applying | – Pressure of governments<br>– Need of collaboration of ports to make an impact<br>– Image to stakeholders | – European level: World Ports Climate Conference 2008<br>– Green image<br>– Neighboring ports make use of it | – European level: World Ports Climate Conference 2008<br>– Green image to stakeholders                                                                                           | – European level: World Ports Climate Conference 2008<br>– Independence of participating ports in the application<br>– simplicity and dynamic initiative | N/A                                           | ESI: Enhancing the environmental performing of ships<br>LNG: Support for a faster implementation of LNG |
| FINANCIAL ASPECTS OF ESI | Proof of environmental certificate responsibility                       | Port                                                                                                                                                                                                                                                                   | Port                                                                                                       | Port                                                                                                         | Shipping line / Shipping agent                                                                                                                                                   | Shipping line & port (environmental charter)                                                                                                             | Port                                          | Shipping line                                                                                           |
|                          | Departments involved                                                    | Environmental + Financial                                                                                                                                                                                                                                              | Environmental + commercial + financial                                                                     | Environmental + commercial + port user association                                                           | CSR + commercial + harbor master                                                                                                                                                 | Environmental + commercial + financial                                                                                                                   | Financial + legal + environmental             | N/A                                                                                                     |
|                          | Main decision-maker                                                     | Board of Directors + Executive Committee                                                                                                                                                                                                                               | Financial                                                                                                  | Commercial                                                                                                   | Commercial                                                                                                                                                                       | Management board based on proposal from commercial and environmental divisions                                                                           | Management                                    | Senator for Economic Affairs, Labor and Ports                                                           |
|                          | Fixed/variable budget                                                   | Variable                                                                                                                                                                                                                                                               | Variable within range                                                                                      | Variable                                                                                                     | Variable                                                                                                                                                                         | Fixed                                                                                                                                                    | Variable (up to a certain limit)              | N/A                                                                                                     |
| FTE & MONITORING         | Total amount of rebates                                                 | ± € 500,000                                                                                                                                                                                                                                                            | Confidential                                                                                               | Confidential                                                                                                 | € 135,000                                                                                                                                                                        | € 100,000                                                                                                                                                | N/A                                           | N/A                                                                                                     |
|                          | % of total port dues                                                    | 0.5% - 1%                                                                                                                                                                                                                                                              | Not disclosed (confidential)                                                                               | < 1%                                                                                                         | ± 0.5%                                                                                                                                                                           | 0.2% - 0.5% of the ship dues (= ship related charges, volume related charges)                                                                            | N/A                                           | N/A                                                                                                     |
|                          | Number of calls under ESI / number of calls of sea-going vessels (2014) | 501 / 14,009                                                                                                                                                                                                                                                           | N/A                                                                                                        | 1,712 / 25,393                                                                                               | 633 / 4,927                                                                                                                                                                      | N/A                                                                                                                                                      | N/A                                           | 445 / 2,045                                                                                             |
|                          | Total FTE resources per year                                            | Ca. 0.5 FTE                                                                                                                                                                                                                                                            | Ca. 0.5 FTE                                                                                                | Ca. 1 FTE                                                                                                    | 0.2 – 0.3 FTE                                                                                                                                                                    | Ca. 0.5 FTE                                                                                                                                              | N/A                                           | N/A                                                                                                     |
| SSS                      | Main dimension of monitoring                                            | Financial, incl. # ships & total amount of rebates                                                                                                                                                                                                                     | Financial, incl. # ships & total amount of rebates                                                         | Financial + Environmental                                                                                    | No monitoring but reflecting upon future measures and KPI's. And within the ESI working group; experts of Le Havre are contributing to an environmental impact assessment module | No monitoring, but within the ESI working group; experts of Le Havre are contributing to an environmental impact assessment module                       | N/A                                           | N/A                                                                                                     |
|                          | Structural evaluation                                                   | Quarterly reporting to Executive Committee + monitoring                                                                                                                                                                                                                | Yearly ad-hoc adaptations                                                                                  | Permanently monitoring of changes in the ship portfolio                                                      | No reporting to Executive Committee                                                                                                                                              | Yearly reporting to the Management Board                                                                                                                 | N/A                                           | N/A                                                                                                     |
|                          | Dedicated tariff structure and/or rebate within general tariffs         | Dedicated tariff structure                                                                                                                                                                                                                                             | Dedicated tariff structure and rebate                                                                      | Dedicated tariff structure                                                                                   | Dedicated tariff structure and extra waste rebate                                                                                                                                | Dedicated tariff structure, but rebate related to transshipment of containers via SSS                                                                    | Dedicated tariff structure                    | Dedicated tariff structure                                                                              |

## 2.5 DISCUSSION OF THE RESULTS

### 2.5.1 *Port governance*

The general characteristics of the seven ports show that the geographically based approach of port management and ownership developed by Suykens and Van de Voorde (1998) is valid. Almost all ports share the 'Hanseatic' governance culture, as they fall under local municipal management but act at the same time as an autonomous company. There is one exception to this rule, i.e. the Port of Le Havre, which falls under central governmental control. As a result, the operation of the scheme is held outside the actual pricing formulas, which are subject to approval from higher regulatory bodies. More particularly, the incentive is not handled through the invoicing system, but rather via a fund distributed at the end of every fiscal year. The other PMBs make use of a variable budget, which means that their schemes are open for adjustments during the year. The budget earmarked for a scheme is generally the result of a learning-by-doing process.

Although the ports do not have significant differences regarding governance structure, with the exception of Le Havre, they vary from each other regarding the other descriptive characteristics, e.g. size, specialization and geographic location. These differences influence the format of implementation, i.e. budget allocated for total annual rebates, categories and numbers of eligible vessels, but do not have a real tangible effect on the rationale of having an environmentally differentiated charging scheme in the first place. As stated by Verhoeven (2010a), financial capability has an effect on how a PMB wants to assert itself, ranging from a mere conservative player to fulfilling an entrepreneurial role, which has a certain impact upon the level of port performance. The Port of Rotterdam, as the largest port within the sample, is more keen to set an example for others compared to the smaller ports that limit the yearly number of rebates (e.g. Le Havre, Zeebrugge). At the same time, Rotterdam, like Zeebrugge, did not want to reveal the total amount distributed, although in both cases there is a different rationale behind this decision. As the Port of Rotterdam applies a very business- and profit-oriented approach, it considers such detailed financial information as confidential and part of its competitive advantage. For the Port of Zeebrugge, the rebates budget varies considerably due to a learning-by-doing approach, yet it is supposed to stay within a certain range for a given year. In general, the scheme in itself is not the main driver of the environmental strategy, given the multiple projects the PMB is involved in. As a result, the PMB chooses not to disclose the total amount of the budget (or the % of total revenue or port dues) foreseen for the scheme on an annual basis (also because it is not stable).

Finally, one has to consider the relatively small financial revenue basis of PMBs, where investments have to be covered, as well as personnel costs. As a result, the total amount for rebates will remain limited, in order to prevent endangerment of the financial stability of the organization.

### 2.5.2 *Port environmental management*

The list of relevant environmental aspects a port has to deal with consists, in a majority of the investigated ports, of the following issues: air quality, waste, noise levels, land conservation,

odors, and efficient energy use.<sup>5</sup> While the primary focus remains that of air quality for most of the case study ports, the concrete interpretation behind the term ‘air quality’ has shifted from more global objectives (CO<sub>2</sub> reduction) to more local issues (pollutants harming the local community's well-being, such as NO<sub>x</sub> and fine particulate matter (PM)). Environmental incentive schemes are intended to stimulate the idea of ‘greening the fleet’, not only regarding CO<sub>2</sub> emissions but especially regarding specific maritime-related emissions harming the local community's health and well-being, e.g. PM, NO<sub>x</sub>. In other words, there is a tendency to incorporate pollutants with a local impact in environmentally differentiated pricing schemes to a greater extent. Some PMBs (i.e. Antwerp, Bremen, Hamburg, Rotterdam and Le Havre) even make use of ‘add-on’ features to the basic scheme, e.g. offering a rebate for the use of LNG fuel.

In terms of measuring and monitoring the impact of the schemes, we observe that such a proactive approach is not yet rooted into the operational management of the ports. It seems that the PMBs are - in the main - fully aware of the financial aspect, but contrarily have little insight into the environmental impacts of differentiated charging. The larger ports among the sample, i.e. Rotterdam and Antwerp, indicated that they report and follow up the financial aspects (e.g. amount of rebates given in a certain period) and descriptive characteristics (e.g. amount of eligible vessels that called the port) of the scheme on a permanent basis, unlike Zeebrugge, which does not possess the slack resources to maintain records of all those data on a permanent basis, and consequently applies an ad-hoc approach. Furthermore, Rotterdam is the only port in the sample that has an environmental monitoring mechanism in place; analytical exercises on potential impacts exist (results are not public), but even then results are limited. The lack of important and useful data seems to be the main underlying issue behind a failure to analyze the environmental impact of the application of an environmentally differentiated charging scheme from a quantitative perspective.

Limited variation regarding the departments involved in the decision-making process of the environmentally differentiated charging schemes is exhibited within the cases studied. While in a majority of cases the environmental department was the initiator of the scheme, we observed a high degree of involvement of the commercial department in the decision-making process, with it mostly being the case that both departments supported the cause before the Executive Committee. This insight supports the idea that the use of charging schemes as a marketing tool is already an established initiative.

The total amounts of FTE resources that are needed to operate the scheme are somewhat comparable across ports. The Port of Amsterdam seems to have implemented the best practice: although Amsterdam applies a relatively complex rebate structure based on both the ESI and the Green Award (for sea-going vessels and inland waterway vessels), it deploys relatively fewer resources relative to the other ports within the sample, as it relies on an ICT supported automated approach. The entire process, from verifying in the ESI database if a ship is eligible for the incentive until drawing up the respective invoice, is almost fully automated. In this way, the approach needs considerably less human resources relative to the other ports considered here. Furthermore, shipping lines automatically receive the incentive and do not need to apply for it.

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<sup>5</sup> cf. results of the ESPO Environmental Report 2019, available at <https://www.espo.be/media/Environmental%20Report-2019%20FINAL.pdf>.

### 2.5.3 Port charging and pricing

Based on the analysis, environmentally differentiated pricing as part of the environmental strategy is a relatively recent practice in the European Union (since 2011), with Antwerp, Rotterdam, Hamburg and Le Havre acting as frontrunners. In the years since, many PMBs have followed their example, which implies that the 'momentum' is still high, and that it is quite likely that many other PMBs will also follow their example.

From Table 2.1, it becomes clear that the total amount of rebates as a percentage of the total amount of port dues offered by the ports in the Hamburg-Le Havre range is relatively low (0.5 to 1% of port dues, which can, however, be significant in absolute amounts). However, the relative percentage is more or less the same for all PMBs, which indicates that they are aware of the importance of market-based pricing. And yet, it seems that smaller ports (e.g. Zeebrugge) and ports that are subjected to greater competition, given their less diverse traffic structures (e.g. Le Havre), have special conditions regarding the incentive schemes. In the case of Zeebrugge, rebates are only given to selective cargo markets in order to minimize the financial gap the scheme provokes. In the case of Le Havre, only the ten best performing shipping lines will receive a rebate, including a selection of applicable cargo markets, and within a fixed, limited budget. The compensation per shipping line cannot exceed 10% of the total ship dues (i.e. one part of the total port dues) of the customer: the port dues are split between ship-related charges on one side and cargo-related charges (based on volume) on the other.

In addition, research on the impact, and thus, by extension, the proportion of rebates compared to the cost of investment in technologies to improve the environmental performance of a ship shows that environmentally differentiated charging schemes do not result in enticing levels of savings for the ship owner (as the applied rebate percentages are too low as a proportion of the total cost structure). Therefore, in the short term at least, the incentive scheme will not directly lead to altered behavior of the ship owners in the form of investments in green technologies on existing vessels. However, the incentive scheme may be effective when it comes to the development of new ships (i.e. shipping lines favoring technologies that go beyond mere compliance), and thus contribute to behavioral change in a longer-term perspective (COGEA, 2016).

As stated by a Green Award representative during the stakeholders' meeting in light of feedback from an EU study on environmentally differentiated pricing (February 2016):

*"Investments in green solutions should be viewed as a CSR strategy by both the shipping lines and the ports, because the costs of greener solutions will never be covered by the rebates. It is only a small part of the total costs."*

### 2.5.4 Port corporate social responsibility

Although motives vary between PMBs, they could initially be considered as a reactive approach towards the global climate agenda set by governments: the 1997 Kyoto Protocol and the follow-up in Copenhagen in 2007, followed by the development of a World Ports Climate Conference in 2008, and permanent follow-up structure. Legislative initiatives on the national or regional level (e.g. the setting of National Emission Ceilings, or NECs) were highlighted as one of the main drivers for the implementation of an incentive scheme, as ports were

considered important parts of regional and national environmental strategies, and thus pressured by governmental stakeholders and NGOs to develop concrete actions.

Concerted efforts between PMBs led to the development of the Environmental Ship Index (ESI). All the ports included in the sample refer to the ESI. This is not a coincidence, as these are the ports (with exception of Zeebrugge) that were the core European members of the ESI working group. Advantages of the ESI mentioned by all the respondents are its simplicity, transparency, the voluntary nature, the relatively small administrative burden, but most of all the liberty of choice regarding implementation. The latter explains the smaller differences that exist between the adopted approaches, manifested in varying percentages of rebates, the ranges eligible for rebates, the maximum number of rebates, etc. In addition, it appears that, throughout the years, PMBs have added additional environmental schemes in parallel to the basic principle of the ESI, leading to additional rebates being awarded to shipping lines that go beyond the conditions of the ESI.

All of the PMBs apply the rebates in light of enhancing their environmental performance, and consequently their reputation and image towards stakeholders. The motivation for acquiring a 'green image' towards stakeholders was highlighted as being of particular relevance by the PMBs, and deemed more significant than the short-term environmental impact and/or impact on green investments by shipping lines (i.e. altering behavior), or even changes in the ship portfolio calling at the port. A number of interviewees qualified the scheme as 'a signal to the market', not expecting a short-term impact in terms of altering behavior, but rather a longer-term message that environmentally differentiated pricing schemes might in the future increasingly reward proactive environmental behavior.

#### 2.5.5 Institutional Theory

In the previous discussion of port CSR, and more particularly the motives behind it, coercive isomorphism under the form of the global climate protocols, and their national, regional - and sometimes even local - follow-up, has led to the creation and adoption of green pricing schemes (as the ESI initiative basically came about as a reaction to these developments). However, we also note the presence of normative isomorphism through the adoption of the ESI as an environmentally differentiated charging scheme by the case study ports: PMBs that opt for this scheme adhere to the specific rules set out by the permanent task force of IAPH, which consists of experts from the industry. Following the establishment and successful implementation of ESI, other ports followed and adopted more or less similar schemes, albeit without a real in-depth analysis of whether this route was the most optimal for the port at hand. The complexity of the issue has led to many simply copying existing initiatives, instead of elaborating new ones, indicating that mimetic isomorphism has also led to the instilling of ESI-based differentiated port charging.

*"If the 'big boys' decide on the content of a certain incentive scheme, the smaller ports are almost unable to change this and have to follow"* (representative of one of the case study ports).

The case of the Port of Zeebrugge is particularly interesting in this respect. This is the only port that indicated applying an environmental charging scheme is one of the essential key determinants that allow it to 'stay in the loop' of potential supply chain actors. This would indeed imply a form of mimetic isomorphism, given that the Port of Zeebrugge has looked at other competing ports within its range to learn about practices that could enhance its green image towards the supply chain stakeholders. Given that it is the customers of the port that

exert such pressure, this element could also be considered as a form of coercive pressure. Yet, it is through the uncertainty involved in the implementation of environmentally differentiated pricing schemes that the port opted to apply a similar scheme to the other case study ports, so mimetic isomorphism seems to play - in this particular case, at least - a more dominant role. This is an important implication for other small- or medium-sized ports. It seems that the decision as to which scheme or index to adopt was thus, in the case of the Port of Zeebrugge, more that of conforming to the decisions taken by the other 'larger' ports, rather than conducting a complementary or additional internal analysis of possible various schemes, which in turn would have required a larger investment for research and expertise by the PMB. It has been highlighted before that small- and medium-sized ports lack the human and financial slack resources to engage in detailed research activity (Langenus and Dooms, 2015) to enable themselves to overcome the uncertainty and bounded rationality that is apparent in this situation of environmental management. While it seems that ports with a more limited resource basis will undergo heavier 'mimetic' pressures, larger ports face more coercive pressures, resulting in the implementation of practices that are, in turn, based on research by consultants or experts on the matter, or, alternatively, based on recommendations that are derived from industry organizations' expert advice (normative isomorphism).

Finally, competitive isomorphism, driven by pressure to become more operationally efficient, does not seem to exhibit a prominent presence, although some signs could be observed, as some ports, within the context of specific cargo markets subject to high degree of competition (e.g. containers or short sea ferry traffic), did mention that there are also commercial interests involved:

*"Some of our clients expect that we adopt similar schemes as our nearby competitors, and for some heavily contested markets an additional incentive actually enhances our commercial policy, while greening our image to the community"* (representative of one of the case study ports).

#### 2.5.6 Conclusive table

Table 2.2 presents an overview and brings evidence of associations between the different ideas and concepts presented during the previous sections, on the level of the literature and the case studies.

It is important to notice that those ideas and concepts need to be interpreted in an integrated way, in the sense that the presented conclusions are not solely limited to the topic heading under which they are explained. For example, from the case studies it became clear that the framework of an environmentally differentiated charging scheme is influenced by a market-based pricing approach, as the relative percentage for rebates is more or less the same for all PMBs. The possibility of following and integrating the concept of market-based pricing in the full implementation of the scheme only arises when the commercial department is involved in the decision-making process, as these persons are generally more aware of the importance of the concept of 'competitive advantage' than the environmental department. It is therefore also not surprising that the implementation of the scheme has a certain marketing or commercial value, besides its environmental objective. This example shows the complexity and the interdependence of the different aspects and related conclusions.

Table 2.2 – Conclusive table of results

|                               |                                              | LITERATURE                                                                                                                                                                                                          | CASE STUDIES                                                                                                                                                                                                                                                                        |
|-------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PORT GOVERNANCE               | Public-private structure                     | <ul style="list-style-type: none"> <li>➤ Increasing managerial autonomy for PMBs; hybrid organizations</li> <li>➤ PMB as community manager to maintain a 'license to operate'</li> </ul>                            | <ul style="list-style-type: none"> <li>➤ The higher the degree of autonomy of PMBs, the higher the leeway for the implementation of environmentally differentiated pricing schemes</li> </ul>                                                                                       |
|                               | Degree of autonomy                           | <ul style="list-style-type: none"> <li>➤ Port associations developed around environmental pricing vs. antitrust rules</li> </ul>                                                                                    | <ul style="list-style-type: none"> <li>➤ Descriptive characteristics of the PMB influence the format of implementation</li> </ul>                                                                                                                                                   |
|                               | Financial capability                         | <ul style="list-style-type: none"> <li>➤ Financial capability determines the level of entrepreneurship of the PMB and thus the level of environmental initiative taking</li> </ul>                                  | <ul style="list-style-type: none"> <li>➤ Financial capability determines the level of advancement in the implementation of environmentally differentiated pricing schemes</li> </ul>                                                                                                |
| PORT ENVIRONMENTAL MANAGEMENT | Environmental challenges/issues              | <ul style="list-style-type: none"> <li>➤ Environmental parameters in pricing schemes depend on the prioritization of environmental issues of each individual PMB</li> </ul>                                         | <ul style="list-style-type: none"> <li>➤ Most relevant environmental issue is air emissions &amp; quality (CO<sub>2</sub>, PM<sub>10</sub>, NO<sub>x</sub>, SO<sub>x</sub>)</li> </ul>                                                                                              |
|                               | Environmental management & monitoring system | <ul style="list-style-type: none"> <li>➤ Implementation of environmental management systems for monitoring purposes are necessary</li> </ul>                                                                        | <ul style="list-style-type: none"> <li>➤ No measuring and monitoring system in place</li> </ul>                                                                                                                                                                                     |
|                               | Decision-making process                      | <ul style="list-style-type: none"> <li>➤ Environmental representatives have their roots in a variety of departments</li> </ul>                                                                                      | <ul style="list-style-type: none"> <li>➤ Commercial department strongly involved in the decision-making process</li> <li>➤ 0.5 FTE – 1 FTE needed to fully operate environmental differentiated pricing scheme</li> </ul>                                                           |
| PORT PRICING                  | Optimal pricing policy                       | <ul style="list-style-type: none"> <li>➤ Pricing policy is a trade-off between financial, economic, social and environmental objectives</li> </ul>                                                                  | <ul style="list-style-type: none"> <li>➤ Rebates = 0.5% to 1% of total port dues</li> </ul>                                                                                                                                                                                         |
|                               | Market-based pricing                         | <ul style="list-style-type: none"> <li>➤ Port dues are only a small share of overall door-to-door transport costs</li> <li>➤ Environmental differentiated charging as an element of market-based pricing</li> </ul> | <ul style="list-style-type: none"> <li>➤ Relative percentage for rebates more or less the same for all PMBs which indicates awareness of the importance of market-based pricing</li> <li>➤ Rebates are not large enough to change short-term behaviour of shipping lines</li> </ul> |
| PORT CSR                      | "Green" image                                | <ul style="list-style-type: none"> <li>➤ Costs of a damaged reputation are believed to be higher than costs of green port dues</li> <li>➤ Environmental differentiated pricing as a marketing strategy</li> </ul>   | <ul style="list-style-type: none"> <li>➤ Environmental performance as part of the general strategy to stimulate both, a port's CSR and competitive advantage</li> </ul>                                                                                                             |
|                               | Rationale for adoption                       |                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>➤ Adoption of a green pricing scheme as reactive action within the "World Ports Climate Initiative"</li> <li>➤ Environmental pricing as marketing tool to promote a green image</li> </ul>                                                   |

## 2.6 STRATEGIC AND POLICY IMPLICATIONS

The empirical results of the cross-case study allow the drawing-up of a number of implications/recommendations. These are put forward in consideration of both the empirical evidence of the case studies and the theoretical considerations of the literature review.

### 2.6.1 Set-up schemes

From the interviews it became clear that straightforward, simple, voluntary systems, which are not overly administratively complicated and costly, gain an advantage compared to schemes that are very sophisticated, often not transparent, more costly to implement and difficult to understand for different stakeholders. For smaller and medium-sized ports, like Zeebrugge, this would appear to be a major bottleneck. Therefore, the success of the ESI must rest upon its simplicity, its comprehensibility, its transparency, and its added potential to allow a PMB to tailor the system to the particular market and to the environmental and governance situation of the port cluster. Furthermore, adhering to these principles also keeps implementation costs down. Nevertheless, the relative lack of resources for standardized audits and inspections in light of compliance with the applied ESI scheme in a port somewhat harms the perceived strength of this widely adopted system. This reservation has also been made by the industry itself, and since 2020 the workings of the ESI scheme have been updated, including attention being given to the topic of auditing. Also, government support in the form of formal audit initiatives could be helpful and, from a financial perspective, even necessary

for some smaller ports (as their resource base is too small) in order to further increase the credibility of these schemes that have been adopted on an industry-wide scale.

### 2.6.2 *Bureaucratic and transaction costs*

Given the complexity and the interdisciplinary knowledge needed to run a green port dues incentive scheme across all ports on an individualized level, the analysis of the question as to the quantity of resources expended at the level of the PMB shows that the respondents were not fully aware of the total administrative/bureaucratic costs (environment, commercial, human resources, IT, finance and accounting department). Environmentally differentiated pricing schemes are considered to increase transaction costs, and are somewhat contested for that reason, given their limited impact on altering shipping line behavior (Van Den Berg et al., 2017). For example, the claiming procedure of the ESI rebate in Amsterdam has become an automated system, but they still permanently need 0.2-0.3 FTE for other related tasks. In comparison, the experts of the Port of Antwerp, where the whole process is implemented manually, estimate that they need 0.5 FTE to operate the entire scheme. Given the cross-functional nature of the issue, we observed that PMBs lack sufficient awareness of the total bureaucratic (internal to the organization) and transaction (externally related) costs involved. While the research has made significant advances in providing these insights (and the cost drivers), further research is needed regarding the full real cost structure incurred by the PMBs, in order to improve the quality of decision-making with regard to which scheme to use, as well as the way to implement it within the administrative processes of the PMB. Connections of port accounting systems with the database of the incentive schemes might offer a platform for a significant reduction in administrative burdens relating to implementation (contrary to e.g. manual procedures to check invoices against port calls).

### 2.6.3 *Financial impact and monitoring*

Furthermore, although PMBs want to show a green image towards the outside world without losing too much of their financial competitive advantage, applying any incentive ‘bonus’ scheme will rarely result in a ‘financial performance neutral’<sup>6</sup> outcome (only in the case of a high price elasticity of demand, i.e. the costs of the incentive scheme will be covered by an increase in the number of ships that call at the port). In practice, to limit the possible financial burden, a transfer of value would be needed from high polluting to less polluting vessels by recalibrations in the general tariff structure (i.e. a ‘bonus-malus’ scheme). This creates the risk of provoking unwanted and inefficient market shifts (i.e. shipping lines diverting calls to ports with less stringent schemes). Also, if every vessel is compliant with the incentive, the effectiveness of the scheme is lost. As a result, every strategic incentive on the level of environmentally differentiated pricing is likely to have a limited life span: it is effective during the start-up and expansion phase, but when it reaches the maturity phase the strategic incentive loses impact (Wilmsmeier, 2012). Increasing the ranges of the incentives is a way to expand the lifespan of the scheme. However, to protect the financial balance of the PMB, a recalibration of the general tariffs would be necessary, potentially causing an overall negative effect on the competitiveness of the port. While recalibrating tariffs has more chance of succeeding in larger, diversified ports (given their greater financial resources), such an approach would probably make little-to-no sense for smaller and medium-sized ports that bear a relatively greater risk of loss of traffic and loss of income.

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<sup>6</sup> See Annex 1 in the Appendix for more information on the concept of financial performance in the specific context of PMBs.

Finally, with regard to financial monitoring, an important insight relates to the final recipient of the incentive. In some ports, the infrastructure dues and the incentive are paid by/to the ship agent. In other ports, the invoice/credit note is sent directly to the shipping line. Also, related to the consumption of fuel, according to the respondents, shipping lines tend to be relatively non-responsive, as the consumption is charged to charterers/shippers. In other words, key stakeholders might feel less concerned. With these insights in mind, it is clear that the mechanism of rewards and incentives is not as straightforward when it comes to the main beneficiary, meaning the stakeholder that should be approached with the incentives vs. who receives the rebates.

#### 2.6.4 *Conflicting policy objectives*

The same question as posed by Wilmsmeier (2012, p.7) comes to the fore when writing this chapter: *“Is it wise to artificially introduce differentiation into a market-driven sector to reach certain local, national or even regional policy goals?”* Because of the commercialization and even privatization trend of the last few years, PMBs have become increasingly commercially driven entities, which means that the strategic decisions they take should lead to ‘financial performance neutral’ approaches, and thus contribute to preserving their competitive advantage. Nevertheless, it can be concluded that the current incentive schemes applied by the PMBs investigated in this chapter do not fully comply with this goal and, in most cases, cause an increase in the total cost. As a result, the sustainability of these schemes is questionable in the long term. Moreover, to safeguard the success of the incentive schemes, or, in other words, to meet certain broader policy goals, we might advocate an increase in external, governmental funding. However, the port industry would risk returning to a context of heavier reliance on subsidies, which goes against current reform tendencies. Finally, in the context of stakeholder power and the global context, institutions other than the PMBs (such as the IMO) should take greater responsibility for changing the behavior of shipping lines.

## 2.7 CONCLUSION

Environmentally differentiated charging schemes are nowadays part of the general strategy of many PMBs. This chapter shows that although the underlying applied incentive scheme (in this case the ESI) is the same across all ports investigated, the practical implementation of the scheme is not as straightforward, and substantial differences exist regarding many aspects linked to the decision-making and implementation of a scheme. It seems that environmentally differentiated pricing is considered to be an economic instrument to help secure a port’s market position (e.g. development of a green image), but at the same time it is implemented in a way that best suits the port (e.g. through selectivity in cargo markets to minimize the financial gap). Therefore, important questions arise as to when environmentally differentiated pricing schemes are to be categorized as being successful. Should success be defined by the number of ships calling at a port while complying with the conditions of the scheme, or should it instead be defined by the number of ports that apply the environmentally differentiated pricing scheme, as the implementation is based on a voluntary system and thus the impact of the system increases through an increase in the number of adopters? We could say that the strength of such schemes relies upon both the number of ports that implement them and the amount of shipping lines that adapt to the conditions of such a scheme. However, once a majority of vessels accords to the higher standards as defined by the incentive scheme, the practice of environmentally differentiated pricing loses its value. A distinction can no longer be made between polluting and non-polluting vessels, which decreases the incentive of doing

better. Furthermore, PMBs would be obliged to reward every vessel that complies with the standards, causing a large revenue gap. For this reason, it is important that incentive schemes continue to be adapted/updated, based on continuous monitoring of the environmental standards of the vessels in current use (to the extent such monitoring and adaptations to pricing schemes are possible and useful).

With regard to future research, an element worthy of investigation resides in the concerted efforts that form the basic principle of most of the available third-party schemes investigated (ESI, Green Award). Should these be regarded in the same manner as price-fixing? Since antitrust rules state that no type of collaboration between ports regarding pricing is allowed, should environmentally differentiated charging be considered as a special feature in a port's pricing structure? Recent literature claims that environmental performance fosters economic performance, and as such can be regarded as a commercial asset, causing new ground for competition (Orlitzky et al., 2003; Porter and van der Linde, 1995). In the context of ports, it means that those that pursue sustainable alternatives, more specifically regarding environmental compliance, will be favored as partners in the supply chain, as increased or proactive compliance with environmental objectives strengthens the competitive position. As a result, supply chain actors will have to compete to prove their added value (Acciaro, 2015; Adams et al., 2009; Rao and Holt, 2005; Wooldridge et al., 1999). Therefore, questions might be raised from a more theoretical perspective as to whether these practices need be considered in the same manner as price-fixing.

Another point for future research is the application of a different research approach to the problem formulated in this chapter. The topic has been tackled from a descriptive perspective, but it would also be interesting to examine the subject in a more prescriptive manner. The Quality Function Deployment (QFD) technique could be of interest, as the overall purpose of QFD is that of gathering the opinions of customers - or in this case stakeholders - and translating them in order to find relationships between and answers to the 'how', 'what' and 'why' variables. This technique has previously been advocated for as a proper tool for environmental decision-making (Berglund, 1993). Another recently developed tool that attempts to provide a decision-tree with regard to the choice of implementing an environmentally differentiated charging scheme for PMBs is that of Geerts, Doms and Langenus (2017).

Finally, the main limitation of this research is that the cross-case analysis was only conducted within the Hamburg-Le Havre range. Future research that would analyze other port ranges or regions on this matter would undoubtedly be of value to further understand any potential geographical dimension. Which aspects will differ significantly, and which will share commonalities? Based on interactions with the port experts, it seems that in other port ranges of Europe and outside Europe, different approaches towards differentiated port dues exist. One could expect that the four types of isomorphism would differ substantially once other regions or ranges were to be the focus of analysis, given that pressures can stem from competitors, customers, governments, supranational bodies, etc. As these differ between port ranges, the related pressures would logically result in different motives for adopting similar (or dissimilar) practices. Therefore, a conclusion could be that isomorphism in the European port industry is bound by geographical distance; yet, we call for further research in other port ranges to validate this finding.

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### **CHAPTER 3**

#### **TACKLING UNCERTAINTY IN GREEN PRICING DECISION-MAKING: THE CASE OF PORT INFRASTRUCTURE**

Geerts, M., Dooms, M. & Langenus, M. (2018). *Green pricing decision-making: tackling uncertainty in the case of port infrastructure*. In: Pettit, S. & Beresford, A. (eds.). *Port Management: Cases in Port Geography, Operations and Policy*. London: Kogan Page, pp. 207-244.



### 3.1 INTRODUCTION

The transport industry continues to be a subject of societal criticism, as it is regarded as a large polluter generating substantial negative externalities (Bergqvist & Egels-Zandén, 2012; Puig et al., 2015; Wooldridge, McMullen & Howe, 1999). Stakeholders expressing their preferences with regard to environmental performance are not limited to environmental pressure groups or local and regional governments, but also supply chain actors are increasingly putting pressure on the sustainability footprint of the various nodes of the supply chain (Denktas-Sakar & Karatas-Cetin, 2012). Ports, as important nodes in transport networks, try to respond to these pressures by paying greater attention to environmentally friendly objectives and resulting strategic actions (Becker et al., 2013; Puig et al., 2015; Wooldridge et al., 1999). Port clusters, and in particular PMBs, that fail to integrate these objectives and actions within their strategies will experience a decrease in their competitiveness (Haezendonck, 2001), as economic performance appears to be interrelated with environmental performance (Porter & van der Linde, 1995).

The existence of port collaborative platforms and/or specific trade associations (e.g. IAPH's World Ports Climate Initiative, the EcoPorts Foundation, etc.) confirms that a significant number of PMBs believe a certain degree of harmonization throughout the industry is needed in order to achieve the biggest environmental impact. These inter-organizational collaborations aim to develop methods and instruments in order to counter the existing environmental challenges. As a result of these concerted efforts, the concept of 'environmentally differentiated charging' or in other words 'green port dues' that could be applied within the existing pricing structures on a global scale (e.g. Environmental Ship Index (ESI), Green Award, etc.) has been developed. Such environmentally differentiated charging schemes enable shipping lines to reduce their total port dues when the ships that call at a port comply with certain conditions of environmental friendliness.

However, it appears that the concept of 'green port dues' is not yet rooted within the main pricing (or charging) practices of every port and its PMB. Whereas the shipping industry is regulated and controlled by governments in order to assure a minimum level of compliance in regard to environmental liabilities and responsibilities, the current approach to the use of 'green port dues' is that of compliance through voluntary self-regulation. Given that each port is unique in terms of its governance structure, geographical characteristics, and influence from local social and normative contexts (alongside international influence), a custom-made approach is considered more suitable (Acciaro, 2015; Verhoeven, 2010). Yet, when the application of such schemes is limited to a small group of ports, the scope for PMBs' influence over the environmental footprint at their port, to the mutual advantage of both industries and their respective stakeholders, likewise remains limited.

This contribution focuses on providing a tool that could help PMBs take the first step towards applying the concept of 'green port dues', or validate the existing strategies for PMBs that have already implemented the principle within their pricing scheme. Section 3.2 expands on the factors that trigger the uncertainty in light of green pricing decision-making. The findings it outlines have led to the development of a standardized tool that is described in Section 3.3. In

Section 3.4, the tool is then applied to four port cases as a way of validation. Section 3.5 offers concluding remarks, limitations and suggestions for further research.

### 3.2 (GREEN) PRICING DECISION-MAKING

The uncertainty within the decision-making process as to the application of the concept of 'green port dues' presents a burden for PMBs, as the integration of environmental parameters into the regular pricing structures and the resulting financial, commercial and environmental implications are not always clear. Not all PMBs possess the necessary slack resources to investigate their environmental performance or to perform the needed, and often sophisticated, market, financial and economic analyses required.

Furthermore, given the differences in governance models of PMBs, ranging from fully privatized to fully public organizations, not every PMB has sufficient autonomy to decide on the matter of port infrastructure pricing (Verhoeven, 2010). The level of proper decision-making is often subject to various regulations imposed by national and/or regional legislation. For example, in Spain the 'Law on the Economic Regime and the Provision of Services in Ports of General Interest' of 2010 regulates the financial autonomy and the provision of services of Spanish ports. More specifically, it defines the framework with regard to port dues and port services to which the PMBs are required to adhere (Verhoeven, 2010). As a result, some PMBs are not free to decide upon the level of port dues and possible incentive schemes, affecting the regular pricing structure. Thus, achieving an industry-wide significant positive impact based on environmentally differentiated charging schemes seems to be hindered by the complexity of the industry and the uncertainty related to the matter. Furthermore, PMB managers have to deal with social networks that consist of economic and environmental stakeholders pursuing different - and often conflicting - values (Dooms, Verbeke & Haezendonck, 2013; Parola & Maugeri, 2013; Strandenæs & Marlow, 2000), complicating both internal and external decision-making.

Several factors are thus observed that influence and give rise to a significant degree of complexity and uncertainty in pricing decision-making and act as a barrier to the implementation of 'green port dues' as a negative externality reducing mechanism. The objective of this contribution is to provide a supporting tool that could be used by PMBs in order to lower this barrier to implementation. A Complex Adaptive Systems (CAS) lens is applied to the issue, as it facilitates explanations as to how a bottom-up approach can lead to an industry-level impact. As stated by Choi, Dooley, and Rungtusanatham (2001), every supply network can be regarded as a complex system, or, even more specifically, a complex adaptive system. A CAS model is focused on the interaction between different agents (i.e. entities that populate the network and response to inputs they receive from the environment) that will reveal emergent patterns on the system level and will eventually influence the environment around it (i.e. actors that call upon the services and products of the supply chain/system) (Choi et al., 2001). The concept can be easily translated to the port industry, as it consists of many elements or subsystems, which are interrelated. PMBs, terminal operators, shipping lines, customs, etc. can be considered as the agents within the entire port industry, which can, in turn, be viewed as the system. Complex adaptive systems are considered to be open, dynamic systems. This means that the behavior of the system will be defined by the simultaneous and parallel actions of the agents within the system itself (Choi et al., 2001). They adapt to changes that occur in their environment, e.g. changes in throughput, regulation or stakeholder pressures. By supporting the decision-making process and stakeholder dialogue

on the level of a PMB (the agent level) and thus reaching emergent behavior (e.g. with regard to large scale application of environmentally differentiated charging principles), the system (i.e. the industry) will be influenced as a whole (Bekebrede, Lo & Lukosch, 2015; de Bruijn & Herder, 2009). The system level output would then be an improved environmental performance of the industry, leading to increased stakeholder satisfaction.

### 3.3 DEVELOPMENT OF A MULTI-CRITERIA BASED TOOLBOX

#### 3.3.1 *Introduction*

In recent years, many new instruments - as a result of applied research projects on environmental practices, management and indicators (e.g. Ecoports, Portopia), as well as several conferences (e.g. GreenPorts) and other initiatives (e.g. the Environmental Code of Practice of the European Seaports Organization) - have been adopted in response to the increased consciousness and knowledge of the environmental impact of ports (Haezendonck, Doooms & Coeck, 2006). The concept of environmentally differentiated charging found its origins in 1996 within the Swedish system<sup>7</sup> and has been under constant development with several schemes created by the most prominent actors in the industry (most prominently Green Award, ESI, Blue Angel, Rightship). However, following its introduction, it can be stated that the concept of environmentally differentiated charging, when it comes to the actual and industry-wide implementation on the level of individual PMBs, remains a complex and multi-faceted story. A recent survey of 94 European ports pointed out that 56% of the respondents applied some form of environmentally differentiated charging (European Seaports Organization (ESPO), 2019). It is not only the diversity that exists between many PMBs (degree of autonomy, geographical features, governance model, financial resources, etc.), but also the fact that the mechanism is based on voluntary self-regulation that makes the concept rather complex. Therefore, a decision-making support tool that could bring more clarity and support to the PMBs (agent level) seems appropriate. As a result, the emergent behavior of the PMBs would be able to more strongly influence the industry level (systems level).

#### 3.3.2 *Phase 1: Identification of determining criteria*

First, a literature review was conducted to develop an overview of the variables that could influence the decision-making process of a PMB in the framework of implementing a differentiated charging scheme with respect to environmental performance. Secondly, case study research was conducted to gather insights from a number of PMBs that differ substantially in their general structure/profile and that have already implemented a certain format of 'green port dues'. The objective was to examine the extent to which these PMBs provide information on all facets of their environmentally differentiated charging on their website (financial consequences, environmental performance of the scheme, monitoring, etc.). In-depth semi-structured interviews followed this desk research to collect missing information and/or validate the first two steps. 14 different PMBs<sup>8</sup> were interviewed over a seven-month period (June 2015 - December 2015). It should be noted that all PMBs interviewed are located

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<sup>7</sup> Tripartite Agreement between the Swedish Maritime Administration, the Swedish Port and Stevedores Association and the Swedish Shipowners' Association, as a result of the recognition for the need of environmental impact reduction mechanisms (Kågeson, 1999).

<sup>8</sup> Port of Amsterdam, Antwerp, Bremen, Civitavecchia, Gothenburg, Hamburg, Le Havre, Riga, Rotterdam, Setubal, Stockholm, Tallinn, Valencia, Zeebrugge.

in Europe. Given that most of the available third-party schemes are the result of concerted efforts of some of the largest European PMBs (such as ESI, Green Award, etc.), the schemes implemented by the interviewed PMBs are thus primarily variants of the ESI or Green Award. The general idea behind ESI is to reward shipping lines that go beyond compliance with the legal standards, and all this in a transparent fashion. The strengths of the ESI scheme from the perspectives of the interviewees are:

- ❖ ESI is not linked to any formal (European) regulation, meaning the ESI scheme is the result of a joint collaborative effort of PMBs and port trade associations (IAPH) and not the result of a top-down legal approach;
- ❖ ESI only serves as a measure to objectify environmental performance (related to the emission of air pollutants). It allows all PMBs the flexibility to reward the shipping business in a way that best fits with their port strategy and the specific environmental challenges they face;
- ❖ It is applied on a voluntary basis.

During the interviews, the following aspects formed the main focus in order to provide a global overview of the PMBs' situation: a description of the port, how and if charging indexes were implemented and motives behind this, details and impact on the financial dimension, implementation and monitoring, and dialogue with stakeholders about the matter. In most cases, between two and four experts from the PMB, not only limited to the environmental department, attended the meetings, which is in line with the multidisciplinary nature of the issue. This extensive case study material provided a large number of insights regarding daily practices and the rationale behind the decision-making process of the implementation of 'green' port infrastructure charging.

Based on the information gathered, and by adopting a bottom-up approach, which allows the development of a tool from the perspective and knowledge of the potential users, it can be stated that ports are confronted with several context variables, both in an internal and external context, that have an influence on the way of thinking, acting, decision-making, etc. In general, all these variables can be subsumed into four dimensions that can be defined as the decision-making parameters with regard to how, and if, environmentally differentiated charging schemes would be implemented:

- Market. These variables give insights into the competitiveness of the port. Does the port experience significant competition in its main markets, or is it a leading port with high and stable market shares? It is clear that in the latter situation the port is a leading player in the industry and does not experience much short-term economic vulnerability, meaning that it will not be forced to limit its incentive schemes to elite groups or selected cargo markets, but rather it could even enhance its position by giving the incentive to all its customers or by including 'add-on' features in the scheme (e.g. rebates for the use of LNG fuel, rebates related to fine particles, etc.).
- Environmental and social responsibility. This dimension is linked to the extent to which a port is confronted by many environmental issues and/or does not have to formally take into account many stakeholders in formal and informal decision processes; for example, a port that is located within a large urban area might have to consider the local community as a more important stakeholder than a port that is a remote coastal port. Both the sum of environmental issues a port has to account for and the amount and complexity of stakeholder relations provide an indication of the amount of managerial attention the port should pay to the implementation of environmental

charging schemes and, furthermore, to what extent the port can implement its scheme in the basic format and/or should expand it with 'add-on' features.

- Governance. This dimension relates to the degree of autonomy the port has in its daily operations and its decision-making processes. If the port acts as an autonomous company with an autonomous board, then the port has its own decision-making powers regarding the port tariff structure. There are also situations where the port is under the full authority of a national or regional government, meaning that initiatives regarding incentive schemes and port tariffs in general require approval by higher institutions (or are even set or determined by them).
- Financial position and human resources. These variables define the amount of available resources for the integration of an environmentally differentiated scheme into the port's daily operations. The stronger the financial position, the more leeway a port has with regard to rebate schemes. Alternatively, the port may also have to pay greater attention to the financial consequences. In many cases, one would expect that the financial position of a port is proportional to the amount of human resources available. The larger the financial basis, in general, the larger the potential pool of employees is, and thus more (human) resources are available to implement and administratively support the initiatives.

The extent to which the port cluster is affected by some, or all, of these variables, and the extent to which the PMB can exert control on these, influences the facets of a port's 'vulnerability' or, vice versa, its 'resilience'. In other words, these variables define the amount of 'complexity' a port and respectively the PMB has to deal with and has to take into account for its daily operations. The external complexity refers to both the market and the environmental and social responsibility context (i.e. the number of direct competitors; the amount of environmental complexity and stakeholders a PMB has to deal with, meaning their perceived impact and influence on the decision-making process, the geographic location and political situation of the port, etc.), while the internal complexity mainly refers to elements of the governance structure and the overall financial situation and slack resources available (i.e. the 'degree of freedom' to act autonomously and with no internal restrictions regarding the matter).

### 3.3.3 Phase 2: Integration of the different criteria

The information collected and insights gained concerning the significant variables and the underlying dimensions of complexity can be projected into two different matrices (see Figure 3.1).

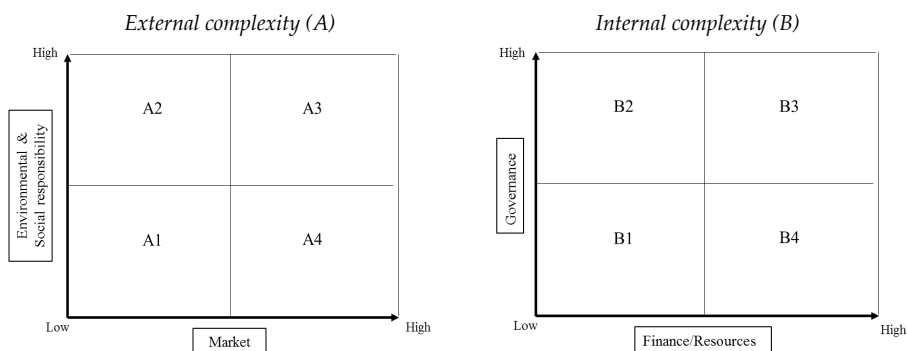


Figure 3.1 - Integration of the criteria

As both matrices show, it is possible to define four quadrants per matrix. Every quadrant has its own focus and explanation (see *infra*). Thus, based on the specific internal and external characteristics of a port, and related scores achieved on the different dimensions, it becomes possible to position every port in one of the quadrants upon each of the two matrices. As a result, a port profile can be created as a combination of the two selected quadrants (e.g. A1B4, etc.). Such a port profile, based on both the internal and external context, allows the PMB to gain better insights into the needs and preferred approach regarding environmentally differentiated port charging for the particular port cluster they manage. In total, in theory, 16 different combinations are possible.

- A1 = The port has a relatively strong market position (low complexity), meaning that it can act relatively independently of the actions of other ports. It is able to define its own best practices. It can probably rely on a diversified, stable traffic base and therefore a decrease in one cargo market can usually be absorbed by the other segments or recouped in the short term. The port is not confronted by a large number of environmental issues and/or does not have to take into account many stakeholders in formal and informal decision processes (local communities, interest groups, local or regional government, port users, etc.) (low complexity).
- A2 = The port has a relatively strong market position (low complexity), meaning that it can act relatively independently of the actions of other ports. It is able to define its own best practices. It can probably rely on a diversified, stable traffic base and therefore a decrease in one cargo market can usually be absorbed by the other segments or recouped in the short term. The port is confronted by numerous environmental issues and/or has to take into account many stakeholders in formal and informal decision processes (local communities, interest groups, local or regional government, port users, etc.) (high complexity).
- A3 = The port has a rather weak/moderate market position (high complexity). It experiences significant competitive pressure that constrains the commercial actions it takes. It needs to follow the large players in the industry. The port is probably not able to rely on a stable, diversified traffic base, and therefore a decrease in one cargo market cannot be immediately absorbed by the other segments or recouped in the short term. The port is confronted by numerous of environmental issues and/or has to take into account many stakeholders in formal and informal decision processes (local communities, interest groups, local or regional government, port users, etc.) (high complexity).

- A4 = The port has a rather weak/moderate market position (high complexity). It experiences significant competitive pressure that constrains the commercial actions it takes. It needs to follow the large players in the industry. The port is probably not able to rely on a stable, diversified traffic base, and therefore a decrease in one cargo market cannot be immediately absorbed by the other segments or recouped in the short term. The port is not confronted by a large number of environmental issues and/or does not have to take into account many stakeholders in formal and informal decision processes (local communities, interest groups, local or regional government, port users, etc.) (low complexity).
- B1 = The port has a high degree of freedom, meaning that it operates largely independently. It does not need the approval of higher institutions. It has the ability to decide upon tariff setting and incentive schemes. The port has a large financial and/or human resource basis: it has a large budget that can be used for purposes besides the daily operations. In many cases, human resources are proportional to the magnitude of the financial statement. Consequently, the port is able, and thus probably also willing, to deploy resources to tasks regarding the scheme.
- B2 = The port does not have a high degree of freedom, meaning that its decisions are validated or determined by governmental institutions. It does not have the full right to decide upon tariff setting and incentive schemes. The port has a large financial and/or human resource basis: it has a large budget that can be used for purposes besides the daily operations. In many cases, human resources are proportional to the magnitude of the financial statement. Consequently, the port is able, and thus probably also willing, to deploy resources to tasks regarding the scheme.
- B3 = The port does not have a high degree of freedom, meaning that its decisions are validated or determined by governmental institutions. It does not have the full right to decide upon tariff setting and incentive schemes. The port does not have a large financial and/or human resource basis: it can be considered as a relatively small port. Consequently, resources are scarce, and are valuable in the fulfillment of daily operations. There is not much leeway to deploy them to other tasks. In most cases, these ports will not be very willing or able to devote a significant proportion of their time or valuable resources to operate the scheme, given their resource constraints.
- B4 = The port has a high degree of freedom, meaning that it operates largely independently. It does not need the approval of higher institutions. It has the ability to decide upon tariff setting and incentive schemes. The port does not have a large financial and/or human resource basis: it can be considered as a relatively small port. Consequently, resources are scarce, and are valuable in the fulfillment of daily operations. There is not much leeway to deploy them to other tasks. In most cases, these ports will not be very willing or able to devote a significant proportion of their time or valuable resources to operate the scheme, given their resource constraints.

Both individual matrices can be merged into one general matrix, defined by the underlying dimensions 'internal complexity' on the horizontal axis and 'external complexity' on the vertical axis (see Figure 3.2). The port's profile created by the outcomes of its position in the two detailed matrices can also be projected into the general matrix whereby mixed low/high situations (A2 and A4, B2 and B4) in the sub-matrices are defined as 'medium' complexity situations in the general matrix. All 16 different scenarios resulting from combinations of the

two sub-matrices can be projected into one of the quadrants of the general matrix, corresponding with a certain degree of internal and external complexity. Customized recommendations are linked to each scenario. These recommendations have the general aim of reducing decision-making uncertainty and providing practical guidelines for the implementation of the practice of environmentally differentiated pricing. They are constructed through a bottom-up approach based on the information gathered during the different interviews. It becomes possible to position different port profiles into one framework which allows conclusions to be drawn as to the main differences and similarities between ports, and thus on their approaches to the implementation of environmentally differentiated pricing reflected in the reasoning of the guidelines. These three matrices also form the functional structure of the support tool.

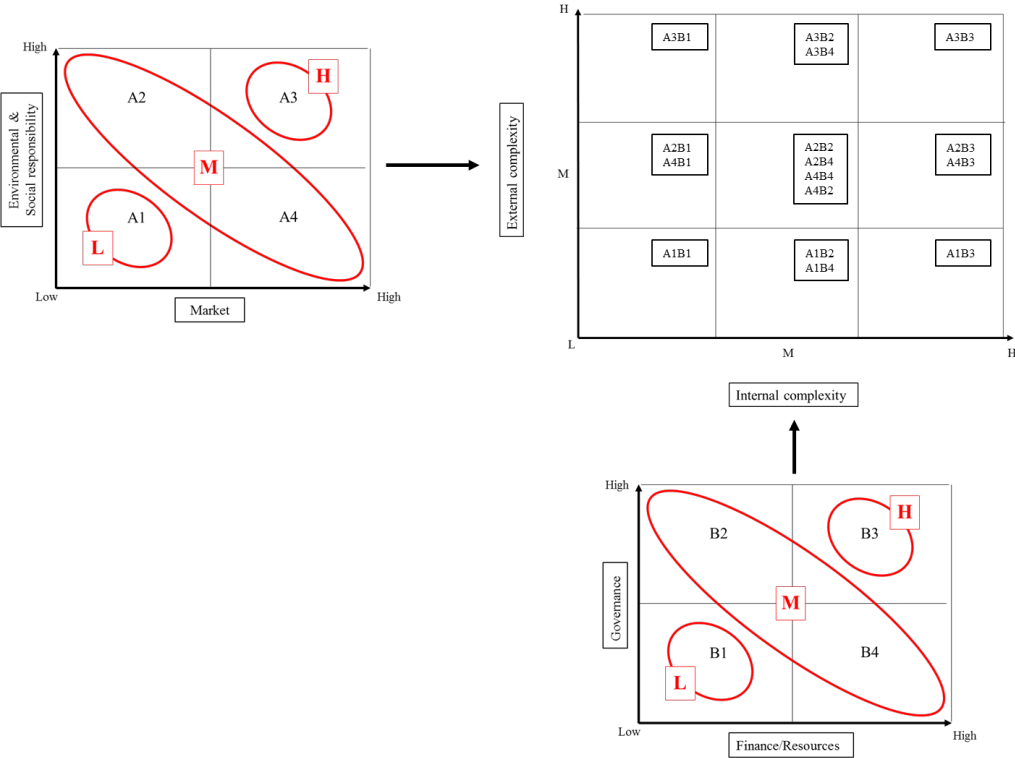


Figure 3.2 – Foundation of the supporting tool

3.3.4 Phase 3: Towards a practical toolbox

Given the conceptual framework of the support tool, practical additions are needed in order to reach the point of a user-friendly solution in light of supporting the green pricing decision-making process for individual ports or groups of ports. As the conceptual framework is based on positioning the port in one or other of the different quadrants of the (sub)matrices, it is important to have an objective perspective on the significance of the aspects for each individual port using the tool. For this reason, a limited set of questions were developed and linked to each dimension of the individual sub-matrices (environmental & social

responsibility, market, finance/resources, governance). Each answer is linked to a 'high' or 'low' value. When all answers are considered and all related values summed, the position of the port in the framework for the different dimensions is defined (i.e. corresponding with a value on the horizontal and vertical axis of the two individual matrices). The set of questions and further clarifications, linked to all the dimensions, can be found in the Appendix (Annex 2).

This conceptual framework is also transformed into a practical online solution publicly available for any stakeholder ([www.environmentalcharging.eu](http://www.environmentalcharging.eu)). The user-friendly interface is based on the questions linked to each of the dimensions. Based on the analysis of the provided answers, the profile of the port is displayed, which is then linked to recommendations consisting of practical guidelines. Annex 3 in the Appendix contains screenshots of the online toolbox.

It should be noted that this toolbox provides a first approach to the problem of uncertainty within green port decision-making. Additional technical and in-depth knowledge provided by actual practitioners/experts applying the schemes on a day-to-day basis can still improve the conceptual approach and guidelines provided. However, this contribution already presents an easy-to-operate and academically sound framework that is able to stimulate and simplify the decision-making process within PMBs in search of knowledge on appropriate schemes, without having to tap into and analyze the vast amount of information and (tacit) experience already available.

More specifically, this toolbox provides support for port management and policymakers in the following ways:

- It supports the decision-making process of selecting a particular implementation strategy regarding environmentally differentiated port pricing;
- It decreases uncertainty around the decision-making process and offers insights for PMBs currently not applying any scheme;
- It provides learning opportunities for PMBs that currently apply a scheme (through assessing and challenging the appropriateness of the current scheme);
- It supports PMBs and their stakeholders in the environmental discussion.

Although the toolbox provides a first approach to reducing uncertainty, it is obviously not a substitute for managerial judgment. The results/recommendations produced by the toolbox should not be interpreted as the only truth, but should be looked at as practices and guidelines, based on best practices, that can bring some clarity and knowledge in light of eliminating and supporting some specific approaches/strategies.

## 3.4 APPLICATIONS

### 3.4.1 *Introduction*

The first conceptual idea of the toolbox was presented during a stakeholders' workshop at the end of January 2016, consisting of around 30 experts from PMBs (including some of the respondents), (European) trade associations representing various port actors and markets, shipping lines, and NGOs, with the objective of validating the approach followed and receiving further input. The finalization and testing phase of the toolbox, which occurred at

the beginning of March 2016, consisted of direct interaction with the industry trade association IAPH-PIANC, the representative of Ecoports within the European Seaports Organization (ESPO), and two leading PMBs from the Hamburg-Le Havre range (Antwerp and Rotterdam, two of the key founding members of the World Port Climate Initiative).

By means of appropriate examples, and following the validation process, we demonstrate the working of the support tool for the Port of Antwerp<sup>9</sup>, Le Havre, Zeebrugge and Valencia. We would like to note that the concept of the toolbox is incorporates information gleaned from all 14 case studies. However, providing practical applications of all 14 ports would lead us too far from the core objective of this contribution, therefore we opted to limit the discussion to some key ports. For a general overview of information on ports applying environmentally differentiated charges in the Hamburg-Le Havre range, we refer to the summarizing table, published in Geerts, Dooms, and Langenus (2017).

In light of this contribution, the table has been slightly modified, and the case of Valenciaport has been added (see Table 3.1). Based on the information in Table 3.1, and detailed additional insights gathered during the in-depth interviews, the practical application of the support tool can be demonstrated. Furthermore, for the cases of Antwerp and Zeebrugge we will also provide the recommendations linked to their specific port profile. As these recommendations are developed based on the insights collected during the interviews, it is clear that practitioners/experts applying the schemes on a day-to-day basis can still add more information and value to the tool. The other two cases discussed (Le Havre and Valencia) are limited to the explanation of the tool applied to the specific situation of the ports.

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<sup>9</sup> Results regarding the Port of Antwerp have been validated by representatives of the PMB itself.

Table 3.1 – Overview of cases

|                          | Port of                             | ANTWERP                                                                                                                   |  |                                                                                                                                                 |  | ZEEBRUGGE                                                                                                                                                                |  | LE HAVRE                                                                                                                                                                                                           |  | VALENCIA                                                                                                                                                                                                                                                                   |  |
|--------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|                          |                                     | Hamburg –Le Havre                                                                                                         |  | Hamburg –Le Havre                                                                                                                               |  | Hamburg –Le Havre                                                                                                                                                        |  | Hamburg –Le Havre                                                                                                                                                                                                  |  | Mediterranean                                                                                                                                                                                                                                                              |  |
| CHARACTERISTICS          | River/coastal port                  | River                                                                                                                     |  | Coastal                                                                                                                                         |  | Coastal                                                                                                                                                                  |  | Coastal/ river                                                                                                                                                                                                     |  | Coastal                                                                                                                                                                                                                                                                    |  |
|                          | Located in or near large urban area | YES                                                                                                                       |  | NO                                                                                                                                              |  | NO                                                                                                                                                                       |  | Limited interference                                                                                                                                                                                               |  | YES                                                                                                                                                                                                                                                                        |  |
|                          | Located in SECA area                | YES                                                                                                                       |  | YES                                                                                                                                             |  | YES                                                                                                                                                                      |  | YES                                                                                                                                                                                                                |  | NO                                                                                                                                                                                                                                                                         |  |
|                          | Ownership / governance model        | Municipality-owned / Autonomous company                                                                                   |  | Municipality-owned / Autonomous company                                                                                                         |  | Municipality-owned / Autonomous company                                                                                                                                  |  | State-owned establishments with limited autonomy w.r.t. pricing                                                                                                                                                    |  | State-owned establishments with no autonomy w.r.t. pricing                                                                                                                                                                                                                 |  |
|                          | Total revenue (€ - 2014)            | 338 406 000                                                                                                               |  | 69 436 143                                                                                                                                      |  | 69 436 143                                                                                                                                                               |  | 173 210 000                                                                                                                                                                                                        |  | 120 933 724                                                                                                                                                                                                                                                                |  |
| ENVIRONMENTAL STRATEGY   | Total cargo (Tonnes - 2014)         | 199 012 082                                                                                                               |  | 43 500 000                                                                                                                                      |  | 43 500 000                                                                                                                                                               |  | 67 592 820                                                                                                                                                                                                         |  | 67 020 000                                                                                                                                                                                                                                                                 |  |
|                          | Dominant cargo                      | <ul style="list-style-type: none"> <li>- Containers</li> <li>- Liquid bulk</li> <li>- Other conventional cargo</li> </ul> |  | <ul style="list-style-type: none"> <li>- LNG</li> <li>- Short sea RoRo</li> <li>- LoLo containers</li> </ul>                                    |  | <ul style="list-style-type: none"> <li>- Liquid bulk</li> <li>- Containers</li> </ul>                                                                                    |  | <ul style="list-style-type: none"> <li>- Containers</li> <li>- Other conventional cargo</li> </ul>                                                                                                                 |  | <ul style="list-style-type: none"> <li>- Containers</li> <li>- Other conventional cargo</li> </ul>                                                                                                                                                                         |  |
|                          | Presence of industry                | ++                                                                                                                        |  | 0                                                                                                                                               |  | +                                                                                                                                                                        |  | 0                                                                                                                                                                                                                  |  | 0                                                                                                                                                                                                                                                                          |  |
|                          | Relevant environmental aspects      | <ul style="list-style-type: none"> <li>- Air quality</li> <li>- Waste</li> </ul>                                          |  | <ul style="list-style-type: none"> <li>- Air quality</li> <li>- Waste</li> <li>- Noise</li> <li>- Land use &amp; nature conservation</li> </ul> |  | <ul style="list-style-type: none"> <li>- Land use &amp; nature conservation</li> <li>- Water quality</li> <li>- Air quality</li> <li>- Waste</li> <li>- Noise</li> </ul> |  | <ul style="list-style-type: none"> <li>- Air quality</li> <li>- Soil quality</li> <li>- Water quality</li> <li>- Waste management</li> <li>- Natural resources consumption</li> <li>- Energy efficiency</li> </ul> |  | <ul style="list-style-type: none"> <li>- Air quality</li> <li>- Soil quality</li> <li>- Water quality</li> <li>- Waste management</li> <li>- Natural resources consumption</li> <li>- Energy efficiency</li> </ul>                                                         |  |
| DIFFERENTIATED CHARGING  | Autonomous tariff setting           | YES                                                                                                                       |  | YES                                                                                                                                             |  | YES (budget is fixed, but system behind division of it is autonomously determined)                                                                                       |  | YES (5% if compliance with international rules and if agreement with the PMB on 'good environmental practices')                                                                                                    |  | NO                                                                                                                                                                                                                                                                         |  |
|                          | ESI                                 | YES (10%, if score $\geq$ 31 points)                                                                                      |  | YES (10%, if score $\geq$ 30 points)                                                                                                            |  | YES, but only applied to the top 10 shipping lines with a maximum rebate of 10% (score $\geq$ 31 points)                                                                 |  | YES                                                                                                                                                                                                                |  | YES                                                                                                                                                                                                                                                                        |  |
|                          | Green Award                         | NO                                                                                                                        |  | NO                                                                                                                                              |  | NO                                                                                                                                                                       |  | NO                                                                                                                                                                                                                 |  | NO                                                                                                                                                                                                                                                                         |  |
|                          | Additional environmental schemes    | YES (incentive scheme on fine particles)                                                                                  |  | NO                                                                                                                                              |  | YES                                                                                                                                                                      |  | <ul style="list-style-type: none"> <li>- Rebate on concession fees regarding container traffic, if modal shift objective is realized</li> <li>- Rebate related to transshipment of containers via SSS</li> </ul>   |  | <ul style="list-style-type: none"> <li>- A 15% reduction on port fees is granted to operators handling bulk cargoes and 15% for the remaining types of cargoes.</li> <li>- A 15% bonus is envisaged for fishing activities, shipbuilding activities and yachts.</li> </ul> |  |
| FINANCIAL ASPECTS of ESI | Start date of use                   | ESI: 2011<br>Other: 2015                                                                                                  |  | 2012                                                                                                                                            |  | 2012                                                                                                                                                                     |  | 2011                                                                                                                                                                                                               |  | 2011                                                                                                                                                                                                                                                                       |  |
|                          | Focus on certain market segment     | NO                                                                                                                        |  | YES (focus on short sea shipping)                                                                                                               |  | YES (focus on car carriers & containers)                                                                                                                                 |  | NO                                                                                                                                                                                                                 |  | NO                                                                                                                                                                                                                                                                         |  |
|                          | Fixed / variable budget             | Variable                                                                                                                  |  | Variable within range                                                                                                                           |  | Fixed                                                                                                                                                                    |  | Variable                                                                                                                                                                                                           |  | Variable                                                                                                                                                                                                                                                                   |  |
|                          | Total amount of rebates             | $\pm$ € 500 000                                                                                                           |  | Not disclosed (confidential)                                                                                                                    |  | € 100 000                                                                                                                                                                |  | Not disclosed                                                                                                                                                                                                      |  | Not disclosed                                                                                                                                                                                                                                                              |  |
|                          | % of total port dues                | 0.5% - 1%                                                                                                                 |  | Not disclosed (confidential)                                                                                                                    |  | 0.2% - 0.5% of the ship dues (= ship related charges, ≠ volume related charges)                                                                                          |  | Not disclosed                                                                                                                                                                                                      |  | Not disclosed                                                                                                                                                                                                                                                              |  |
|                          | Total FTE resources per year        | Ca. 0.5 FTE                                                                                                               |  | Ca. 0.5 FTE                                                                                                                                     |  | Ca. 0.5 FTE                                                                                                                                                              |  | Ca. 1.5 FTE                                                                                                                                                                                                        |  | Ca. 1.5 FTE                                                                                                                                                                                                                                                                |  |

Note: Table adapted from Geerts et al. 2017 with Valenciaport as addition

### 3.4.2 *Case of Antwerp*

#### 3.4.2.1 *General background of the port*

The Port of Antwerp, being part of the Hamburg-Le Havre port range, is a large seaport located on the river Scheldt and is managed by the municipal autonomous company 'Antwerp Port Authority', which acts as a landlord. To ensure the accessibility, safety and ecological sustainability of the Port of Antwerp, other governmental authorities on the Flemish, federal, and international levels also play a role. It is one of Europe's most central seaports: sea-going vessels can transport goods 80 km inland via the river Scheldt, into the industrial and consumer heart of Europe. In this area, the PMB provides land, warehouses, covering and quays in concession to private enterprises to develop their commercial activities. In 2014, the Port of Antwerp had a total revenue of 338,406,000 euro.

The most prominent environmental issues for the Port of Antwerp are air quality and waste, a relatively low number of environmental issues compared to the other ports (see Table 3.1). Nevertheless, the strategy of environmentally differentiated port dues is just one element of the 80 measures that are implemented in order to improve air quality. The Antwerp PMB's tariff setting is laid down in a port regulation that is determined by its Board of Directors. Since 2011, the tariff regulation has included the ESI as a basis for differentiating port tonnage dues according to the environmental performance of the ships calling at the Port of Antwerp. In practice, this means that vessels with an ESI score of at least 31 points receive a discount of 10% on net invoiced port dues. In order to collect the discount, a ship must be registered and be published on the public part of the ESI website. Besides the general rule, there are a few other additional environmental discounts introduced by the PMB (e.g. an incentive for controlling or limiting fine particles since 2015, based on longer-term projection on the uptake of LNG as ship fuel and the introduction of scrubbers).

Port dues cover ca. 40% of the total revenue of the PMB, and the rebates given under the ESI scheme represent around 0.5% - 1% of the total port dues. The additional scheme related to the fine particles emissions covers another small part of the total of given rebates. There is no upper limit on uptake (so it is a variable budget) and no recalibration of the tariff structure is made to compensate, so the scheme actually represents a net cost to the PMB. In general, detailed analysis, also for designing the scheme and estimating the total uptake ex-ante, is costly and very difficult. The current level of the incentive (% of rebate) is mostly determined by 'educated guessing' (=best guess estimate) rather than by a trustworthy predictive model. The discount scheme is non-discriminatory.

The internal transaction cost to operate the scheme consists of several resources, primarily derived from human input:

- follow-up of the project by the environmental department, including participation in various international workgroups (estimated at ca. 10 to 20% of a full-time equivalent (FTE));
- currently around 10 working days per quarter for the financial department (but increasing given the manual process) (estimated ca. 25% of an FTE);
- other managerial attention and follow-up by various departments (management reporting, interaction among functions);
- as such, in total, a cost of ca. 0.5 FTE is estimated for operation of the scheme;

- other costs include membership fees of the ESI and other minor operating expenses and costs.

Finally, the Port of Antwerp has already produced three substantive sustainability reports. The elaboration was a two-way approach: it required intensive stakeholder consultation, but, in turn, the stakeholders can use it as a strong tool for monitoring their own progress.

#### 3.4.2.2 *Implications regarding the tool*

After completion of the online version of the support tool by the representatives of the PMB of Antwerp, the port profile A2B1 was allocated to the Port of Antwerp (i.e. A2 in the matrix that defines 'external complexity' and B1 in the matrix that defines 'internal complexity' – see also Figure 3.2). Based on the information provided in the section above, it is possible to justify this position.

As the Port of Antwerp is one of the largest ports of Europe, it can rely on a large financial basis and a large human resource capacity, which allows the port to pay attention to other aspects. Besides taking care of the main business of cargo handling, the PMB can strengthen, for example, its stakeholder relations or competitive advantage. The PMB can put aside a substantial budget for rebates, as the port is financially strong. Also, with regard to human resources, the PMB is able to appoint FTEs to the managing of the scheme. As a result, the level of 'financial complexity' is relatively low for the Port of Antwerp. Furthermore, the PMB is autonomous with regard to tariff setting and allocating rebates, which corresponds with a low level of 'governance complexity'. These two features place it in quadrant B1.

It can be stated that the Port of Antwerp has a strong market position, as it is relatively independent of the commercial actions of other ports, and relies on a diversified, stable traffic base, representing a low level of 'market complexity'. The PMB does not face many different environmental issues, but operates in a densely populated urban environment and needs to include many stakeholders, each providing their point of view and opinion, significantly affecting and complicating the strategic decision-making process of the PMB (i.e. 'high environmental and social complexity'). These features place it in quadrant A2.

Recommendations/implications linked to this profile (A2B1) are the following:

1. To obtain a larger share in the total of vessels that comply with environmental standards and thus to obtain a larger impact as a port:
  - ➔ consider implementing more initiatives, or incentive schemes (e.g. combine the ESI and Green Award);
  - ➔ consider making use of a tier system (e.g. apply the ESI with an initial discount when achieving a score of 20, and a higher second discount at the score of 31) or 'add-on' features (e.g. extra discounts for additional initiatives like the use of LNG, OPS, etc.).
2. Try to pursue an open communication towards the stakeholders; organize meetings on a regular basis, make use of social media to communicate. The higher the level of transparency, the greater the proportion of stakeholders that will be convinced of the goodwill behind the approach/direction the port wishes to take.
3. The PMB has the advantage of being able to apply the scheme(s) that is/are most suitable for the port; the required budget and human resources are available, taking into account the complexity of the stakeholders' relations.

4. Because of the large financial basis, it is not necessary to discriminate in cargo markets. The PMB is able offer the rebate to every eligible vessel.

### 3.4.3 *Case of Zeebrugge*

#### 3.4.3.1 *General background of the port*

The Port of Zeebrugge, located on the North Sea coast, is an autonomous company regulated by public law and with the city of Bruges as the main shareholder. It has become, in barely a couple of decades, an important entry port for the European market with an annual cargo volume of, on average, 43.5 million tonnes. It has gradually developed itself into a versatile port, which does not solely focus on European roll-on/roll off traffic, its main traffic category. The coastal port has also invested in intercontinental (container) traffic, container feeder traffic, conventional cargo, liquefied natural gas, cruises and the shipment of new cars, where it is one of the two leading hubs in Europe. In 2014, the Port of Zeebrugge had a total revenue of 69,436,143 euro.

Its environmental strategy is based on a straightforward, ad-hoc approach in which collaboration with the relevant port community and other authorities is a key element. The most important topics of the environmental strategy of the Port of Zeebrugge are the following:

- land use and nature conservation: the port is influenced by the presence of special protection zones in the port area itself and in its vicinity;
- air quality strongly linked to fuel quality and ship performance in general;
- waste: the provision of superior port waste reception facilities; and
- noise: from direct port activities and from indirect sources such as port-related traffic.

In 2012, the Port of Zeebrugge began to apply an environmental charging scheme that is based on the ESI. A 10% reduction is granted on the calculated tonnage duty if the vessel scores 30 or more on the Environmental Ship Index (ESI), with a limit, however, of 750 euro per call. The total budget of the rebates varies, yet it is supposed to stay within a certain range. Because the Port of Zeebrugge is a medium-sized port, it does not have the human and financial resources to be able to play a driving role on its own, and thus considers collaboration with other ports a key element. The decision of which scheme or index to adopt was thus, for the Port of Zeebrugge, more a way to conform with the decisions taken by the other 'larger' ports, rather than conducting a complementary or additional internal analysis of possible various schemes. Smaller and medium-sized ports simply do not have the human and financial resources to engage in detailed research activities regarding the best scheme to be adopted. In sum, a 'learning by doing' approach is followed for the monitoring of the charging scheme, based on take-up by the shipping lines. In concrete terms, the scheme is now almost entirely focused on the main traffic segments within the port's portfolio. For larger ports, with a broader financial resource basis, it is easier to find channels or ways to compensate for the rebates because of their more diversified nature.

Furthermore, the PMB pays special attention to maintaining a good relationship with local communities, governmental institutions, interest groups, shareholders, environmental pressure groups, etc. It attempts to maintain a continuous dialogue with these stakeholders and tries to involve itself in many environmental projects.

### 3.4.3.2 *Implications regarding the tool*

The port profile A4B4 (i.e. A4 in the matrix that defines ‘external complexity’ and B4 in the matrix that defines ‘internal complexity’ – see also Figure 3.2) is the corresponding position of the Port of Zeebrugge allocated by the online support tool.

With an annual total revenue of around 70 million euro, the Port of Zeebrugge is a rather small port, experiencing much strong competitive pressure from neighboring (often larger) ports in its core markets (containers and short sea ferry to the UK) which limits the commercial actions that it is able to take. In order not to be too dependent on one traffic base and to ensure its overall competitive position is maintained, the PMB has enlarged its traffic portfolio, reflecting the complexity with regard to its ‘market dimension’. The range of environmental issues the PMB is confronted with is rather high, but many of them do not require the same amount of attention. Furthermore, the PMB recognizes an average level of stakeholder pressure and complexity in formal and informal decision processes. Taking into account these average levels in both situations, the sum of values (linked to the answers of the questions) is reflected into a low level of ‘environmental and social complexity’. The total score positions the port in quadrant A4.

As a medium-sized port, the PMB can neither rely on a large financial budget nor on a large pool of human resources, which constrains its ability to deviate from its economic core business of generating revenue. Moreover, the PMB even applies a maximum level of rebate per ship call and focuses the scheme on certain cargo segments in order to limit the financial gap caused by the rebates. As a result, the level of ‘financial complexity’ is high for the Port of Zeebrugge. Furthermore, the PMB is also autonomous with regard to tariff setting and allocating rebates, corresponding with a low level of ‘governance complexity’. These two features place it in quadrant B4.

Recommendations and implications linked to this profile (A4B4) are as follows:

1. Consider investing in an automated system to integrate the scheme into the administrative processes, and reduce the reliance on manual processes, so scarce and valuable human resources can keep their focus on their core tasks (e.g. automatic connection of the ESI database with the database registering the incoming calls in the port, so that registration of vessels eligible for the rebate is performed automatically and a manual procedure is no longer needed).
2. In light of the limited financial resources, it is advisable to define a maximum rebate per ship call and/or a maximum amount of eligible calls. Another approach is to reward only the best-performing shipping lines (e.g. only the top 15 of best performing shipping lines receive a rebate).
3. Consider making a selection of cargo markets that can benefit from the rebate.
4. In light of the limited financial resources, it is advisable to invest in a charging scheme that is focused on the most important environmental issue (e.g. ESI for air emissions; Green Award for water quality, energy-efficiency, waste, etc.).
5. The approaches followed by neighboring ports can be regarded as good examples. It should be borne in mind that the cumulative sum of rebates makes it attractive for shipping lines to call at certain ports.
6. Try to gain insight into the price elasticity of demand, as high price elasticity can sometimes generate more revenue. A high price elasticity of demand means high price sensitivity from shipping lines. In some circumstances, a higher rebate will generate

more revenue, due to the trade-off between losses from the rebate but gains from an increase in calls.

#### 3.4.4 *Case of Le Havre*

##### 3.4.4.1 *General background of the port*

The Port of Le Havre (landlord model) is located in the north of France and consists of a series of canal-like docks, the Canal de Tancarville and the Grand Canal du Havre, that connect Le Havre to the River Seine. From 2000, the port underwent several large structural changes; besides the existing infrastructure, 5,000 meters of additional quay and three new terminals were built. In 2014, the annual total revenue of the Port of Le Havre was 173,210,000 euro. The port is located in a rich and diverse estuarine environment, and the balance between the development of industrial and port activities and the preservation of a rich and fragile ecosystem needs to be ensured on a permanent basis. Several protection policies are in place both at the European and regional levels.

As the port is located in the area of the Seine estuary, it has to deal with sensitive issues regarding the environment. To cope with the need for a coherent and sustainable management of the area, the PMB implements an environmental policy. In general, there are five main topics that drive the environmental strategy, in particular sustainability issues regarding dredging and the presence of industry in the port:

- land use and nature conservation;
- water quality;
- air quality (incl. greenhouse effects);
- waste; and
- noise.

The Port of Le Havre is one of the pioneers and initiators of the ESI working group, and, as such, was one of the first adopters. It was the only French port to sign the initial convention of the ESI. Their environmental incentive scheme is thus based on the ESI, and became operational in 2012: ships with an ESI equal or above 31 are eligible for an incentive. In total, the PMB assesses the human resources involved (across all departments) at around 0.5 FTE.

The scheme applied by the Port of Le Havre offers some interesting particularities:

- The scheme is not officially part of the tariff regulation (this is the reason for it being difficult to find the specifics in the public domain). It is considered a separate budget, allocated to the environmental department. This was a deliberate management choice given the specific legislative aspects in France surrounding tariffs and potential collaborative structures like the ESI. Another reason is the adoption of a more prudent approach when it comes to formal implementation (fixed budget instead of variable).
- The scheme is formally described and fixed in an 'environmental charter', signed annually between all stakeholders at the level of the HAROPA<sup>10</sup> organization. As a result, it should not be considered as a rebate, but rather as a separate, redistributive

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<sup>10</sup> HAROPA is a collaborative agreement between the Ports of Le Havre, Rouen and Paris, which focuses on the environmental management of the Seine estuary.

fund. As such, it comprises a real cost to the port, as there is no compensation sought elsewhere.

- The annual budget of the scheme (or rather fund) is fixed at 100,000 euro which represents around 0.2% to 0.5% of the total port dues respectively ship dues. At the end of each calendar year, the total number of eligible ship calls (with a score of 31 and more) is determined, and an average amount per call is calculated (100,000 euro/total calls). As a next step, the calls are aggregated per customer (shipping line) and the ten customers with the largest share of ESI eligible calls are compensated out of the fund (i.e. the fund is redistributed to these ten customers – so a ‘de minimis rule’ is applied). The compensation cannot exceed 10% of the total ship dues (i.e. one part of the total port dues) of the customer: the port dues are split into ship-related charges and cargo-related charges (based on the volume), with the ESI being applicable to the ship dues. The PMB is reviewing the system and is considering the idea of also adopting cargo-related charges as a basis upon which to award financial compensation (i.e. the amount of cargo handled will also be taken into account to avoid ships simply calling at the port to benefit from the incentive as a means to artificially increase the number of calls).
- The incentive scheme is applied to two market segments: container ships and car carriers.
- Transshipment containers (from deep-sea to short-sea feedering) are charged differently. This incentive is essentially implemented to stimulate the short-sea shipping dimension between the North Sea and the Atlantic Ocean (English Channel): when the share of gross tonnage transshipped from sea-going vessel to sea-going vessel is equal to or higher than 20% of the total gross tonnage unloaded or loaded, an adjustment is granted.

The Port of Le Havre has two ways through which it formally involves stakeholders:

1. An annual meeting and discussion with the shipping lines is organized. Here, feedback is gathered on the operation and characteristics of the scheme. This local meeting is complementary to the annual stakeholder consultation within the ESI working group.
2. The ESI is integrated within the regional air protection management plan (‘Plan de Protection de l’Atmosphère’). This plan is communicated to all port users annually.

#### *3.4.4.2 Implications regarding the tool*

The online support tool determines the quadrants A3B2 (i.e. A3 in the matrix that defines ‘external complexity’ and B2 in the matrix that defines ‘internal complexity’ – see also Figure 3.2) to be the port profile for the Port of Le Havre. The explanation for this position can be found in the port’s background information.

Although an annual total revenue of over 170 million euro defines the Port of Le Havre as a medium- to large-sized port, giving it a fairly strong market position, it has to take account of actions of other competing ports and has to anticipate these actions in order to keep its competitive advantage, in particular in the container and RoRo markets (as it occupies a dominant position in the liquid bulk market). For this reason, the PMB does not provide rebates for every cargo market (rebates are only foreseen for two market segments: container ships and car carriers) and defines an annual budget with a maximum of 100,000 euro that can be used for rebates. The PMB goes even further by only rewarding the ten best performing

shipping lines. Besides these characteristics of the scheme, there is also the special feature of the use of a separate fund for the rebates, as, given certain legislative aspects in France, the scheme may not be part of the tariff structure. This shows the complexity on the level of 'governance aspects' that the Port of Le Havre has to deal with. Some aspects fall under the control of the government (like the pricing strategy for port dues), resulting in an alternative approach to the implementation of the scheme as compared to the Ports of Antwerp and Zeebrugge. As Le Havre is a medium- to large-sized port with regard to financial and human resources, and, as the scheme consists of a fixed level of rebate budget, the application of the scheme does not result in unexpected payouts. Therefore, the level of 'financial complexity' is defined as low. The Port of Le Havre tries to involve, to the greatest extent possible, the important stakeholders not only in the general working of the port but also in the specific implementation of the ESI scheme. The PMB organizes a meeting with the shipping lines on an annual basis to discuss the features of the scheme, which makes the decision-making process rather complex. In light of ongoing environmental issues, the port exhibits a high level of complexity, as it is located in the region of the Seine estuary. Taken together, these insights correspond to quadrants A3 and B2.

### 3.4.5 *Case of Valencia*

#### 3.4.5.1 *General background of the port*

The Port of Valencia is a hub for the Western Mediterranean region, and distributes cargo throughout a 2,000 km radius, including the south of the European continent and the North African coasts. The port transports the full range of cargoes (bulk, liquid and containers) – albeit with a clear dominance of container traffic, while also serving passenger traffic with regular lines to and from the Balearic Islands and Italy, and with cruise options. As defined in Spanish legislation<sup>11</sup>, the Port of Valencia is a state-owned body, governed by public law, while having at the same time its own legal status, equity and a limited level of management autonomy, characterized by the landlord model.

The general environmental strategy of the PMB of Valencia relies on the involvement and contribution of port stakeholders in environmental initiatives carried out by the PMB. The most relevant environmental aspects within the environmental strategy are:

- air, soil and water quality;
- waste management;
- natural resources consumption; and
- energy efficiency.

In 2011, the Spanish Port Legislation introduced incentives for ships and port operators that sign an 'Environmental Best Practices Agreement' with the PMB (i.e. the PMB itself does not have any influence in determining port dues or rebates). The shipping company or the ship owner can receive a 5% rebate on port dues if:

- 1) they have an agreement with the PMB on 'good environmental practices' associated with the operations and permanence of ships in the port;

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<sup>11</sup> Spanish Legislative Royal Decree 2/2011 of 5 September

- 2) vessels demonstrate compliance with international environmental rules and conventions.

Some 'bonuses' are also granted to port operators. Specifically, a 20% reduction on port fees is granted to operators handling bulk cargoes and 15% for the remaining types of cargoes. Finally, a 15% bonus is envisaged for fishing activities, shipbuilding activities and yachts.

The cost of the scheme is covered by the PMB's budget. However, this is not considered as a structural component of the environmental budget. Furthermore, the scheme does not apply a fixed maximum of total rebates given in terms of share of the total revenue, i.e. as long as vessels comply with the requirements, the port is obliged to apply the discount. In practice, it is estimated that 1.5 FTE are required for the monitoring of the process.

Stakeholders are involved in the process of defining the environmental strategy, as they are part of the stakeholder forum (EcoPort II Group) in which all environmental initiatives are presented and discussed. Through this forum, all interested port-related actors can actively participate in the definition of environmental objectives, which facilitates communication and dissemination of required information to the members of the port community.

#### *3.4.5.2 Implications regarding the tool*

The port profile of the Port of Valencia, as presented by the online support tool, is A2B2 (i.e. A2 in the matrix that defines 'external complexity' and B2 in the matrix that defines 'internal complexity' – see also Figure 3.2). The characteristics of the port explain the position obtained.

The most prominent feature of the Port of Valencia is its governance model, as the Spanish ports are very strictly regulated. Most of the decisions are taken at government level, leaving a very limited amount of managerial autonomy for the PMB itself. Introducing incentives in the general pricing structure was consequently not a decision taken by the PMB, but rather by the Spanish Port Legislation. Therefore, the Port of Valencia is characterized by a high level of 'governance complexity'. With a total revenue of around 120 million euro in 2014, the port can be considered as a medium- to large-sized port. As the scheme is applied to all cargo types and to every vessel that calls at the port, and as there is no fixed rebate budget, we can state that the 'financial complexity' the PMB has to deal with is moderate. This is especially true given that the PMB does not have to make the necessary analysis and related decisions concerning the general tariff structure, and instead simply needs to follow what the legislation prescribes. On the other hand, the PMB is responsible for preserving a good relationship - and communication - with its stakeholders. Several prominent stakeholders are part of the decision-making process with regard to the environmental strategy of the Port of Valencia.

Furthermore, the PMB has to deal with a relatively large number of environmental issues which, together with the insights in light of the involved stakeholders, define a high level of 'environmental and social complexity'. Finally, the port is not selective in terms of cargo traffic and does not only reward the best performers with regard to the implementation of ESI, but all ships exceeding compliance requirements. Given these insights, combined with the feature of being strictly regulated, we can state that the port has a relatively strong market position (low complexity), as it is not dependent on specific actions of other ports and defines its own best practices (i.e. obliged by legislation). Overall, these features position the port in quadrants A2 and B2.

In conclusion, we project the obtained port profiles of the four case-study ports, based on the four individual dimensions of the two detailed matrices, into the general matrix, highlighting the differences and similarities between the ports (Figure 3.3). General conclusions can be derived based on the specific position of the ports in the matrix, reflecting the internal and external complexity of individual or a group of ports.

- Port of Antwerp: A2B1
- Port of Zeebrugge: A4B4
- Port of Le Havre: A3B2
- Port of Valencia: A2B2

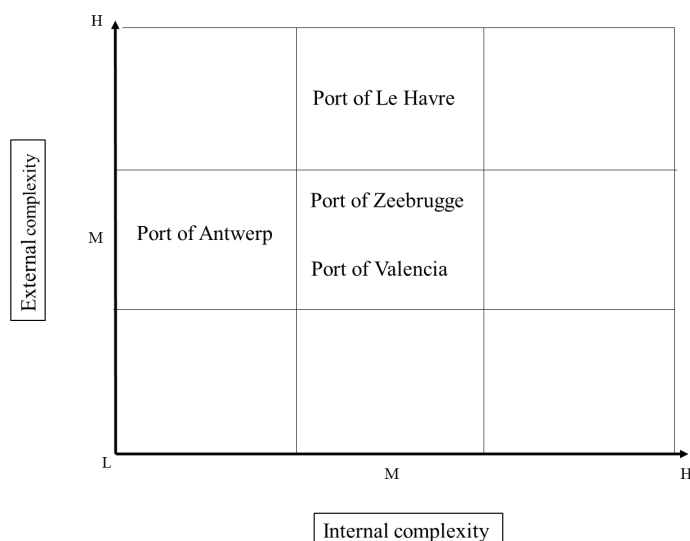


Figure 3.3 – Projection of the different port profiles into the general matrix

Figure 3.3 shows that the Port of Le Havre is the port with the highest level of ‘external complexity’. The Port of Antwerp is the port that experiences the fewest issues with regard to governance and financial /human aspects, as the level of ‘internal complexity’ is low. The Port of Zeebrugge and the Port of Valencia are positioned in the most central quadrant of the matrix, reflecting average levels across all dimensions. Nevertheless, it should be noted that the underlying values - corresponding with certain answers - of the individual port profiles certainly differ, and that it is only the sum of all answers and values that positions the ports in the same quadrant.

As derived from the initial desk research and as stated during the several in-depth interviews, the concept of environmentally differentiated charging is a complex tangle. Nevertheless, the support tool described in this chapter shows that decreasing the uncertainty around this topic is possible when knowledge transfer and transparency are achieved. The latter is a very important condition for success; only when PMBs are prepared to share important knowledge and insights is simplification of the issue possible, allowing interesting tools and mechanisms to be developed in order to have an industry-wide impact.

### 3.5 CONCLUSION

With around 80% of total world trade in terms of volume being carried by sea, ports are of utmost importance within global supply chains. In other words, ports can be considered as catalysts for economic development (Becker et al., 2013). Despite the fact that the port industry can be considered relatively energy-efficient and climate-friendly, it needs to be acknowledged that the general feeling is one of displeasure regarding ports' impacts upon the environment, human health and climate. Being part of large ecosystems involves various stakeholders interacting with and putting pressure on each other, with the ultimate goal of improving the level of environmental performance (Denktas-Sakar & Karatas-Cetin, 2012).

As previously mentioned, in order to respond to the increased awareness and knowledge of the environmental impact of ports, many new instruments, stemming from research projects (e.g. Ecoports, Portopia), as well as several conferences (e.g. ESPO, Association Internationale Ville et Ports (AIVP)) and other initiatives (e.g. Environmental Code of Practice of ESPO) have been implemented by several different port actors (e.g. PMBs, trade associations, etc.) during recent years (Haezendonck et al., 2006; Lam & Notteboom, 2014). Among the multitude of possible measures to counter the environmental challenges of maritime operations, 'green port dues' or 'environmentally differentiated charging' has been receiving increasing attention in the last few years, generating some concrete, bottom-up initiatives as a result of concerted efforts between PMBs, trade associations, and others (e.g. the Environmental Ship Index, Green Award, etc.). As this incentive requires some adaptation in the general pricing structure of the PMB, not all PMBs are eager to implement such an initiative. This is even more the case due to the fact that a number of factors that create uncertainty and hinder the decision-making process of port managers are present (Geerts et al., 2017).

The key objective of this contribution is to create a learning environment, by means of a simple, transparent and straightforward toolbox, to support PMBs and their stakeholders in their discussion, decisions and final choice of implementing a particular scheme. Nevertheless, the toolbox can also be of value for PMBs that already have a scheme in place: it provides learning opportunities by assessing the appropriateness of the current scheme. The ultimate goal of the toolbox is to provide a multi-criteria-based assessment/decision tree in the form of a questionnaire, through which it is possible to link elements of the port profile to concrete recommendations regarding implementing environmentally differentiated charging schemes, as well as reviewing existing best practices.

From the literature review and subsequent in-depth interviews held with 14 different PMBs, we observed that the variables defining the basic features of a port, and thus its profile, can be subsumed into four dimensions. These, in turn, can be linked to the internal (governance and financial/resource basis) and external (market and environmental and social responsibility) context of the port:

- ❖ governance: reflecting the degree of autonomous management of the PMB in setting pricing/charging schemes;
- ❖ financial/resource basis: based on the availability of slack resources (financial and human resources) to engage in differentiated pricing/charging schemes (and the associated ex-ante and ex-post analyses, monitoring, and administrative processes);
- ❖ environmental and social responsibility: referring to the complexity and interrelatedness of the environmental and stakeholder challenges the port cluster faces;

- ❖ market: referring to competitive pressures in the cargo markets in which the port is active.

However, four methodological remarks regarding the toolbox need to be made: (1) the simplicity of the tool implies certain limitations in terms of its ability to take into consideration the detailed situation of every port. As such, the toolbox is not built from a normative approach-based point of view. Recommendations derived from the application of the toolbox are either intended as a starting point for discussion on the level of the individual port, or, alternatively, confirm or challenge the scheme currently in place and/or the choices already made; (2) the structure behind the working mechanism of the toolbox is based on expert knowledge and expert opinions. This results in a certain degree of subjectivism, which calls for a coordinated effort by current providers (ESI, Green Award, etc.), trade associations (IAPH, ESPO, others) and individual PMBs to adopt and expand the current toolbox and to feed it with data in order to expand the learning environment and facilitate the decision-making process with regard to 'green port dues'; (3) the current cases considered might not provide a full match for every port with a current best-practice port, as the case studies are predominantly landlord models. Further and ongoing validation will be needed once the tool is in general use; (4) the practice of environmentally differentiated schemes is still, even for the leading ports, essentially a learning exercise and not yet a stable concept. The schemes will continue to evolve in a dynamic way; similarly, the toolbox will need to evolve, leading to a need for frequent revision/updates (i.e. adding new information and insights on the application and results of schemes).

To conclude, the discussion presented in this chapter emphasizes the importance and need for dialogue between different stakeholders on the subject of environmental performance, and more specifically 'green port dues' as an incentive to reduce negative impacts of the port industry. In light of the empirical analysis, two reflections can be made that need further investigation in future research.

First, the geographic situation matters, as environmental challenges for shipping and ports will vary from region to region (e.g. in Europe: Baltic, North Sea, Atlantic, Mediterranean, Black Sea). Given that every maritime region is also characterized by its own special features and needs, the concept of environmentally differentiated port dues needs to be considered and aligned with the different geographical priorities and stakeholder pressures.

Second, some PMBs are of the opinion that the subsidiarity principle might play a role; the question of at which level the environmental regulatory initiative has to be taken may be relevant. Given that each individual port has a unique local environmental situation and given that the shipping industry has a strong international character, decisions on a national or regional level would be less appropriate than regulations on a port or global level.

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## PART II



## **CHAPTER 4**

### **DETERMINANTS OF SUSTAINABILITY REPORTING IN THE PRESENT INSTITUTIONAL CONTEXT: THE CASE OF PORT MANAGING BODIES**

Geerts, M., Dooms, M. & Stas, L. (2020). Determinants of sustainability reporting in the present institutional context: the case of port managing bodies. Accepted for presentation at the *International Association of Maritime Economics (IAME) annual conference 2020* (Hong Kong)



**Abstract:** Research on the practice of sustainability reporting that is specifically focused on the approach applied by port authorities (or port managing bodies – PMB) and based on surveys as a data collection method is very limited. Most research consists of single case studies, only partly covers the different dimensions related to the implementation of sustainability reporting, or is based on content analysis. This chapter offers a multidimensional approach of the concept of sustainability reporting based on a global survey yielding 97 complete and valid answers of PMBs. A binomial logistic regression has been conducted to identify those organizational characteristics, whether or not under the control of the PMB, that have the largest explanatory power when it comes to the adoption of the practice of sustainability reporting. The research results present new variables compared to the findings of previous studies, such as proximity to a city, the history of data gathering, and the presence of environmental/social certifications. Furthermore, the chapter also investigates how these organizational characteristics are interlinked with external, contextual forces by making use of Institutional Theory. By combining organizational characteristics with information on the institutional environment in which the PMB operates, a more complete image is obtained. The results of this analysis show that myriad different institutional pressures are in play when it comes to having influence over the decision-making of PMBs with regard to the adoption of sustainability reporting. Furthermore, several prominent associations between one of the isomorphisms and certain organizational characteristics can be observed.

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**Keywords:** sustainability reporting, port managing bodies, institutional theory, regression analysis, international.

## 4.1 INTRODUCTION

Across industries and geographies, stakeholder pressures have created an environment in which a successful corporate strategy is defined by, and dependent on, the integration of strategic objectives related to environmental and social challenges for which organizations are held accountable. In response to this overall greater awareness and concern about an organization's activity and related positive and/or negative effects, businesses have engaged in various sustainability initiatives, e.g. sustainability reporting, to monitor and tackle the existing issues. Open communication and transparency are nowadays key aspects in the process of enhancing an organization's accountability. Hence, *"accountability involves the responsibility to undertake certain actions and the responsibility to provide an account of those actions"* (Moneva, Archel & Correa, 2006, p.126). However, as stated in the research of Adams (2002), the collection of environmental data is not directly connected to the systems for collecting economic data, confirming limitations to mere financial reporting. Therefore, the field of accounting for more integrated performance has been developed, in particular that of sustainability reporting, which goes beyond financial/economic reporting, to also include the other two aspects of the Triple Bottom Line (TBL): information related to environmental and social performance. Disclosing sustainability-related information through a sustainability report (SR) can be regarded as an important strategic key element to foster the trust, loyalty and confidence of different stakeholders, as an SR can serve as proof that an organization accounts for more than just profitability (Herold, 2018). In the mainstream business literature, a significant amount of research has been conducted in terms of identifying the motivations and drivers to engage in sustainability reporting (Adams 2002; Bebbington, Higgins & Frame, 2009; Herzig & Schaltegger, 2006; Thijssens, Bollen & Hassink, 2016). The organizational practice itself remains mainly voluntary (Hahn, Reimsbach & Schiemann, 2015), leaving room for experimenting on what to disclose and which guidelines to use. The Global Reporting Initiative (GRI) is, at present, the best-known and generally accepted framework offering guidelines for the practice; it was founded in light of standardizing and improving comparability of SRs on a global level (Brown, de Jong & Levy, 2009). However, in spite of these convergence efforts, comparability between SRs is still often limited because of differing external (institutional environment) and internal (organizational characteristics) factors (Hahn & Kühnen, 2013; Herzig & Schaltegger, 2006). A good understanding of both internal and external determinants is necessary in order to further improve the development of sustainability reporting frameworks and diminish the variations in their global application.

Despite a rapid increase in attention to and importance of sustainability reporting in many industries, its value has not been fully recognized by the maritime industry; ports in particular. Also, academic research on the topic remains rather scarce and in an emergent phase (Ashrafi et al., 2019; Vejvar et al., 2018). Exploratory research based on a content analysis of ten SRs of leading seaport managing bodies, all based on the GRI framework, revealed that significant differences exist at the level of indicators reported, boundary levels of reporting, as well as stakeholder inclusion in the process (Geerts & Doods, 2017). Building upon this research, this chapter contributes with new empirical insights to this emerging field through the identification of the organizational and contextual factors that positively/negatively influence the practice of sustainability reporting by PMBs on an international level.

We start by reformulating (controllable) organizational determinants identified in existing literature across industries (Brammer & Pavelin, 2008; Monteiro & Aibar-Guzman, 2010; Fifka, 2013; Hahn & Kühnen, 2013; Kouloukoui et al., 2019; Tagesson et al., 2009; Thijssens et al., 2016) and adapt those to the specific context of ports. We also add a newly defined

determinant 'sustainability integration' that tries to capture the extent to which sustainability, in all its aspects, is part of the 'organizational DNA'. Furthermore, in order to explain the influence of the environment and society - to which PMBs are contingent - on the initiation of sustainability reporting, we apply Institutional Theory. This theory has already proven its validity across different domains, as it leads to a better understanding of the dynamics independent of strategic analysis in sustainability decision-making (Husted & Allen, 2006; Tavares & Dias, 2018). With regard to seaports, the application of this theory has been very limited (Acciaro, 2015; Geerts, Langenus & Doms, 2017; Santos, Rodrigues & Branco, 2016). This chapter not only adds value to the literature by making use of Institutional Theory as an explanatory crux, but also by applying those theoretical insights to real empirical data in order to (in)validate existing assumptions.

The collection of data was accomplished by means of an online survey that was developed in direct collaboration with the International Association of Ports and Harbors (IAPH). Hahn and Kühnen (2013) reveal, in their literature review of 178 articles related to sustainability reporting as a practice in business, management and accounting research, that a survey technique was only used in a tiny 4% of those papers. Furthermore, 58% of the analyzed papers are based on document analyses showing a general deficit in both exploratory and confirmatory approaches. By applying the survey technique, we were able to conduct an analysis with a higher level of managerial-driven psychological depth than most analysis based on content analysis. It is the first study to generate broader institutional insights based on the real answers of port managers and link these with the results of a regression analysis in order to maximally reveal the driving mechanisms behind sustainability reporting in the port sector. The results in this chapter do not show individual cases, as responses have been processed on an anonymous basis and in strict confidence. In brief, our analysis contributes to the existing literature in several ways: 1) little is thus far known about sustainability reporting by PMBs on a global scale, 2) it incorporates many already existing determinants into one large model and identifies the new determinant 'sustainability integration', 3) it employs a survey, 4) Institutional Theory, based on real empirical results, is applied.

The chapter is structured as follows: Section 4.2 provides an overview of identified determinants that have a positive/negative influence on the initiation of sustainability reporting. For each determinant, the specific context of PMBs will be discussed. Section 4.3 positions Institutional Theory in the context of ports and explains the institutional forces to which PMBs respond. Section 4.4 discusses the methodology. The analysis and discussion of the results are provided in Section 4.5, which is further divided into two subsections, each focusing on a separate research question:

- *What are the determinants influencing the practice of sustainability reporting in the context of PMBs?*
- *Which organizational characteristics and institutional pressures emerge together and play a role?*

The chapter concludes with some managerial implications, limitations of the research, as well as suggestions for future research.

## 4.2 DETERMINANTS INFLUENCING SUSTAINABILITY REPORTING

The most well-known benefit of sustainability disclosure is that of reducing information asymmetry between the organization and its stakeholders, eliminating room for speculation, and thus diminishing the overall risk level of the organization (Cormier & Magnan, 1999; Brammer & Pavelin, 2004; Brammer & Pavelin, 2008). However, even with the knowledge of the advantages of sustainability reporting, many organizations still opt against initiating the development of an SR. The main identified reason relates to organizational costs linked to the disclosure of sustainability information: *“the costs of measuring, verifying, collating and publishing environmental information, and the loss of strategic discretion associated with making public commitments to verifiable future actions and/or performance”* (Brammer & Pavelin, 2008, p.122).

As stated by Cormier and Magnan (1999), decisions made with regard to defining a sustainability disclosure strategy will always be the result of a cost-benefit assessment (sometimes intrinsic). Decision-making in light of sustainability disclosure is therefore expected to depend upon a range of organizational and environmental aspects that influence the benefits and costs (including opportunity costs) of disclosing such information. Sustainability reporting will be more costly for some organizations than for others. Through the years, and across various industries, countries and institutional environments, several (controllable) organizational characteristics have been identified as significant explanatory variables to clarify the initiation and existence of sustainability reporting (Brammer & Pavelin, 2008; Cormier & Gordon, 2001; Fifka, 2013; Hahn & Kühnen, 2013; Kolk, 2004; Kouloukoui et al., 2019; Monteiro & Aibar-Guzman, 2010; Naser et al., 2006; Tagesson et al., 2009). We selected those variables that would also apply to the port industry, and adjusted them to the specific context of PMBs. Furthermore, we also added variables rarely investigated in literature, e.g. number of social/environmental certifications, and a newly defined one, i.e. sustainability integration. Other variables did not make the selection due to data availability reasons, as we wanted to keep the survey as clean and appealing as possible, in order to maximize the response rate. In the analysis that follows, we start by reformulating the selected determinants in light of the context of the port industry and attempt to detect the extent to which they apply to PMBs.

### 4.2.1 Size and organizational visibility

The assumption that there is a positive relationship between the size of an organization and the level of sustainability disclosure has been analyzed and confirmed by multiple studies over the past decades (Brammer & Pavelin, 2004; Brammer & Pavelin, 2008; Hahn & Kühnen, 2013; Kouloukoui et al., 2019; Monteiro & Aibar-Guzman, 2010; Naser et al., 2006; Prado-Lorenzo, Gallego-Alvarez & Garcia-Sanchez, 2009; Tagesson et al., 2009). Several arguments exist in support of this positive correlation. Firstly, in general, larger organizations occupy spotlight positions, causing their activities to be more visible to the public, external agents, governments, etc. In this way, they are also exposed to a higher degree of attention from stakeholders in relation to their sustainability efforts, translated into greater pressures (Brammer & Pavelin, 2008). Secondly, as those larger organizations are monitored by the public eye, they are expected to handle matters in a way that benefits society. In order to limit those external pressures, they are more willing to voluntarily disclose information (Kouloukoui et al., 2019). Thirdly, as mentioned above, the preparation and disclosure of Triple Bottom Line information is costly. Compared to small- and medium-sized

organizations, larger ones possess the necessary resources (financial and human) to collect, analyze and report data (Monteiro & Aibar-Guzman, 2010; Naser et al., 2006).

Research of Ashrafi et al. (2019) shows that the same reasoning holds in the context of ports. The adoption of sustainability initiatives seems to be correlated with the size of the port, as most small- and medium-sized ports did not adopt any sustainability measure, most likely explained by the expenses associated with it. Hence, the related hypothesis is stated as follows:

H<sub>1</sub>: There is a positive relationship between the size of the PMB and the production of an SR, *ceteris paribus*.

#### 4.2.2 *Financial performance*

Several studies have looked at the possible association between an organization's financial performance and the disclosure of TBL information (Hahn & Kühnen, 2013; Kouloukoui et al., 2019; Monteiro & Aibar-Guzman, 2010; Tagesson et al., 2009). A higher level of financial performance is often associated with a higher level of power, translating into a higher level of stakeholder pressure. Being in a good financial condition increases the ability and flexibility to bear costs that are linked to investments in sustainability initiatives, of which sustainability reporting is one (Hahn & Kühnen, 2013), as well as costs linked to revealing potentially damaging information (Cormier & Magnan, 2003). It is therefore expected that organizations with a higher financial performance will more easily disclose TBL information to differentiate themselves and minimize the possibility of adverse selection (Akerlof, 1970).

Research conducted by Kuznetsov et al. (2015) shows that small ports are not very willing to invest in environmental management systems, as such investment causes a burden upon their net profit. Small- and medium-sized ports often mention a reduction in profits or at best make reference to a break-even situation when it comes to investments in sustainability actions (Ashrafi et al., 2019). However, financial performance as a separate variable in the analysis of sustainability reporting by PMBs has not been previously researched. In our study, we will use total annual operating revenue/financial turnover as a proxy to indicate financial performance, as, currently, no commonly accepted indicator exists, due to, *inter alia*, different governance frameworks and/or PMB business models. Annex 1 in the Appendix provides an in-depth discussion and further explanations regarding this highly complex topic in the specific case of PMBs, and a clear argumentation for the choice for total annual operating revenue as proxy. The hypothesis is as follows:

H<sub>2</sub>: There is a positive relationship between a PMB's financial performance and the production of an SR, *ceteris paribus*.

#### 4.2.3 *Country / region*

Countries are characterized by different legal frameworks, national culture and behavior. The question remains as to whether these variations are reflected in the practice of sustainability reporting. Some countries, e.g. Sweden, and continental groupings, e.g. the EU, have chosen to enact some ground rules as well as binding policies with regard to sustainability reporting (European Union, 2014; GRI, 2010). Besides the legal environment in which organizations operate, the national culture of a country, not only in terms of history and tradition, but also in terms of moral values, can also influence the decision-making and handling of

organizations. Prevailing moral values shape the ethical behavior of an organization and thus have an influence on the issues an organization selects as being worthy of resource allocation (Adams, 2002).

Research of Santos et al. (2016) indicates that the national context in which the PMB operates plays a role in the existing variety when it comes to sustainability communication. Also, previously conducted exploratory research, based on a content analysis comparison of SRs of ten different leading PMBs, shows country dependence differences (Geerts & Doods, 2017). For this reason, we define the following hypothesis:

H<sub>3</sub>: The region of origin has an influence on the practice of sustainability reporting by PMBs, *ceteris paribus*.

#### 4.2.4 *Level of autonomy*

Only limited extant literature has analyzed the impact of different ownership structures, i.e. private vs. public, on the disclosure of environmental and social information (Cormier & Gordon, 2001; Naser et al., 2006; Tagesson et al., 2009). According to Santos et al. (2016), when looking at possible determinants for sustainability disclosure, the integration of information on ownership structures has not been applied for the port sector. Nevertheless, the situation of PMBs regarding their ownership structure is highly complex and thus interesting to investigate in this context. While the ownership structure of a PMB is often considered a hybrid structure, as shareholders can be a mix of the public and private sector, in most cases the ownership structure does not provide a clear representation of the actual level of autonomy of managerial decision-making. This means that while many PMBs act like limited liability companies with varying executive power, they are obliged to report back to their private and/or public shareholders, i.e. local, regional and national governments (Pallis, 2007; van der Lugt, Doods & Parola, 2013). In general, because of this hybrid nature, PMBs are confronted with substantial public-private interactions and interests both on a daily basis and in longer-term strategic decision-making, showing the need for good and transparent communication strategies in order to continue to evolve toward the same objective (Notteboom et al., 2015). This, in extension, also applies to decisions related to the adoption of sustainability practices, as an increased level of autonomy will also increase the accountability of port managers. In light of the specific context of ports, we formulate the following hypothesis:

H<sub>4</sub>: There is a positive relationship between the level of autonomy of a PMB and the production of an SR, *ceteris paribus*.

#### 4.2.5 *Stakeholder inclusion*

In recent decades, a wide array of research has already highlighted the need for multidimensional information when it comes to sustainability reporting in comparison to traditional financial reporting, as the audience is not limited to shareholders alone (Belluci & Manetti, 2019; Deegan & Rankin, 1997). Various salient stakeholders (clients, government, local community, etc.) demand a clear view on an organization's business conduct, taking into account all TBL domains (Hahn & Kühnen, 2013). As stated by Belluci and Manetti (2019, p.92):

*“Dialogue with stakeholder groups is essential for sustainability reporting because it enables organizations to create truly material and relevant reports about the true creation of value for all stakeholders”.*

This dialogue can entail different degrees of involvement and models, in the range of no-or-limited inclusion (informing, one-way dialogue) to full inclusion (majority of stakeholder representation in the decision-making). However, some authors claim (Campbell, 2003; Hess, 2008) that, to date, organizations have used stakeholder inclusion more in an opportunistic manner, essentially as a legitimization tool to change stakeholders' expectations. Therefore, we believe that the lower the level of stakeholder inclusion, the greater the chance an SR's purpose will be limited to that of legitimacy. The opposite reasoning holds as well: the higher the level of inclusion of stakeholders, the more the organization wishes to achieve a consensus of stakeholders' needs and expectations, which will, in turn, be reflected in an SR. Only when stakeholders are consulted to a high degree and on an ongoing basis will the content of an SR not only show what the focal organization believes its stakeholders want to know but also those issues (positive and/or negative) that are regarded as material by the stakeholders themselves. Research of Geerts and Doms (2020) shows the importance of good and open communication between an organization and its stakeholders, as results show that what is material for stakeholders is not always supported to the same extent by the focal organization, and this also applies to the underlying reasons as to why organizations (should) produce an SR (Kolk, 2004).

In the specific context of ports, the approach towards proper stakeholder inclusion is even more complicated because of the prevailing hybrid ownership structures and the variety of involved stakeholder groups, with all aiming for different (sometimes conflicting) objectives (Doms, 2019; Geerts & Doms, 2020). Port managers are increasingly aware of the fact that disclosure should consist of a range of diverse topics, tailored to the needs and demands of each individual stakeholder group, in order to reduce the risk of information asymmetry. Hence, we formulate the following hypothesis:

H<sub>5</sub>: The higher the level of stakeholder inclusion in general strategy formulation, the greater the chance that a PMB will publish an SR, *ceteris paribus*.

#### 4.2.6 History of performance data gathering

For several decades, organizations have been obliged to disclose information on their financial/economic situation, translating into a certain (minimum) need for data collection and analysis. However, with the increase in importance of social and environmental aspects linked to business activities (Lozano, 2013) and the associated reporting, this also calls for a more holistic and comprehensive approach regarding the data gathering efforts of organizations. Unfortunately, most data and information related to social and environmental aspects cannot be found in the public space, as it concerns tailored information. The process of data gathering and analysis requires time, resources and sometimes proprietary and tailor-made built-in measuring models. These challenges are exacerbated in the context of PMBs, as they often rely on external stakeholders for data collection in order to gain insights as to the impacts of the operations of the port cluster (Langenus & Doms, 2015). We believe that when an organization is willing to invest in collecting and analyzing data beyond the necessary, this also indicates that the organization is willing to commit supplementary resources with regard to sustainability initiatives, of which sustainability reporting is an important one. The combined tangible efforts oriented toward data gathering and the associated performance

reporting provide the impression of caring, as the organization tries to keep track of its progress across all the Triple Bottom Line domains. Vice versa, if an organization is not willing to invest, or maybe not able to collect extra information due to resource barriers, this will negatively influence the potential for producing an SR. In light of this reasoning, we define the following hypothesis:

H<sub>6</sub>: The more comprehensive the history of performance data gathering as part of the general corporate strategy, the greater the chance a PMB will publish an SR, *ceteris paribus*.

#### 4.2.7 *Proximity to the city*

Research of Adams (2002) shows that organizations with on-site head offices pay greater attention to the 'well-being' of local communities than organizations that do not have their head offices on site. For the latter, shareholders and employees are the most important stakeholders, for whom a traditional financial report is often enough. The same logic holds for the port industry. According to Darbra et al. (2004), the space between ports and cities, i.e. the proximity of the two to one another, influences the corporate social responsibility behavior of the PMB, as it constitutes a variable in the construct of potential stakeholder conflict. Reporting practices can be regarded as a partial response to the need for intense stakeholder interaction to manage expectations of, and disagreements with, the local community (Belluci & Manetti, 2019). We believe that the closer a PMB is located to densely populated areas, the larger its visibility will be, the higher the importance of local communities as stakeholders will be, and thus the larger the role an SR may play in contributing to the support for port activities. For these reasons, we formulate the following hypothesis:

H<sub>7</sub>: There is a positive correlation between the proximity of a PMB to a city and the publication of an SR, *ceteris paribus*.

#### 4.2.8 *Environmental and social certifications*

At present, various standards, codes and schemes, both on the general and industry-specific level, have been developed to certify a port's environmental and social performance (ISO 14001, ISO 26000, PERS, GreenMarine, etc.), all promoting and contributing to better sustainability practices. Organizations often strive to achieve compliance with several standards, as this emphasizes a part of their strategic posture; i.e. strengthens their 'sustainable' image towards their stakeholders. Those certificates are means of proof that the organization is willing to differentiate itself from its industry peers through an independent auditing of its adherence to and application of social and environmental management procedures. After literature review, no other study in the domain of ports has considered this variable as potential determinant of sustainability disclosure. The hypothesis is formulated as follows:

H<sub>8</sub>: There exists a positive relationship between the number of environmental/social certificates/labels a PMB has obtained and the production of an SR, *ceteris paribus*.

#### 4.2.9 *Sustainability integration*

The concept 'sustainability' goes beyond pure environmentalism. Not only does it refer to the safeguarding of natural systems and resources, but it also comprises the principles of social equity and economic development. Sustainability implies an acknowledgement of the fact

that these different aspects do not work as stand-alone mechanisms, but are rather parts of a larger global perpetual system. Translating this into an approach on the organizational level is a complex undertaking, as it requires a proactive attitude towards sustainability at multiple levels throughout organizational structures and systems. Many individual initiatives in the context of sustainability can be undertaken by organizations, and these provide an indication as to the amount of invested effort. However, a long-term commitment to sustainability requires economic, environmental and social considerations to be regarded as part of the core business activities of the organization, while simultaneously being supported by and reflected in the organizational culture, i.e. through norms, values and beliefs (Bonn & Fisher, 2011; Oertwig et al., 2017). If steps and actions towards sustainable development are undertaken, organizations will always make sure that these improvements will be communicated to the public, as not only the actions alone, but also the transparency pertaining to these actions have benefits such as, among others, building trust and loyalty, and improvement of stakeholder relations (Borga et al., 2009). One of the means of communication that is gaining in importance is an SR, as it serves as a complement to the financial report, showing longer-term commitment to sustainability.

We believe that the amount and type of sustainability initiatives an organization implements and the degree of integration across organizational levels act as indicators of the extent to which sustainability is incorporated into the 'organizational DNA' and thus will also indirectly influence the willingness to develop an SR (Ashrafi et al., 2019). Therefore, we formulate the following hypothesis:

H<sub>9</sub>: There exists a positive relationship between the extent to which the concept of sustainability is incorporated into the 'organizational DNA' and the production of an SR, *ceteris paribus*.

#### 4.3 INSTITUTIONAL FRAMEWORK

In Section 4.2, we identified several organizational explanatory variables, regardless of whether or not they fall under the control of the PMB, for the initiation of sustainability reporting. However, organizational activities are also subject to contextual factors, conditioned by the 'field' in which they operate (Powell & DiMaggio, 1991).

*"Fields are best understood as the center of dialogue and interaction, through which a diverse range of institutions come to bear on field participants, and influence common organizational behaviors and their rationality"* (Bebbington et al., 2009, p.593).

However, the conditioning effects of the same 'field' or institutional environment can also only partially justify the differences that exist concerning the initiation of sustainability reporting. In contrast to existing literature that often only looks at one of the two approaches (Adams, 2002; Bebbington et al., 2009; Higgins & Larrinaga, 2014; Kouloukoui et al., 2019), it is the combination of both corporate characteristics and contextual factors that allows an unveiling of the driving mechanisms behind the practice of sustainability reporting.

Following Institutional Theory, organizations are confronted with institutional pressures in the form of mandatory provisions (coercive isomorphism), behavioral standards (mimetic isomorphism), individual morality (normative isomorphism) and the eagerness to achieve competitive advantage (competitive isomorphism), often occurring as a combination of

several of these, pushing organizational behavior to a certain homogenous objective defined by the 'field' at issue (Li et al., 2019).

- *Coercive isomorphism* – formal and informal pressures from governments and other social forces, i.e. stakeholders, with the threat of punishment when not respected. In the case of the port industry, this can be revealed through regulations, laws, and rules (e.g. IMO International Standards) or powerful stakeholder relationships (e.g. terminal operators, shipping lines, etc.).
- *Mimetic isomorphism* – organizations tend to copy the actions of successful and more legitimate counterparts. In order to overcome bounded rationality and uncertainty, PMBs often choose similar sustainability practices to the frontrunners in their domain, e.g. the growing institutionalization of the landlord model.
- *Normative isomorphism* – transferal of norms and values through methodologies, models, standards and practices developed and diffusion through professional networks or by formal education. The GRI and Ecoports are two examples of voluntary-based standards and codes of conduct that promote sustainable development in (maritime) organizations.
- *Competitive isomorphism* – in order to achieve a competitive advantage, organizations will cross traditional boundaries, for example those of traditional reporting. Sustainability reporting can have a positive effect on a PMB's stakeholder relationships, thus leading to superior performance.

As stated by Herold (2018, p.9), “the key message of isomorphism is that organizations with similar institutional pressures will eventually adopt similar strategies or logistics to gain legitimacy”, as is the case, for example, with sustainability reporting. However, the explanation behind Institutional Theory neglects the heterogeneity of organizational behavior within the same 'field' (Herold, 2018). It is when the ideas and beliefs that conform to Institutional Theory are combined with the information on organizational characteristics (Section 4.2) that a more complete image of the situation can be painted. Based on this knowledge, we formulate a supplementary research question focusing on the existing heterogeneity of organizational behavior of PMBs when it comes to SR adoption: *Which organizational characteristics and institutional pressures emerge together and play a role, and under which conditions?* This understanding will allow academics, as well as practitioners, to develop new frameworks and guidelines better-adapted to the features and needs of the port industry and its players.

#### 4.4 METHODOLOGY

As the objective of the study is to establish a better understanding of the practice of sustainability reporting and how it could be promoted in the industry worldwide, we sought the views of global experts who are active in PMBs and possess knowledge on, and are involved in, the decision-making processes in the areas of sustainability, strategy and performance of the PMB. To achieve this objective, we worked in close collaboration with the International Association of Ports and Harbors (IAPH).

#### 4.4.1 Research construct

We divide the research into two large sections, each based on one of the posed research questions: 1) *What are the main determinants influencing the practice of sustainability reporting in the context of PMBs?* 2) *Which organizational characteristics and institutional pressures emerge together and play a role, and under which conditions?* The first section of the analysis is based on the research construct shown in Figure 4.1.

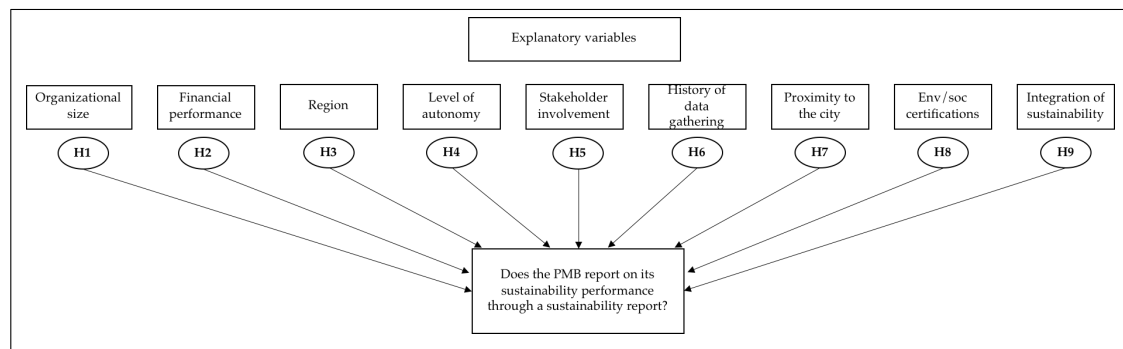


Figure 4.1 – Research construct

In the literature review of this chapter we investigated and defined all variables that could possibly explain the variance of the dependent variable: *Does the PMB report on its sustainability performance through an SR?* Table 4.1 presents an overview of all variables in play and their relevant measurement levels. The dependent variable ‘SR’ consists of five ordinal answer categories, and has been defined based on exploratory research (Geerts & Dooms, 2017) and confirmed by the IAPH as well as representatives of the Port of Antwerp. We have opted to define the variables ‘SIZE’ and ‘FIN’ with an ordinal scale, as this helped to increase the response rate (see also Section 4.2). The ordinal variable ‘DATA’ contains four answer categories, each referring to a certain period and completeness of the performance of data gathering. The construction of the variable ‘STAKEH’ is based on an adapted version of the stakeholder model of Friedman and Miles (2006) (see Annex 4 in the Appendix). Respondents were asked to indicate the level of stakeholder inclusion during general strategy formulation processes that best reflects the current situation of the PMB. Last, the variable ‘SUST’ tries to capture the degree of sustainability efforts of a PMB (cf. implementation of sustainability initiatives). The variable is constructed as a sum of selected answers from a list of options (nine statements referring to different sustainability initiatives). In order to differentiate among the answers, a weight was allocated to each answer separately, based on their added value to the general concept of sustainability. The allocation of a higher weight to the nine statements is based on: 1) whether voluntary willingness forms the basis of the sustainability initiative, 2) whether the sustainability initiative is linked to and/or has an effect on the core activities of the PMB, 3) whether interactions with external stakeholders occur during the formulation and implementation of sustainability initiatives. The measurement level of all other variables is more straightforward.

Table 4.1 – Overview of variables

| Variables          | Description                                                                                                                                                                                                                                                                                                              | Type of measurement and total categories |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| <i>Independent</i> |                                                                                                                                                                                                                                                                                                                          |                                          |
| SIZE               | Number of employees, expressed in FTEs (2018)                                                                                                                                                                                                                                                                            | Ordinal                                  |
| FIN                | Financial turnover (2018)                                                                                                                                                                                                                                                                                                | Ordinal                                  |
| REGION             | Region where the PMB is situated                                                                                                                                                                                                                                                                                         | Multinomial                              |
| AUTON              | Level of autonomy (privatized, government-controlled, hybrid structure)                                                                                                                                                                                                                                                  | Ordinal                                  |
| STAKEH             | Perceived level of stakeholder inclusion in the general strategy formulation                                                                                                                                                                                                                                             | Scale (7-point scale)                    |
| DATA               | History of data gathering in all areas (eco, soc, env)                                                                                                                                                                                                                                                                   | Ordinal                                  |
| PROX               | In the immediate vicinity of a large urban/metropolitan area                                                                                                                                                                                                                                                             | Binomial (yes/no)                        |
| CERT               | Total number of obtained env/soc certifications from the provided list                                                                                                                                                                                                                                                   | Scale                                    |
| SUST               | Integration of sustainability initiatives/actions                                                                                                                                                                                                                                                                        | Scale                                    |
| <i>Dependent</i>   |                                                                                                                                                                                                                                                                                                                          |                                          |
| SR                 | Different degrees of development of a sustainability report<br><i>Yes, certified SR according to international standards (e.g. GRI)</i><br><i>Yes, integrated in annual report</i><br><i>Yes, separate annual SR, but not certified or following another international standard</i><br><i>Ad-hoc report</i><br><i>No</i> | Multinomial                              |

For the second part of the analysis (Section 4.5.3) we make use of descriptive association techniques (e.g. boxplots, etc.) to find possible relationships between the organizational characteristics of PMBs (defined by the independent variables of Table 4.1) and the dominance of institutional pressures in play. The latter has been captured by a specific question, for which the answer categories serve as proxies for the different well-known institutional isomorphisms, i.e. multinomial variable. We are aware that applying such an ‘ad hoc’ taxonomy can create a feeling of subjectivity. Nevertheless, using this taxonomy allows us to establish an exploratory format to test micro-level variables against macro-level phenomena.

#### 4.4.2 Survey design and data collection

All data used for this research has been provided by the PMBs themselves and gathered by means of an online survey, for which the questions have been developed from the literature review and exploratory interviews with experts in the port environment in order to assure the content validity. The use of a survey was a deliberate choice for three reasons (Van Selm & Jankowski, 2006). First, it allows the obtaining of more managerial-driven information on the initiation of sustainability (reporting) compared to a content analysis of reports in which only pure facts that are available for the public can be observed and analyzed. The focus of the research is upon discovering more in-depth latent forces. Second, it aids in the recruitment of respondents, as the option of anonymity offered by an anonymous online survey is believed to create an environment in which sharing of experiences and opinions is facilitated. Third, as the study intends to cover a global scale, online surveys facilitate a more widespread reach.

The structure of the questionnaire starts with two general questions concerning the uniform understanding and interpretation of the concepts of sustainability and sustainability

reporting, followed by questions probing the PMB's views on sustainability performance, strategy and reporting, and ends with some high-level PMB profile questions. All questions are posed in a way that allows us to easily allocate information to each of the hypotheses formulated in the literature review. Furthermore, questions were expressed as close-ended affirmations for two reasons: 1) to improve the anonymity of the organizations and 2) to increase the chance of achieving a high response rate (Kelley et al., 2003). As the sector of PMBs is of limited size, in the case of open-ended constructions the possibility exists that such a formulation could lead to the identification of some respondents (e.g. only a small number of very large PMBs exists in each region), which in turn could have a significant negative influence upon the response rate. To even further increase the response rate, we translated the survey into French, Spanish and Chinese. Encoding of the survey into an online format was accomplished by making use of the software program 'Qualtrics'. The questionnaire was verified in multiple phases by the representatives of the IAPH, with modifications added after each phase, before final validation.

The survey launch was presented during the annual conference of the IAPH in May 2019, and was thereafter promoted through several of their social media channels. We also directly approached representatives of PMBs and other experts within and outside our own network via email, professional networks such as LinkedIn, and cold calls. Furthermore, we also obtained the endorsement of several institutions and organizations in the industry that shared the survey with, or promoted it to, their members (e.g. MEDports), as well as the support of individuals reaching out to their own network. The objective was to reach and collect completed surveys from representatives of PMBs around the world, thereby also limiting selection bias. The introduction prior the survey stated that the representatives in question should have an understanding of the concepts of sustainability (reporting) and a feeling of the present situation of the PMB on those topics. This form of data collection method and strategy allowed PMBs with a diversified port profile around the world to be reached. However, at the same time, it also gave rise to certain limitations, meaning that the response rate and related non-response bias has been difficult to capture as we had no control over the sampling frame in question. Following this reasoning, it is important to interpret the results of the research with a certain degree of caution, and primarily from an exploratory perspective. More specifically, results will be of significant value when focusing on the specific port characteristics shaping the investigated sample, but they cannot simply be extrapolated to the entire global PMB population.

The online survey remained open for six months (from May 2019 to October 2019), during which several reminders were sent out. Through the attempt of this study to examine a global sample and take into account a multitude of possible explanatory influences, we filled in the gap in earlier research that has mainly focused on sustainability reporting in single contexts or on partial explanations of the phenomenon.

#### 4.4.3 *Statistical models and data analysis*

The dependent variable, i.e. practice of sustainability reporting, measures five distinct categories, with the number of observations in each category ranging between 12 and 26. Originally, we wanted to apply a multinomial logistic regression based on the five answer categories of the dependent variable. However, a logistic model containing few numbers of events per variable can result in undesired consequences, such as convergence problems, biased regression coefficients, and misleading conclusions (Peduzzi et al., 1996; Vittingho & McCulloch, 2007). In order to increase the robustness and validity of the model, we rescaled

the outcome variable to a binary variable consisting of the following two categories: 1) producing any format of an SR or 2) not producing anything at all. In order to present a complete and truthful picture, a stepwise forward model selection procedure was performed to find the most parsimonious logistic model for explaining the majority of variance of the data, while in the same process also checking for multicollinearity via the relevant Variance Inflation Factors (VIFs). Models with few variables have the advantage of being numerically more stable, avoid overfitting the data, generalize better (as they depend less on the observed data) and have smaller standard errors. Stability of the obtained results was checked with a backwards and stepwise variable selection method, resulting in identical conclusions. All statistical analyses were performed using R (R Development Core Team, 2019). The stepwise variable selection methods were performed with the `step()`-function of the MASS package (Venables & Ripley, 2002). This function uses the Akaike Information Criterion (AIC) to estimate the quality of each model relative to the other models. Furthermore, graphs are created using the R package ggplot2 (Wickham, 2016).

## 4.5 RESULTS AND DISCUSSION

Prior the larger analysis, which focuses on the two large sections, descriptive statistics are used to showcase the distribution of the profiles of PMBs from which completed surveys were received.

### 4.5.1 *Profile of sample PMBs*

In total, 97 fully completed and valid surveys were recorded. Given the nature of the applied data collection method - an online survey - and the business-to-business sector, we can state that this is a more-than-reasonable result for this specific industry. Other studies in the same domain that have relied on a survey encountered the same challenges and response rate (Ashrafi et al., 2019; van der Lugt, de Langen & Hagdorn, 2015). The respondents' profiles exhibit a variety in terms of region, size and governance model. Table 4.2 shows that PMBs located in the regions of Africa, Central and South America, and Asia and the Middle East were the least willing to fill out the survey. The answer categories containing only 1 answer were eventually deleted in light of fulfilling the condition of robustness of the further statistical analysis (see Section 4.4.3), with the exception of Africa, for which we integrated all answers into a single answer category. We were aware that the continuation of the analysis and interpretation of the results was to be made with a certain degree of caution, as the underrepresentation of developing regions may have resulted in a bias towards developed countries. Furthermore, there is an equal distribution when looking at the financial turnover of the PMBs, and a more-or-less normal distribution when analyzing the number of employees. Finally, when looking at the answers regarding the format of sustainability reporting (taking into account the five original categories), we observe an equal distribution. The sample for analysis is thus a reliable reflection of most of the possible real-life scenarios, reducing the risk of self-selection bias. The fact that even still 25% of all respondents do not report anything (yet) is already an interesting finding on itself as it shows that the practice of sustainability reporting follows a similar path as the innovation adaption lifecycle with PMBs as either innovators, early adopters or laggards, and that the practice of sustainability reporting is not yet fully institutionalized (Diederer et al., 2003; Westerman, McFarlan & Lansiti, 2006). In the next section of the chapter, we will investigate whether there are specific (controllable) organizational characteristics that could explain the difference in adoption behavior.

Table 4.2 – Overview of the profile of sample PMBs

|                                                                                        | Number of respondents | Percentage |
|----------------------------------------------------------------------------------------|-----------------------|------------|
| <i>Region</i>                                                                          |                       |            |
| North Africa                                                                           | 3                     | 3.1%       |
| West and Central Africa                                                                | 5                     | 5.2%       |
| East and South Africa                                                                  | 1                     | 1.0%       |
| North America                                                                          | 14                    | 14.4%      |
| Central and South America                                                              | 1                     | 1.0%       |
| Middle East                                                                            | 1                     | 1.0%       |
| Asia and Far East                                                                      | 5                     | 5.2%       |
| Australia / New Zealand                                                                | 7                     | 7.2%       |
| Europe                                                                                 | 59                    | 60.8%      |
| Other                                                                                  | 1                     | 1.0%       |
| <i>Financial turnover / operating revenue (2018)</i>                                   |                       |            |
| 0 to 10 Million USD                                                                    | 20                    | 20.6%      |
| 10 to 50 Million USD                                                                   | 31                    | 32.0%      |
| 50 to 100 Million USD                                                                  | 24                    | 24.7%      |
| 100 Million USD or above                                                               | 22                    | 22.7%      |
| <i>Number of employees, expressed in FTEs (2018)</i>                                   |                       |            |
| 0 – 50 FTEs                                                                            | 17                    | 17.5%      |
| 50 – 100 FTEs                                                                          | 8                     | 8.2%       |
| 100 – 500 FTEs                                                                         | 50                    | 51.5%      |
| 500 – 1000 FTEs                                                                        | 10                    | 10.3%      |
| More than 1000 FTEs                                                                    | 12                    | 12.4%      |
| <i>Sustainability reporting format</i>                                                 |                       |            |
| <i>Does the PMB report on sustainability?</i>                                          |                       |            |
| Yes, certified SR according to international standards (e.g. GRI)                      | 15                    | 15.5%      |
| Yes, integrated in annual report                                                       | 25                    | 25.8%      |
| Yes, separate annual SR, but not certified or following another international standard | 19                    | 19.6%      |
| Ad-hoc report                                                                          | 12                    | 12.4%      |
| No                                                                                     | 26                    | 26.8%      |

#### 4.5.2 Determinants of sustainability reporting

As our results were realized using different variable selection methods while simultaneously always checking for multicollinearity, we claim that we were able to identify those variables that actually have the greatest impact on the practice of sustainability reporting. The outcome of this analysis is presented in Table 4.3, showing the three variables that create the model with the highest quality. Of interest is the fact that the well-known determinants such as size, financial turnover and level of autonomy investigated in previous studies do not seem to be significant enough when including all variables in a single analysis. This result can potentially be explained by two reasons: The first is the fact that, in general, other parameters seem to have a larger explanation power, while the second is that it is likely that the value of size and financial turnover have decreased in recent times, highlighting a tendency in which sustainability reporting is no longer only understood and embraced by the larger PMBs, but also by small- and medium-sized players. This is confirmed by anecdotal evidence such as the active participation of smaller ports in industry task forces on the harmonization of sustainability reporting for ports (e.g. the IAPH-PIANC workgroup 174 on the topic).

Table 4.3 – Results of binomial logistic regression

| Variables | Parameter estimate | P-value    | VIF      |
|-----------|--------------------|------------|----------|
| PROX      | 1.7783             | 0.00805 ** | 1.062781 |
| DATA      | 1.6444             | 0.00667 ** | 1.181638 |
| CERT      | 0.6648             | 0.02620 *  | 1.199024 |

Sig. level: \*\*\*\* 0.001; \*\*\* 0.01; \*\* 0.05

Looking at the results of the analysis in Table 4.3, we observe two variables ‘DATA’ and ‘CERT’ that are under the direct control of the PMB in terms of strategic decision-making and resource allocation, and one variable ‘PROX’ being a fixed organizational characteristic (or rather natural factor condition, as it relates to geographical location). For the latter, it can be stated that the odds of producing an SR is estimated to be almost six times ( $\exp(1.7783) = 5.920$ ) larger for PMBs located in proximity to a city than for those that are not, all other predictors held constant. The significance of this variable can be explained by the amount of stakeholder pressure the PMB effectively needs to deal with. Or, alternatively, as the data of the variable is based on a ‘yes/no’ question, the significance could also be explained by the PMB’s perception of being closely located to the city and thus having a sense of responsibility towards the community. In general, the closer a port is located to densely populated urban regions, the more likely it is that the PMB will need to defend the presence of the port towards several stakeholder groups, given the external effects of port activities. As previous research has already shown, producing an SR can help in the mitigation of this pressure, as such a report can serve as a formal commitment that the PMB takes the concerns and needs of the stakeholders in question seriously. The need for intense interaction with stakeholders to manage expectations can be partially covered by the development of an SR.

Next, the variable ‘DATA’ shows us that, for PMBs that have a stronger history of performance data gathering, the odds of having an SR are higher. When a PMB decides to consistently invest in measuring and monitoring processes, structures and models to keep track of the progress regarding its TBL dimensions, it acknowledges the value that this kind of longitudinal information has, not only in terms of complying with sustainability development goals but also in terms of risk management. The availability of multidimensional information can lead to a decrease in overall costs, as risks can be more easily and proactively identified, leading to better damage control management, as well as the proactive formulation of strategies to improve sustainability performance. In other words, the PMB exhibits a structured blueprint for frequently creating an SR.

Last, PMBs that have more social/environmental certifications are more likely to produce an SR, all other parameters held constant. From our results, it appears that the willingness to comply with certain social and environmental certifications can be regarded as a sort of ‘first step’ into developing an overall sustainability strategy. It counts as a proxy, an indicator of the likelihood of developing an SR. However, based on observed real-life behavior, e.g. by the Port of Antwerp, we know that interaction in the other direction does not always hold. More in particular, while the Port of Antwerp was an early adopter of certifications, over time it decided to no longer pursue several certifications, as these did not always request the same level of informational detail and scope as the information the PMB tries to pursue on a daily basis and through its SR. In other words, the implementation of an SR substitutes the certifications as a means to show the tangible commitments of the PMB to its community of stakeholders when it comes to sustainability.

These results suggest that developing an SR is not just a stand-alone practice with the sole objective of ‘aiming to please’, but that it is part of a longer-term, larger strategy of doing business, as shown by the significance of the variables ‘DATA’ and ‘CERT’.

#### 4.5.3 Associations between port characteristics (organizational factors) and institutional environment (contextual factors)

Through this analysis we aim to discover whether certain organizational characteristics are associated with one or more institutional isomorphisms. In other words, which combinations of organizational characteristics and institutional pressures occur together more often than others? The most interesting and value-adding results are shown and discussed in the following paragraphs.

Looking at the first variable ‘SIZE’ (Figure 4.2), we notice a very high presence of the isomorphisms ‘competitive advantage’ and ‘normative’ for the largest PMBs, i.e. more than 1,000 FTEs. This means that the largest PMBs acted proactively, and began to report either from the perspective of a strong belief in the competitive benefits of reporting or out of moral norms and values towards reaching a sustainable future. Also, the category of smaller ports deserves our attention. Compared to what intuitively would be thought of as being exhibited, i.e. ‘mimetic’ isomorphism, this category also shows a high presence of the ‘competitive advantage’ isomorphism. Even more, this category consists of 20% of the total respondents. This outcome can be explained by the fact that small PMBs do not have the same bargaining power towards the external environment as larger ones (often these are dominant economic actors in a region), meaning that, in their actions, they are more dependent upon how society perceives the presence and sustainable added value of the port. Following this reasoning, those PMBs are highly aware of the power (competitive advantage) of an SR. According to the results, medium-sized PMBs are more likely to be driven by the ‘coercive’ isomorphism, i.e. feel compelled to develop an SR as a result of pressure to conform to legal requirements or of reputational objectives. Similar results can be observed for the variables ‘FIN’ and ‘DATA’, possibly explained by the fact that all three variables are indirectly linked with the same underlying factor; ‘availability of resources’.

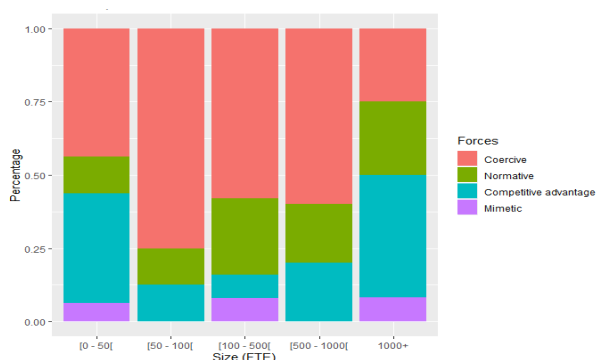


Figure 4.2 – Association independent variable ‘SIZE’ and institutional pressures

A second result, shown in Figure 4.3, is that the ‘normative’ isomorphism is not present in more developing/emerging countries/regions such as Africa and Asia. In those regions, sustainability reporting is still often a question of availability of resources. The total cost-benefit balance of certain sustainability actions will outweigh the moral balance.

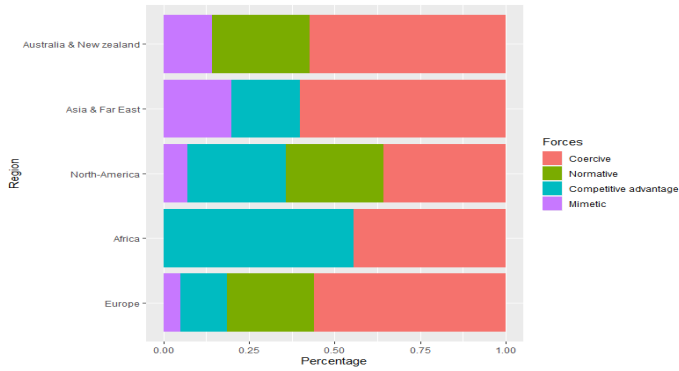


Figure 4.3 – Association independent variable 'REGION' and institutional pressures

Third, there does not seem to be evidence of a strong association between the number of social/environmental certifications achieved by the PMB and the 'normative' isomorphism (Figure 4.4). In other words, pursuing these certifications appears to be a conscious strategic decision at an organizational level, independent of the kind of underlying pressure.

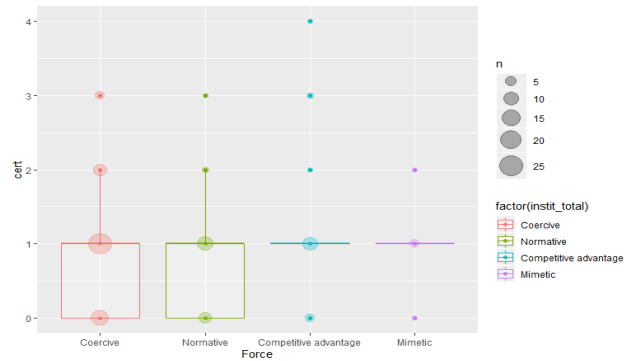


Figure 4.4 – Association independent variable 'CERT' and institutional pressures

Figure 4.5, displaying the variable 'SUST' against the different isomorphisms, clearly shows that PMBs that put effort into developing organization-wide sustainability initiatives and that try to make the concept of sustainability a part of the larger organizational structure and thinking, regard the initiation of sustainability reporting as an obligatory step in pursuing a normative differentiation strategy. The latent 'normative' pressure will play a role for PMBs that, in general, already have a high degree of awareness for sustainable development. The number of sustainability initiatives undertaken and the organizational levels to which they are implemented is a reflection of the extent to which the concept of sustainability is incorporated into the 'DNA of a company'.

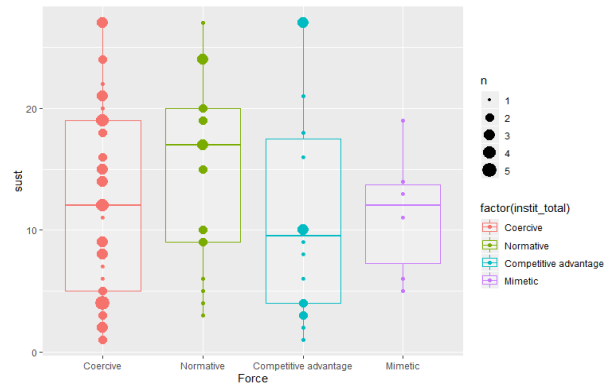


Figure 4.5 – Association independent variable ‘SUST’ and institutional pressures

Furthermore, Figure 4.6 displays the clear association between a high level of stakeholder inclusion during the general strategy planning of PMBs and the force ‘competitive advantage’ as a decisive factor in starting to report. An increasing amount of PMBs acknowledge the importance of substantive and high-quality stakeholder inclusion, as aligning the organization with the stakeholders’ expectations can help in safeguarding their ‘license to operate’. The development of an SR can contribute to this longer-term strategic objective. Only when stakeholders are consulted to a high degree and on an ongoing basis does the content of a report not only show what the PMB believes people want to know, but also those issues (positive and/or negative) that are regarded as material by the stakeholders themselves, leading to high societal acceptance of the PMB.

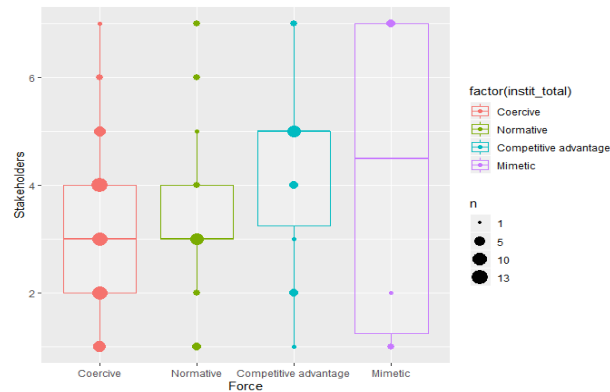


Figure 4.6 – Association independent variable ‘STAKEH’ and institutional pressures

Following the same reasoning, we observe that for PMBs located in proximity to cities and thus confronted with higher levels of stakeholder pressure, the ‘normative’ and ‘competitive advantage’ isomorphisms are more present, compared to those PMBs not located in proximity to cities (Figure 4.7).

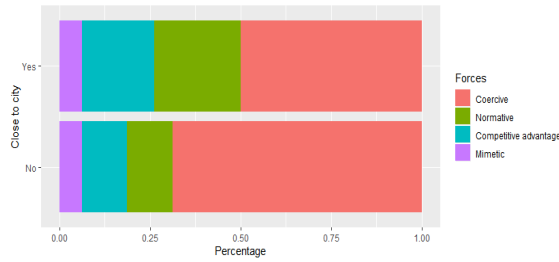


Figure 4.7 – Association independent variable ‘PROX’ and institutional pressures

Finally, the last figure (Figure 4.8) shows that government-controlled PMBs with a lesser degree of managerial autonomy have begun to report on sustainability from a ‘normative’ point of view, i.e. from the need to pursue what is desirable and right for society, compared to more privately owned structures that were led by the ‘competitive advantage’ of the practice, i.e. sustainability reporting as added value from a ‘cost-benefit analysis’ perspective. The outcomes for more hybrid structures, being a mix of both autonomy governance models, interestingly show the exact average results of the two extremes, confirming the relevance of the ‘public-hybrid-private’ continuum in terms of ownership and autonomy for PMB-related research.

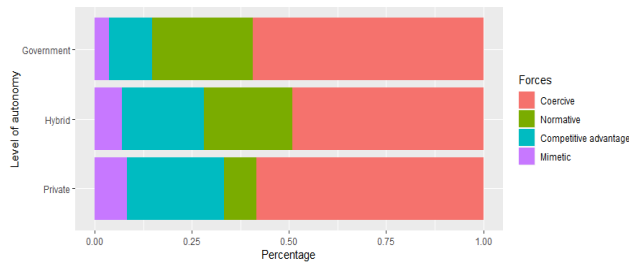


Figure 4.8 – Association independent variable ‘AUTON’ and institutional pressures

#### 4.5.4 Policy and managerial recommendations

Based on our research, we identify two major policy and managerial implications/recommendations, the first with a focus on PMBs and the second on environmental certification bodies such as ECOPORTS, GreenMarine, etc.

- (1) Given that PMBs are part of a larger port cluster, one can question what the boundary setting of indicators of an SR should be, in particular knowing that the history of performance data gathering is identified as both a significant explanatory variable, as well as, more implicitly, a barrier to engaging in sustainability reporting. Should reporting be limited to the exclusive organizational characteristics and responsibilities of the PMB itself, or should this also include the overall cluster and supply chain performance, and to what extent? An important concept underlying this question is the need for knowledge and data transfer with a specific focus on sustainability practices and reporting, which does not appear to be common practice (as yet) within the port industry (Langenus & Dooms, 2015). In order to achieve industry-level sensitivity as to the opportunities and benefits linked to industry-wide sustainability reporting, it is important that each individual PMB acknowledges the importance of

investments in proper data collection and monitoring, as well as in the building of strong trust relationships among the different stakeholders of the port cluster. This requires a set of capabilities in terms of trust building with stakeholders (to obtain data), investment in IT systems (for efficient and trustworthy management of data) and human resources (data analysts). However, the research presented in this chapter shows that it is not specifically a matter of mobilizing those ports with a smaller resource base, as several already exhibit promising first steps. It appears to be more a matter of adapting the existing organizational culture, norms and beliefs within the port industry in general.

- (2) In order for voluntary self-evaluation-based certification schemes to continue to exist, it is important that they continue to position themselves as one of the 'best practices' in the domain of sustainability strategies. The more PMBs adopt the practice of sustainability reporting and report on outcomes rather than compliance with social and environmental management standards, the higher the chance an SR will be considered a general standard in sustainability strategy thinking. In respect to stakeholders, an SR often covers the same aspects as these certifications, albeit in greater detail and thus in a more convincing way, therefore significantly lowering the added value of the certification. Specifically, when the SR is developed in collaboration with the PMB's relevant stakeholders, it pays attention to their social and environmental demands and needs. In sum, the practice of certification might lose relevance when the time and investment required to obtain the certification are not outweighed by (non-)economic benefits to as great an extent as with sustainability reporting.

#### 4.6 CONCLUSION

This study investigates, on a global scale, the dynamics of organizational characteristics and contextual factors (institutional environment) that would positively/negatively influence the practice of sustainability reporting by port managing bodies. It is the first study of this size in the domain of PMBs that incorporates a majority of previously investigated organizational determinants into a single regression analysis in order to discover those that are most important, compared to other studies where often only national contexts or a limited set of variables have been analyzed. Furthermore, it is also the first study concerning sustainability reporting that analyzes the institutional environment in which PMBs operate and, in turn, links these insights with the outcome of the regression analysis in order to maximally reveal the driving mechanisms behind sustainability reporting in the port sector.

Based on the obtained results of a global survey with port managers being the target audience, a set of conclusions can be drawn. First, the most significant organizational determinants to begin reporting on sustainability are: (i) proximity to a city, (ii) history of performance data gathering, and (iii) amount of obtained social/environmental certifications. The latter two are elements over which the PMB has a large degree of control in terms of strategic decision-making and resource allocation. This strengthens the idea that engaging in sustainability reporting is the manifestation of an initial shift in mindset towards a more socially and environmentally responsible plan of action and not just the result of pure economic rationale.

Second, the institutional context in which the PMB operates is as important as its organizational characteristics. Institutional pressures appear to have large and diverse

influences over the decision-making of PMBs with regard to SR adoption. However, as the results show, there is no significant unambiguous interaction between certain organizational characteristics and institutional pressures. This relationship appears to be much more complex, and as a result we are only able to identify more common combinations of organizational characteristics and institutional pressures, highlighting the fact that full convergence in sustainability reporting at a global level has not yet been achieved. Stated differently, at present, the practice of sustainability reporting is not yet fully institutionalized, while recognizing the existence of multiple 'fields'. The results of our research confirm the presence of a great diversity and undermine the idea of 'one approach fits all' for PMBs.

Third, at present, institutionalization of sustainability reporting applies to the activity rather than the content of it, given the wide variety of approaches, whether subject to certification or not. Reaching full consensus on the process and content of an SR, and thus the option of benchmarking, is still in its infancy phase.

The primary limitation of our research arises from the relatively small sample size, partially explained by the nature of the applied data collection method, an online survey, and the focal organization type of our analysis, PMBs. The ratio of the number of respondents and variables included in the analysis was relatively low, limiting the applicability of more sophisticated regression analyses. It is therefore difficult to establish whether or not the other tested variables are significant, because of the limited amount of observations or because of the small explanation power of the variable. Further research, enlarging the sample, could clarify this doubt. Furthermore, the respondents largely stem from developed countries. Unfortunately, no answers were received from Central and South America, and limited responses were received from Asia and Africa. Nevertheless, the answers received are equally distributed over the different answer categories concerning the adopted format of reporting, ranging from 'no SR' to 'fully integrated or GRI certified SR'. The sample analyzed can be regarded as a reliable reflection of most of the possible real-life scenarios. However, further research should include more ports from the other developing regions, as these will have different institutional environments and organizational characteristics, potentially leading to different outcomes. This broader inclusion could also help in strengthening the possibility of extrapolating the results obtained to the entire PMB population. Another point that requires critical caution is that of applied definitions and indicators as proxies for the analyzed determinants: for example, in this study, we use the indicator 'financial turnover' as proxy for the variable 'financial performance', as there is currently no other commonly accepted indicator under the form of, for example, profitability for PMBs (see also Annex 1 in the Appendix). We argue that more rigorous theoretical and empirical research is needed to yield more precise insights on the use of more harmonized financial figures, and, by extension, key financial indicators for PMBs. Finally, supplementary interviews could further enrich the results of the research.

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## **CHAPTER 5**

### **SUSTAINABILITY REPORTING FOR INLAND PORT MANAGING BODIES: A STAKEHOLDER-BASED VIEW ON MATERIALITY**

Geerts, M., & Dooms, M. (2020). Sustainability reporting for inland port managing bodies: a stakeholder-based view on materiality. *Sustainability*, 12(5), 1726.



**Abstract:** Sustainability reporting has been marked by a rise in importance in recent years, as it has proved to be an important management tool in the understanding of where an organization is situated along the sustainability pathway. However, industries have shown different behaviors towards embracing this practice. In this chapter, we turn our attention to the port industry, using the metropolitan inland Port of Brussels (Belgium) as a case study. Given the contested nature of port activities within urban regions, metropolitan inland ports are expected to benefit from the development of a sustainability report, as it allows a more transparent account of the contribution of port activities to the objectives of different stakeholder groups within the urban environment. The case study is based on a survey yielding 74 valid responses from different stakeholder groups (employees, clients, and broader society). Our results show that the expected content of a sustainability report is viewed differently by these various stakeholder groups in terms of the relative importance of the dimensions of the Triple Bottom Line (TBL), as well as in terms of the specific indicators representing material issues. Furthermore, the concept of boundary setting with respect to the different dimensions of the TBL and the desired level of inclusion by stakeholders during the development of a sustainability report are also assessed differently. This chapter is of interest to academics as well as policymakers, as the research results complement existing insights on sustainability reporting in general, and can be used as a basis for stimulating the adoption of sustainability reporting by inland ports.

**Keywords:** sustainability reporting; inland ports; Triple Bottom Line; materiality analysis; stakeholder management; boundary setting.

## 5.1 INTRODUCTION

In the present business environment, organizations are under pressure from diverse groups of stakeholders to pay attention to 'sustainability' when they report on their performance. Existing literature and recent research show that the term 'sustainability' and associated management and reporting practices are mostly centered around three large domains, namely economic, social, and environmental - in other words, the Triple Bottom Line (or TBL) dimensions (people, planet, and profit). From a historical perspective, the end of the 19th century was characterized by the emergence of the practice of financial reporting. About a century later, the importance of social and environmental aspects linked to business activities had increased, and hence organizations were stimulated to publish additional non-financial information [1]. Since then, a remarkable increase in the availability of information related to the (positive/negative) effects of an organization's operations in terms of both social and environmental aspects has been observed [2,3]. An overwhelming majority of the largest global companies, i.e. 93% of the top 250 companies listed in the Fortune Global 500 ranking (also called the G250) [4], invest time and resources into reporting and communicating on what can be defined as sustainable performance [3], which is reflected in an increase in the practice of sustainability reporting of almost 60% since KPMG's first survey on the topic in 1999. The TBL concept is often used as a framework to operationalize the content of a sustainability report [5], as it is based on the same three dimensions (economic, social, and environmental) that are required in a sustainability report, as determined in the Global Reporting Initiative's (GRI) definition [6].

While initially multinational corporations have been central in the sustainability debate, as well as in scientific research around the topic, the scope has recently been broadened to organizations in general. However, international reporting guidelines and standards (such as the GRI), as well as codes of conduct, are still largely built upon the features of larger organizations. Due to this, there exists a reporting gap between large multinationals and small- and medium-sized enterprises (SMEs) [7], as the latter category is constrained by human and financial resources [8]. In general, SMEs continue to struggle to strike a balance between the value that arises from sustainability initiatives, of which sustainability reporting is one, and the associated organizational costs [9]. Furthermore, research on sustainability reporting is largely centered on the private (for profit) sector. On the other hand, public sector organizations, fully or partially owned by the government, may face greater accountability expectations and obligations, as they are charged with tasks covering holistic thinking on social welfare and public justice [10,11]. As a result, public sector organizations and state-owned enterprises (SOEs) are becoming increasingly stimulated, and even legally required in some countries (e.g. Sweden), to disclose sustainability performance information.

For the research presented in this chapter, we turn our attention to the port industry, which is characterized by the presence of public sector organizations. More specifically, we focus on inland ports (as defined by Rodrigue and Notteboom [12]), and the often (partially) government-owned port managing bodies (PMBs) - the use of the term 'port authority' has somewhat diminished, in a large part due to the appearance of many new governance models, covering more responsibilities than those exclusively of an authority [13]. Those PMBs are responsible for coordinating, regulating, and developing economic activities by, inter alia, allocating land to port users (mostly private companies) for performing logistics and industrial activities using inland waterways, while at the same time monitoring both public and private values [14]. Inland ports operate under different, sometimes more extreme, circumstances than seaports, especially in terms of their relatively small organizational size

(when considering both human and financial resources) and their location in densely populated areas. Given the widespread positive and negative externalities associated with port activities, inland PMBs are confronted with stakeholder pressure to improve the 'sustainability' footprint of the logistics and industrial areas they manage. This creates specific challenges in the context of the implementation of sustainability reporting, as the growing complexity of the practice has not yet been paralleled by a similar degree of methodological sophistication [15]. In the specific context of inland ports, there exists a need to better understand the perspectives of different stakeholder groups, both on the general concept of sustainability (reporting) and on the related methodological aspects, such as materiality, boundary setting, and the need for stakeholder inclusion. Furthermore, existing research is often focused on the insights of the post-implementation phase of the practice of sustainability reporting. This chapter provides an alternative approach by placing the focus on a case study that is yet to begin on the development of a sustainability report. Hence, this research aims to provide knowledge on expectations and needs of inland PMBs' stakeholders, stimulating the wider industry to start reporting by partially bridging the often-mentioned barrier of the lack of resources and knowledge.

The chapter is organized as follows. Section 5.2 starts by providing an overview of the current situation of sustainability reporting in the port industry, followed by a discussion on important methodological topics related to sustainability reporting for which no equivocal answer exists at present: TBL concept, boundary setting, materiality, and stakeholder inclusion. Section 5.3 contains an outline of the methodology. Section 5.4 provides an overview and interpretation of the survey results, and Section 5.5 provides a synthesis of the literature insights and survey results; more specifically, theoretical and practical perspectives on the discussed topics. A general conclusion and limitations of the research, as well as suggestions for future research, are presented in Section 5.6.

## 5.2 LITERATURE REVIEW

### 5.2.1 *Sustainability reporting in the port industry*

According to Lynch et al. [3], sectors that have the largest (negative) influence on the environment and society (e.g. oil and gas, mining, etc.) tend to evidence greater efforts concerning sustainability initiatives, with sustainability reporting being a part of this. For example, the airport sector has developed sector-specific guidelines under the auspices of the GRI, providing a practical framework with which to work. However, due to the non-existence of sectoral guidelines for ports and their managing bodies, the port industry has not yet reached the same level as other subsectors in the transportation industry. Nevertheless, in recent years, PMBs have become aware of their role and responsibility in the global transportation supply chain with respect to their environmental and social performance. In the context of seaports, PMBs are increasingly including sustainability reporting into their long-term development strategies [16], as they are not only aware of the benefits linked to it, but they also commonly possess the necessary financial and human resources to do so. However, in general, the industry still evidences a large variety in approaches. This is due to significant differences in terms of the type and profile of port activities (e.g. industrial and logistics-oriented seaports, cruise ports, inland ports and fishing ports), which leads to different (or even an absence of) approaches concerning sustainability reporting [17,18]. Since 2015, as a trade association initiative, some larger seaports have put in place a specific working group - International Association of Ports and Harbors - Permanent International Commission

for Navigation Congresses (IAPH-PIANC) WG174 Sustainability Reporting for Ports - which is participated in by seaport representatives, consultants, and academics. This working group aims to establish port-specific sustainability reporting standards, in order to create a more harmonized reporting framework given the multiple approaches used by the PMBs [18].

In contrast to seaports, sustainability reporting is still largely terra incognita for inland ports. Furthermore, as stated by Vejvar, Lai, Lo, and Fürst [19]:

*“Even though inland port operators strive for economic viability, there are growing pressures from various stakeholders for continuous enhancement of their environmental and social sustainability practices”.*

However, no inland port or dry port, to our knowledge, has, to date, published a sustainability report. Inland ports, given their relatively smaller size in terms of operations, are considered the smaller players within the port sector [19]. They are also subjected to more stringent internal financial and human constraints, and operate in an environment of high external stakeholder pressure. At the same time, their importance increases as they are a key element for sustainable port system development, given their role in new patterns of freight distribution caused by structural changes in logistics, such as port regionalization and the associated development of hinterland services [20,21]. Mostly located within urban surroundings, inland PMBs need to deal with many different stakeholder groups pursuing different economic, social, and environmental interests in the port [21]. Unfortunately, not all of those stakeholder groups are equally aware of the positive contributions of an inland port, such as regional employment creation, value-added generation and more sustainable freight transport. Hence, embedding sustainability practices into strategic plans and reporting on this should support societal stakeholders in their positive perception of the effects of the presence of an inland port in the urban region [22].

#### 5.2.2 TBL principle and boundary setting

At present, organizations are faced by large pressures from different stakeholders to monitor and disclose information beyond mere financial performance. As a result, organizations are forced to rethink their idea of performance measurement in relation to their stakeholders, highlighting the need to include social and environmental dimensions. However, including those extra dimensions into the business strategy and reporting practices requires new frameworks and standards with which to work. The TBL concept is one of the most commonly used frameworks for assessing economic, social, and environmental performance, and is considered to be one of the best markers for defining the level of sustainability of an organization [23,24]. According to Gray and Milne [24], a strong TBL-based report covers and elaborates on all dimensions equally, and provides linkages and trade-offs between them. However, more than 50% of the topic-specific GRI Standards belong to the social dimension [25], suggesting a rather imbalanced implementation.

Furthermore, a topic that has not yet received much attention in literature is that of boundary setting in sustainability reports. Sustainability is foremost regarded as a global concept, which implies a certain degree of complexity when applied at the organizational level [24]. More specifically, sustainability issues related to social or environmental performance transcend the boundaries of the organization [26]. Unlike financial reporting boundaries, which rely on the principle of financial control, boundaries concerning sustainability performance explicitly need to take into consideration impacts beyond full organizational control [15]. Setting the

boundaries between the organization and its context is a multi-faceted issue, as it is not always a case of willingness but also of complexity. Widening the reporting boundary to include, for example, the full port supply chain, calls for data that are often not available in general or not available for the PMB specifically. Vice versa, for some indicators, broadening the scope does not necessarily mean gaining extra insightful information, for example, measuring gender equality on the level of the actors within the whole supply chain is less relevant. This research investigates how inland port stakeholders perceive (1) the idea of an equal contribution of the three TBL dimensions in a sustainability report, and (2) how boundaries should be defined for several categories of indicators.

### 5.2.3 *Materiality and stakeholder inclusion*

In the context of traditional financial reporting, the concept of materiality is shaped by both quantitative and qualitative aspects, defined and written down in standards set by international organizations, imposed by governments, and used as a basic element of market-based investment decision-making [27,28]. For non-financial information, the narrative is very different, as this information cannot be directly and clearly valued in a market setting [29]. Materiality in the context of non-financial information therefore focuses on the external accounting of economic, environmental, social, and governance impacts on stakeholders and not just investors as the principal interested 'market' (or 'audience') [27,30]. Stakeholders, as broadly defined by Clarkson [31], are "*persons or groups that have or claim ownership, rights, or interests in a corporation and its activities, past, present, or future*".

In practical terms, in order to provide a sustainability report in which all stakeholders are provided with relevant and comprehensive information, it is crucial to include those elements that reflect the interests and requests of each stakeholder group [27]. Reporting frameworks, such as GRI Standards, provide guidelines in order to handle the challenge of information asymmetry between organizations and their stakeholders, and to reduce the risk of not covering all material aspects. Therefore, a materiality analysis should be based on a participatory process, proactively engaging all stakeholders in an interactive dialogue in order to determine those aspects of information that are the most material [28]. This dialogue can entail different degrees of inclusion, reflecting gradual paths of stakeholder engagement. In our research, we have used and adapted the model of Friedman and Miles [32] to define the desired level of stakeholder inclusion in the process of sustainability reporting as perceived by stakeholders (Table 5.1). The seven different levels of involvement go from one extreme; 'no or limited inclusion', to the other; 'full inclusion'. It is often considered that the higher the level of inclusion, the greater the societal acceptance of strategic choices, and, thus, the lower the occurrence of unanticipated issues, as committees have been ex ante included in the processes [33].

Table 5.1 - Seven different levels of stakeholder inclusion

| No or limited inclusion                                                                                     |                                                                                                                                              |                                                                                                                                   |                                                                                                                                                     | Full inclusion                                                                                                                              |                                                                                                                              |                                                                                                                            |
|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| 1                                                                                                           | 2                                                                                                                                            | 3                                                                                                                                 | 4                                                                                                                                                   | 5                                                                                                                                           | 6                                                                                                                            | 7                                                                                                                          |
| -Knowledge about the decisions.<br>-One-way dialogue (e.g. briefing sessions, leaflets, corporate reports). | -Educating, explaining, and informing stakeholders.<br>-One-way and/or two-way dialogue (e.g. verified corporate social reports, workshops). | -Stakeholders may advise.<br>-Being heard before a decision.<br>-Two-way dialogue (e.g. surveys, focus groups, interviews, etc.). | -Stakeholders provide conditional support.<br>-Having an influence over decisions.<br>-Multi-way dialogue (e.g. bargaining, constructive dialogue). | -<br>Collaboration/partnership.<br>-Some or joint decision-making power.<br>-Multi-way dialogue (e.g. strategic alliances, joint ventures). | -Minority representation of stakeholders in the decision-making process.<br>-Multi-way dialogue (e.g. board representation). | -Majority representation of stakeholders in the decision-making process.<br>-Multi-way dialogue (e.g. community projects). |

Note: Table adapted from Friedman and Miles [32]

In the specific context of PMBs, especially those managing inland ports, the different types of ownership structures and the variety of stakeholder groups involved complicate the approach towards proper stakeholder engagement and the associated materiality analysis. For example, in most cases, the government does not only operate in a regulatory role but also as a full or partial shareholder of the PMB, which creates a multitude of divergent objectives that need to be achieved simultaneously. In parallel, all other stakeholder requests, such as those of port users, local communities, etc., need to be considered as well, as these parties heavily influence long-term port development plans [34–36]. The solution to this challenge is not limited to mere information dissemination strategies but instead requires a high level of inclusion and a strong collaborative stakeholder approach in order to continuously increase the added value of the port and maintain its ‘license to operate’ [36]. However, even though acceptance of strategic choices is mostly linked to a high level of stakeholder inclusion, it is important to investigate whether the highest level of inclusion is desired by all stakeholders, as this also requires a certain degree of investment in resources from their side. As a result, next to materiality, our research gathers complementary insights on the preferred degree of inclusion of the different stakeholder groups in the context of the development of a sustainability report.

In addition, by including stakeholders at the very beginning of the process and simultaneously taking account of the preferred level of inclusion, PMBs avoid their potential efforts to develop a sustainability report being considered a reactive solution grounded in ‘greenwashing’ reasons. As many papers highlight [37–39], the practice of developing a sustainability report should be intended to inform and educate stakeholders, to create an environment of multi-way dialogue and solution-thinking about pressing problems, to be able to measure and monitor past actions and future plans, etc. In other words, it is of utmost importance that the initiatives implemented with the aim of improving sustainability performance are seen as building blocks of the overall strategy of the organization.

## 5.3 METHODOLOGY

### 5.3.1 Case study selection: the inland Port of Brussels

The definition of an inland port is polymorphic, meaning that it differs depending on certain features, such as its location, activities, connectivity, and role [12]. However, following the reasoning of Rodrigue and Notteboom [12], the Port of Brussels can be described as a comprehensive inland port, as it encompasses inland waterway systems and handles a variety

of traffic structures (inter alia construction materials, oil products and containers). The Port of Brussels is a key node within the Trans-European Transport Network (TEN-T) and is located approximately 50 km from Antwerp, Europe's second-largest seaport. Around 5 million metric tons are transshipped each year at the Port of Brussels. It forms a part of the Seine-Scheldt basin connecting French, Belgian, Dutch and German ports and waterway networks. As the port areas are located in the middle of the Brussels Capital Region (a so-called port 'intra muros'), it is an interesting example of a metropolitan supporting type inland port. The metropolitan supporting type shows a dominant urban and regional logistics functionality (e.g. construction industry logistics and distribution of consumer goods). Furthermore, port activities take place within or close to residential areas, and are subject to continuous outright contestation, hence reflecting the need for intensive and high-quality stakeholder interaction [40].

### 5.3.2 *Survey design: stakeholders and topics*

For the purpose of this research, a survey was designed and disseminated to the major stakeholder groups of the Port of Brussels. The identification of the critical stakeholder groups was conducted making use of the general stakeholder theory [31,33] and complemented by the port-specific insights of Notteboom and Winkelmans [41], who identified four generic categories of stakeholders in the broader port environment. Initially, the following stakeholder groups were considered: personnel of the PMB, clients of the port (in this case, tenants), broader society, and government agencies. The personnel of the PMB were considered to be a salient stakeholder, as they are entrusted with the daily managerial and operational tasks that have a direct impact on the ongoing concerns of the port area. We decided to restrict the 'clients' category to tenants of the port, as there is no direct nor intense commercial relationship of the PMB with inland shipping providers, as the tenants directly contract them and/or own or lease their own vessels for waterway transport. Furthermore, the broader society does not have a direct impact on the daily activities of the port, but at the same time experiences the positive/negative effects of the port activities on their own objectives, and actively influences political decision-makers. Finally, the 'government' stakeholder group is rather specific, as these stakeholders both exist as the principal shareholders/owners of the port, and, simultaneously, need to act in accordance with the interests of the larger Brussels urban community, sometimes even being part of it. This breakdown into stakeholder categories was validated by several representatives of the Port of Brussels.

The survey started with a number of profile questions, followed by two general questions that probed for a uniform understanding and interpretation of the concepts of sustainability and sustainability reporting. The further content of the questionnaire was built upon comprehensive desk research and exploratory interviews with experts in the port environment, focusing on four large topics: 1) the TBL concept, 2) materiality issues, 3) boundary setting, 4) stakeholder inclusion. Questions were expressed as close-ended affirmations, as this line of questioning helps in achieving a higher response rate [42], and is easier to code and analyze, while also avoiding mis-responses and misunderstandings with regard to the scales used [43,44]. To encode the questionnaire into an online format, we made use of the software program Qualtrics. Two pilot test runs were undertaken by three representatives of the Port of Brussels, with modifications added after each pilot test, before final validation.

### 5.3.3 *Data collection*

For the selection of the relevant respondents we made use of, and were dependent on, the stakeholder database of the Port of Brussels. Due to the EU data protection law (GDPR), the identification of relevant stakeholders, as well as the distribution of the survey accompanied by a cover letter, was handled by the Port of Brussels itself. The survey was sent out at the beginning of March 2019, and data were collected across the subsequent period; March and April 2019.

### 5.3.4 *Data processing and analysis*

SPSS was used to conduct statistical tests on the entirety of the data. Furthermore, in order to analyze the question-specific data related to the TBL concept (see *infra*, Section 5.4.2), we applied a similar approach and method to that applied in Calabrese et al. [7], namely the analytic hierarchy process (AHP) method. We opted for AHP because the questions probed for, in a way, subjective, qualitative information. This approach was deliberately chosen, as it is a structured technique used to analyze complex multiple-criteria problems involving qualitative judgments. It splits the decision-making process into separate parts, each part assessing the importance of objects shown as a paired comparison [45,46]. Every partial analysis consists of detailed in-depth results for each stakeholder group, as well as broader overall conclusions.

## 5.4 RESULTS

The most fundamental sample statistics are first described before a discussion of the results of the analysis, divided into the different research areas of the case study, is presented.

### 5.4.1 *Sample statistics*

Four stakeholder groups were initially defined (clients, personnel, broader society and government). Unfortunately, no answers were received from the ‘government’ stakeholder group, which led to the removal of the entire group from the analysis. After personal contacts with several governmental representatives, who answered the survey, it became clear that they filled out the survey from the perspective of their role as moderator of broader societal objectives. Most of them were also part of the local community, as they reside in the Brussels Capital Region (i.e., the ‘broader society’ stakeholder group). In total, 105 responses were received, of which 31 required deletion due to respondent drop-out in the initial stages of the survey. The division of responses is as follows: clients (12), personnel (26), and broader society (36).

Even though the response rate of the ‘clients’ stakeholder group is not considerably high, the responses received were provided by the most relevant members of this group. The key objective was to reach those clients with the largest share in the total usage of the waterways of the Port of Brussels (a group of around 30 members), as they possess the greatest level of control over the port. Furthermore, they also strengthen and confirm the strict terminology of an inland port as applied in this chapter. In 75% of the received questionnaires, the client indeed makes frequent use of the waterways. Furthermore, the survey was sent out to all personnel members in order to not discriminate among the staff. However, being confronted on a regular basis with, and having an opinion/idea about, the concept of sustainability was

a precondition of filling out the survey. In order to minimize the bias of self-selection, questions probing for the function of the respondent and their number of years of interest in sustainability were posed. Out of the 26 answers, only 2 came from personnel working for the department of 'environment, health, and safety services'. All other questionnaires came from respondents throughout various departments, reflecting an accurate representation of the organization. Also, in terms of years of interest, a proper sample of respondents with a variety of experience and knowledge about the subject can be noted. The 'broader society' stakeholder group likewise exhibits a good representation of several different stakeholder profiles.

According to Gay and Diehl [47], the type of research involved (descriptive, correlational, or experimental) defines the number of respondents needed to reach an acceptable response rate for analysis. They state that, in the case of descriptive research, which is applied in this chapter, a sample size covering 10% of the population is sufficient, or 20% when the population is small. Given the number of received responses for each stakeholder group, in particular the clients, we can state that the sample size reflects a plausible proportion of the targeted population. Unfortunately, some questions were not fully completed by the respondents. For this reason, 'n', reflecting the absolute number of answers, is always shown for each question being discussed. However, this never led to the response rate being compromised. In all cases, the condition mentioned above remained fulfilled.

#### 5.4.2 TBL balance

The first part of the survey was developed with the intent of investigating the perception of the stakeholders towards the content of a sustainability report. In other words, should each TBL dimension be equally elaborated upon in a sustainability report? As mentioned in the methodology (Section 5.3.4), the AHP method was applied to analyze this data. Results are shown in Table 5.2. All stakeholder groups do not equally value the three dimensions of the TBL. In general, the findings suggest that the dimension 'environment' should encompass almost 50% of a sustainability report compared to the weak results of the social dimension. Looking at the clients, the difference becomes even larger. For them, the focus lay on the economic and environmental, and less on the social, dimension, in comparison with the other two stakeholder groups.

Table 5.2 - Proportion of TBL concepts in a sustainability report

|                                                         | Economic | Social | Environmental |
|---------------------------------------------------------|----------|--------|---------------|
| Personnel ( <i>n</i> = 26)                              | 23%      | 34%    | 43%           |
| Clients of the port ( <i>n</i> = 12)                    | 31%      | 20%    | 49%           |
| Broader society (including government) ( <i>n</i> = 36) | 21%      | 33%    | 46%           |

In light of current environmental discussions, the importance of the environmental dimension is not surprising. During the past decades, organizations have indeed placed a greater emphasis on environmental issues, leading to a gap in the level of accuracy when comparing the conceptual and practical development of social and environmental performance [23]. Furthermore, looking at the clients' results we can further notice a dominance of the economic over the social dimension. A plausible explanation could be that financial reporting does not entirely satisfy the needs and demands of its relevant stakeholders, which are not shareholders, but are rather interested in and influenced by the actions of the organization. As mentioned by Deegan and Rankin [48], the users of an annual report are not exclusively limited to shareholders, but represent a varied cross-section of society. This supports the growing need for either extending the existing content of an annual report, focusing on more

than just the financial side of an organization, or the creation of a separate sustainability report.

#### 5.4.3 Materiality issues

In order to explore those issues perceived as material by the different stakeholder groups, we made use of a Likert scale to grade each issue according to its level of importance, which is reflected by an indicator (ranging from 1 ‘not important’ to 7 ‘very important’). The shortlist of possible material indicators was compiled based on a literature review, the materiality analysis of the Port of Antwerp [49], and on our own exploratory research in the context of the support for an industry working group (IAPH-PIANC Working Group 174), as well as on recently completed applied research projects, such as the PORTOPIA project [50]. In total, 38 indicators, adapted to the context of an inland port and divided into seven large domains, could be identified: economic (4), social (7), environmental (12), logistic and operational performance (5), mobility (3), port-city relationship (4), and satisfaction/perception (3). These seven domains were identified to cover the specific context of the Port of Brussels, as not all indicators could immediately be categorized under the existing TBL dimensions.

The approach employed in the analysis was similar to the one applied in Font et al. [30], i.e., indicators were considered as Likert scale items on an interval level, to which parametric tests were applied. As stated in Font et al. [30] by Norman [51], regardless of the original data, for sample sizes greater than 5, the central limit theorem underpins the condition that the means of those samples are generally normally distributed. For this analysis we compared the mean of each individual issue/indicator with a materiality baseline, which we set at a score of 5 (out of 7, i.e., 4 as neutral score), thus implying that the indicator is of importance. An extra t-test was applied to those indicators with a mean slightly lower than 5 to investigate if the difference was significant. The overview of means and related results of the list of indicators can be found in Table 5.3. Results show that, for the stakeholder group ‘personnel’, 37 out of 38 indicators comply with the materiality baseline, meaning that they can be considered to be material issues. Only the indicator ‘staff turnover’ is regarded as of insufficient importance to include within a sustainability report. The clients show the same results as the personnel and add the indicator ‘gender equality’ as a low-importance issue. In conjunction with the other results, the broader society group also perceives two indicators as not worthy of paying attention to: ‘staff turnover’ and ‘level of difficulty hiring staff’. Remarkably, all non-significant indicators are part of the social dimension.

Table 5.3 - List of indicators

|                                        | Personnel  | Clients    | Broader Society | Average |
|----------------------------------------|------------|------------|-----------------|---------|
| <b>Economic</b>                        |            |            |                 |         |
| Investment volume                      | 5.2        | <u>4.6</u> | 5.0             | 4.9     |
| Procurement practices                  | 5.6        | <u>4.4</u> | 5.4             | 5.1     |
| Indirect economic impact (added value) | 5.0        | 5.2        | 5.3             | 5.2     |
| Direct economic impact (added value)   | 5.8        | 5.3        | 5.4             | 5.5     |
| <b>Social</b>                          |            |            |                 |         |
| Staff turnover                         | <b>4.3</b> | <b>4.1</b> | <b>4.3</b>      | 4.2     |
| Level of difficulty hiring staff       | <u>4.5</u> | <u>4.4</u> | <b>4.3</b>      | 4.4     |
| Gender equality                        | <u>4.9</u> | <b>3.3</b> | 5.2             | 4.5     |
| Indirect employment                    | 5.5        | <u>4.8</u> | 5.4             | 5.2     |
| Direct employment                      | 5.7        | <u>4.9</u> | 5.6             | 5.4     |
| Health and safety at work              | 5.4        | 5.5        | 5.2             | 5.4     |
| Education and training                 | 5.4        | 5.4        | 5.4             | 5.4     |

| Environmental                                                                                              |     |            |     |     |
|------------------------------------------------------------------------------------------------------------|-----|------------|-----|-----|
| Odors                                                                                                      | 5.3 | 5          | 5   | 5.1 |
| Dredging                                                                                                   | 5.9 | <u>4.8</u> | 5.3 | 5.3 |
| Port expansion                                                                                             | 5.5 | <u>4.9</u> | 5.8 | 5.4 |
| Biodiversity/nature                                                                                        | 6   | 5.1        | 5.4 | 5.5 |
| Noise                                                                                                      | 5.9 | 5.3        | 5.5 | 5.6 |
| Ship waste                                                                                                 | 6.2 | 5.8        | 6.1 | 6.0 |
| Water consumption                                                                                          | 6.5 | 5.6        | 5.9 | 6.0 |
| Green policy and actions                                                                                   | 6.5 | 5.6        | 6   | 6.0 |
| Port waste                                                                                                 | 6.3 | 5.8        | 6.1 | 6.1 |
| Ship discharges to water                                                                                   | 6   | 6.2        | 6.1 | 6.1 |
| Energy consumption                                                                                         | 6.7 | 5.8        | 6.1 | 6.2 |
| Quality/emissions (air, water, soil)                                                                       | 6.7 | 6.1        | 6.1 | 6.3 |
| Logistic and Operational Performance                                                                       |     |            |     |     |
| Spatial productivity per quay meter                                                                        | 5.5 | 5          | 5.3 | 5.3 |
| Area usage of the different sectors                                                                        | 5.5 | 5.1        | 5.2 | 5.3 |
| Throughput per quay meter                                                                                  | 5.6 | 5.2        | 5.5 | 5.4 |
| Seaport connectivity                                                                                       | 5.6 | 5.4        | 5.9 | 5.6 |
| Intermodal connectivity                                                                                    | 5.9 | 5.7        | 6.2 | 5.9 |
| Mobility                                                                                                   |     |            |     |     |
| Modal split commuter traffic                                                                               | 5.7 | 5.1        | 5.1 | 5.3 |
| Road congestion around the port area                                                                       | 5.8 | 5.6        | 6   | 5.8 |
| Future actions                                                                                             | 6.1 | 5.8        | 6.1 | 6.0 |
| Port-City                                                                                                  |     |            |     |     |
| Integration of the port into the Trans-European waterways framework                                        | 6   | <u>4.8</u> | 5.7 | 5.5 |
| Integration of the territorial management of the canal area in present and future plans of the port        | 5.8 | 5.6        | 6.1 | 5.8 |
| Integration of the port into plans for new developments at Federal and Regional levels (Flanders/Wallonia) | 6.2 | 5.6        | 5.7 | 5.8 |
| Integration of present and future port activities into the metropolitan environment                        | 6.3 | 5.5        | 6   | 5.9 |
| Satisfaction/Perception                                                                                    |     |            |     |     |
| User/client satisfaction                                                                                   | 5.7 | <u>4.9</u> | 5.4 | 5.3 |
| Employee satisfaction                                                                                      | 5.8 | <u>4.8</u> | 5.3 | 5.3 |
| Local communities' perception                                                                              | 5.8 | 5.1        | 5.4 | 5.4 |
| N =                                                                                                        | 22  | 12         | 30  | 64  |

Note: Underlined numbers = indicators with a mean lower than 5; Numbers in red = indicators with a mean significantly different from 5 ( $p < 0.05$ )

In order to obtain a more general overview and to shed light on some of the higher-level tendencies, additional descriptive statistics were applied to the data. More specifically, the technique of quartiles was used to gain a more in-depth understanding of the distribution of the responses of all stakeholder groups per indicator. A tendency to assign higher importance to the economic indicators can be observed. However, clients seem to be more interested in general high-level economic indicators, for instance (in)direct economic impact, than those linked to the daily business of the port. Overall, the social indicators are valued as less important. The distribution of answers from personnel for the indicators 'staff turnover' and 'level of difficulty hiring staff' is widely spread, showing that for some this issue is not important enough to be mentioned in a sustainability report. The same phenomenon holds true for the indicators 'health and safety at work' and 'education and training'. Among the answers of the personnel are a number of unexpected tendencies, with people showing no interest in the inclusion of these indicators in a sustainability report. Taking a closer look, it appears that employees with more recent interest in the topic of 'sustainability' (compared to the other respondents) gave the lower scores. Nevertheless, these indicators are given high overall scores by the clients and broader society. Additionally, more than 50% of the clients

are not interested in gender equality in the organization, contrasting with the results of broader society, where 70% of responses are equal to or above the score of 5.

Furthermore, as expected, the environmental indicators are given a high level of importance by all stakeholders. Issues such as energy consumption and quality /emissions almost reach the maximum score of 7. The same level of importance is also acknowledged by academics with papers looking into these specific research areas [52,53]. Results of the 'broader society' stakeholder group make us believe that the survey has been answered by many stakeholders with a professional 'urban development' background. The indicators 'spatial productivity per meter of quay' and 'seaport connectivity', as well as issues related to the port-city relationship and the integration of the port into regional, national, and international transport and infrastructure development plans are given very high scores. In contrast, the answers of clients regarding the integration of the port into the Trans-European waterways framework are very divided, with one of the lowest means of the exercise (see Table 5.3). A possible explanation for this is that most waterway users in Brussels use fixed, specific connections that already function very well and are not hampered by infrastructural bottlenecks witnessed across the wider EU waterway network. Finally, developing an indicator that reflects the perception and satisfaction of the different stakeholders is regarded as very important by the personnel of the PMB. It shows awareness of the increasing influence that external stakeholders have over port activities and development, making investment in superior stakeholder management a necessity.

#### 5.4.4 *Boundary setting*

Besides defining the materiality of several indicators, setting the boundaries is another complex dilemma that needs to be addressed when preparing a sustainability report. The respondents were asked to select the boundary that they deemed of high relevance for the PMB to report on (based on what is feasible in the PMB's present situation) for each dimension (economic-social-environmental). We defined the boundaries based on the organizational and geographical/operational features of the port, following the approach and philosophy in Archel, Fernandez and Larrinaga [54]. If the PMB should report an indicator on both the level of the PMB itself as well as on the level of the port cluster separately, the respondent needed to tick both boundaries A and B. If the respondent was of the opinion that the PMB should measure an indicator only on the level of the port cluster (and thus not separately for the PMB), only boundary B should be ticked. Table 5.4 shows the results of this exercise.

Table 5.4 - Boundaries per domain perceived by the different stakeholder groups

| <b>Economic</b>                 |     |     |     |     |            |
|---------------------------------|-----|-----|-----|-----|------------|
|                                 | A   | B   | C   | D   | No opinion |
| <b>Personnel (n = 22)</b>       | 55% | 59% | 32% | 23% | 5%         |
| <b>Clients/users (n = 12)</b>   | 42% | 58% | 17% | 8%  | 8%         |
| <b>Broader Society (n = 30)</b> | 43% | 53% | 30% | 23% | 20%        |
| <b>Social</b>                   |     |     |     |     |            |
|                                 | A   | B   | C   | D   | No opinion |
| <b>Personnel (n = 22)</b>       | 55% | 41% | 45% | 23% | 5%         |
| <b>Clients/users (n = 12)</b>   | 33% | 25% | 58% | 17% | 8%         |
| <b>Broader Society (n = 30)</b> | 37% | 43% | 57% | 10% | 20%        |
| <b>Environmental</b>            |     |     |     |     |            |
|                                 | A   | B   | C   | D   | No opinion |
| <b>Personnel (n = 22)</b>       | 64% | 55% | 36% | 27% | 5%         |
| <b>Clients/users (n = 12)</b>   | 42% | 42% | 33% | 50% | 8%         |
| <b>Broader Society (n = 30)</b> | 40% | 50% | 43% | 43% | 20%        |

Note: A = Port Managing Body organization; B = port area/cluster (including industry/logistics and including the hinterland interface); C = local/regional community; D = impact of upstream and downstream supply chain activities taking place outside the port borders and beyond the local/regional community.

Although there is accordance on the contribution of environmental indicators in a sustainability report, a small difference between the stakeholder groups can be seen when it comes to defining the relevant boundaries. For the clients and community stakeholders, it seems to be of high importance that environmental indicators are calculated comprising all activities of the supply chain, in contrast to the view of the personnel, who consider boundaries A and/or B as sufficient. A similar reasoning applies in a large part to the social dimension, with clients and broader society stakeholders focusing on boundary C. In general, we can state that the personnel prefer to first place a focus on their own organization with attempts to broaden the scope, in comparison to the two other stakeholder groups, for whom the boundary of the organization is a minimum condition and who prefer to see indicators calculated on broader boundaries. For all stakeholder groups, the economic dimension should be analyzed with a focus on the first two boundaries, thus focusing on those actors that can have a direct impact on the going concern of the organization.

#### 5.4.5 Stakeholder's willingness for inclusion

The creation of mutual responsibility between the organization and its stakeholders is necessary to maintain the 'license to operate', as expectations can be managed and aligned with each other [55]. However, such inclusion also requires time and effort from the stakeholders. Eventually, stakeholders would prefer a level of inclusion for which the cost-benefit balance will be neutral or positive.

Table 5.5 - Preference for stakeholder inclusion by the different stakeholder groups

|                                    | <b>Mean</b> | <b>SD</b> |
|------------------------------------|-------------|-----------|
| Personnel (n = 21)                 | 4.95        | 1.564     |
| Clients/users of the port (n = 11) | 4.64        | 1.690     |
| Broader society (n = 30)           | 4.90        | 1.213     |

Based on the adapted version of the model of Friedman and Miles [32] (see Section 5.2.3, Table 5.1), each respondent was asked to indicate the desired level of inclusion during the process of sustainability reporting. Each level is linked to a number, ranging from 1 (no inclusion) to

7 (full inclusion). Table 5.5 presents the mean and related standard deviation. All stakeholder groups have a mean of almost 5, which corresponds with a level of collaboration, joint decision-making, and multi-way dialogue. However, looking at the standard deviations, this result should be interpreted with caution. A more in-depth analysis of the results shows that the majority of the clients gave a score of 5 or 6, but two outliers could be identified with a score of 1 and 2. In all probability, this can be explained by the type, size, portfolio of activities, etc. of the organizations in question. The distributions of the personnel and broader society are quite comparable, with answers equally divided between 3 and 7. This shows that the personnel of the port are aware of the importance of strong stakeholder inclusion, not only for reasons of anticipating demands and expectations, but also for creating a learning environment stimulated through mutual interaction. Although important to the urban region, the PMB is not a dominant player and does not have the ultimate bargaining position, which causes long lead times in the realization of projects (5 to 10 years). For this reason, the PMB should always keep its stakeholder strategy on point.

Furthermore, a question concerning preferred communication tools was also posed to the external stakeholder groups (clients and broader society). Figure 5.1 shows that surveys and workshops are the tools perceived as most desirable by both stakeholder groups. In a second phase, more face-to-face meetings are favored, with preferences for one-on-one conversations shown by the clients and focus groups by the community stakeholders. A consultation frequency of once every six months is seen as optimal by the majority of respondents from both groups.

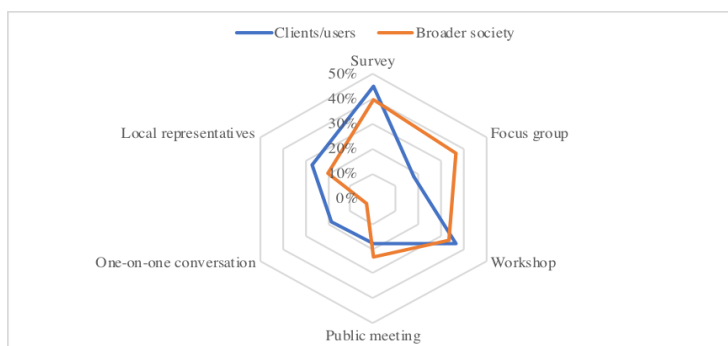


Figure 5.1 - Communication means preferred by clients/users and broader society

## 5.5 DISCUSSION

Table 5.6 gives an overview of the different topics discussed by linking the literature and the survey results and adding concluding reflections. These reflections form the synthesis of the theoretical and practical perspective on some topics deemed important at present with regard to sustainability reporting. Some additional explanation is provided in the sections below.

Table 5.6 - Conclusive table

|                                                                                                                                                                                                                                                                        | Sustainability Reporting Literature                                                                                                                                                                        | Survey Results (Port of Brussels)                                                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TBL balance</b>                                                                                                                                                                                                                                                     | ➤ Increased importance of reporting on more dimensions than the mere financial performance of an organization.                                                                                             | ➤ The 3 dimensions of the TBL are not equally valued by the stakeholder groups.                                                                                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                        | ➤ A strong TBL report equally values all dimensions and identifies trade-offs and linkages between economic, social and environmental performance.                                                         | ➤ The environmental dimension should cover up to 50% of the content of a sustainability report, according to all stakeholders.                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                        | ➤ More than 50% of the GRI Standards belong to the social dimension.                                                                                                                                       | ➤ Relatively weak results for the social dimension.<br>➤ Clients put more importance on the economic compared to the social dimension.                                                                                                                                                                                   |
| <b>Reflection</b>                                                                                                                                                                                                                                                      |                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                          |
| The optimal balance between the three dimensions of the TBL is context-dependent and should take into account all needs of the different stakeholder groups.                                                                                                           |                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                          |
| <b>Materiality issues</b>                                                                                                                                                                                                                                              | ➤ Audience shifted from only shareholders to all stakeholders.                                                                                                                                             | ➤ All non-significant indicators are part of the social dimension.                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                        | ➤ More difficult to 'value' (quantify) information from the environmental and social dimensions.                                                                                                           | ➤ All stakeholder groups stipulate environmental indicators as being the most material.                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                            | ➤ No significant differences between materiality preferences of the stakeholder groups.                                                                                                                                                                                                                                  |
| <b>Reflection</b>                                                                                                                                                                                                                                                      |                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                          |
| Need for sector-specific frameworks and guidelines on sustainability reporting.<br>For each dimension (eco, soc, and env), the highest common denominator of the demands of the different stakeholder groups in terms of total material topics should be investigated. |                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                          |
| <b>Boundary setting</b>                                                                                                                                                                                                                                                | ➤ No fixed definition of boundary setting and its unit of measurement for a PMB.                                                                                                                           | ➤ The PMB personnel prefers to primarily focus on the own organization, with attempts to broaden the scope compared to the clients and broader society stakeholders for whom the boundary of the organization is a minimum ambition when it comes to the environmental and social dimension of sustainability reporting. |
|                                                                                                                                                                                                                                                                        | ➤ No fixed guidelines stipulating the required boundary per indicator.                                                                                                                                     |                                                                                                                                                                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                        | ➤ In general and at present, boundary setting is still mainly based on the consideration of financial control of the organization.                                                                         | ➤ Overall alignment between stakeholder groups on the boundaries for economic indicators.                                                                                                                                                                                                                                |
| <b>Reflection</b>                                                                                                                                                                                                                                                      |                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                          |
| Boundary setting depends on the used unit of measurement, e.g. operational vs. organizational boundaries.<br>Broadening boundaries can lead to the inclusion of negative performance outside one's own organization.                                                   |                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                          |
| <b>Stakeholder's willingness for inclusion</b>                                                                                                                                                                                                                         | ➤ Stakeholder inclusion should go beyond dissemination of information and should reach a strong level of collaboration: stronger stakeholder inclusion improves the outcome of the sustainability process. | ➤ All stakeholder groups prefer the same level of inclusion (not maximum) in the process of sustainability reporting.                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                          |
| <b>Reflection</b>                                                                                                                                                                                                                                                      |                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                          |
| Full inclusion is not preferred by the stakeholders themselves, as the costs would outweigh the perceived benefits.                                                                                                                                                    |                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                          |

### 5.5.1 TBL balance and materiality issues

More purpose-driven employees, risk education, monitoring long-term risks, etc. as internal, sometimes organization-specific advantages, cover just one part of the full set of advantages of sustainability reporting. Societal aspects, more externally driven, such as an increase in transparency, enhanced reputation, improved market position, improved stakeholder relations, etc., complete the list and characterize the growing importance of the practice [1,3,56]. Although sustainability reporting has already proven to be of value for organizations, developing such a report is not straightforward, as social and environmental performances are very difficult to quantify and are unique to each organization. Issues that are considered material by stakeholders will differ between organizations, for example those situated in developing or developed countries, as local environmental and social requirements differ, and it is highly likely that a different interpretation of the ideal ongoing concern strategy exists. These different conditions and playing fields for organizations will also be translated into

different 'optimum' TBL balances for each and every organization. However, it is important that each TBL dimension contains a minimum level of content, determined by the highest common denominator, in terms of objectives of the different stakeholder groups. Even though every situation is unique and requires correct judgment, the need for sector-specific guidelines is high, as these could aid in defining a necessary minimum level of compliance.

#### 5.5.2 *Boundary setting*

Boundary setting in the context of financial reporting is known and well-defined, i.e., based on the concept of financial control. Sustainability reporting, on the other hand, involves more than the economic aspects of an organization, meaning that the principle of boundary setting should not limit its considerations merely to those aspects under financial control. Based on the unit of measurement, several approaches to sustainability boundary setting can be articulated. Two commonly used units of measurement are based on organizational and operational features, respectively horizontal and vertical boundary setting. In the context of ports, operational boundaries are often applied. Furthermore, based on the results, we observe that the PMB is more willing to broaden an indicator's boundary when this potentially results in showcasing more positive news, cf. the social dimension. In contrast, when broadening the boundary is associated with the potential publication of negative news, the PMB will be reluctant, cf. the environmental dimension.

Boundary setting is an important element of sustainability reporting as, when well-defined, it can form the link between the organizational micro- and macro-level contributions of the port cluster managed by the PMB to sustainable development. These insights will allow the identification and monitoring of high-level integration opportunities [57], as well as the possible negative effects caused by seaports but 'absorbed' by inland ports. Inland ports with a strong 'license to operate' might provide tangible benefits to seaports, as the latter rely on inland ports to achieve more sustainable hinterland logistics, and thus improve their own sustainability impacts. This is in contrast to the inland ports in question, as they are responsible for the last leg of the transport chain and thereby confronted with the transition to the least attractive transport mode: road. In light of the research presented in this chapter, we also identified the availability of resources as a major barrier for inland ports to engage in sustainability reporting; more in-depth collaboration between inland and seaports within the same network/supply chains seems warranted. The main challenge of such collaboration is most likely the definition of sustainability reporting outputs, which still appeal to local stakeholders (e.g. local communities).

#### 5.5.3 *Stakeholder's willingness for inclusion*

Although the level of stakeholder inclusion is mostly positively correlated with societal acceptance of strategic choices made on the level of the organization [33], a specific element related to cognitive or information overload should be considered [58]. When more stakeholders become involved in organizational and decision-making processes, this also means greater exposure to new information and a potential increase in complexity of institutional partnerships. However, every organization, and by extension institutional system, is limited by its size, inter alia defined by its human and financial resources, which corresponds with a certain level of cognitive saturation. More specifically, above a certain level the benefits of additional information will exceed the costs of processing it. When stakeholders within the system ignore this limitation, the chance that they will be confronted with a cognitive overload at some point in the future increases, leading to an overall loss of

value in terms of the information presented. In general, it is a balancing exercise, with a saturation level defined by the stakeholders' and organizations' particular characteristics. Therefore, the level of cognitive saturation of the Port of Brussels's stakeholder system will probably be lower in comparison to a large seaport, such as the Port of Antwerp, and thus matching another optimal number of stakeholders to be included.

## 5.6 CONCLUSION

Inland ports operate under different, sometimes more extreme, circumstances than seaports, specifically when it comes to resource availability (human and financial), and the multitude of stakeholders influenced by the presence of the port in an urban context. This research contributes to existing literature, as it approaches the concept of sustainability reporting in the context of inland port managing bodies from the perspective of three of their important stakeholder groups (personnel, clients and broader society). The research results of the chapter are of interest to academics and practitioners, as well as policy makers. The Port of Brussels has been used as a case study in order to discover potential gaps in expectations between different stakeholder groups with regard to sustainability (reporting) and its sub-dimensions: materiality, boundary setting and stakeholder inclusion. The research shows how materiality analysis and adequate boundary setting can play crucial roles in addressing the demands and needs of the different stakeholder groups, hence creating a better understanding and future progress in managing expectations. A sustainability report resulting from various exercises across all TBL dimensions can be regarded as the epitome of the 'sustainability DNA' of the port managing body, and will be of importance in strengthening its 'license to operate'.

Limitations of the research concern the focus on one case study and the relatively small sample size. Due to the adoption of a holistic approach in this research based on a single case study (Port of Brussels), generalizations of the results should be made with caution. For example, following the typology of Dooms, Haezendonck and Valaert [40], the Port of Brussels is a metropolitan inland port for which certain sustainability issues will probably be of more importance compared to inland ports that fall under the definition of an industrial inland port. Also, the stakeholder groups, and the extent to which they exert pressure, will be different for both types of inland ports. However, we argue that the results related to the level of preferred stakeholder inclusion (by all stakeholder groups) during the sustainability reporting process can be extended to the case of inland ports in general, as the reasoning behind this choice will be similar in all cases. The same also holds for the results around the topic of boundary-setting. The general objectives, as well as the norms and values of the different stakeholder groups in question (clients, broader society and personnel), remain similar for all types of inland ports. Therefore, we expect these results to not differ tremendously and to be applicable to the majority of inland ports. In sum, this research, even though based on a single case study, can serve as a basis and source of information for inland PMBs when investigating the potential of sustainability disclosure, given the lack of examples in this domain. Of course, finally, the importance of reproducing this exercise for every inland port individually remains.

In addition, based on the findings of this exploratory research, several applications and possibilities for future research can be defined. First, as the focus of this research lies on the Port of Brussels as a metropolitan inland port, it would be interesting to replicate the analysis for other types of inland ports, such as industry-supporting types, or to other types of economies, such as emerging economies. For emerging economies in particular, the role of the

port managing body when it comes to sustainability reporting (given different port governance frameworks), as well as the results of a materiality analysis of sustainability issues and the number of stakeholders to be included, might differ substantially. Second, the survey instrument for this research has been developed in a way that it can easily be applied and adapted to the specificities of other inland ports, or even smaller seaports proximal to or within urban environments, without any detriment to the robustness of the survey. Questions are developed from a holistic point of view, and are not inherently linked to features of the Port of Brussels. Third, the current insights could be complemented with in-depth interviews or focus groups with stakeholders to provide a more in-depth analysis of the underlying reasons behind some of the specific results of the survey. To conclude, the analysis combines ideas found in literature with evidence in practice, which demonstrates the mutual benefits of collaborative research between academics and real-life practitioners.

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## **PART III**



## **CHAPTER 6**

### **RESEARCH IMPLICATIONS, MANAGERIAL / POLICY RECOMMENDATIONS, AND FUTURE RESEARCH AGENDA**



This chapter contains a reassessment of all previous chapters presented in this PhD dissertation, with a focus on frequently discussed topics in literature as well as in practice, supported by additional data that has not been used and captured in the previous chapters. Specific research implications and managerial and policy recommendations will be provided, as well as some exploratory future research ideas. We structure our reflection around five elements:

1. Stakeholder perception(s) of sustainability
2. Motives and barriers for (not) implementing sustainability initiatives
3. The boundary-setting dilemma
4. The institutional environment
5. The future of sustainability initiatives in ports

## 6.1 STAKEHOLDER PERCEPTION(S) OF SUSTAINABILITY

### 6.1.1 *Triple Bottom Line concept and stakeholder inclusion*

The growing awareness that an organization (in this case the Port Managing Body – PMB) should be held accountable for much more than the economic aspects of its business model alone has highlighted the need to rethink the idea of ‘good’ performance management and related measurements towards integrating the concept of ‘sustainability’. The Triple Bottom Line (TBL) principle is regarded as one of the best markers and concepts of operationalization for ‘sustainability’ and ‘sustainable development’, as it focuses on the separate assessment of the economic, social and environmental dimensions, as well as on their triangulation effects. As stated by Gray and Milne (2004, p.7):

*“The TBL captures a simple but important idea: if an organization is indeed a social and environmental entity as well as an economic/financial entity then it needs to pay as much attention to (if not control) its social and environmental activities as it does to its financial activities”.*

The environment of non-financial information is much more complex to navigate, as shareholders (or other persons with a direct, transactional relationship) are no longer the only audience interested in the performance of the PMB, with other primary and secondary stakeholders, impacted by the daily operations of the organization, also being taken into consideration.

Based on the research findings of this PhD dissertation, we can state that, today, a considerable number of PMBs recognize the value of paying attention to the multidimensional approach when implementing sustainability initiatives in the port area in view of both shorter- and longer-term sustainability challenges. Figure 6.1 shows the point in time from which PMBs (n = 97) explicitly and formally recognized the TBL principle in their public documents. However, it can be seen that over a quarter (27%) of the surveyed PMBs still do not recognize the importance of equally valuing the economic, social and environmental dimension. A closer look reveals that the use of this principle is related to the degree of autonomous

decision-making of the PMB. Almost 50% of all government-controlled PMBs surveyed (n = 27) do not recognize the value-added of the TBL principle, compared to 25% for the fully privatized structures (n = 12) and 17% for the hybrid structures (n = 58). This result is highly surprising, as a public entity is entrusted with the responsibility of always acting in the interest of the public, highlighting the need for the accounting of social and environmental information.

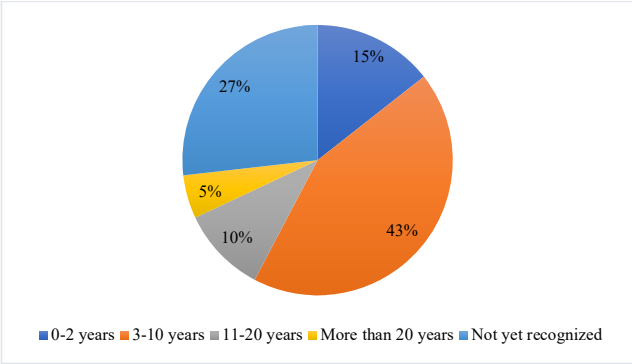


Figure 6.1 - Recognition of the TBL principle in public documents

Furthermore, in line with the principle of equally valuing all TBL dimensions and reaching a level of complete and holistic integration, part of the research probed the extent to which the three dimensions (economic, social, environmental) should be elaborated on in a sustainability report (SR); one of the most well-known sustainability initiatives. Table 6.1 presents the perceptions of different stakeholder groups, as also identified in Chapter 5 and now extended with the views of representatives of 97 PMBs, with regard to the required proportions of the TBL dimensions in an SR<sup>12</sup>. We are aware that this comparison is characterized by a certain degree of ambiguity and that interpretations should be made with caution, as the analysis incorporates two different reference frameworks and sample sizes. However, it is of value to indicate some raw exploratory insights into the perceptions of different stakeholder groups, while also identifying some interesting future research paths.

Table 6.1 - Proportion of TBL dimensions in a sustainability report

|                                                 | Economic | Social | Environmental |
|-------------------------------------------------|----------|--------|---------------|
| PMBs (n = 97)                                   | 32%      | 31%    | 37%           |
| Clients of the port (n = 12)                    | 31%      | 20%    | 49%           |
| Broader society (including government) (n = 36) | 21%      | 33%    | 46%           |

We notice a small discrepancy in the way it is perceived that the dimensions should be covered in an SR between the PMBs themselves and their relevant external stakeholders (local community and clients). PMBs acknowledge the need for a holistic approach in which the three dimensions receive equal attention in an SR. External stakeholders, on the other hand, still place an emphasis on the coverage of environmental issues, not fully acknowledging the importance of the triangulation mechanism at work. The results show that all involved parties

<sup>12</sup> Results of the research related to Chapter 5 are combined with data stemming from the survey used for the analysis in Chapter 4. The same question was posed in both surveys.

tend to perceive the TBL principle, or, in other words, 'sustainability', in a different way, leading to a potential 'perception gap'. The differences in sustainability perceptions could potentially (negatively) impact a PMB's path to sustainability. For this reason, it is of high importance that PMBs include their stakeholders in their sustainability initiatives' development and implementation processes from the start, as only then will PMBs gain enough knowledge about and insights into the interests and requests of each stakeholder group, thus reducing the possibility of information asymmetry. In addition, it is advised that this collaborative process should be built upon a mutually continuous dialogue between all parties. However, the current research in this PhD dissertation reveals that, to date, the level of stakeholder inclusion in the general strategy formulation of the PMB, as well as in, for example, the development of a particular sustainability initiative such as sustainability reporting, has been less than sufficient, respectively scoring 3.5 and 3 out of 7 (see Chapter 5, Table 5.1 for the corresponding measurement table). These findings indicate that PMBs more often choose to apply an ad-hoc approach with regard to stakeholder inclusion, where stakeholders are heard and provide advice, but do not have any direct influence over the final decision, i.e. the way the actual sustainability practice is implemented and monitored. Identifying the key stakeholder groups of the PMB and recognizing them as important building blocks of the PMB's strategic success, as well as measuring and monitoring the impact of implemented sustainability initiatives on the different stakeholder groups concerned, will create an environment of mutual respect and understanding, not only benefitting the PMB itself but also society as a whole.

Findings of Lu, Shang and Lin (2016) support these insights, as their research shows a positive relationship between external sustainable collaboration and internal sustainable management in ports, or, in other words, sustainability performance. However, even though it is expected that the implementation of certain sustainability initiatives and the inclusion of stakeholders in the process will have a positive effect on the sustainability performance of organizations, or in this case PMBs, one can wonder as to the extent to which those same stakeholders perceive these efforts as solid proof of the organization's true sustainability commitment. In light of future research, it would be worth investigating whether there is a potential perception gap between PMBs and their stakeholders concerning actions geared towards achieving higher-level sustainability goals.

In addition, when trying to address present global sustainability challenges in a more tangible way, reference is often made to the 17 Sustainability Development Goals (SDGs) of the United Nations (UN). These have been drawn up to represent a new approach to due diligence for sustainable development actions. The SDGs are not a group of discrete objectives, but rather form an intertwined framework. For a development intervention to be sustainable, it should not only capture the social, economic and environmental impacts it generates and related trade-offs and synergies between all dimensions (cf. the TBL principle), but should also consider the extent to which it is developed, owned and carried out in partnerships while also analyzing the wider internal and external societal context in terms of social cohesion, inclusion, tensions and conflicts (Brown & Rasmussen, 2019; Sow, 2017). More specifically, the emergence of the SDGs has enlarged the original P-model (People, Planet, Prosperity) with two extra dimensions: Partnerships and Peace. However, in order to contribute to the SDGs as an organization, it is important that they be integrated into the core strategy. To obtain a general view on how the SDG framework is embraced by the port industry, we asked the PMBs (n=97) which SDGs have a direct link to their core strategy. As observed, not all SDGs are evenly relevant in the case of PMBs. Figure 6.2 presents the results.

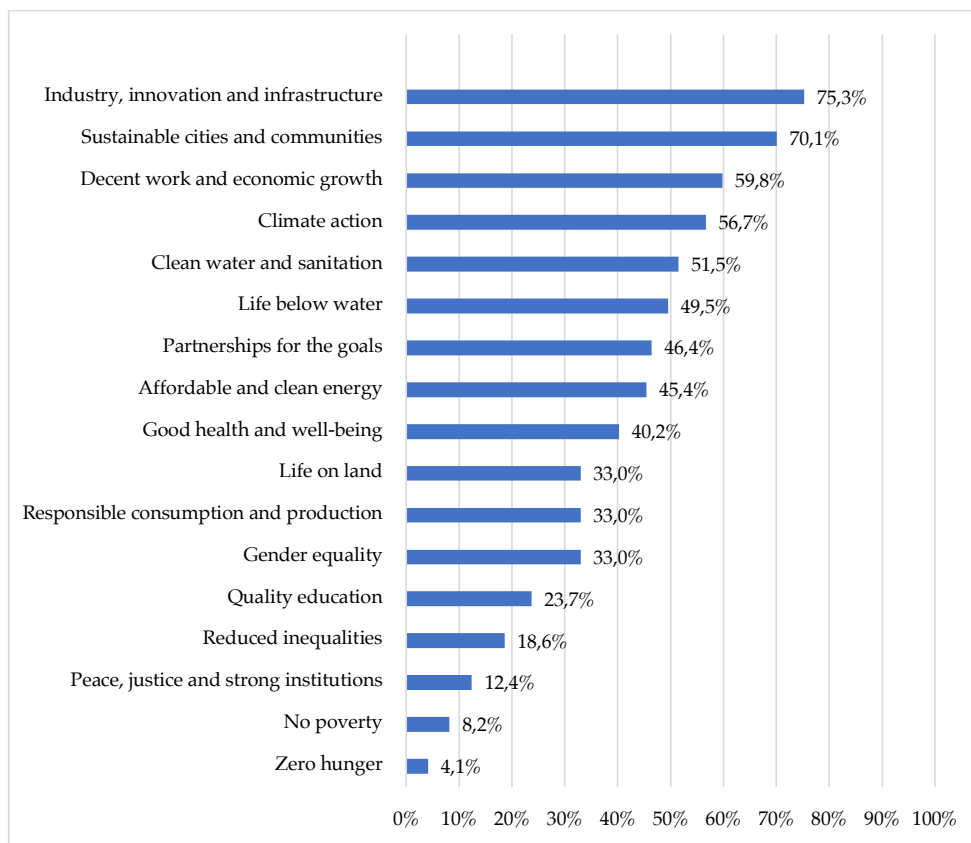


Figure 6.2 – Links between SDGs and the core strategy

From Figure 6.2, we observe that, for example, in 75% of cases, the SDG “industry, innovation and infrastructure” is directly linked with the PMB’s strategy. However, the results also highlight that efforts made in light of the two new Ps - ‘partnerships and peace’ - can still be intensified, especially when acknowledging the fact that ports can be regarded as economic clusters (de Langen & Haezendonck, 2012), and thus partnerships in terms of knowledge sharing, project collaboration, etc. are of high importance. Future research could help us investigate the rationale underpinning certain choices and in mapping means to achieve a higher level of inclusion of most of the SDGs in the strategy formulation of PMBs.

### 6.1.2 Human resources

Given the multidimensional nature of the concept of sustainability, we also observe, based on the insights gathered across the chapters, that there is no unequivocal answer to the question of which department is/should be involved in the initiation and approval of sustainability initiatives. The following departments are ranked the highest in terms of necessary involvement:

- Environmental, Health & Safety
- General Management / Corporate Strategy

- Marketing & Communication
- Finance
- Technology, Engineering, Infrastructure & ICT

The Environmental, Health & Safety department is often the initiator of various sustainability initiatives, as their principal task is to ensure that the PMB provides a safe and secure working environment for its personnel and that the surrounding port area is preserved in the best possible way. However, in order to embed these initiatives in the general strategy and vision of the PMB, the support of General Management is vital. The fact that General Management is selected as the second most important 'department' shows that sustainability efforts are not set up for the mere sake of quick wins, but are developed and implemented as part of the longer-term business model.

Furthermore, the involvement of the Marketing & Communication department strengthens the notion that PMBs want to publicize their sustainability initiatives, as this can have positive effects on their reputation, and, more structurally, their social 'license to operate'. It can be seen that a significant proportion of PMBs consider the motivation for achieving a 'green image' in the eyes of stakeholders to be more important than the short-term environmental impact itself. However, PMBs often regard their efforts as 'signals to the market', setting an example to others. In general, a risk of loss in credibility of the PMB from their stakeholders' perspective (and thus reputational damage) is plausible when there is evidence of 'greenwashing'. Therefore, the PMB should always strive to ensure that the green marketing strategy applied is a realistic reflection of the sustainability situation within and of the PMB, and pursue a clear long-term vision with tangible actions.

The high ranking of the Finance department confirms the often-large cost implications that are linked to the adoption of sustainability initiatives, on the levels of both capital and operational expenses. Most initiatives do not result in a 'financial performance neutral' outcome, and require a well-considered cost-benefit analysis. The financial balance of the PMB should always be borne in mind, in particular given the strong tendency toward increased financial accountability of PMBs through various port reform processes. It is difficult to imagine situations where social and environmental responsibility will be given precedence without considering the financial consequences.

Finally, as the current environment becomes increasingly shaped by high technological demands, successful sustainability initiatives need to be substantially supported by technological processes, either during the development, the implementation, or the monitoring process.

In general, as different PMB departments rely on different knowledge bases and technologies, it is important that, in light of high-quality decision-making processes concerning sustainability performance, knowledge sharing and multidisciplinary team-based efforts take place. While larger PMBs have been able to make such organizational adjustments and possess the necessary slack resources for more intense (and costly) cross-functional decision-making through internal task forces, small- to medium-sized PMBs might have less potential to successfully develop these decision-making processes.

### 6.1.3 The complexity of social capital

A recurring element through the research presented in this PhD dissertation is that the relevance of the social dimension and related social indicators is underappreciated in comparison to the other dimensions of the TBL. This finding could be a spur of what is happening on a larger scale in society at present, meaning changes in the concept of 'social capital'. Some look at these changing times as a 'loss' in social capital (Putnam, 2000), others consider it to be a redefinition of the term to correspond to the new 'ground rule' of the 21st century, i.e. technology (Quan-Haase & Wellman, 2004). The OECD (2007) defines social capital as *"the links, shared values and understandings in society that enable individuals and groups to trust each other and so work together"*. In line with this definition, setting clear objectives (e.g. stimulating transparency and collaboration, risk management, etc.) for the creation of a sustainability initiative such as an SR towards stakeholders is one thing, understanding the underlying principal values with which the different stakeholders enter a potential engagement relationship is another. Only when one is aware of, and prepared to accept, the different reasons for participation will a good understanding among the participants be feasible, increasing the chances for success of the relationship. Underlying latent values centered on one object can be considered as important focal points of stakeholder relationships. We apply this idea to one of the sustainability initiatives discussed in this PhD dissertation, namely sustainability reporting: *Who benefits from what concerning sustainability reporting?* (Figure 6.3).

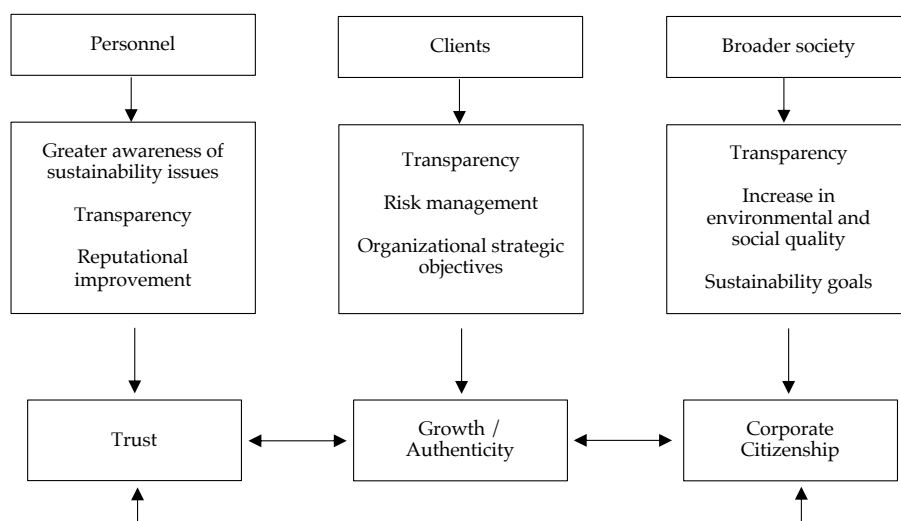


Figure 6.3 - Reasons and underlying values of engagement in the context of sustainability reporting

We consider the same three stakeholder groups as those identified in Chapter 5, in which the Port of Brussels was the object of analysis: personnel, clients and broader society. Every stakeholder group has its own reasons for supporting the idea of sustainability reporting, all related to underlying latent values. Starting from the personnel perspective, the development of an SR would create greater awareness of sustainability issues and increased transparency, leading to greater levels of trust internally as well as towards external stakeholders by reducing uncertainty. As a result of this increased trust, reputation will improve, which, in

turn, will again positively influence the level of trust. Furthermore, when a PMB develops an SR, this can have positive effects on its client database in terms of attracting new clients, as well as in terms of the growth of their existing clients, as the latter are better informed of the present situation of the PMB, leading to better integration and future anticipation for their own strategic agenda. Also, clients that generate an SR themselves will be supportive of the development of an SR by others, as it will potentially strengthen the authenticity of their own SR through the creation of a possible benchmark framework. The broader society stakeholder group acts from a corporate citizenship point of view, meaning that this group will support initiatives that have a positive effect on the social and environmental needs of current and future generations. Knowing that all stakeholders have a different agenda and stipulate different values as prime objectives, it is important to try to meet the demands of all different stakeholder groups in a minimal and balanced manner, in order to allow stakeholder relationships to flourish (Gjerding & Kringelum, 2018).

Based on the above exploratory research insights, we argue that the social capital success rate of a sustainability initiative is partly determined by the creation of a 'win-situation' in the short term for every stakeholder group involved, referring to the more obvious benefits related to the initiative. However, as indicated earlier, every stakeholder group also has additional underlying principal values and reasons to participate in a certain relationship/connection. When, during the development of a sustainability initiative, not only consideration is given to, but also acceptance of the prevailing latent values and reasons of participation of other stakeholder groups, strong embedded long-term relationships can be established, as the initiative coincides with the underlying values of the other stakeholder groups. It is this type of understanding and acceptance that makes relationships and collaborations successful. For this reason, and in light of achieving better collaborations between an organization and its stakeholders, and also on a higher level between policy makers, scientists and practitioners, it is important that future research takes a closer look at these dynamics in an attempt to reveal the significant underlying values of participation to obtain a clear vision and understanding of the concept of 'social capital'.

In addition, a substantial number of studies have already proven that CSR initiatives, of which sustainability reporting is a part, can produce benefits for the organizations implementing them (Barnett et al., 2019). To date, however, little is known about the reverse effects, meaning the extent to which society benefits from these initiatives. How do these initiatives influence the building of social capital, and what are these effects specifically? Barnett et al. (2019) discovered that a shortfall in knowledge on methods and convenient measures to calculate real, tangible 'impact' prevents researchers from assessing this, which is also confirmed by the findings presented through this PhD dissertation. This shows that, in order to take sustainability development to the next level, it is necessary to monitor the developed and implemented sustainability actions to ensure that they are precisely ameliorating what they are supposed to, cf. statistical validity. This is an important knowledge gap that needs to be addressed not only by academics, but also policymakers.

## 6.2 MOTIVES AND BARRIERS FOR (NOT) IMPLEMENTING SUSTAINABILITY INITIATIVES

The involvement of several departments in the decision-making and implementation process of sustainability initiatives (see Section 6.1.2) marks the interconnectedness of the initiatives with the core business activities of the PMB and thus the need to include them as part of the

overall strategy. However, we commonly observed that sustainability efforts are considered as separate, stand-alone objectives, applied on an ad-hoc basis when the need or pressure from internal or external stakeholders is high. Potential explanations for this phenomenon can be found in the motives and barriers of (not) implementing sustainability initiatives. Table 6.2 provides an integrated summary of the most prominent motives and barriers that are identified across all research in this PhD dissertation, i.e. from the perspective of internal and external stakeholders, focusing on two sustainability initiatives in particular: environmentally differentiated pricing and sustainability reporting.

Table 6.2 - Overview of the most prominent motives and barriers

| Research design<br>&<br>Relevant<br>stakeholders | Chapter 5<br>MICRO<br><i>Single port</i><br>1 case<br><i>External stakeholders</i>                                                                                                                                               | Chapters 2 & 3<br>MESO<br><i>Port range</i><br>7 cases<br><i>Internal stakeholders</i>                                                                                                                                                        | Chapter 4<br>MACRO<br><i>Global ports</i><br>97 cases<br><i>Internal stakeholders</i>                                                                                                                                            |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Motives</b>                                   | <ul style="list-style-type: none"> <li>- Transparency towards external stakeholders</li> <li>- Greater awareness of sustainability issues</li> <li>- Improved risk management</li> <li>- Improvement of reputation</li> </ul>    | <ul style="list-style-type: none"> <li>- Pressure of external stakeholders</li> <li>- Reaction to the 'World Ports Climate Initiative'</li> <li>- Promotion of a green image</li> <li>- Alignment with competitors / peer pressure</li> </ul> | <ul style="list-style-type: none"> <li>- Transparency towards external stakeholders</li> <li>- Improvement of reputation</li> <li>- Improved risk management</li> </ul>                                                          |
| <b>Barriers</b>                                  | <ul style="list-style-type: none"> <li>- Lack of resources (human and/or financial)</li> <li>- Data availability</li> <li>- Selection of meaningful performance indicators</li> <li>- Little interest from port users</li> </ul> | <ul style="list-style-type: none"> <li>- Lack of resources (human and/or financial)</li> <li>- Impact too small or not possible to measure and monitor</li> </ul>                                                                             | <ul style="list-style-type: none"> <li>- Lack of resources (human and/or financial)</li> <li>- Data availability</li> <li>- Selection of meaningful performance indicators</li> <li>- Little interest from port users</li> </ul> |

Table 6.2, across all dimensions, i.e. micro vs. meso vs. macro and external vs. internal, conveys a rather uniform message in terms of the perceived motives and barriers for the implementation of sustainability initiatives. Transparency towards external stakeholders (often as a result of pressure from large stakeholders), greater awareness of sustainability issues, improved risk management and reputational factors emerge as the main potential drivers for the initiation of development and implementation of sustainability initiatives. An analysis of the barriers can explain why PMBs sometimes choose to adopt a more passive attitude toward the implementation of sustainability initiatives. A lack of resources (human and/or financial), data availability and selection of meaningful and feasible performance indicators for measuring and monitoring purposes of the impact of the initiative are highlighted as the most significant barriers. The issues of data availability and insufficiency of accurate measuring and monitoring mechanisms are well-known barriers in the broader domain of CSR literature, as is mentioned in Section 6.1.3. Even though during the last decades large organizations in particular have invested in CSR initiatives, there is still little known about the real impact of these initiatives upon society, due to a lack of convenient measuring and monitoring methods, limiting organizations' portrayal of the full (positive) effects of their sustainability-oriented actions (Barnett et al., 2019).

A more in-depth analysis shows that, while larger PMBs have the advantage of being able to rely on a large resource basis, both in terms of financial and human capabilities, they are not always more dedicated to improving their sustainability performance compared to the small- and medium-sized PMBs. On the one hand, larger PMBs need to deal with a higher level of visibility, resulting in a higher degree of attention and pressure from stakeholders, and thus a higher need to provide proof of dedication in order to manage their 'license to operate'

(Brammer & Pavelin, 2008). On the other hand, the size of the PMB is often a good proxy for the bargaining power towards the external environment. In other words, larger PMBs are somewhat less dependent on how society perceives the presence and sustainable added value of the port. In comparison, the approach of small- and medium-sized PMBs is also multifaceted. In some cases, rather than conducting a proper feasibility analysis that could potentially lead to high investment costs as a result of tailor-made research and expertise, they prefer to adopt similar sustainability initiatives to the larger players. PMBs tend to benchmark as to overcome the uncertainty and bounded rationality associated to the implementation of sustainability initiatives. However, it is important to mention that we also identified small- and medium-sized PMBs that are willing to bear the short-term costs of novel initiatives and be an early adopter, as they acknowledge the long-term added value and consider this to be a strong competitive advantage, mainly through differentiation.

Furthermore, the autonomy in decision-making of the PMB is another parameter impacting the freedom of choice for implementing certain sustainability initiatives, as it directly influences a PMB's trade-off between occupying a more conservative position as opposed to fulfilling a more entrepreneurial role. The higher the level of managerial autonomy, defined by the governance structure, the more the PMB will strive to achieve a competitive advantage and think from a position of outperforming the competition, including the role of sustainability initiatives in building competitive advantage. In the context of ports, it is typically the Board of Directors (BoDs) that is the central decision-making entity within a PMB. The BoDs determines the general business strategy and vision of the PMB, which, in turn, should serve as guidance for further decisions on more operational matters, e.g. sustainability issues. Research has already shown that the composition of the BoDs can strongly influence the decisions taken (e.g. gender balance, generational diversity, etc.) (Brammer & Pavelin, 2008; Ferrero-Ferrero et al., 2015; Rao & Tilt, 2016; Schrobback, 2020). Moreover, in the context of ports, the professional background of the board members should also be taken into account (i.e. political vs. business/industry). Research of de Langen and Heij (2014), based on insights from the Port of Rotterdam, states that politicians possibly lack capabilities and incentives for the monitoring of PMBs, as the activities under the responsibility of the PMB distinctly differ from those strictly defined as public activities. In recent years, the composition of the BoDs of some of the larger PMBs (e.g. Port of Rotterdam, Port of Antwerp) have undergone a number of considerable transitions towards greater inclusion of external, independent directors with a strong industry track record, alongside other policies towards board composition and diversification (e.g. gender equality). Intuitively, one would think that this restructuring process would have a (positive) influence on strengthening the sustainability strategy, as this is also a driver of competitive advantage. However, more research is needed on the board composition of PMBs and its impact on decision-making in relation to sustainability initiatives as part of the larger vision of the PMB, and on port performance in general.

To conclude, in order to make an appropriate decision with regard to pursuing certain sustainability initiatives, a complete feasibility evaluation in terms of the costs and benefits, as well as the impact and related stakeholder reactions, should be conducted. Furthermore, alongside detailed knowledge of the competitive status quo position of the port, insights into higher level linkages between all TBL dimensions and into long-term evolutions of the core business activities impacted by the initiative are also essential to fully capture the potential of the sustainability action. Therefore, PMBs should also anticipate internal capabilities for the development of a high-quality measuring and monitoring system. Unfortunately, this kind of

proactive approach has not yet been completely established, a fact which largely stems from concerns relating to the allocation of resources.

### 6.3 THE BOUNDARY-SETTING DILEMMA

In general, sustainability is a global ecological and societal concept, transcending organizational boundaries. In other words, it is a complex systems-based concept, having the largest value at the eco-system level, which complicates its conceptualization at an individual organizational level (Gray & Milne, 2004; Gray, 2010). Therefore: *Should sustainability initiatives taken at PMB level also have an impact far beyond the PMB itself? And how far is 'far enough'?* Unfortunately, there exists no clear answer, nor any sophisticated guidance on how the macro-economic concept of sustainability should be operationalized at a PMB level. For the port industry to become more sustainable, a more product- or service-oriented approach could help, as this diverts focus from the individual PMB to the entire maritime logistics supply chain. Nevertheless, the PMB as an individual entity has the potential to lead by example as it manages an essential node in the entire transport network. In addition and following the above reasoning, in order to gain insight into the past, present and future sustainability situation of the PMB and the port area managed by it, assessment, monitoring and reporting are key. Again, the question of boundaries can be posed in light of reporting standards. The concept of boundaries of reporting is of particular relevance to ports, as it is inextricably linked to the position within, and the dependence on, the supply chain. As stated by Antonini and Larrinaga (2017, p.125):

*“Analogously to the case of financial reporting, boundary setting is a crucial methodological step in the definition of the reporting entity whose performance is described in the sustainability indicator or report. Accurate sustainability boundaries improve the comparability, completeness and relevance of sustainability indicators.”*

Table 6.3 illustrates the results of two investigations that were accomplished as part of the larger research presented in this PhD dissertation. Both investigations are focused on discovering the perception of boundary setting of several indicators, but were executed with different research designs, i.e. content-analysis vs. survey-based approach, and at different moments in time; 2016 vs. 2019.

The first research, conducted in 2016, is based on an in-depth content analysis of ten Global Reporting Initiative (GRI) compliant SRs from leading PMBs<sup>13</sup>. The results highlighted that a complete understanding of the definitions of the indicators and related boundaries applied in every individual SR is extremely difficult, complicating a straightforward comparison process of the different individual reports. The largest unit of difference between the reports appeared to be the definition and applied scope of the boundaries; geographical approach, supply chain approach, organizational approach based on the scope of activities, etc. Furthermore, the analysis also revealed under-developed indicator areas, such as supply chain performance, as well as wide-ranging approaches to the calculation of investments and economic value-added indicators, in particular beyond the organizational boundary of the PMB.

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<sup>13</sup> We made the conscious decision to select ten ports that follow the GRI Guidelines as this should already reflect a certain degree of harmonization and allows the development of a starting framework, while taking into account the fact that the sample of ports covers a certain range in terms of descriptive characteristics. The analysis consisted of an explorative, qualitative exercise where in-depth reading of performance indicators and related boundaries was the main focus. This research was presented as an extended abstract at the IAME 2017 conference in Kyoto, Japan.

The second research is part of the survey discussed and presented in Chapter 4, i.e. results are based on the answers of respondents from 97 global PMBs (the question under consideration can be found in the Appendix, Annex 5).

Table 6.3 - Overview of boundary setting

|               | Content analysis of 10 GRI SRs (2016)                                                             |                                                        |     | Survey with respondents of 97 PMBs (2019) |     |     |     |            |
|---------------|---------------------------------------------------------------------------------------------------|--------------------------------------------------------|-----|-------------------------------------------|-----|-----|-----|------------|
|               | A                                                                                                 | B                                                      | C+D | A                                         | B   | C   | D   | No opinion |
| ECONOMIC      | Indirect / direct economic impact                                                                 |                                                        |     | 67%                                       | 39% | 22% | 13% | 13%        |
|               | Traffic volumes                                                                                   |                                                        |     | 54%                                       | 53% | 18% | 12% | 12%        |
|               | Investment volume                                                                                 |                                                        |     | 68%                                       | 32% | 16% | 5%  | 16%        |
|               | R&D expenses                                                                                      |                                                        |     | 61%                                       | 22% | 5%  | 4%  | 31%        |
|               | Modal split                                                                                       |                                                        |     | 39%                                       | 37% | 15% | 11% | 37%        |
| SOCIAL        | Operational performance                                                                           |                                                        |     | 63%                                       | 38% | 5%  | 3%  | 24%        |
|               | Direct / indirect employment                                                                      |                                                        |     | 62%                                       | 43% | 31% | 21% | 13%        |
|               | Safety / accident rate                                                                            |                                                        |     | 64%                                       | 40% | 10% | 5%  | 14%        |
|               | Training                                                                                          |                                                        |     | 67%                                       | 28% | 8%  | 7%  | 22%        |
|               | Job creation                                                                                      |                                                        |     | 58%                                       | 38% | 31% | 20% | 16%        |
| ENVIRONMENTAL | Energy consumption                                                                                |                                                        |     | 71%                                       | 40% | 13% | 11% | 13%        |
|               | CO <sub>2</sub> emissions                                                                         |                                                        |     | 65%                                       | 34% | 16% | 16% | 16%        |
|               | Other port activity related emissions (PM, NO <sub>x</sub> , SO <sub>x</sub> )                    |                                                        |     | 58%                                       | 39% | 18% | 13% | 20%        |
|               | Port waste                                                                                        |                                                        |     | 69%                                       | 38% | 14% | 10% | 13%        |
|               | Circular economy                                                                                  |                                                        |     | 52%                                       | 39% | 15% | 12% | 33%        |
| GOVERNANCE    | Is there a formal measurement/mechanism in place to examine the perceptions of local communities? | Surveys on perception / Complaints line / Ombudsperson |     | -                                         | -   | -   | -   | -          |
|               |                                                                                                   | Consultation for projects, strategy, reporting         |     | -                                         | -   | -   | -   | -          |

A = Port Managing Body organization

B = Port area/cluster (including industry/logistics and including the hinterland interface)

C = Local/regional community

D = Impact of upstream and downstream supply chain activities taking place outside the port boundaries and beyond the local/regional community

|                                       |
|---------------------------------------|
| 0 – 3 SRs mention the indicator or NA |
| 4 – 7 SRs mention the indicator       |
| 8 – 10 SRs mention the indicator      |

|                                        |
|----------------------------------------|
| 0 – 30% use this reporting boundary    |
| 31% – 60% use this reporting boundary  |
| 61% – 100% use this reporting boundary |

When analyzing the results of both investigations together, we observe that more than 60% of all surveyed PMBs claim to have calculated that specific indicator for boundary A in their SR for almost every presented indicator. However, during the execution of the content analysis, indicators that were clearly defined and calculated for boundary A were rarely found for each separate topic. This finding illustrates two potential problems: (i) the existence of a possible misunderstanding, or even a certain illiteracy, regarding sustainability among PMBs and their stakeholders, as information is perceived differently by all parties (see also Section 6.1.1), (ii) a possible malfunction in the internal communication of PMBs, as not all internal stakeholders seem to be fully informed on the content presented in their SR. Moreover, remarkably, many respondents to the survey indicate that they had no opinion about the boundary setting of the indicators, specifically when it comes to topics that are not yet strongly established in a practical way in the mindset of the industry, such as e.g. circular economy related indicators and, more surprisingly, the modal split of hinterland traffic.

A lack of communication and knowledge sharing with their relevant internal and external stakeholders, as well as among the PMBs themselves, are most likely the reasons for these existing issues. A better understanding of (i) how the concept ‘sustainability’ should be defined for PMBs, (ii) which complex web of inter-linkages exist at the level of stakeholders, and (iii) how sustainability should be managed in practical terms, can only be achieved when PMBs are willing to share information and knowledge with each other with the common goal of creating an industry-wide position and approach. In parallel, stakeholder inclusion of, inter alia, port users and local communities, in light of integrating their demands and information from a supply chain perspective, are also highly essential components in the process of providing more robust and supported long-term sustainability development plans.

However, setting the boundaries between the PMB and its context remains a multi-faceted issue, as it is not exclusively a case of willingness, but also of complexity. Broadening the scope of indicators to the full supply chain calls for data that is often not available in general or not available to the PMB in particular. Of course, vice versa, for some indicators, broadening the scope does not necessarily mean gaining extra insightful information, e.g. reporting on gender equality at the level of the supply chain is probably less relevant.

To conclude, the boundary-setting dilemma in the context of ports and their PMBs is a wicked problem. The numerous organizational, geographical, operational and stakeholder-based differences that exist among ports complicate the exercise of defining boundaries based on only one of the dimensions. For example: (i) organizational/legal boundaries will provoke issues on the level of ‘management model’ inclusivity (private vs. public, landlord vs. service), (ii) geographical boundaries will provoke issues in terms of spatial contexts (urban vs. coastal/nature areas; water areas), and (iii) stakeholder-based boundaries will provoke issues in terms of different salience/materiality of stakeholders and issues. However, the current ‘freedom’ in terms of defining and calculating indicators and the related boundaries most certainly leads to confusion, at least from an external stakeholder perspective, about the real impacts of the sustainability initiatives taken by the PMB with regard to the environment. While no industry-specific guidelines are developed, the risk of confusion, self-conceit and even a certain level of delusion will continue to dominate over transparency and clarity. Therefore, developing clear definitions of sustainability indicators and setting generally accepted boundaries, starting from the micro perspective of individual PMBs, are important key components in the process of capturing the holistic and integrated nature of the concept of sustainability.

## 6.4 THE INSTITUTIONAL ENVIRONMENT

### 6.4.1 *Institutional pressures at work*

The research in this PhD dissertation reveals that the choice of pursuing carefully considered sustainability initiatives is not solely bounded by rationality and deliberate managerial decision-making, but is also driven by underlying institutional pressures pushing to be responsive to societal rules and expectations imposed by the environment in which the PMB operates. Institutional Theory has proven to be a valuable theoretical lens by which to capture the dynamics between the PMB and its surroundings. It is the combination of both organizational characteristics and contextual factors that forms the driving mechanisms behind the installment and dispersion of sustainability initiatives throughout a 'field', which can be defined by a network, a geographical area, etc. As PMBs are not all part of the same 'field' or institutional environment, the level of influence of the various institutional isomorphisms (coercive, normative, mimetic and competitive advantage) differs. Even within the same 'field', the concept of isomorphisms has limitations in explaining the full range of existing heterogeneity among PMBs, only strengthening the importance of taking account of the interconnectedness between the organizational characteristics and institutional complexity.

Based on the research conducted around environmentally differentiated pricing and sustainability reporting, we are able to showcase the most interesting and prominent associations regarding these two sustainability initiatives and the contextual factors (Table 6.4). Typically, several institutional pressures are in force at the same time. However, in a large proportion of instances, 'coercive' isomorphism is still the most dominant. Nevertheless, besides the large presence of the 'coercive' pressure, we want to point out some other interesting and prominent associations between the sustainability initiative implemented, the specific organizational characteristics of the PMB, and the underlying institutional pressures.

Table 6.4 - Overview of the most prominent associations: sustainability initiatives, institutional pressures and organizational characteristics

|                                                                                             | COERCIVE                                                                                                                                                                                                                                                                                                                                     | NORMATIVE                                                                                                                                                                                                                                                                                                                                                                                                                 | MIMETIC                                                                                                                               | COMPETITIVE ADVANTAGE                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Environmentally differentiated pricing scheme, i.e. ESI</b><br><i>Chapters 2 &amp; 3</i> | <ul style="list-style-type: none"> <li>- PMBs located in proximity to cities experience more pressure from the regional government</li> <li>- Larger PMBs are more subject to the legal pressures of global climate protocols due to high visibility</li> <li>- Reputational objectives towards stakeholders (especially clients)</li> </ul> | <ul style="list-style-type: none"> <li>- Rules set out by permanent task force of IAPH, within which mostly powerful PMBs are active members</li> <li>- Proactive approach of financially strong PMBs for handling in accordance with the new 'sustainability' norms</li> </ul>                                                                                                                                           | <ul style="list-style-type: none"> <li>- Adoption of similar green port dues schemes by PMBs with a limited resource basis</li> </ul> | <ul style="list-style-type: none"> <li>- Larger and more important PMBs are frontrunners, setting the example and acknowledging the added value in the long run</li> <li>- PMBs use the initiative to differentiate themselves from competitors active in the same market segment</li> </ul>                                                                                        |
| <b>Sustainability reporting</b><br><i>Chapters 4 &amp; 5</i>                                | <ul style="list-style-type: none"> <li>- Medium-sized PMBs act to conform to legal requirements or reputational objectives</li> </ul>                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>- Proactive approach of large-sized PMBs for handling in accordance with the new 'sustainability' norms</li> <li>- PMBs that have a high awareness for sustainability integration in the overall strategy</li> <li>- PMBs located in proximity to cities feel more responsible to do what is 'right'</li> <li>- Government-controlled PMBs with low managerial autonomy</li> </ul> | <ul style="list-style-type: none"> <li>- More present in emerging countries</li> </ul>                                                | <ul style="list-style-type: none"> <li>- Proactive approach of the largest- but also smallest-sized PMBs</li> <li>- PMBs that acknowledge the importance of a higher level of stakeholder inclusion</li> <li>- Enhancement of the 'license to operate', especially for PMBs located in proximity to cities</li> <li>- Privately owned PMBs with high managerial autonomy</li> </ul> |

Table 6.4 shows that, although only one industry is the subject of the analysis, the exercise of which isomorphisms/pressures are (more) applicable, given certain organizational characteristics, needs to be conducted for each sustainability initiative separately. For example, in light of implementing environmentally differentiated pricing schemes, we observe that the 'mimetic' pressure plays an important role for PMBs with a limited resource basis. Intuitively, we would expect the same for the practice of sustainability reporting. However, this seems to be less the case, as a high degree of association is apparent between small-sized PMBs and the isomorphism of 'competitive advantage'. Also, PMBs that are located in proximity to cities will develop an SR based on the willingness to do 'right' towards its stakeholders, i.e. 'normative' pressure, or from the acknowledgement that the publication of an SR can help strengthening the 'license to operate' of the port, i.e. 'competitive advantage'. In comparison, the implementation of an environmentally differentiated pricing scheme appears to mostly result from the idea of 'fitting in', i.e. 'coercive' or 'mimetic' pressure. Also, 'competitive advantage' played a role in the early stages, as the frontrunners had the power to determine the general standards and framework to which other PMBs needed to adapt.

It is worth mentioning that caution is warranted when interpreting the phenomenon of a number of large, financially strong PMBs (e.g. Port of Rotterdam and Antwerp) having similar

sustainability practices in place, such as an ESI-based pricing scheme. We want to point out that this should not be considered a result of mimetic behavior; the results of this research show no evidence that points to outright copying of strategies by the larger PMBs. This phenomenon, thus, is the result of joint efforts of PMBs (i.e. industry organization expert research, advice and working groups: e.g. ESI Working Group, World Port Sustainability Program of IAPH) to achieve a certain level of harmonization in the industry to be able to take a coordinated position/approach towards stakeholders, and it is therefore rather a manifestation of normative behavior. However, as mentioned throughout the different chapters, small- and medium-sized PMBs look towards the larger PMBs for inspiration and ready-to-implement ideas.

In sum, the findings above highlight the fact that several parameters influence the final behavior of a PMB, and any organization in general: (i) the 'field' and present isomorphisms, i.e. industry, geographical area, etc. in which the organization is active, (ii) the individual organizational characteristics, and (iii) the sustainability initiative in question. Chapters 2 and 4 contain in-depth findings and explanations on the first two parameters and their interconnectedness. Therefore, the focus of the next paragraph lies on the final parameter, the sustainability initiative in question.

Besides the organizational and contextual factors, we also find that the total level of advantage gained from the implementation of a certain sustainability initiative is an important parameter in the decision-making process. In other words, the magnitude of the 'win-situation' that the PMB can create for itself will also impact its organizational behavior. The larger the 'win-situation' that can be created, the more a proactive approach will be adopted by the PMBs. The research on environmentally differentiated pricing schemes shows that the general attitude behind the implementation of the sustainability initiative among most PMBs one was of 'staying in the loop', with the exception of the large, financially strong PMBs responsible for the creation of the Environmental Ship Index (ESI) pricing scheme. As a way of keeping up with their competitors and to safeguard their present position in the supply chain, many PMBs imitated their competitors and have adopted similar schemes. Furthermore, there is a high cost linked to operating the sustainability initiative in itself, leaving limited leeway for a large investment in a proper internal and complementary analysis, which further encourages the behavior of imitating the practices of others.

In the case of sustainability reporting, other dynamics are more dominant. It seems that the advantages of an SR for the PMB itself are more substantial compared to those of the environmentally differentiated pricing scheme initiative, meaning the information and data that are gathered and the analyses performed in light of the preparation of an SR can be of crucial added value in light of internal managerial purposes, such as, among other things, internal transparency and risk management. In other words, the development of an SR is interlinked with almost all core business activities of the PMB and requires the inclusion of various stakeholders, but, when conducted successfully, it can be of tremendous value in terms of ex-ante as well as ex-post evaluation of the operations of the PMB.

#### 6.4.2 *Institutionalization process of sustainability initiatives*

Based on the information and insights provided in all chapters of this PhD dissertation, we argue that the different phases of the institutionalization process of sustainability initiatives evidence a similar pattern to that of the life cycle of a product (Levitt, 1965). In this section, we further elaborate on this idea and indicate some future exploratory research paths.

A first important step in order to provide an explanation for the institutionalization process of sustainability initiatives, is to define the 'field' that will be subject of the analysis. In this case, we follow the reasoning of Hoffman (1999) who indicates that 'fields' can also be formed around 'issues' instead of 'industries', which are most often considered analogous to a 'field'. In other words, we consider sustainability, and any sustainability initiative in particular, as the 'field' in question, thus going beyond any organizational or geographical boundary. Furthermore, Institutional Theory is characterized by four types of isomorphisms or institutional pressures exerted within the 'field': coercive, mimetic, competitive advantage and normative. The theory does not privilege one isomorphism over another, but does indicate that their relative emphasis differs at distinct levels and times in the institutionalization process (Larrinaga, 2007). Considering all the above, we argue that the product life cycle curve captures the evolution of the institutionalization process of sustainability initiatives, as presented in Figure 6.4.

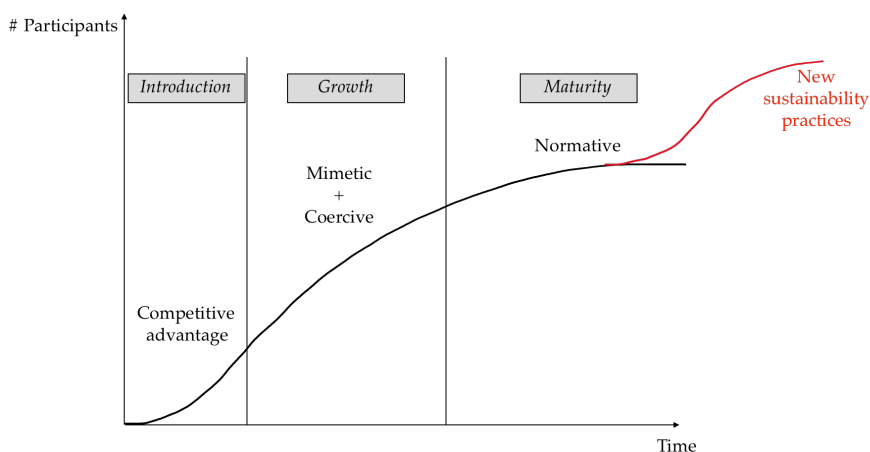


Figure 6.4 - Institutionalization process of sustainability initiatives

The introduction of a certain sustainability initiative often originates from a voluntary basis initiated by a small group of organizations called 'early adopters' that believe in the business benefits, i.e. competitive advantage, linked to the initiative and that desire a leadership position. This group of organizations can emerge within the same industry or across various industries, as in this case the 'field' is defined around the 'issue' of sustainability. However, the downside of occupying a pioneering position is that it comes with large costs, risks and uncertainties to be borne. For this reason, it is often the large, financially strong organizations that hold these positions.

After a certain period of time, the new sustainability initiative will reach a certain rate of acceptance among not only other organizations, but also national and regional governments, reflected by more 'participants'. From this moment on, during the 'growth' phase of the sustainability initiative, the 'competitive advantage' isomorphism will lose its power, and other pressures will become more dominant. Other organizations will start copying the successful practices of their peers, as they notice that the benefits of compliance outweigh the costs, i.e. mimetic pressure. Also, governmental institutions will begin to acknowledge the

added value of the sustainability initiative as part of the larger objective of becoming more sustainable, and will start imposing regulations, i.e. coercive pressure.

At some point in time, the initiative will be regarded as the norm by sustainability networks, industry associations and other interest groups, marking a pivotal moment of a shift in mentality. From this point on, the sustainability initiative will have attained its maturity phase and will be characterized by a certain level of homogeneity, as a majority of organizations will have implemented the sustainability initiative as a result of coercive, mimetic or normative pressure or from a perspective of competitive advantage. When the level playing field shows a form of saturation, it indicates the completion of the institutionalization process of that specific sustainability initiative and the potential emergence of new sustainability practices building upon the new fundamentals.

Applying this knowledge to the port industry, and with a specific focus on the two sustainability initiatives presented and explained in this PhD dissertation, we argue that these practices are not yet completely institutionalized, but are now situated in the 'growth' phase. Large, financially strong PMBs have profiled themselves as early adopters of these two initiatives (as they possess the financial and human resources to bear the risks and costs linked to their implementation), which has led to imitation behavior by other smaller-, medium-, and even large-sized PMBs as well as regional governments stepping up the pressure by imposing 'soft' regulations. However, as reflected in the findings of the previous chapters, there are still many PMBs that have not yet adopted any of the initiatives, showing that these initiatives are not yet considered as the general 'norm' to follow. Reaching the phase of maturity even possesses a dialectical subtext, meaning that, on the one hand, when the industry as a whole wants to achieve a higher sustainability level, this often goes together with a higher level of port collaboration in terms of sharing of knowledge and best practices, cf. altruism. On the other, sharing such information sometimes leads to sacrificing the individual competitive advantage the PMB has, cf. individualism. The outcome of this trade-off will determine the pace at which the industry will evolve to the optimal sustainability level.

Further research with a focus on longitudinal analysis is needed to fully, and in more detail, understand the dynamics behind the life cycle of the adoption of a sustainability initiative in general, and in the port industry in particular. When it becomes clearer how the dynamics evolve over time, as well as which organizational characteristics lead PMBs to take a more prominent role during each of the phases, the future development of new more custom-made initiatives will be facilitated, as the 'learning-by-doing' process can be limited, and adjustments can be anticipated in advance. With the success of this approach, we expect the motives and barriers for (not) implementing a sustainability initiative to evolve over time as well.

## 6.5 THE FUTURE OF SUSTAINABILITY INITIATIVES IN PORTS

Table 6.5 gives an overview of the topics discussed in the previous sections, highlighting the most prominent areas of improvement and general points of attention for each topic.

Table 6.5 - Overview of industry-wide areas of improvement and points of attention

| Points of attention and improvement       |                                                                                                                                                                                                                                                                         |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Triple Bottom Line</b>                 | <ul style="list-style-type: none"> <li>- More focus on the interconnectedness and triangulation effects of the three individual dimensions of sustainability: economic, social and environmental</li> <li>- Need for equal valuation of the three dimensions</li> </ul> |
| <b>Stakeholder inclusion</b>              | <ul style="list-style-type: none"> <li>- Encouraging dialogue between all relevant stakeholders on a permanent basis</li> <li>- Importance of knowledge sharing</li> </ul>                                                                                              |
| <b>Human resources and technology/ICT</b> | <ul style="list-style-type: none"> <li>- Involvement of a multidisciplinary team, as sustainability has an impact on several different core business activities</li> <li>- Sustainability initiatives need to be substantially supported by technology</li> </ul>       |
| <b>Motives and barriers</b>               | <ul style="list-style-type: none"> <li>- Need for the development of initiatives and solutions at a more meso (industry) level to overcome the barrier of resources at the micro level</li> </ul>                                                                       |
| <b>Boundary setting</b>                   | <ul style="list-style-type: none"> <li>- Higher-level institutions should invest in the development of sustainability guidelines based on PMBs' organizational characteristics with room for case-dependent adjustments</li> </ul>                                      |

The common denominator of Table 6.5 is the need for increased harmonization/standardization on an industry level with regard to sustainability initiatives in general, and the approach towards implementing them in particular. At present, individual PMBs are establishing their own sustainability initiatives, mainly based on their own understanding of 'moving forward to become more sustainable'. A first necessary step in the abstract process of harmonization is achieving an improved alignment of the perceptions on the concept of 'sustainability', as a full consensus on environmental stewardship and socially responsible practices has not yet been reached within the port industry. The result of this exercise will determine the overall future sustainability direction of the port industry and delineate a level playing field.

During the past decades, but mostly in other large industry domains, several organizations, working groups, sustainability programs and other initiatives have arisen globally with the specific aim of providing guidance and frameworks to organizations in regard to the management of their accountability for their social and environmental performance level. For example, the Global Reporting Initiative (GRI) is a well-known institution that supports organizations, irrespective of their size or sector, by providing guidelines and standards on sustainability reporting. However, as the GRI Standards are based on the compartmentalization of the concept of sustainability, meaning the assessment of sustainability is based on the individual TBL dimensions and separate time horizons, and is very limited on interlinking indicators, this approach is not sufficient for the complex environment in which PMBs operate. As part of the survey for Chapter 4, we asked the respondents of the PMBs if they already produce a form of SR and, if so, which framework is used, if any (Figure 6.5).

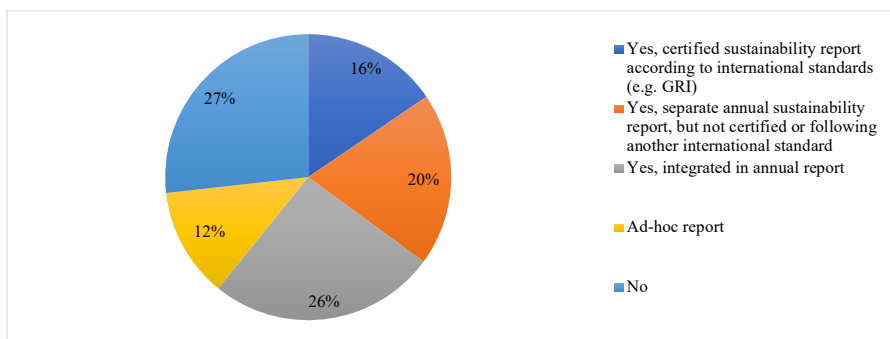


Figure 6.5 - Current tendency concerning the publication of an SR

The findings, presented in Figure 6.5, indicate that more than half of the PMBs produce an SR on a regular annual basis, of which, however, only 16% make use of the GRI as reporting framework. About half of the PMBs (46%) apply their own approach and best practices for the production of an SR. Furthermore, we also observe that one quarter of the responding PMBs still do not produce an SR of any kind. These results highlight the existing debate on whether the GRI Standards in their present format are fully compatible with application in the port industry.

Figure 6.6 shows that almost half of the responding PMBs are not even acquainted with the framework, and that 35% point out the need for sectoral guidance, i.e. GRI Standards adapted to the specific context of the port industry. At present, the existence of different sustainability reporting approaches, or sustainability assessment methods in general, results in disparities in the presented indicators and analyses. This limits the comparability of SRs and the option of using them as a benchmarking tool in order to provide higher-level industry results and tendencies.

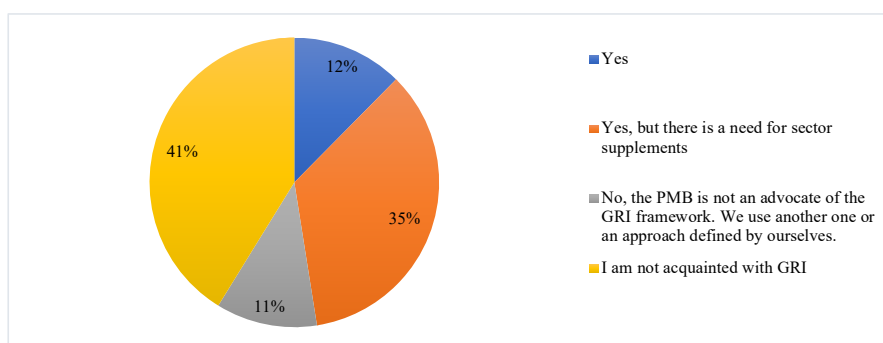


Figure 6.6 - Relevance of GRI guidance

In general, there is need for a more holistic and comprehensive approach to assess sustainability in port clusters. However, given the large existing organizational variety among PMBs regarding their, inter alia, size, ownership, managerial autonomy, financial turnover and geographical area, reaching a certain level of harmonization on an industry level for each sustainability initiative is a complex and tedious task to attempt to accomplish. Based on the information obtained, and meetings and conversations with experts in the industry, we are

able to formulate three important principles to be applied as a basis for either harmonization or standardization exercises:

- (1) Rely on an equal trade-off between theory and practice, i.e. collaborative approaches between practitioners and scientists.
- (2) Support dialogue and knowledge-sharing between all stakeholders that will be impacted by the initiative, as well as among PMBs themselves, i.e. port collaboration.
- (3) Leave room for case-specific nuances, e.g. the existence of stricter regulation in some countries can possibly impede the implementation of a certain sustainability initiative.

The toolbox on environmentally differentiated pricing developed and presented in Chapter 3 of this PhD dissertation serves as an example of how PMBs can be supported in their process of becoming more sustainable through a more standardized approach. The toolbox is based on a decision tree that, after the answering of a few questions, provides a port profile to which specific recommendations, taking into account the various differences in organizational characteristics, are linked. It is very important that these kinds of initiatives are supported and promoted by the industry, as they can help PMBs in their future sustainability development, especially those PMBs with a smaller financial resource basis (and thus no possibility to perform the analysis themselves) in order to 'remain in the game'. The larger the collective belief of the industry in a certain sustainability initiative, combined with greater numbers of PMBs implementing or making use of it, the higher the actual value of the product and the larger the overall impact on society and the planet.

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## **APPENDIX**



## ANNEX 1

**Financial performance in the context of PMBs**

Defining financial performance (and thus relevant financial indicators) in the context of PMBs is a highly complex task, in particular if financial performance figures need to be harmonized or standardized for both qualitative and quantitative research purposes. Several reasons for this can be identified. The most important is arguably the existence of a large diversity of port governance models, ranging from fully government-owned PMBs to fully privatized ones, as a result of different port reform processes between countries, influenced by pre-existing political cultures. Current models are thus characterized by different ownership structures and levels of autonomy, meaning PMBs can be owned by a municipal, regional or national government (e.g. Spain), can operate as an autonomous and more commercially operating organization under the control of the government (e.g. Belgium, the Netherlands) or can even be fully privatized (e.g. the UK). These differences in governance and ownership models have an influence on the level of managerial autonomy and decision-making, the various incentives PMBs are subject to, and the financial possibilities PMBs have, as some government-owned ports are able to rely on governmental (financial) support, unlike ports with a more commercial identity that are forced to work within a setting of full cost recovery (de Langen & Heij, 2014; Strandenæs & Marlow, 2000; Van Den Berg, de Langen & Van Zuijlen, 2017; van der Lugt, Doooms & Parola, 2013). Also, what may possibly be regarded as government support in one country, may, in another, be regarded as a cost/investment that needs to be covered by the PMB itself, and thus be registered under a different item in the financial statements. In other words, the cost structure and revenue streams differ between all PMBs, reflected in different financial flow patterns. Moreover, these governance differences are also translated into differences regarding the scope of the PMB's activities, available assets and applied terminologies, as well as the use of different accounting principles in the financial statements. In fact, on both a European and global level, no commonly enacted accounting rules exist for PMBs in particular to follow (EU Regulation 2017/352, 2017). Further to this, a significant number of PMBs do not make financial statements publicly available.

Even when similar governance structures, such as autonomous government-owned ports, are applied, differences in the practical implementation and operation of this model can be captured, based on regional differences. De Langen and Heij (2014, p.399) point out existing differences for this particular case:

- 1) *"The geographical scope of PMBs. While in some countries (Taiwan, South-Africa), the PMB operates all major ports in the country, in other countries, the PMB focuses on one specific port. In addition, in some countries, PMBs that manage and develop various regional ports have emerged (de Langen & Haezendonck, 2012 for the case of Copenhagen Malmo Ports that manages both as an integrated port complex).*
- 2) *The scope of activities of PMBs. While some PMBs provide only sites for terminals and maritime access, others provide a broader range of services, including port community systems, open access pipelines, open access rail or barge terminals and towage services.*
- 3) *The governance structure of the PMB. While some supervisory boards consist of politicians (such as the case in France) in other countries, supervisory board members have a background in business and operate independently.*

- 4) *The ownership of the PMB. While in most countries PMBs are fully government-owned, in some countries (Greece, Slovenia, Sweden), a minority of the shares is owned by private shareholders."*

In light of the above, and given that there are no indications of recent changes of this particular situation, we argue that selecting the most comprehensive and correct financial indicator is extremely difficult in the context of PMBs. However, given the context of the research, we give preference to annual financial turnover/revenue by elimination of others, e.g. EBITDA, market share, investments, and sometimes because of a lack of data availability, e.g. solvency. The reasons for not applying the other indicators are as follows:

- Profit: Taking account of the discussion above, using this indicator would lead to a distorted picture, as the level of subsidies, and thus the cost structure, can differ entirely between PMBs. Furthermore, PMBs are mostly still regarded as not-for-profit or hybrid organizations, with a mixed objective of being financially self-sustaining as well as contributing to larger economic and societal objectives such as investment promotion, trade facilitation, and sustainable cluster development. Thus, focusing merely on the profit indicator would divert us from the core tasks of a PMB, namely facilitating business, stimulating employment and securing safety in the port area.
- Market share: This indicator most often uses throughput volumes as a proxy. However, calculating this indicator is feasible when focusing on a specific port range, for specific traffic types. As, for the purposes of this research, the world is our level playing field, capturing this indicator is not possible or relevant.
- Investments: As mentioned earlier, some PMBs can rely on various sources of governmental support to make large investments. As a result, this indicator may not always highlight the financial position of the PMB based on its own operating strategy. Even in the case of the Port of Rotterdam, which is an example of a corporatized PMB, the PMB was able to rely on an equity stake of 500 million euros from the Dutch state to enhance its investment capacity, e.g. to bridge a funding gap for the Maasvlakte 2 project.
- Solvency: Data are not available.

Research of de Langen and Heij (2014) further shows that the two principal revenue streams of a PMB are port dues and land rents. The research also confirms that, in the case of the Port of Rotterdam, both revenue streams increased after corporatization. In other words, the revenue stream gives an indication of a PMB's true efforts to achieve a stronger financial position. In general, a PMB's objective is the creation of value for external stakeholders, and this can be better captured by looking at services and other sources generating revenue. As an example, a low value for the profit indicator can be misleading, as this could be the result of a high level of governmental support, but also of a certain mismanagement in light of obtaining more or higher revenue streams, which is thus not reflected in the profit indicator.

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## ANNEX 2

### Set of questions linked to each dimension of the individual matrices

#### Market:

- 1) Does the port want to focus the incentive scheme to
  - A. a broader group of customers/ships beyond compliance? (=Low)
  - B. a small, leading, elite group of customers beyond compliance? (=High)
- 2) Does the port want the scheme to be selective in terms of the number of cargo markets?
  - A. Yes (=High)
  - B. No (=Low)

#### Clarification on the questions:

- 1) How many ships does the port want to reach with the incentive scheme? e.g. if the port wishes to not only reward the best ships but also ships that reach minimal compliance (i.e. not limited to the best performers), the use of a tiered system might be recommended (e.g. Port of Amsterdam, Port of Los Angeles). Does the port want to do more than just the basic scheme and want to include different kinds of “add-on” features with it (e.g. rebates for the use of LNG, rebates related to fine particles, etc.)? If the answer is positive to these insights, choose option A, otherwise B.
- 2) Does the port want to apply the scheme to its most important cargo market(s) to ensure both the environmental advantages and also a limitation of the negative financial gap resulting from of the rebates, or even an increase in traffic given the lower tariff for a certain cargo market? Does it pursue a win-win situation on both criteria? If yes, choose option A, otherwise choose B. Note: This implies also some knowledge on the price elasticity of the various cargo markets. For cargo markets which are price-elastic, applying a rebate based on environmental performance may also attract more cargo to the port (or may convince users to stay).

### Environmental and social responsibility:

- Which environmental issue(s), listed below, receive(s) the highest priority within the current environmental plan of the port and/or are subject to high stakeholder pressure?
  - A. Local air quality / emissions
    - a. NO<sub>x</sub>
    - b. PM<sub>2,5</sub>; PM<sub>10</sub>
  - B. Waste
  - C. Water quality
  - D. Energy efficiency
  - E. Noise
  - F. Odors
  - G. Land and nature conservation
- Does the port directly impact a large nearby urban or metropolitan area?
  - A. No or limited impact (=Low)
  - B. Moderate to high impact (=High)
- In general, what is the perceived complexity in terms of the decision-making process on environmental issues, more particularly in terms of stakeholder inclusion?
  - A. Inclusion only means communication, with no or limited feedback (=Low)
  - B. Stakeholder's opinion is asked, but will not greatly affect the original decision (=Low)
  - C. Time consuming, but we largely reach a consensus (=High)
  - D. Systematically the largest obstacle to overcome (=High)

|                                   |
|-----------------------------------|
| Total ≤3 = Low<br>Total >3 = High |
|-----------------------------------|

### Finance/Resources:

- How large is the port's total annual operating revenue within which an incentive scheme needs to fit?
  - A. Less than 25 million euro (=High)
  - B. Between 25 and 75 million euro (=High)
  - C. Between 75 and 150 million euro (=Low)
  - D. More than 150 million euro (=Low)
- To what extent is the port willing/capable of devoting human and financial resources to make the scheme fully operational (i.e. administration, audits, financial reviewing, presence in international working groups, etc.)?
  - A. Less than 0.25 Full Time Equivalent (=High)
  - B. Between 0.25 and 0.5 Full Time Equivalent (=High)
  - C. Between 0.5 and 1 Full Time Equivalent (=Low)
  - D. More than 1 Full Time Equivalent (=Low)

Clarification on the questions:

- 1) The larger the PMB's total annual operating revenue, as a proxy for financial performance, the larger its potential for implementing particular incentive systems (see Annex 1 for more information on the concept of financial performance in the context of PMBs). It is also an indication of the amount of potential slack resources (e.g. human resources) that can be dedicated to the administration of a scheme. Note: With **total annual operating revenue** we suggest a total of three traditional revenue streams (from the perspective of a landlord PMB): port or harbor dues (paid by shipping lines), concession or lease fees (paid by tenants in the case of landlord ports), and other revenues (from operational or other activities). Where the scheme should only be fitted into, for example, the port or harbor dues, only this revenue stream needs to be considered.
- 2) Implementing and maintaining an incentive scheme requires human and administrative resources within various PMB departments (environment, commercial, marketing, accounting and finance). Does the port want to go beyond the mere administrative operations of the scheme: e.g. also engage in audits, inspections, monitoring and participation to international working groups (i.e. dedicating 0.5 FTE or beyond) or does the port aim for an efficient, ICT-supported solution putting minimal additional stress on the different departments involved (i.e. less than 0.5 FTE)?

#### Governance:

- Is the port autonomous with regard to tariff setting and allocating rebates?
  - A. Yes, (= Low)
  - B. Yes, but ratification by the government or other public body is required (= High)
  - C. No, a higher governmental level decides and sets the framework for port charging (=High)

## ANNEX 3

### Screenshots of the online toolbox

← → 10.250.46.60:6780/toolbox/#/ ☆ 🛡️ 📄 ☰

## Port Environmental Charging Toolbox



It appears that differentiated environmental charging schemes are not yet rooted within the main pricing or charging strategies of every port and its port cluster authority. In order to make the initiative of differentiated charging more approachable for every kind of port, intuitive and straightforward toolbox, based on a few questions, can help port managing bodies and their stakeholders in their discussion, decisions and final choice of implementing a particular scheme. The ultimate goal is to provide the port with a port profile, based on features both from the internal and external context. In a next step, concrete recommendations regarding implementing differentiated charging schemes, as well as the appropriate existing best practices will be linked to the port's profile\*.

[Discover your port profile and useful recommendations](#)

\*Three remarks need to be made:

1. The simplicity of the tool implies certain limitations in terms of taking into consideration the detailed situation of every port. As such, the toolbox is not built from a normative approach based point of view. Recommendations provided by the toolbox are either a starting point for the discussion at the level of the individual port or, alternatively, confirm or challenge the scheme currently in place and/or the choices already made;
2. The current amount of cases treated might not provide for every port a full match with a current best-practice port. Further and ongoing validation will be needed once the tool gets in permanent use;
3. The practice of environmentally differentiated schemes is still, even for the leading ports, essentially a learning exercise and no stabilized solution. The schemes will evolve in a dynamic way and so will the toolbox need to evolve in a dynamic way, leading to a need for frequent revision/updates (i.e. adding new information and insights on the application and results of schemes).

Ports are confronted with variables, both within the internal and external context, that have an influence on the way of thinking, acting, decision making, of a port managing body. The extent to which the port cluster is affected by some or all of these variables, and can exert control on these, influences the facets of a port's "vulnerability" or, vice versa, its "resilience". In other words, these variables define the amount of complexity a port has to deal with and has to take into account for its daily operations.

The different variables are divided into two dimensions:

- **External complexity/resilience** refers to both the market and the environmental and social responsibility context (i.e. the amount of direct competitors; the amount of environmental complexity and stakeholders a port has to deal with, meaning their perceived impact and influence on the decision-making process; the geographic location of the port; etc.)
- **Internal complexity/resilience** mainly refers to elements of the governance structure and the overall financial situation and slack resources available (i.e. the "degrees of freedom" to act autonomously and with no internal restrictions regarding the matter).

Eight straightforward questions will help to determine the position of the port regarding the two dimensions.

START

MARKET

Question 1/8

Does the port want to focus the incentive scheme to

- ☐ A broader group of customers/ships beyond compliance?
- ☐ A small, leading, elite group of customers beyond compliance?

**i** How many ships does the port want to reach with the incentive scheme? E.g. if the port wishes to not only reward the best ships but also ships just beyond compliance (i.e. more ships than only the best performers), the use of a tiered system might be recommended (e.g. Port of Amsterdam, Port of Los Angeles). Or does the port want to do more than just the basic scheme and want to put different kinds of "add-on" features to it (e.g. rebates for the use of LNG, rebates related to fine particles, etc.)? If the answer is positive to these insights, choose option A, otherwise B.

See Results  
(8 more answers required)

Next question →

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MARKET

Question 2/8

Does the port want the scheme to be selective in terms of the number of cargo markets?

☐ Yes
☐ No

Does the port want to apply the scheme on its most important cargo market(s) to ensure both the environmental advantages as well as a limitation of the negative financial gap as a result of the rebates, or even an increase in traffic given the lower tariff for a certain cargo market? Does it pursue a win-win situation on both criteria? If yes, choose option A, otherwise choose B. Note: This implies also some knowledge on the price elasticity of the various cargo markets. For cargo markets which are price-elastic, applying a rebate based on environmental performance might also attract more cargo to the port (or might convince users to stay). An impact analysis based on the elasticity of cargo markets is available in the study.

Previous question

See Results  
(7 more answers required)

Next question

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ENVIRONMENTAL & SOCIAL RESPONSIBILITY

Question 3/8

Which environmental issue(s), listed below, receive(s) the most priority within the current environmental plan of the port and/or are subject to high stakeholder pressure?

☐ Local air quality/emissions
☐ NOx
☐ PM2,5; PM10
☐ Waste
☐ Water quality
☐ Energy-efficiency
☐ Noise
☐ Odors
☐ Land and nature conservation

Previous question

See Results  
(6 more answers required)

Next question

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ENVIRONMENTAL & SOCIAL RESPONSIBILITY Question 4/8

Is the port directly impacting a large nearby urban or metropolitan area?

- ☒ No or limited impact
- ☐ Moderate to high impact

← Previous question See Results (4 more answers required) Next question →

← → 10.250.46.60:6780/toolbox/#/profile ☆ 📄 📱 ☰

ENVIRONMENTAL & SOCIAL RESPONSIBILITY Question 5/8

In general, what is the perceived complexity in terms of the decision-making process on environmental issues, more particularly in terms of stakeholder inclusion?

- ☒ Inclusion only means communication with no or limited feedback
- ☐ Stakeholder's opinion is asked, but will not affect much the original decision
- ☐ Time consuming, but mostly we get on the same page
- ☐ Systematically the largest obstacle to overcome

← Previous question See Results (3 more answers required) Next question →

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FINANCE/RESOURCES AVAILABLE

Question 6/8

How large is the port's total annual operating revenue, within which an incentive scheme needs to fit?

☐ Less than 25 million euro  
☐ Between 25 and 75 million euro  
☐ Between 75 and 150 million euro  
☐ More than 150 million euro

*i* The question wants to assess the financial capability a port managing body has to allocate to environmentally differentiated incentive schemes. It is also an indication for the amount of potential slack resources (e.g. Human Resources) to dedicate to the administration of a scheme. The larger the total operating revenue, potentially the larger a port managing body's potential for implementing particular systems. Note: with **total annual operating revenue** we suggest the total of 3 traditional revenue streams (from the perspective of a landlord port authority): port of harbor dues (paid by shipping lines), concession or lease fees (paid by tenants in the case of a landlord ports), other revenues (from operational or other activities). Should the scheme need to be only fitted into e.g. the port or harbor dues, only this revenue stream needs to be considered.

Previous question

See Results  
(3 more answers required)

Next question

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FINANCE/RESOURCES AVAILABLE

Question 7/8

How many human and financial resources is the port willing/capable to devote to make the scheme fully operational (i.e. administration, audits, financial reviewing, presence in international working groups, etc.)?

☐ Less than 0,25 Full Time Equivalent  
☐ Between 0,25 and 0,5 Full Time Equivalent  
☐ Between 0,5 and 1 Full Time Equivalent  
☐ More than 1 Full Time Equivalent

*i* Implementing and maintaining an incentive scheme requires human and administrative resources within various port managing body departments (environment, commercial, marketing, accounting and finance). Does the port want to go beyond the mere administrative operations of the scheme: e.g. also engage in audits, inspections, monitoring and participation to international working groups (i.e. dedicating more than 0,5 FTE or beyond) or does the port aim for an efficient, ICT supported solution putting minimal additional stress on the different departments involved (i.e. less than 0,5 FTE)?

Previous question

See Results  
(2 more answers required)

Next question

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GOVERNANCE STRUCTURE
Question 8/8

Is the port autonomous with regard to tariff setting and allocating rebates?

☐ Yes  
☐ Yes, but there is there a ratification needed by government or other public body  
☐ No, a higher government level decides and sets the framework for port charging

Previous question
See Results  
(one more answer required)

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WHAT IS YOUR PORT PROFILE?

External Complexity

High

A2

A3

Low

Market

Internal Complexity

High

B2

B3

Low

Finance/Resources

Environmental and Social Responsibility

High

A2

A3

Low

Market

Governance

High

B2

B3

Low

Finance/Resources

| Quadrant | Explanation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A4       | <p>The port has a rather weak/moderate <u>market</u> position (high complexity). It experiences much competition that is able to limit its commercial actions. It needs to follow the large players in the industry. Probably, it can not rely on diversified traffic and therefore a decrease in one cargo market cannot be absorbed by the other segments.</p> <p>The port is not confronted with a lot of <u>environmental</u> issues and/or does not have to take into account many stakeholders in formal and informal decision processes (local communities, interest groups, local or regional government, port users, etc.) (low complexity).</p>                             |
| B3       | <p>The port does not have a high <u>degree of freedom</u>, meaning that its decisions are validated or determined by governmental institutions. It does not have the full right to decide about tariff setting and incentive schemes.</p> <p>The port does not have a large <u>financial and/or human resource basis</u>: it can be considered as a relatively small port. Consequently, resources are rare and valuable to fulfil daily operations. There is not much leeway to deploy them to other tasks. In most cases, these ports will not be very willing or able to devote much time of their valuable resources to operate the scheme, given their resource constraints.</p> |

Go back to Port Profile
See Recommendations

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☆🔒📄☰

RECOMMENDATIONS

The port has a rather weak/moderate market position, meaning that it experiences a lot of competitive pressure that constrains the commercial actions it takes, and probably does not rely on diversified traffic. It is not confronted with a lot of environmental issues and/or the stakeholder's contribution to the decision-making process is not too complex. Nevertheless, it cannot rely on a large financial budget and a large pool of human resources. Furthermore, the port managing body is under the control of the government.

1. Tariff setting is under the responsibility of the government, environmental incentive schemes linked to the pricing structure might be difficult / impossible to implement. As a result, initiatives might be directed to rebates linked to procedures that are under the full control of the Port Authority, e.g. waste management and collection.
2. Consider making use of a distributive fund that is not directly linked to or directly influences the general pricing structure (collected from own resources or maybe issued by the government). In this way, the procedures of tariff setting will not be interfered, but at the same time it becomes possible to 'reward' shipping lines outside the tariff/invoicing process. Shipping lines pay the normal tariff, but will receive the rebate as a 'gift of recognition' afterwards.
3. Consider investing in an automated system to integrate the scheme into the administrative processes, and avoid manual processes, so scarce and valuable human resources can keep their focus on their core tasks (e.g. automatic connection of the ESI database with the database registering the incoming calls in the port, so that registration of vessels eligible for the rebate is done automatically and no manual procedure is needed anymore).
4. In light of the limited financial resources, it should be good to define a maximum rebate per call and/or a maximum amount of eligible calls. Another approach is to reward only the best performing shipping lines (e.g. only the top 15 of best performing shipping lines receive a rebate).
5. Consider making a selection of cargo markets that can call upon the rebate.
6. Try to gain insight into the demand elasticity, as a high demand elasticity can sometimes generate more revenue. A high demand elasticity means high price sensitivity from shipping lines. In some circumstances, a higher rebate will generate more revenue, because of the trade-off between losing from the rebate but winning from an increase in calls.

Quick References:

- [📄 Quick Reference Guide Indexes](#)
- [📄 Quick Reference Guides Scheme Implementation](#)

Go back to Results

Restart

## ANNEX 4

### Seven different levels of stakeholder inclusion

| No or limited inclusion                                                                                    |                                                                                                                                           |                                                                                                                                   |                                                                                                                                                     | Full inclusion                                                                                                                            |                                                                                                                              |                                                                                                                            |
|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| 1                                                                                                          | 2                                                                                                                                         | 3                                                                                                                                 | 4                                                                                                                                                   | 5                                                                                                                                         | 6                                                                                                                            | 7                                                                                                                          |
| -Knowledge about the decisions<br>- One-way dialogue (e.g. briefing sessions, leaflets, corporate reports) | - Educate, explaining and informing stakeholders<br>- One-way and/or two-way dialogue (e.g. verified corporate social reports, workshops) | - Stakeholders may advise<br>- Being heard before a decision<br>- Two-way dialogue (e.g. surveys, focus groups, interviews, etc.) | - Stakeholders provide conditional support<br>- Having an influence over decisions<br>- Multi-way dialogue (e.g. bargaining, constructive dialogue) | - Collaboration / partnership<br>- Some or joint decision-making power<br>- Multi-way dialogue (e.g. strategic alliances, joint ventures) | - Minority representation of stakeholders in the decision-making process<br>- Multi-way dialogue (e.g. board representation) | - Majority representation of stakeholders in the decision-making process<br>- Multi-way dialogue (e.g. community projects) |

Note: Table adapted from Friedman and Miles (2006)

## ANNEX 5

### Question about the present state of boundaries of indicators

Which **boundaries** should be used as a basis for reporting? To what level should the PMB be responsible for reporting indicators on a specific boundary?

We have selected some of the most prominent indicators present in SRs, based on desk research of 15 Sustainability Reports.

Please indicate the boundary/boundaries that the PMB is currently reporting on.

In the event that the PMB does not yet have an SR, please choose the boundary to which you believe the PMB should be responsible for reporting on (based on what is feasible in the PMB's present situation).

*A = Port Managing Body organization*

*B = Port area/cluster (including industry/logistics and the hinterland interface)*

*C = Local/regional community*

*D = Impact of upstream and downstream supply chain activities taking place outside the port boundaries and beyond the local/regional community*

Example: If the PMB reports an indicator on both the level of the PMB itself and on the level of the port cluster separately, please tick both boundaries A and B. If the port measures an indicator only on the level of the port industry (and thus not for the PMB separately) tick only boundary B.

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