DOCTORAL THESIS

# Enhancing Sustainable Development of the Estonian Maritime Sector through Policy-making Framework

Kaidi Nõmmela

TALLINNA TEHNIKAÜLIKOOL
TALLINN UNIVERSITY OF TECHNOLOGY
TALLINN 2023

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DOCTORAL THESIS
12/2023

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TAL TECH PRESS

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This dissertation was accepted for the defence of the degree 07/02/2023

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**Defence of the thesis**: 10/05/2023, Tallinn

**Declaration:**
Hereby I declare that this doctoral thesis, my original investigation and achievement, submitted for the doctoral degree at Tallinn University of Technology has not been submitted for doctoral or equivalent academic degree.

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signature


ISSN 2585-6898 (publication)
ISBN 978-9949-83-964-3 (publication)
ISSN 2585-6901 (PDF)
ISBN 978-9949-83-965-0 (PDF)
Printed by Koopia Niini & Rauam

TALLINNA TEHNIKAÜLIKOOL
DOKTORITÖÖ
12/2023

# Eesti merendussektori jätkusuutliku arengu toetamine läbi poliitikakujundamise raamistiku

KAIDI NÕMMELA

TAL TECH
KIRJASTUS

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## List of publications

The list of author's publications, on the basis of which the thesis has been prepared:

I **Nõmmela, K**.; Kõrbe Kaare, K. (2021). Strategic Development of Maritime Related Industries: The Role of Maritime Cluster Researches. In: Proceedings of the 32nd International DAAAM Symposium 2021 (0500−0507). DAAAM International. (DAAAM Proceedings; 1). DOI: 10.2507/32nd.daaam.proceedings.072

II **Nõmmela, K**.; Kõrbe Kaare, K. (2022). Evaluating Maritime Cluster Economic Impact: The Maritime Cluster Impact Index. In: Reliability and Statistics in Transportation and Communication (556−565). Springer, Cham. (Lecture Notes in Networks and Systems; 410). DOI: 10.1007/978-3-030-96196-1_51

III **Nõmmela, K**.; Kõrbe Kaare, K. (2022). Maritime Policy Design Framework with ESG Performance Approach: Case of Estonia. Economies, 10 (4), #88. DOI: 10.3390/economies10040088

IV **Nõmmela, K**.; Kõrbe Kaare, K. (2022). Incorporated Maritime Policy Concept: Adopting ESRS Principles to Support Maritime Sector's Sustainable Growth. Sustainability, 14 (20). DOI: 10.3390/su142013593

Copies of the publications constituting the thesis are included in the appendix and marked in the text in Roman numbers as presented above.

Other related publications:

V **Nõmmela, K**.; Piirimäe, K. (2019). Expertise of the Economic Model for Estonia's Maritime Activities. University of Tartu. ISBN 978-9985-4-1220-6

VI **Nõmmela, K**.; Purju, A. (2016). Shipbuilding industry in the Baltic Sea Region. In: Liuhto, K. (Ed.). The Maritime Cluster in the Baltic Sea Region and Beyond. (106−125). Turku: Centrum Balticum. (BSR Policy Briefing; 1).

VII Fedotov, Y. V.; Hannola, L.; Loest, K.; Meyer, J.; **Nõmmela, K**.; Novikova, O.; Patokina, O. A.; Portsmuth, R.; Sergeev, V.; Sytsko, P.; Turkia, R.; Vinogradov, A.; Volskaya, A.; Vostrova, R. (2013). Guidebook to financing infrastructure for transport and logistics within the Northern Dimension (Find). In: LUT Scientific and Expertise Publications. (203). Lappeenranta, Finland: Lappeenranta University of Technology.

VIII Holma, E.; Hunt, T.; Lappalainen, A.; Mustonen, M.; **Nõmmela, K**.; Portsmuth, R.; Yliskylä-Peuralahti, J. (2013). Five Baltic Ports together: Forecasts, trends and recommendations. In: Centre for Maritime Studies, University of Turku. (80). Turku, Finland: University of Turku.

IX Portsmuth, R.; Hunt, T.; Terk, E.; **Nõmmela, K**.; Hartikainen, A. (2012). Estonian Maritime Cluster. Proceedings of Estonian Maritime Academy, 13. ISSN 1736-2075

## Author's contribution to the publications

Contribution to the papers in this thesis is:

I Main author. The author has developed the concept and methodology of the study, collected background information and data, analyzed the data and synthesized the results, made conclusions, and composed the paper. The author presented the paper at the 32nd DAAAM International Symposium conference "Intelligent Manufacturing & Automation" on October 28 to 29, 2021 in Vienna, Austria.

II Main author. The author has developed the concept and methodology of the study, collected background information and data, analyzed the data and synthesized the results, made conclusions, and composed the paper. The author presented the paper at the RelStat 2021 "International Multi-Conference Reliability and Statistics in Transportation and Communication" conference from October 13 to 16, 2021 in Riga, Latvia.

III Main author. The author has developed the concept and methodology of the study, collected background information and data, analyzed the data, carrying out the case study, and synthesized the results, made conclusions, and composed the paper to publish in the scientific journal's "Economies" special issue "Issues in Macroeconomic Policy and Analysis in Recent Period".

IV Main author. The author has developed the concept and methodology of the study, collected background information and data, analyzed the data, carrying out the case study, and synthesized the results, made conclusions, and composed the paper to publish in the scientific journal's "Sustainability" special issue "Sustainable Maritime Policy and Management".

# Introduction

Global sustainable development is supported and encouraged by the United Nations' Sustainable Development Goals (UN's SDGs), with strong emphasis on environmental, social, and governance (ESG) aspects. The European Union (EU) considers sustainable development one of its core principles and a priority objective in policy-making. While the integration of the SDGs into policy-making has been at the centre of international politics in recent years, ESG aspects have lacked direct focus. ESG aspects have become important indicators for evaluating performance and serve as a basis for strategic planning and investment decisions in the corporate sector. Therefore, incorporating these aspects into policy-making is decisive. As stated in the UN's Sustainable Development Goals Report 2020 (UN, 2020), the SDGs are not achievable by 2030. In order to enhance the achievement of the goals, local policy-making should incorporate sectoral sustainability aspects into policy-making taking into account ESG aspects and sectoral specificities through a comprehensive approach.

The maritime sector has an important role in achieving global sustainable development (IV; Fratila et al., 2021; Stanković et al., 2021; Bergek et al., 2021; Fasoulis & Rafet, 2019), being one of the major contributors to the world's trade (around 80% to 90% of the world's international trade (UNCTAD, 2021)). Due to the specificities of the sector, it differs from other economic sectors in a maritime country (III). A variety of sustainability-related guidelines and international agreements make the planning and achieving the sustainable development in the maritime sector a great challenge (IV).

There has been limited research on the potential role of local maritime policy-making in order to support the achievement of global and local sustainable development (IV). In addition, little is known about how to integrate ESG aspects into local maritime policy, taking into account the specificities of the sector. The EU has emphasized the implementation of the cluster concept in maritime policy-making in order to achieve sustainability goals, at the same time, considering the multiplicity of cluster concepts and the increasing ESG expectations in the sector, the implementation of the maritime cluster concept into the local policy-making process needs a new approach. In order to support the maritime sector's sustainable development and achieve the international sustainability goals (e.g., UN's SDGs) a comprehensive maritime policy-making framework is needed that integrates sustainability agreements and goals, the maritime cluster concept, ESG aspects, and the maritime specificities.

The aim of this thesis is to develop a coherent framework for maritime policy-making that is contributing to the enhancement of the sustainable development of the Estonian maritime sector. In order to achieve the main goal, the following sub-goals were set:

- propose a solution to integrate the maritime cluster concept into local policy-making process,
- propose a solution for maritime policy design process with focus on sustainable development,
- develop a framework for maritime policy-making with emphasis on sustainable development.

The elements of the developed policy-making framework is tested on the case study of the Estonian maritime sector, as the availability of detailed datasets and maritime policy documents is inevitable. The focus is on the concept of maritime cluster and how to incorporate it into policy-making. The study analyzes ways to support the maritime sector through policy-making and proposes a framework for maritime policy-making that

is based on internationally recognized theoretical background on the policy-making process and empirical analysis on how to integrate the maritime specificities, the cluster concept, ESG aspects, and international sustainability guidelines into local maritime policy-making.

This PhD research contributes to concepts, methods, and techniques for comprehensive maritime policy-making related to cluster concepts, sustainable development, and ESG areas. The results of this thesis can be boarded to other maritime countries as the international maritime sector has characteristics that are common to each region when taking into account local specificities. The research uses mixed method design, including literature reviews, comparative analysis, statistical analyses, testing and experimenting, case studies, etc.

The novelty of this thesis is addressing the potential of local policy-making in order to support achieving the international sustainability agreements with the focus on enhancing sustainable development from the point of view of the maritime sector. The proposed techniques and methods use the latest international agreements and developments in the sustainability area (e.g., the draft ESRS) and are developed to be dynamic taking into account changing economic circumstances. The practical relevance and necessity of this thesis lies in the maritime policy-making process in Estonia, where the last policy implementation period in 2012–2020 failed to give the expected results.

This thesis is based on four publications (I–IV) that are included in this work. The publications were disseminated in scientific journals (III and IV) and conferences (I and II). The author of this thesis has researched the development of the Estonian maritime sector for more than ten years and has contributed to a number of publications on this research topic. The author has been involved in her professional career in several maritime-related studies and analyses that have served as inputs to policy-making.

## Abbreviations

| | |
|---|---|
| AFS | International Convention on the Control of Harmful Anti-fouling Systems on Ships |
| BSR | Baltic Sea region |
| BWM | International Convention for the Control and Management of Ships' Ballast Water and Sediments |
| CO2 | Carbon dioxide |
| GDP | Gross domestic product |
| GHG | Greenhouse gas |
| EC | European Commission |
| ECCP | European Cluster Collaboration Platform |
| EEXI | Energy efficiency existing ship index |
| EFRAG | European Financial Reporting Advisory Group |
| EMSA | European Maritime Safety Agency |
| EMTAK | Estonian Classification of Economic Activities |
| ESG | Environmental, social, governance |
| ESRS | European sustainability reporting standard |
| EU | European Union |
| FTSE | Financial Times Stock Exchange-Russell Group |
| ICS | International Chamber of Shipping |
| IMO | International Maritime Organization |
| KPI | Key performance indicator |
| MARPOL | International Convention for the Prevention of Pollution from Ships |
| MEPC | IMO's Marine Environment Protection Committee |
| MSCI | Morgan Stanley Capital International |
| NACE | Statistical classification of economic activities in the European Community |
| NFRD | Non-Financial Reporting Directive |
| OECD | Organization for Economic Co-operation and Development |
| OPRC | International Convention on Oil Pollution Preparedness, Response and Co-operation |
| R&D | Research and development |
| SDG | Sustainable development goals |
| SME | Small and medium-sized enterprise |
| UN | United Nations |
| UNCLOS | United Nations Convention on the Law of the Sea |
| UNCTAD | United Nations Conference on Trade and Development |

Explanations of abbreviations used in the thesis are shown in the table.

# 1 Background

## 1.1 Research problem and questions

Sustainability and environmental, social, and governance (ESG) aspects are important directions of development in today's global economy. The protection of the seas and ecosystems has become increasingly important in ensuring the safety of food and the living environment (OECD, 2020). Sustainable development focuses on the current situation and future needs when making decisions (IV; Ballhorn, 2005). The ESG concept from the perspective of private companies includes environmental factors (companies' performance with regard to the natural environment), social factors (companies' management of its employees, suppliers, customers, and communities), and governance factors (companies' leadership, internal controls, anti-corruption, etc.). (Aldowaish et al., 2022) Business results based on ESG criteria affect companies' strategic development opportunities, as investors and other stakeholders have started to pay closer attention to the ESG aspects.

The international maritime sector has an important role in ensuring the global sustainable development (IV). The maritime sector is strictly regulated, and a variety of sustainability goals, reporting standards, frameworks, and guidelines are setting high expectations for the sector in terms of ensuring sustainability. The maritime sector differs from other economic sectors due to its specificities (interdisciplinarity, variety of interests, global dimensions, limited sea resources, public marine resources, very large investments with long implementation period, national and international governance, etc.) (IV). Development of the sector in a maritime country[1] is influenced by long traditions and cultural connections with the maritime identity. Growing expectations for the sustainable development of the maritime sector impose tough conditions on the sector's green efficiency (in processes, technologies, management, etc.), but also enable the sector to increase its productivity performance and improve the sector's image and value for stakeholders (Felício et al., 2021).

Currently, there has been limited research on the potential contribution and role of local policy-making to enhance the global sustainable development (IV). As stated in the UN's Sustainable Development Goals Report 2020 (UN, 2020), the SDGs are not achievable by 2030. In order to enhance the achievement of the goals, local policy-making should incorporate sectoral sustainability aspects into the policy-making process, taking into account the specificities of the sector. In addition, little is known about how to integrate ESG aspects into maritime policy to support the sustainable development of the sector and enhance the overall competitiveness of a maritime country.

Located by the Baltic Sea, Estonia is an eastern border country of the EU (III). The total length of the Estonian coastline is 3794 km, while the land border is only 633 km. The Estonian maritime sector is an important employer, and the developments in the sector affect the country's economy. In the years 2012–2020, maritime activities were coordinated by the public sector based on the Estonian Maritime Policy 2012–2020. From 2021, the main management of the sector's policy is taking place as an addendum

[1] In this thesis, 'a maritime country' is defined as a country bordering the sea whose economic and social welfare is dependent on the use of the sea, including transport, tourism, food, national security, and other maritime-related activities.

to the Transport and Mobility Development Plan 2021-2035 (Annex 4, "Maritime Transport Policy Concept"). From the end of 2022, the White Paper on Maritime Policy 2022–2035[2] was added, which was also prepared as a sub-document of the development plan. After the end of the last policy implementation period in 2020, several representatives of the sector remained dissatisfied with the sector's development (III). Although several studies in the last decades have addressed the Estonian maritime sector and its sub-sectors, the governance of the Estonian maritime sector and the strategic planning of maritime developments by means of policy-making have not been studied until now.

The main objective of this thesis is to develop a framework for maritime policy-making that is contributing to the enhancement of the sustainable development of the Estonian maritime sector. This framework takes into account the most relevant guidelines related to sustainable development and proposes multiple elements and techniques for policy-making in the maritime sector. By applying the framework, it is possible to support the actors of the sector at different levels to achieve sustainability goals and enhance the development of the Estonian maritime sector in order to promote the economy and well-being of the entire country.

The research questions of this thesis are the following:

1. How to incorporate the maritime cluster concept into the local maritime policy-making process?
2. How should a maritime policy be designed to enhance the sector's sustainable development?
3. Which components are part of the sustainable development in the maritime policy-making framework?

## 1.2 Importance and specificities of the maritime sector

A country's seaside location is considered one of the most valuable factors in ensuring development and prosperity. Maritime-related economic activities, like shipping, ports, fishing and aquaculture, maritime recreation, and coastal tourism activities, etc., all require access to the sea (Zaucha & Matczak, 2018). The development of the maritime sector in a maritime country is crucial, as the fundamentals of maritime extend into other sectors (IV). Therefore, the maritime sector has a significant impact on a country's sustainable development.

Ports and shipping are accelerators for regional and national economic development as their activities create positive effects on the economy: improve economic growth, increase GDP per capita, increase employment, reduce transport costs through accessibility, increase private investment, encourage trade, improve logistics, attract other related activities and new industries, etc. (Mudronja et al., 2020; Gherghina et al., 2018). Historically, it is known that cities arose around ports and maritime transport. Ports are a significant link in supply chains and distribution centres in international trade. At the same time, the sector requires continuous development through investment in infrastructure, innovation, and human capital to improve quality and performance and be internationally competitive.

[2] As the research of this doctoral thesis was carried out before the end of 2022, when the White Paper on Maritime Policy 2022–2035 was adopted, the document was not included as a research object.

The maritime sector is unique, differing from other sectors (III; Pantouvakis & Vlachos, 2020; Karagiannis et al., 2022). The main specificities of the sector are the following (Braid, 2005; Al-Bisher et al., 2012; Van de Voorde & Verhoeven, 2016; Zaucha & Matczak, 2018; Pantouvakis & Vlachos, 2020; Bochenski et al., 2021; Kivalov, 2021; Karagiannis et al., 2022; IV):

- Interdisciplinarity
- Multiplicity of interests
- International dimensions
- Volatility due to global demand and supply
- Strict regulations
- Strong relationships with environmental and social impacts
- Use of limited and public marine resources
- Large-scale and long-term capital investments
- Management by national and international institutions
- Dynamism due to complementarity between different transportation modes

The maritime sector is interdisciplinary, involving a combination of elements from different fields, such as technology, economics, environment, sociology, etc. As a result, maritime policy is influenced by the interests of other sectors, which can be conflicting at times. The maritime sector has international dimensions due to the openness of the world sea, being largely affected by global demand and supply and governed by international organizations (III). The maritime sector is strictly regulated by all supranational organizations as well as national regulations. As marine resources are limited and generally belong to the public, their management and distribution are the responsibility of governmental entities rather than private entrepreneurs. The sea area is considered a limited resource, thus maritime activities need to compete for the space at the sea.

The maritime sector has a strong environmental and social impact, and membership in the sector is characterized by the existence of core companies (III). Sectoral investments are large and long-term, which causes the impact of changes in the economic environment to be delayed. This, in turn, prevents quick and flexible decision-making. The maritime sector is part of a multimodal transport chain where modes of transport complement each other to offer a customer door-to-door transport. In the chain, strong dynamism ensures a competitive position in business growth to fulfil the role of maritime transport.

Managing maritime governance plays an important political role as symbols of interest cohesion (Łukaszuk, 2018). A number of different international and regional organizations have been established to jointly manage the world's seas, which do not belong to any country but are open to all. Globalization, which changed the world's economy, emerged precisely thanks to the freedom of the world's seas and the free movement of people and information. International maritime governance consists of a conceptual approach to maritime affairs (including blue economy, security, marine safety, and a legal framework) and international maritime policy. Maritime governance is about sectoral activities and policy domains with a focus on different jurisdictional levels (at the international, national, regional, and local level) and maritime stakeholders (public sector, market parties, politicians, interest groups, and networks). In the UN documents, maritime governance mainly deals with the environment, climate change, and sustainable development (Łukaszuk, 2018; Hoefnagel et al., 2013). There are four main features of effective maritime governance (Łukaszuk, 2018):

- Horizontal and vertical multi-layered interdependency between actors and activities
- Coordinated international approach
- Wide scope of stakeholders
- Being a dynamic process rather than a static set of regulations

The role of maritime governance is increasing both at the international and national level as growing competition over maritime space and sustainability issues have raised new challenges that require innovative approaches.

## 1.3 Sustainability expectations to the maritime sector

The maritime sector is one of the major contributors to global trade: around 80% to 90% of the world's international trade in goods is carried by sea (UNCTAD, 2021; OECD, 2022a). In the EU, maritime transport carries 77% of external trade and 35% of intra-EU trade (EMSA, 2021). Although maritime transport is considered to be the least environmentally damaging form of commercial transport (ICS, 2022), the increasing use of the seas has harmful effects on the environment as well as humans and society (Fasoulis & Rafet, 2019). In the EU, maritime transport produces 13.5% of all greenhouse gas emissions from transport, followed by road transport (71%) and aviation (14.4%) (EMSA, 2021). As the maritime sector has a global nature, the ESG impact of the sector has been addressed at different international levels with a number of sustainability-related agreements and guidelines (IV). The UN's SDGs set very high expectations for the global sustainable development (IV). The International Maritime Organization (IMO) has adopted more than 50 international conventions and 1,000 codes and recommendations for shipping, and the EU has consistently introduced new, stricter rules for the sector (EMSA, 2021). In addition, there are expectations for the sustainable development of the maritime sector at national level, both for ships sailing in a country's waters and visiting ports as well as for maritime industries operating offshore or inland.

### *Global agreements and goals*

The most comprehensive global strategy for achieving sustainability is the UN's Agenda 2030 with the Sustainable Development Goals, which was unanimously adopted by all 193 members of the UN in 2015. The Agenda 2030 is a plan with actions and goals for pursuing a sustainable future while focusing on people, planet, prosperity, peace, and partnership (UN, 2015). The 17 SDGs and the 169 associated targets include economic, social, and environmental dimensions. The main responsibility of the maritime sector is primarily seen in the SDG "Life below water" (SDG 14) (IV) although the sector can be linked to all SDGs (Wang et al., 2020). An overview of the maritime sector's main role in achieving the SDGs is shown in Table 1 (next page).

*Table 1. Overview of the role of the maritime sector in achieving the SDGs.*

| SDG | Role of maritime sector in achieving the SDGs |
|---|---|
| 1. No poverty | Safe and secure shipping, sustainable growth in blue economy |
| 2. Zero hunger | Efficient and economical supply chains for global food distribution, reported and regulated fishing |
| 3. Good health and well-being | Reduction of maritime-related pollution |
| 4. Quality education | Safety, security and environmental protection at sea and on land due to maritime education and training |
| 5. Gender quality | Gender equality in the maritime sector |
| 6. Clean water and sanitation | No dumping and waste disposal at sea |
| 7. Affordable and clean energy | Research and development activities of clean energy technology for the maritime sector |
| 8. Decent work and economic growth | Supportive and healthy work environment for seafarers and other workers. |
| 9. Industry, innovation and infrastructure | Efficient development through partnership in entire maritime cluster |
| 10. Reduced inequalities | Enhanced capacity of countries which lack the technical knowledge and resources to operate safe and efficient maritime sector's activities |
| 11. Sustainable cities and communities | Secure supply chains that support global logistics infrastructure |
| 12. Responsible consumption and production | Reduced waste generation, both at sea and on land |
| 13. Climate action | Controlled emissions from the shipping sector and the entire maritime industry |
| 14. Life below water | Improved prevention of pollution from ships |
| 15. Life on land | Ensured security in ports and in hinterlands |
| 16. Peace, justice and strong institutions | Safe, secure and environmentally protective maritime governance |
| 17. Partnerships for the goals | International and national partnerships to achieve the agreed sustainability goals |

*Source: Wang et al. 2020, amended by the author, IV*

The IMO is the main regulatory body for the maritime sector at the international level. The IMO is the UN's specialized agency founded in 1958. The overall objective of the institution is to ensure safe, secure, and efficient shipping on clean oceans. (IMO, 2013) All EU Member States are members of the IMO, and the European Commission has observer status. The IMO has adopted over 50 conventions to regulate maritime transport, such as:

- The United Nations Convention on the Law of the Sea (UNCLOS, 1982)

- The London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention, 1972)
- The International Convention for the Prevention of Pollution from Ships (MARPOL, 1978, 1997)
- The International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC Convention, 1990)
- The International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS Convention, 2001)
- The International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention, 2004)
- The Nairobi Convention on the Removal of Wrecks (Nairobi Convention, 2007)
- The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships (Hong Kong Convention, 2009), etc.

To lead and facilitate the sustainable development in the international maritime sector, the IMO has adopted a number of regulations in the last decade. In 2011, energy efficiency regulations were established with the MARPOL Annex VI (i.e the energy efficiency design index (EEDI) and the ship energy efficiency management plan (SEEMP)). The first stage of EEDI started in 2015 with the aim of reducing 10% of CO2 in new ships, followed by 20% of reduction in 2020 and 30% for 2025. In 2016, the IMO started the mandatory data collection system with an aim to collect and disclose ships' fuel oil consumption information. The IMO's Marine Environment Protection Committee (MEPC) adopted the initial strategy for the reduction of greenhouse gas (GHG) emissions from maritime transport in 2018, targeting to reduce CO2 emissions by 40% by 2030 (compared to 2008) and total annual GHG emissions by 50% by 2050. In 2020, the 0.5% sulphur oxide emissions limit for shipping sector was entered into force and year later, the Energy Efficiency Existing Ship Index (EEXI) requirement for ships was adopted. (IMO, 2023)

In order to fully gain the effect of the IMO's regulations on sustainable development, the member have to implement the regulations into the local policies and laws. In 2019, the IMO adopted a strategy to support the member in integration of the SDGs (IMO, 2019). The document stated that the members should reflect the current situation and developed maritime policies linked to the SDGs in their reports to the IMO. Therefore, the members are both obligated to interpret the sustainability related regulations to local laws, and report the implementation as well as contribution to the SDGs to the IMO institutions. The IMO offers assistant and guidelines to support the members, but it highly depends on the local governance representatives' (i.e. delegation size) and their initiatives (Psaraftis & Kontovas, 2020).

There is a variety of sustainability-related reporting standards and guidelines to follow the progress of sustainable development (IV). Non-financial reporting, including sustainability-related reporting, is regulated by different international and national legislation from various bodies, both by public institutions and stock exchanges. In general, the reporting framework is chosen by the relevant regulation or left to the discretion of the reporter. Companies often have to report results repeatedly in different forms depending on the requirements (e.g., national regulations, for financial services, on the stock exchange, etc.). According to the European Financial Reporting Advisory Group (EFRAG, 2021), the most used guidelines are national standards, the Global Reporting Initiative Standards (GRI), the UN's SDGs, the Task Force on Climate-Related

Financial Disclosures recommendations, the International Labour Organization (ILO) guidelines, and different guidelines of the Organization for Economic Cooperation and Development (OECD) (IV).

Similar to standards and guidelines, there are also several indices that measure the level of sustainability both at the country level and at the company level. In order to assess the performance of countries in achieving the SDGs, an overall ranking score has been developed (Sachs et al., 2022). The SDG index indicates a country's position between a score of 0 and a score of 100 and can be interpreted as a percentage of SDG achievement (a score of 100 indicates that all SDGs have been achieved). The index shows what the country's development trend has been towards achieving the SDGs and what priorities should be set in order to reach the goals by 2030. In 2021, the average SDG index score was 66.0, and from 2015 to 2019, the world progressed at an average rate of 0.5 points a year, which was too slow to achieve the SDGs by 2030. In 2021, the top three countries were Finland, Denmark, and Sweden; Estonia was in the 10th place (Sachs et al., 2022). Other well-known sustainability indices are: MSCI ESG Ratings, the Dow Jones Sustainability Index, the FTSE4Good Index Series, the IMO EEXI (energy efficiency existing ship index), etc.

### *The EU regulations and goals*

The EU considers sustainable development as its main principle and is committed to the UN's SDGs in all its activities. 22 of the 27 EU member states have access to the sea; only 5 countries have no sea border (EU, 2022). The Integrated Maritime Policy of the EU (2007, 575 final) adopted in 2007 set the goal to enhance the sustainable development of maritime activities and coastal regions by improving maritime policies (IV). After the UN adopted Agenda 2030, the EU put together the European Consensus on Development in 2017. The document indicated the shared vision and action framework for the development of cooperation and underlined the links between the development and other European policies. (The new European Consensus on Development, 2017) In 2018, the European Parliament adopted the resolution on maritime governance in relations to the SDGs (2018/C 458/02).

The European Commission (EC) published the European Green Deal in 2019, with the goal of enhancing the transformation of the EU's society and economy to be more sustainable. (COM(2019) 640 final). In relation to maritime development, the document states that the sustainable development of the blue economy have a central role in reaching the international goals. The goals are to support the multimodal transport, to broaden emissions trading, to regulate ships' pollution in the EU ports, to use the sea areas more efficiently, to support the offshore industry, and to stop unreported and unregulated fishing. (COM(2019) 640 final)

In order to monitor the process of sustainable development, the EU has established non-financial reporting requirements since the beginning of the 2000s. In 2003, the Fourth Directive on annual accounts (2003/51/EC) was approved in the EU, supplementing the content of certain sectors of companies' annual reports with non-financial indicators. Since then, different member states have introduced their own non-financial disclosure requirements. The EC adopted the "Single Market Act" (COM(2011) 206 final) in 2011 with the goal of removing barriers to the movement of services, innovation, and creativity in order to foster growth and employment. In the same year, in 2011, the EC stated in its communication "A renewed EU strategy 2011–14 for Corporate Social Responsibility" (COM(2011) 681 final) the importance of improving company disclosure of social and environmental information.

More detailed requirements for non-financial reporting were set by the EU in 2014 in Directive 2014/95/EU (the NFRD), with the aim of enhancing the harmonization of non-financial information in the EU. According to this act, large companies and groups of companies with public-interest (average of 500 employees), shall include in the annual report a non-financial information (i.e. information about the company's impact to ESG aspects) (IV). Companies may rely on different national, union-based or international frameworks when providing that information.

In 2017, the EC issued guidelines on non-financial information reporting and the methodology (2017/C 215/01). The aim of the guidelines was to provide help to companies including their management reports qualitative information. This document did not create any new legal obligations for the parties, and companies were still able to use other international, EU-based, or national frameworks. In 2021, the EC adopted a proposal (COM(2021) 189 final) to amend directives on corporate sustainability reporting to improve non-financial statement reporting. This proposal supplements and revises the sustainability reporting requirements set out in the NFRD as the current legal framework did not provide needed information due to unreliable and incomparable information, or not provided information by all companies (IV).

The proposal recommends to extend the scope of the reporting requirements, specify in more detail the information that companies should report, and require them to report in line with mandatory EU sustainability reporting standards. (IV) In 2022, the EU proposed a draft for a mandatory European Sustainability Reporting Standard (ESRS) (EFRAG, 2022) that consisted of three layers (sector agnostic, sector specific, and entity specific), three reporting areas (strategy, implementation, and performance measurement), and three topics (environmental, social, and governance) (IV). The draft ESRS categories and main indicators are shown in Table 2.

*Table 2. Categories and main indicators of the draft ESRS.*

| **ESRS category** | **Main indicators** | |
|---|---|---|
| general | ESRS 1 | general principles |
| | ESRS 2 | general, strategy, governance and materiality assessment |
| environment | ESRS E1 | climate change |
| | ESRS E2 | pollution |
| | ESRS E3 | water and marine resources |
| | ESRS E4 | biodiversity and ecosystems |
| | ESRS E5 | resource use and circular economy |
| social | ESRS S1 | own workforce |
| | ESRS S2 | workforce in the value chain |
| | ESRS S3 | affected communities |
| | ESRS S4 | consumers and end-users |
| governance | ESRS G1 | governance, risk management and internal control |
| | ESRS G2 | business conduct |

*Source: EFRAG, 2022; IV*

## 1.4 The concept of maritime cluster

Cluster concept researchers acknowledge the fact that a common definition of a cluster has not yet been agreed upon (Cortright, 2006; Han, 2006; Deloreux & Shearmur, 2009; Lagoudis et al., 2019), and the debate on what constitutes a cluster is an on-going process in economic research (Andersson et al., 2004). According to Michael E. Porter (2000), a well-known economic theorist, cluster is "*a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities. The geographic scope of clusters ranges from a region, a state, or even a single city to span nearby or neighbouring countries*." A cluster includes an array of linked industries with companies ranging from raw material producers to final product producers, i.e., all links in the supply chain and related professional associations. (Porter, 1998) Clusters also include educational and research institutions (educational institutions, research laboratories, in-service training and retraining providers), government organizations (national, regional and local policy-makers), and providers of financial and other support services (banks, insurance companies, etc.) (EU, 2010). Countries in the BSR have defined maritime clusters using a variety of theoretical and methodological approaches over the years. Many authors used Porter's definition or their own interpretations of different definitions to define the cluster. (I)

The members of the cluster, i.e., the links in the logistics chain, are characterized by the same internal factors, such as raw materials and inputs, partnerships, customer relationships, technology and innovation, and a workforce. The members of a cluster work together to create a competitive business environment for the parties and to have a say in the supply of public goods and in the development of sectoral regulations and policies. The expected result of operating as a cluster is the creation of added value for the members of the cluster and for the entire surrounding area. Externally, clusters can be very different. The external boundaries of clusters can be defined on the basis of geographical scope and the most important internal cooperation links (local, regional, national, and international). (Porter, 1998) Clusters with strong cooperative links with companies or institutions operating in other countries are considered international.

The external characteristic of clusters is also the total number of cluster members. Clusters can be made up of a few members, while larger clusters can reach up to several thousand members. There is no exact breakdown by cluster companies and institutions. The European Cluster Collaboration Platform (ECCP), established by the European Commission in 2016, has divided smaller clusters into 1–50 members and the largest into more than 500 members (ECCP, 2017).

In addition to borders and the total number of members, the field of activity of the cluster can also be considered an external feature of the cluster. It is important to distinguish between the field of activity of clusters and the general activities of the economy, i.e., economic sectors. Although these are quite similar communities, which may sound the same in their names, such as the shipbuilding cluster and the shipbuilding sector, they are still different in content and structure. The main differences between the two will be the differences between their members. This means that the maritime cluster includes not only companies operating in the maritime sector but also other companies from the logistics chain, such as metalworkers, machine builders, sail manufacturers, and other related companies and institutions that provide services, products, and labour to the maritime sector. In addition, in the case of maritime clusters, it is very important that public sector institutions, including educational and research

institutions, belong to the cluster; in the case of economic activities, these institutions form a separate activity field. (ECORYS Nederland BV, 2012) The groups of cluster characteristics written by Koschatzky and Lo (2007) are shown in Table 3.

*Table 3. Characteristics of clusters.*

| **Characteristics** | **Specification** |
|---|---|
| *Internal characteristics* | |
| Workforce (workforce structure and needs) | 1. narrow workforce structure, i.e., staff with specific professional training, regulated, e.g., by international requirements;<br>2. broad workforce structure, i.e., workforce from different sectors. |
| Relationships between members | 1. operating in one market (horizontal level);<br>2. being in one value chain (vertical level);<br>3. intra-sectoral capacity (lateral level);<br>4. common technology (technological level);<br>5. existence of a central authority (focal level). |
| Competition | 1. weak competition; 2. cooperative competition; 3. strong competition (the strength of competition is determined by the relationships between the members of the cluster, and they have both positive and negative characteristics in the long run). |
| Competitiveness | 1. low competitiveness; 2. nationally competitive; 3. international competitiveness (the limits of competitiveness are linked to the geographical scope feature, but these features are not completely interdependent). |
| *External characteristics* | |
| Geographical scope | 1. local, 2. regional, 3. national, 4. international, 5. global. |
| Geographical orientation | 1. closed communities that have arisen primarily to serve local demand;<br>2. regional communities that serve both local demand and the surrounding area;<br>3. international communities that may have weak local links but a strong role in international markets. |
| Members | i.e., the structure of enterprises and institutions:<br>1. existence of core company – one or more core enterprises around which associations of enterprises are concentrated;<br>2. proportions of members at different levels - the extent to which companies, public sector bodies or other institutions are represented in the cluster;<br>3. size of enterprises - micro, small, medium or large enterprises depending on the number of employees. |
| Number of members | 1. small, 2. medium and 3. large clusters (conditional distribution). |

*Source: Koschatzky and Lo (2007)*

*Relationships between cluster members*

The members of the maritime cluster are connected to each other on the basis of different types of cooperation. Jacobs and de Man (1996; cited in EU, 2010) have listed the different levels at which the collaborative links necessary to belong to a cluster can exist. These levels are:

- Operating in one market (horizontal level)
- Being part of a single value chain (vertical level)
- Intra-sectoral capacity (lateral level)
- Common technology (technological level)
- Existence of a central authority (focal level)

Maritime companies operating in one market, which are located on the so-called horizontal level, are, for example, two ports, three shipbuilding companies, etc. Such companies are mainly competitors but may cooperate in selling certain services or goods. These companies are also united by cooperation projects and broader development visions, whose realization may require mutual support. Projects may include, for example, increasing the overall competitiveness of ports in the region by removing administrative barriers, etc.

Companies operating in one value chain are mainly bound by the buyer-seller relationship in the cluster concept. This means that some companies buy input from other companies, which may be a raw material or a service, which is the most clearly distinguishable relationship between the members of the cluster (Cortright, 2006). For example, a shipbuilding and ship repair company buys a service to install a ship's interior from another company.

The intra-sectoral capacity level includes, in addition to companies, other support service providers, whose activities determine the competitiveness of a cluster. For example, it is possible to look at the labour supply of educational institutions. The workforce is one of the cornerstones of both a successful company and a successful cluster, and as a result, the activities of educational institutions and general education policy have a significant impact on the competitiveness of clusters. It is important that maritime companies be actively involved in the development of curricula for schools and higher education institutions providing maritime education, which will enable educational institutions to provide graduates with the skills they need for the labour market.

In addition, cluster members are characterized by the use of similar technology. Innovation and sectoral technological development simultaneously affect different companies, which would also increase the competitiveness of the maritime cluster more broadly. Research institutions with sectoral research and development activities play an important role. The use and development of technology are influenced by international cooperation.

Cluster members can be linked to the presence of one or more core companies in the cluster. The cluster is often characterized by the existence of core companies, which are surrounded by various small and medium-sized enterprises that provide input to core companies and vice versa. Such clusters are usually local, small-scale clusters with one or two core companies, geographical constraints, a relatively small total number of members and a certain field of activity. In the case of larger clusters, there may be several core companies in one cluster that usually differ from each other in terms of their main activity. Clusters can exist without core companies, which does not make them any weaker.

*Formation and development of clusters*

Clusters are self-generated systems that cannot be created but whose development can be directed and managed. The main reason for the emergence of clusters is considered to be historical development, e.g., certain raw materials are grown in the local area for centuries and a local cluster develops from it; unusual local demand, such as the demand for environmental pollution resulting from a natural disaster, which results in a combination of local and/or new businesses and the public sector; local entrepreneurship, which develops over time into a set of cooperating companies and institutions; and new innovative companies that affect the surrounding business environment. (Porter, 1998)

Sölvell (2009), a cluster concept researcher, identified the phases of cluster formation. According to Sölvell, "*a cluster, like any social system, experiences birth, growth, extinction, and death*." After formation, the cluster goes through a growth phase, whose development depends on a number of factors, e.g., cooperation and competition among members, openness to international markets, strong customer relationships, and social capital. Clusters evolve rapidly and vigorously with these factors, involving new members, evolving research and innovation, growing labour needs, and increasing the overall impact on the region. The growth of the cluster also depends on the structure of the members – whether core companies dominate the cluster or whether the structure is uniform. The growth phase of a cluster is the most important moment when national and local policies could influence the development of the cluster both through general regulations, such as regional tax, transport, labour, and education policies, and through targeted policies, such as sectoral industrial policies. (Sölvell, 2009) The activity of a cluster is not generally eternal; however, the time of clusters' activity can vary widely. Clusters last longer when they have a strong business environment and social capital, supported by local policies and strong links between internal and external cooperation. The reasons for the disappearance of the cluster may be the loss of demand, changes in the economic environment, policy change, radical technological development, etc. Some clusters are 'dying' completely, but others are maintained in the final phase by artificial means, such as public subsidies. This last phase in the cluster development is called the museum phase. (Sölvell, 2009) Stages of the cluster development are shown in Figure 1.

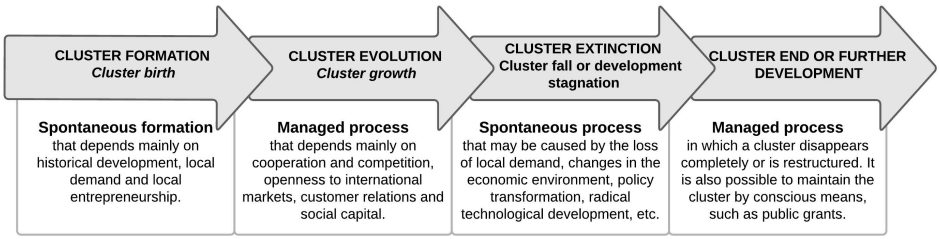


*Figure 1. Stages of the cluster development. Source: Sölvell, 2009; Boja, 2011, composed by the author*

The overall cycle of the cluster development depends mainly on the factors of the first two phases – emergence and growth (Amdam & Bjerre, 2015). A cluster that develops in the interests of companies operating jointly in the region is considered to be more permanent than a cluster created by the existence of random links. For example, an analysis by Amdam and Bjarnar (2015) found that a maritime cluster on the west coast of Norway developed from historical traditions where fishermen who owned boats

with neighbours and relatives actively pursued the goal of increasing their common competitiveness. As the maritime cluster was built by local people, using local resources, and serving local customers, local banks were willing to lend more easily, which enabled the cluster to develop significantly at a time when other economic sectors were suffering from the economic downturn. (Amdam & Bjerre, 2015)

Based on the above, it can be concluded that the establishment of a cluster depends on the relationship between local producers and customers and on local raw materials for the successful development of clusters. It is important to emphasize that a successful cluster cannot be based primarily on the availability of cheap labour, which is one of the main drivers of mobility in companies and economic sectors. The goal of internationalization should be customer relationships outside the region, not the desire to reduce costs by using cheaper labour. (Amdam & Bjerre, 2015)

## 1.5 The concept of the policy-making process

In this thesis, a policy is referred as a set of goals, decisions and activities to solve problems that has been officially agreed on the governmental level and which is used as a basis for decision-making (Newton and van Deth, 2010). A public policy, with an aim to solve public problems is the main output of the political system in a country. A policy-making process includes a continuous series of decisions from different levels of governmental institutions that sometimes compete and overlap due to specific constraints, but which all try to solve both new problems and side effects of old policies. (Newton and van Deth, 2010)

In theory, a five-stage model is commonly used to describe a policy-making process (Figure 2, next page) (Jann & Wegrich, 2006; Knill & Tosun, 2008; Howlett & Giest, 2015), where the last stage leads directly back into the first stage, and therefore it is called a continuous policy-making cycle (Newton and van Deth, 2010). The first stage of the cycle is agenda setting, within it policy-makers define the problems and develop possible solutions. A number of public problems might be defined there, but only a small amount will be given official attention by policy makers. The factors determining whether a defined problem reaches the policy agenda may be cultural, political, social, economic or ideological, as actual agenda setting stage is related to the larger political situation in a country. (Knill & Tosun, 2008) An important aspect of the agenda setting is the division of the defined problems between the responsibilities of the public sector and the private sector. The main constraint in this stage is the fact that as the world and expectations change, so do the priorities and problems to solve the change. (Newton and van Deth, 2010)

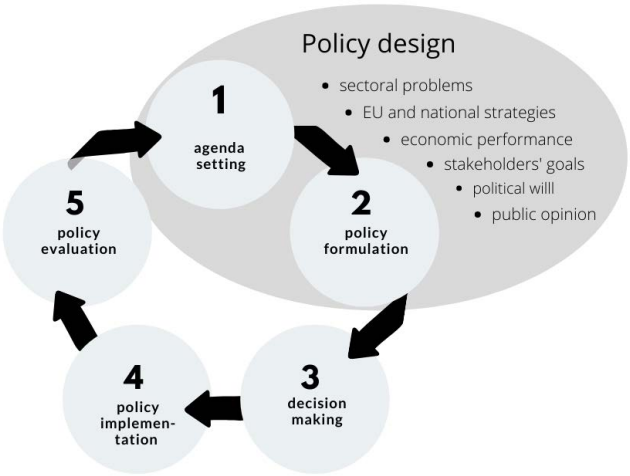


*Figure 2. The policy-making cycle with main inputs of the design process. Source: Jann & Wegrich, 2006; Knill & Tosun, 2008; Howlett & Giest, 2015, composed by the author, III*

The second stage of the policy-making cycle is policy formulation. In this stage, a number of different options are considered and appropriate solutions are chosen. This stage involves discussions, acceptance or rejection of feasible solutions and actions, and selection of the most appropriate policy instruments. A policy design should be based on policy elements, including problems, goals, solutions, and assessment tools) (Howlett 2014; Howlett and Cashore 2009). The stage requires an analysis of the executive, legislative, political and scientific background of the policy elements. (Knill & Tosun, 2008)

The third stage is decision-making, which is not considered by some authors as a separate stage, but is included, as part of the previous stage since policies do not always have to be formulated as an official document (Jann & Wegrich, 2006). In this thesis, however, the policy-making process has been studied as a process that results with an official document, which is why this stage plays an important role. In this stage, a final decision is made upon the priorities, solutions and activities of the political agenda. The final decisions are the most important outputs of the political process. (Newton and van Deth, 2010) Important criteria for making a decision are expected costs and benefits, public opinion, time resources, political interests, and the effectiveness of reaching goals. (Knill & Tosun, 2008)

The fourth stage is implementation of the adopted policy by responsible parties. This stage is the most dynamic as policies often get changed, delayed or blocked in the process of implementation due to practical reasons (e.g., economic change, side effects, etc.), changes in the interest of implementing institutions, or unforeseen legal restrictions (Jann & Wegrich, 2006; Newton and van Deth, 2010). This stage is crucial as policy success depends on how well bureaucratic structures implement final decisions. And vice versa, the design of the adopted policy is relevance for implementation success. (Knill & Tosun, 2008)

The last stage of policy-making cycle is policy evaluation. This stage includes evaluating the results and chosen the possible next steps (e.g., amending the existing policy, adding new elements, etc.) (Howlett and Giest, 2015). Policies should be evaluated for different aspects, including efficiency (using of resources) and effectiveness (achievement of goals). This stage provides feedback, identifies new

problems and serves as a basis for the new circle of the policy-making process. (Knill & Tosun, 2008) There are a number of internationally recognized guidelines for carrying out a policy evaluation (e.g., the OECD Framework for Regulatory Policy Evaluation, the EU guidelines, including the Joint Funding Action "Policy Evaluation Network," etc.) (III).

Policy-making process can focus either problems or goals (III). In the first approach, the policy design process searches new possibilities to solve the defined problems (III; Howlett 2014). The focus on the goal-oriented approach is setting the goals first, and then finding ways to achieve these goals. The first approach is considered to be more effective in the policy implementation stage, as accurately defined problems allow to choose more detailed actions to solve them (III; Walker, 2000).

# 2 Research design

## 2.1 Research strategy

The research strategy of this thesis follows a traditional scientific research method based on inductive approach, including observing and collecting data, describing a research phenomenon, followed by asking research questions and hypothesizing, and conducting analyses and experiments to understand and explore research topics and to answer the questions, and proving or disproving the hypothesis. This thesis includes three main research topics: the concept of maritime cluster, sustainability expectations to the maritime sector, and the concept of the policy-making process, which all were explored based on a case study of the Estonian maritime sector. The main aim of this thesis is to develop a framework for maritime policy-making that is contributing to the enhancement of the sustainable development of the Estonian maritime sector. The thesis did not focus on finding specific solutions to sustainability related problems in the maritime sector, rather developing a framework for policy-makers to help them to support the sustainable development of the sector with their activities.

The philosophy of science of this thesis is based on a combination of constructivism and post positivism. From the constructivism perspective, the thesis uses an approach to explain and identify the policy-making framework, which is not easily developed through quantitative analyses. The constructivism lies in the theory of learning from gathered knowledge to gain new knowledge and make decisions. (Wogu et al., 2011) It allows developing the framework based on previously gained knowledge and experiences from observing the Estonian maritime sector's development as it has been over the years, and supporting the results with scientific theory and background. In constructivism, the knowledge depends on a specific occasion, which means the results are not usually generalizable. (Highfield & Bisman, 2012) However, as the maritime sector is a cross-border economic activity, the thesis combines the constructivism with post positivism, which allows to generalize results based on empirical observations (Fox, 2008). This enables to develop the framework not only for the Estonian maritime sector to use, but also extend the results to other maritime countries taking into account their specificities.

The research was carried out using mixed methods design, which combined qualitative and quantitative research methods, which derives from the implementation of post positivism approach. The post positivism prefers to use a hybrid methods design as this aims to explore both objective and subjective, internal and external aspects of the research object (Panhwar et al., 2017). The main methods used in this thesis varied between research tasks and included observing, literature reviews, document reviews, comparative analysis, descriptive statistics methods, testing and experimenting, etc.
The overview of the research problem, hypothesis, research topics, research questions, research tasks and methods, and related publications is shown in Table 4 (next page).

*Table 4. Research topics, hypothesis, questions, tasks, and related publications.*

| **Research problem** | There is a lack of systematic and comprehensive local policy-making framework to support the enhancement of the sustainable development of the maritime sector. | | | |
|---|---|---|---|---|
| **Hypothesis** | It is possible to develop a maritime policy-making framework that is contributing to the enhancement of the sustainable development of the Estonian maritime sector. | | | |
| **Research topics** | **Research questions** | **Research tasks** | **Research methods** | **Publi-cations** |
| I. The concept of maritime cluster | 1. How to incorporate the maritime cluster concept into local maritime policy-making process? | Find out different concepts of the maritime cluster and their use in the Baltic Sea countries' policy-making | Analysis of the theoretical background of cluster concept, literature review, comparative analysis of the BSR countries' maritime cluster studies | I |
| | | Analyze the cluster-based economic policy-making, and propose a solution how to integrate the maritime cluster concept into local maritime policy-making process | Analysis of the governance and economic state of the Estonian maritime sector based on policy documents, economic indicators, analysis of development dynamics and background of the sector, proposing a new approach based on the results of the case study | I, II |
| II. Sustainability expectations to the maritime sector | 2. How should a maritime policy be designed to enhance the sector's sustainable development? | Explore the most relevant sustainability guidelines and goals that affect the development of the maritime sector, and propose a solution for maritime policy design process | Analysis of the results of literature review and document review on sustainability expectations and goals, experimenting on integrating ESG areas into the policy-making process based on the case study | III, IV |
| III. The concept of the policy-making process | 3. Which components are part of the sustainable development in the maritime policy-making framework? | Develop a systematic and coherent maritime policy-making framework that is contributing to the enhancement of the sustainable development of the maritime sector | Analysis of the theoretical background of the policy-making process, synthesis of the results of previous activities, testing the results on the case study | I, II, III, IV |

*Source: composed by the author*

The thesis consists of three main parts: theoretical, analytical, and empirical with further research. The theoretical part was carried out in order to thoroughly understand the selected research topics. This part includes observing the development dynamics of the Estonian maritime sector and governance since 2004, collecting theoretical and practical background information about the topics, and reviewing literature in all relevant aspects. After preparing the theoretical part, the research questions and hypotheses were formulated, and a detailed case study was selected. When choosing the questions, hypothesis and the case study, the author relied on the scientific information gathered in the previous part with the aim of contributing to the scientific development of the research topics in the best possible way by solving existing problems, offering practical solutions, and generating new scientific knowledge.

In the analytical part of the thesis, various studies were conducted according to the research tasks. The results of the studies were formulated into four scientific articles, which are the basis of this thesis. The first and second article focused on the concept of the maritime cluster. The third and fourth article analysed the sustainability expectations to the maritime sector and policy-making processes. The author presented the results at two international conferences, where the research topics were discussed by the fields of experts and audience.

In the empirical part, the author analyzed the results of the previous part in accordance with the research tasks, synthesized the results, and prepared the final policy-making framework with new components and methods to contribute to the enhancement of the sustainable development of the Estonian maritime sector. This was followed by making conclusions and discussing the results with planning of further research. The visualized research strategy is shown in Figure 3.

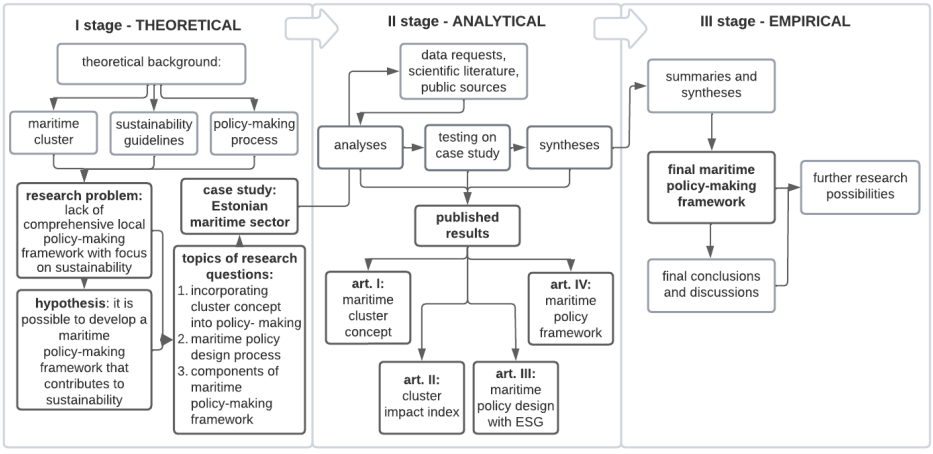


*Figure 3. The visualized research strategy. Source: composed by the author*

The primary sources of input for the thesis were data requests and scientific literature. Methods of data collection and analysis varied between research tasks. Data on the current state and development of the Estonian maritime sector were obtained mainly from the e-business register database. The author of the thesis observed the development of the Estonian maritime sector from 2004 until 2021, and carried out various descriptive statistics analyses to understand and explore the development dynamics. Secondary data was collected based on various public sources and previous

studies. In order to integrate the maritime cluster concept into the local policy-making process, the theoretical background of the cluster was first studied based on scientific literature and practical recommendations of international institutions. Then a comparative analysis of the maritime cluster studies of the Baltic Sea countries was carried out. Based on the results, a proposal was made to integrate the cluster concept into the policy-making framework.

The scientific literature was examined to provide a basis for a maritime policy-making framework. In order to propose the solution for maritime policy design process and components of the maritime policy-making framework observations and statistical analyzes of the development of the Estonian maritime sector in the years 2004–2021 were carried out (distribution of the maritime sector); analyzes of maritime documents of the Baltic States were conducted (maritime cluster impact index); meta-analyses were prepared based on the annual results of companies in the Estonian maritime sector (maritime sustainability maturity model); based on public sources and scientific literature, policy design elements supporting sustainable development were analyzed (maritime policy design and evaluation). All developed elements were tested and experimented based on the case study of the Estonian maritime sector.

The research strategy and methodological approach chosen in this thesis favoured the comprehensiveness of the results and allowed them to be applied outside the Estonian maritime sector. Although, the results were tested on the case study of the Estonian maritime sector, the development process involved also significantly broad-based public sources and scientific literature and data outside Estonia. The long-term goal of this thesis is to help connect Estonia's identity as a maritime country more strongly with sustainability related activities through policy-making.

## 2.2 Case description

### 2.2.1 Maritime governance in Estonia

In Estonia, the coordination of maritime activities is divided between different ministries and their subsidiaries, and there is no single governing body to coordinate it all. Although the maritime activities are divided based on the competences of the ministries, the Estonian maritime governance system has been criticized for the lack of an official resolution for such a division and the fragmentation of activities among several agencies.

The strategic goals and action plans of maritime-related activities have been established by various development plans. The Transport and Mobility Development Plan 2021–2035 and the White Paper on Maritime Policy 2022–2035 can be considered the most fundamental because these documents cover the widest range of maritime activities; other development plans are rather focused on one specific maritime field (environment, fisheries, security, etc.).

In the years 2012–2020, maritime activities were coordinated on the basis of the Estonian Maritime Policy 2012–2020. From 2021, maritime activities are included as a sub-section to the Transport and Mobility Development Plan 2021–2035 (Annex 4, "Maritime Transport Policy Concept"). From the end of 2022, the White Paper on Maritime Policy 2022–2035 was added, which was also prepared as a sub-document of the development plan. Both documents contain the vision of the Estonian maritime sector, a description of the current situation and proposed solutions together with activities and responsible institutions. The documents include topics related to maritime transport, maritime security, marine environment, education and science, coastal

culture, etc. The White Paper and the Annex 4 to the Transport and Mobility Development Plan are very similar. Some solutions and activities have been replaced by new ones in the White Paper, some performance indicators have been specified, and a challenges section has been added to each goal, but the general vision and strategic goals are the same. Both documents are valid until 2035 and their implementation is organized by the Ministry of Economic Affairs and Communications in cooperation with other ministries. Every year, ministries, agencies and other institutions prepare an overview of the implementation of activities under their responsibility and submit it to the Ministry of Economic Affairs and Communications (on activities of the Annex 4 by February 1 and on activities of the White Paper by April 1).

Currently, as of December 2022, there are 16 valid sector development plans in Estonia, of which 7 include maritime-related activities (Estonian Government, 2022). A remarkable change in the Estonian maritime coordination took place in 2021 when the Deputy Secretary General for Maritime Economy position was created in the Ministry of Economic Affairs and Communications with a focus on the coordination of the marketing of Estonia as a maritime country, analysis of the maritime economy and field of legislation. The Deputy Secretary General for Maritime Economy should contribute to the importance of Estonia's role as a maritime country, increase the competitiveness of Estonia's maritime economy, and be responsible for the development and achievement of the results of the "Ships under the Estonian flag" project. (Riigikantselei, 2021) The main maritime activities, the coordinating institutions, and currently valid (as of December 2022) strategic development plans are listed in Table 5 (next page).

Maritime management is supported by the Maritime Council, the Maritime Affairs Support Group at the Riigikogu (Parliament of Estonia), and the Maritime Economy Round Table. The Maritime Council was formed in 2008 as a citizens' initiative with the aim of contributing to the creation and implementation of Estonian maritime policy. The Maritime Affairs Support Group at the Riigikogu was formed in 2019 to bring maritime issues to the attention of the Parliament. The Maritime Economy Round Table was initiated in 2021 by the Deputy Secretary General for Maritime Economy.

*Table 5. Main maritime activities with coordinating institutions and development plans.*

| **Maritime activities** | **Coordinating institutions** | **Main development plans*** |
|---|---|---|
| maritime transport, including shipping and port operations | Ministry of Economic Affairs and Communications and Transport Administration | Transport and mobility development plan 2021–2035<br>White Paper on Maritime Policy 2022–2035 |
| marine environment, protection and use of fishery resources, wildlife rescue from marine pollution | Ministry of the Environment, Environmental Board and Environmental Inspectorate | Estonian environmental strategy until 2030; Agriculture and fisheries development plan until 2030<br>Transport and mobility development plan 2021–2035<br>White Paper on Maritime Policy 2022–2035 |
| security and defence activities at sea areas | Ministry of Defence and Defence Forces | National defence development plan 2017–2026<br>Transport and mobility development plan 2021–2035<br>White Paper on Maritime Policy 2022–2035 |
| commercial fishing and aquaculture sector | Ministry of Rural Affairs and Agriculture and Food Board | Agriculture and fisheries development plan until 2030 |
| maritime science and education | Ministry of Education and Research | *Education strategy 2021-2035, but maritime activities are not reflected in the development plan*<br>Transport and mobility development plan 2021–2035<br>White Paper on Maritime Policy 2022–2035 |
| maritime culture and historical maritime traditions | Ministry of Culture | *Culture development plan 2021–2030, but maritime activities are not reflected in the development plan*<br>Transport and mobility development plan 2021–2035<br>White Paper on Maritime Policy 2022–2035 |
| sea rescue, removing marine pollution | Ministry of the Interior and Estonian Rescue Board | Internal security development plan 2020–2030<br>Transport and mobility development plan 2021–2035<br>White Paper on Maritime Policy 2022–2035 |
| maritime spatial planning | Ministry of Finance | National spatial plan |

** As of December 2022*
*Source: composed by the author*

Since 2010, the Estonian maritime sector and its sub-sectors have been addressed in various studies using methodically different approaches, e.g., "Estonian Maritime Cluster study" (Portsmuth et al., 2012), "Current State of the Estonian Maritime Cluster and Possible Developments" (Nõmmela, 2012), "Labour Demand study of the Maritime Sector" (Rozeik et al., 2015), "Economic Impact Study of the Maritime Sector" (Hunt, et al., 2016), "Future of Maritime Trade: Development trends and scenarios" (Anspal et al., 2020), "Aquaculture in the Estonian Sea Area: Basic data and studies" (Kotta et al., 2020), etc. These studies have been ordered according to specific needs for planning the development of the sector. However, the results of such studies are not comparable, but they can be separately used as inputs to each other and to the policy-making process.

### 2.2.2 Current economic state of the Estonian maritime sector

The Estonian maritime sector consists of companies and associations that engage in maritime activities and have their registered office in Estonia. In order to describe the economic state of the sector, all undertakings dealing with maritime as a principal or secondary economic activity have been included in this thesis based on the data of the Estonian e-business register. The distribution of the Estonian maritime sector based on the Estonian Classification of Economic Activities (EMTAK) used in this thesis is shown in Table 6. The distribution of the maritime sector is based on the distribution proposed as a result of the research conducted in this thesis.

*Table 6. Distribution of the Estonian maritime sector based on the EMTAK.*

| Sub-sector | EMTAK 2008 | NACE rev 2 | Activity |
|---|---|---|---|
| Shipping | 50101 | 50.10 | Sea and coastal passenger water transport |
| | 50201 | 50.20 | Sea and coastal freight water transport |
| | 50202 | 50.20 | Towing and pushing of ships |
| | 52292 | 52.29 | Sea ship loading services (freighting) |
| Ports | 52221 | 52.22 | Port and waterway operation services |
| | 52229 | 52.29 | Other support activities for water transportation |
| | 52241 | 52.24 | Cargo handling (loading and unloading ships) |
| | 42911 | 42.91 | Construction of water projects |
| Marine industry | 30111 | 30.11 | Building of ships |
| | 30112 | 30.11 | Building of floating structures |
| | 30121 | 30.12 | Building of pleasure and sporting boats |
| | 33151 | 33.15 | Repair and maintenance of ships and boats |
| | 35113 | 35.11 | Electricity production from wind power (offshore) |
| | 35112 | 35.11 | Electricity production from water power (sea hydro plants) |
| Fishing | 03111 | 03.11 | Marine fishing |
| | 03211 | 03.21 | Marine aquaculture |

*Source: EMTAK 2008, composed by the author*

** The EMTAK classification does not allow drawing concrete boundaries between the sub-sectors of the maritime sector because several companies operate simultaneously in several fields and the sub-sectors are not completely distinguishable in terms of areas of activity. Considering this limitation, the description of the current situation must be contested.*

Based on the maritime cluster concept, the sector also includes activities that have no separate EMTAK code for maritime and are part of the core activities of other economic sectors, but provide service and input to maritime:

- Maritime tourism
- Transportation and storage
- Processing and preserving of fish
- Manufacturing
- Financial and insurance activities
- Education
- Accommodation and food service activities
- Wholesale and retail trade
- Public administration and defence
- Scientific activities

According to e-Business Register data, in 2021, there were 793 actively operating[3] companies whose primary or secondary activities are related to the Estonian maritime sector (sub-sectors: sea transport, ports, marine industry, or fisheries). 76.5% of them operated in the maritime sector as their principal activity and 23.5% as a secondary activity. Most of the companies operate under the maritime industry (269; 33.9%) and maritime transport (227; 28.6%) sub-sectors, while the share of the companies in the fisheries (164; 20.7%) and seaports (133; 16.8%) is the lowest. In all sub-sectors, most of the companies are engaged in the sub-sector with their principal activity: marine industry (79.2%), maritime transport (78.4%), seaport (72.4%), and fisheries (68.3%). The shares of the sub-sectors and the proportion of principal and secondary activities are shown in Figure 4.

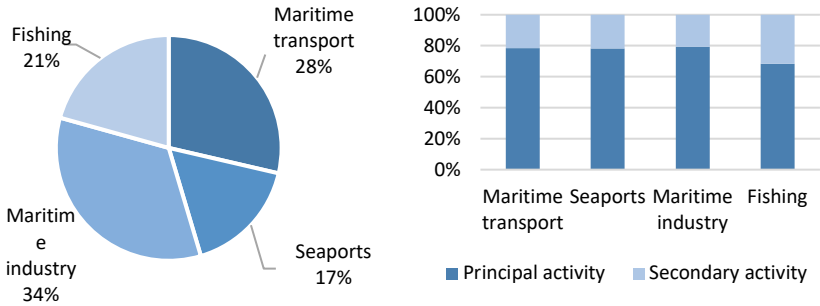


*Figure 4. Shares of the sub-sectors based on the number of companies and the proportion of main and secondary activities in the sub-sectors, 2021. Source: e-Business Register, composed by the author*

The comparison of the years 2018 to 2021 shows an increase in the number of companies until 2020, after which the number of actively operating companies has decreased. The latter is largely due to the effects of the COVID-19 crisis on the economy. In the maritime industry sub-sector, the decrease started in 2020. The number of companies of the maritime sector's sub-sectors in 2018 until 2021 is shown in Figure 5 (next page).

[3] As an actively operating company, the study considers companies that had a sales revenue of more than €0 in the research year.

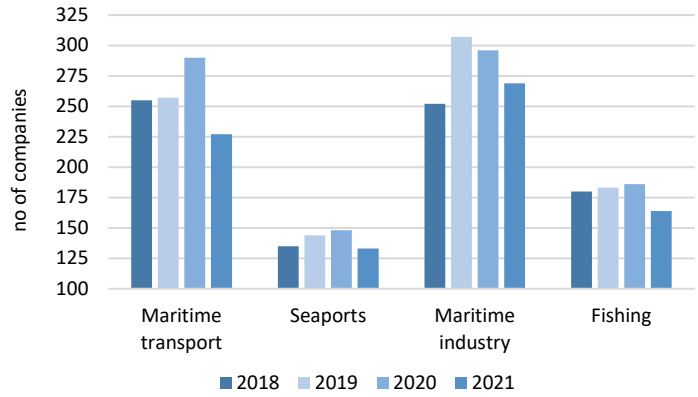


*Figure 5. Number of companies of the maritime sector's sub-sectors, 2018-2021. Source: e-Business Register, composed by the author*

The sales revenue distributed according to the share of activities was the largest in the maritime transport sub-sector in the years 2018 to 2021. The changes can be seen especially in 2020 and 2021, when the entire world was hit by the economic crisis due to COVID-19. The sales revenue of the fishing sub-sector was lower compared to others. Considering the distributed sales revenue, the largest companies in 2021 were Ookeani Konteinervedude Ltd., Hansa Shipping JSC., and Tallink Grupp JSC. in the maritime transport sub-sector; Bunker Partner Ltd., Tallinna Sadam JSC., and DBT JSC. in the seaports sub-sector; LTH-Baas JSC., Tallinn Shipyard Ltd., and Baltic Workboats JSC. in the maritime industry sub-sector, and Reyktal JSC. and Reval Seafood Ltd. in the fisheries sub-sector. The distributed sales revenue of the maritime sector's sub-sectors in 2018 until 2021 is shown in Figure 6.

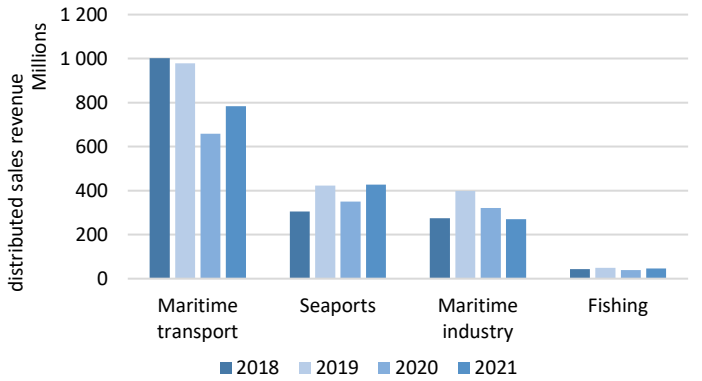


*Figure 6. Distributed sales revenue of the maritime sector's sub-sectors, 2018–2021. Source: e-Business Register, composed by the author*

In the years 2018–2021, the sub-sector of ports had the largest total number of employees. The total number of employees cannot be calculated according to the share of the principal and secondary activities in a way similar to the distribution of the sales revenue. Therefore, the sector includes several large freight forwarder companies and construction companies engaged in water construction, with maritime as a secondary

activity. Similar to other economic indicators, there was also a decline in the total number of employees by 2020. The total number of employees of the maritime sector's sub-sectors in 2018 until 2021 is shown in Figure 7.

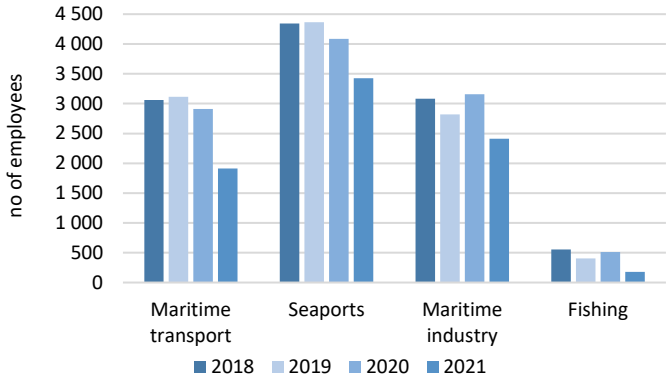


*Figure 7. Total number of employees of the maritime sector's sub-sectors, 2018–2021. Source: e-Business Register, composed by the author*

The Estonian maritime sector is characterized by individual core companies and numerous smaller companies operating in the sub-sectors. The economic performance of large companies has a great influence on the economic performance of the entire sector. The division of maritime companies into four main areas of activity allows us to see the effects of the changes taking place in the maritime sector in different areas. For example, it can be seen that the impact resulting from the COVID-19 crisis reached the maritime industry later, as the contracts there have been signed for a long time, and the decline will therefore arrive later. At the same time, considering that a number of companies are operating in several sub-sectors simultaneously and in Estonia's location by the Baltic Sea, the maritime sector cannot be regarded as a separate, single branch of the economy, but rather an important component of the entire country's well-being and performance.

# 3 The proposed maritime policy framework

## 3.1 Integrating the maritime cluster concept into policy-making

The EU has emphasized the implementation of a cluster concept in maritime policy-making as one of the main encouragers to follow the UN's development strategy in order to achieve the sustainability goals. At the same time, as a result of the analyses of the theoretical background of economic clusters, the existing guidelines for the implementation of the concept and previous studies with different approaches on the use of the cluster concept in various maritime countries, it has become clear that under today's circumstances, the implementation of the idea of the maritime cluster in policy-making needs more specific guidelines and agreed-upon theoretical and practical approaches.

A cluster concept can have different meanings (I, Cortright, 2006; Brett & Roe, 2010; Pinto et al., 2015), so its integration into strategic decision-making should be based on its characteristics. Taking into account the ESG criteria and that the maritime cluster includes not only the main maritime activities (shipping, ports, fishing, maritime industry) but all related activities (science and education, public administration, finance and banking, insurance, etc.), there are certain stages of the policy-making cycle when applying the cluster concept is suitable. The illustrative process of integrating the maritime cluster concept into policy-making is shown in Figure 8.

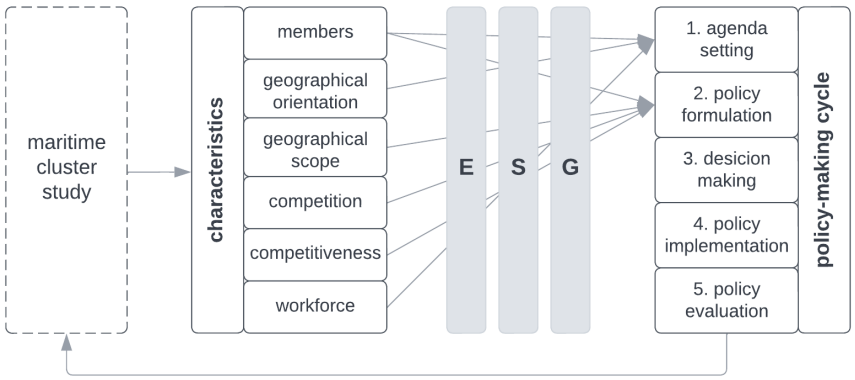


*Figure 8. Integration of the maritime cluster concept into policy-making cycle. Source: composed by the author*

Before starting the policy-making stages, it is necessary to conduct a maritime cluster study, which would identify the characteristics and members of the local maritime cluster. At this point, it is important to emphasize that a cluster study rather than a usual sector-based study is required to identify the members on the basis of cooperation ties. This work uses Porter's 2000 definition of a cluster: "a *cluster is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities. The geographic scope of clusters ranges from a region, a state, or even a single city to span nearby or neighbouring countries*." The maritime cluster study should be based on scientifically recognized researchers' theories of the cluster concept and be comparable to other maritime cluster studies in the region. The latter is achievable if, based on regional agreement,

the distribution of maritime traditional fields is based on the NACE classification, and national specificities are added only as appendices to the study. As this thesis research showed, a number of maritime cluster studies have been carried out in the BSR over the years using multiple theoretical and methodological approaches, which makes a current comparison impossible.

The ESG aspects (including environmental, social, governance) have been in the focus of international policy makers and stakeholders to deliver long-term value with strategic decision-making. In sustainable finance, the implementation of ESG criteria in the decision-making process has been especially intense. (OECD, 2022b) As the growing attention to sustainability matter has reached every sector, the integration of the ESG aspects and the maritime cluster concept as policy input have great potential to strengthen the policy design process with valuable information. The integration of the ESG aspects with the results of a maritime cluster study enables to quantify the ESG performance of the cluster through the ESG criteria (proposed in the policy design evaluation process, see Section 3.3.4). The latter is necessary, as the information provided by the business sector has become a decision point for stakeholders, whose agenda is full of ESG related matters (dos Santos & Pereira, 2022). The analysis of the cluster study results in every ESG aspect offers policy makers a detailed overview of the maritime sector's development and current state in relation to sustainability issues in the broadest way thanks to the cluster concept approach.

The results of the maritime cluster study can be used as input in the first stages of policy-making: agenda setting and policy formulation, as these stages require the broadest comprehensive involvement and overview of the field. Since the extension of the principles of sustainability to activities outside the maritime sector is important for achieving the goals, the application of the cluster concept already in the policy design creates a balanced foundation for this. All characteristics of the cluster must be evaluated on the basis of ESG criteria (impacts, connections, perspectives, problems, etc.) before being considered as inputs. The approach of the maritime sector should be applied in the next stages of policy-making, as a narrower view allows for a more detailed identification of problems and the development of solutions. The cluster concept can also be used in the last stage of policy-making (policy evaluation), but this reverse back as an input to the first stage, as the policy-making process is a continuous process (i.e., a circle) (see Section 1.5).

## 3.2 Distribution of the maritime sector for policy-making

Based on the PhD research on the characteristics, the current state, specificities, previous research and theoretical background of the maritime cluster and maritime sector, the Estonian maritime sector should be divided into sub-sectors and horizontal dimension as input for policy-making (IV). Resulting from the development dynamics of the Estonian maritime sector and the specificities of the sub-sectors, the four main sub-sectors should be maritime transport, seaports, maritime industry, fishing, and the one horizontal division (i.e., maritime fundamentals) should include all maritime related aspects and fields that are part of other economic fields but directly related to the sea and maritime affairs (education, research and development, security, public services, financial and insurance, recreation, historic tradition, cultural values, etc.) (IV). The recommended distribution of the maritime sector in policy-making is shown in Figure 9 (next page).

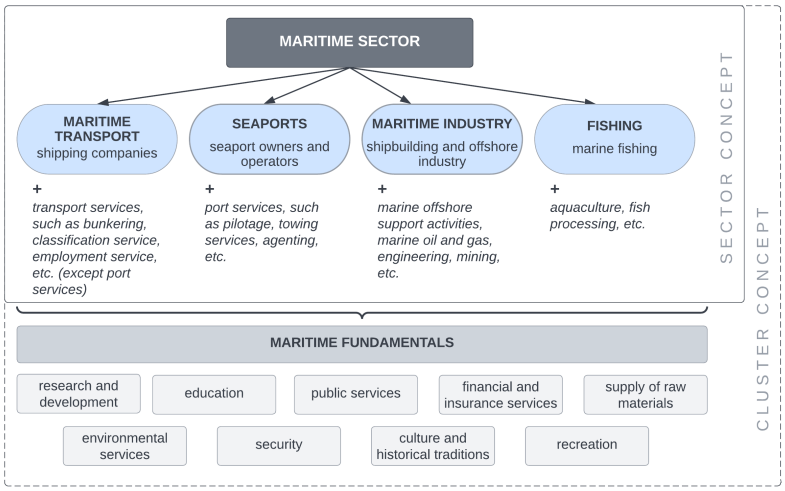


*Figure 9. Recommended distribution of the maritime sector in policy-making. Source: composed by the author*

The idea behind this recommended distribution is to focus and highlight the main maritime activities (transport, ports, maritime industry, and fisheries) and dedicate a separate development strategy to each one of them, exploring their problems, solutions, and goals separately in ensuring sustainable development. Together with the main activities, attention should be paid in action plans to the areas operating around them, e.g., in the case of ports, companies providing support services in the port. Finding out the fundamental dimensions of maritime is necessary to pay attention to their development as a key to sustainability and their role in other sectors. One of the greatest values of being a maritime country is the wide range of activities related to maritime affairs, which extend into almost all other fields of life. Without emphasizing these activities, it is not possible to achieve 100% sustainability-related goals. The distribution allows to keep the focus on the main sub-sectors and their development and to transfer responsibility to other sectors by defining the maritime sector's dimensions for ensuring sustainable development.

The maritime governance of Estonia has potential to change the policy design approach and continue developing the relevant policies separately for the main sub-sectors (as it has been done in the fishing sector and the new White Paper on Maritime Policy 2022–2035 foresees for the maritime industry) and incorporate the maritime fundamentals into sectoral policies in order to support the achievement of sustainability goals. The latter is necessary due to four main reasons (Salomon & Dross, 2013, modified by the author):

1. the importance of maritime issues is insufficient in other Estonian sectoral policies;
2. the other policy fields do not accept enough sectoral responsibility and do not acknowledge the connections between maritime sustainability issues;
3. maritime sustainability development and maritime resources used by other sectors are interrelated;
4. there is a lack of an effective regulatory framework in Estonia that defines action across sectors, provides overarching coordination, and defines the political prioritisation of objectives.

## 3.3 The proposed framework

### 3.3.1 The concept of the proposed framework

This thesis proposes a policy-making framework with measures and guidelines to enhance the sustainable development of the maritime sector (Figure 10, next page). The framework is based on the concept of the policy-making process (based on Jann & Wegrich (2006), Knill & Tosun (2008), Howlett & Giest (2015), see Section 1.5), which has been supplemented with methods and elements necessary to support the development of the maritime sector as a result of the analyses carried out during the preparation of the thesis. The proposed framework contributes to strengthing the identity of being a strong maritime country. The framework promotes to see the maritime sector as a well-integrated component of a maritime country's economy as well as social and political field (IV). The following is a brief description of the parts of the framework in a sequence of policy-making stages, followed by an overview of methods and recommendations developed during this research. Detailed explanations of the methods, models and recommendations developed during this thesis research are given in scientific publications (see Annexes 1–4).

In the first stage of policy-making, "agenda setting", it is important to start by finding out the current situation and development dynamics of the maritime sector by conducting a maritime cluster study. The cluster study must be based on the economic theory of the cluster, be comparable to similar studies of other countries along the Baltic Sea, and be based on the cooperation of the members (see Section 3.1). In order to find out the current situation of the maritime sector according to ESG criteria, the maritime sustainability maturity model proposed in the study should be applied (see Section 3.3.2). Before the next policy-making stage, the maritime sector should be divided according to the recommendation into four main activities (maritime transport, sea ports, maritime industry, and fisheries) and maritime fundamental activities (see Section 3.2).

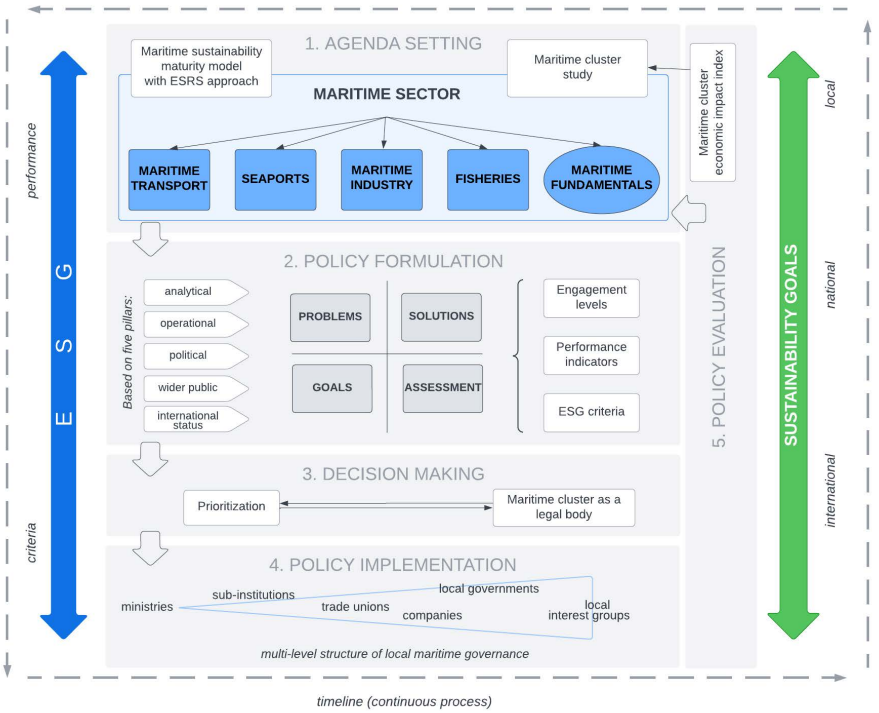


*Figure 10. The proposed framework for the maritime policy-making to support sustainable development. Source: composed by the author*

The second stage of policy-making, "policy formulation" (also called "policy design" together with the first stage), is one of the most important parts of the process, as it contains the activities and policy elements with the greatest impact on the results and policy output. At this stage, it is important to focus on a problem-oriented approach and analyze the results in different pillars (analytical, operational, political, wider public, and international status) (III, see Section 3.3.3). The key at this stage is to focus on the matrix of policy design elements (problem, objective, solution, and evaluation) for all the main sub-sectors of the maritime sector and maritime fundamentals. Upon completion of the policy design, an assessment of its effectiveness should be carried out based on engagement levels, ESG criteria, and performance indicators. As a result of this stage, drafts for the development strategies of all four main maritime sub-sectors are prepared separately, and additionally, drafts are prepared for the inclusion of the maritime fundamentals in other sector policies (e.g., research and development, food production, energy resources, safety and security, etc.), local development plans, and national policy documents (IV).

The third stage of the policy-making cycle, "decision making", includes two important features: (1) prioritization of objectives, resources, and schedules and (2) creation of a maritime cluster as a legal body. Prioritization is necessary because it allows to balance what was agreed upon in the previous stages, to distribute the available resources according to the possibilities and to prepare actions and timetables for the policy drafts. One of the most important aspects in this process is the availability of funding opportunities. As the state budget strategy has a decisive role in shaping final versions of sectoral policies, it is important to base the prioritization on the actual resources.

In order to increase the involvement and responsibility of the parties operating in the sector, a maritime cluster as a legal body should be established. Although it is possible to define maritime clusters based on different theoretical concepts, the strengths of the cluster as a legal body are agreeing on the distribution of activities, enhancing the possibilities of cooperation, and being a strong partner for policy makers (IV).

The fourth level of policy-making, "policy implementation", proposes the implementation of the policy by changing the current local maritime governance (IV). In Estonia, the governance of the sector should be in charge of one governmental institution. The activities to reach the policy goals could be divided among different institutions in multiple levels (ministries, institutions, local governments, interest groups, etc.) (IV). The division should be set in a legal act that gives the responsible ministry a basis for the management and the control factor.

The last stage in the policy-making cycle is "policy evaluation", which is based on internationally accepted guidelines (e.g., the OECD Framework for Regulatory Policy Evaluation, the EU guidelines, including the Joint Funding Action "Policy Evaluation Network", etc.). This thesis does not attempt to analyze the suitability of general policy evaluation frameworks for maritime policy but offers an evaluation measure to assess the policy effects – the maritime cluster impact index (see Section 3.3.5).

### 3.3.2 The maritime sustainability maturity model with the draft ESRS approach

In a policy design process, a valuable input includes necessary information about the development and current state of the policy object. In addition to the cluster study, the thesis proposes to use a maturity model as one of the widely used management tools for evaluating the business performance (Bititci et al., 2015; IV). A maturity model helps to evaluate the current state of the maritime sector or its sub-sectors performance in sustainable development based on selected criteria. In the literature review, there are several examples of maturity models in the maritime sector, but none of them offer the possibility to evaluate the entire sector's state taking into account the most relevant sustainability guidelines, rather previous models are developed to specific circumstances. Therefore, the thesis proposes a maritime sustainability maturity model with the draft ESRS[4] approach based on the insights of previous examples, sustainable guidelines, and analysis of the Estonian maritime companies' annual reports (IV). The proposed maritime sustainability maturity model is shown in Figure 11 (next page).

[4] As of carrying out this thesis, the European sustainability reporting standard was in the preparation stage (October 2022).

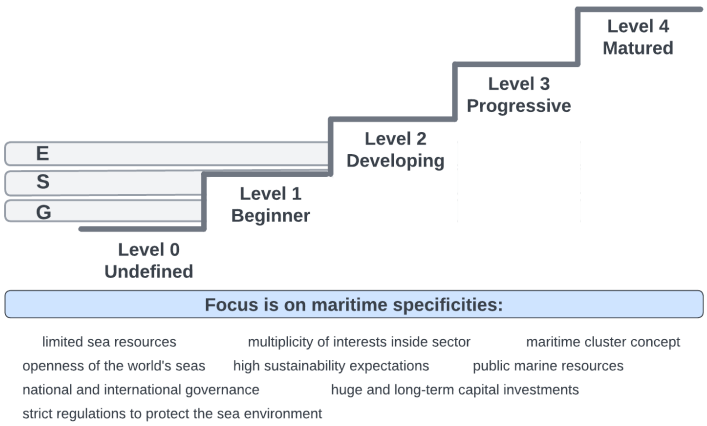


*Figure 11. Maritime sustainability maturity model. Source: IV*

The presented model has five levels that are connected to the ESG concept and the draft ESRS. The thesis proposes to use the draft ESRS indicators to evaluate the maritime company's performance based on the annual reports. As the ESRS suggests that all non-financial information be included in the companies' annual activity reports, the thesis used associated keywords to combine the draft ESRS indicators and the Estonian maritime companies results according the their disclosure (IV) and calculated the maturity score for the entire maritime sector, separately for each main indicator of the draft ESRS and for different sub-sectors using the following equation (IV):

$$\text{Average}_I = \sum_{i=1}^{n} A_I / n_I \qquad (1)$$

where *I* is category for which the score is calculated, *A* – total score, and *n* – maximum score (IV). The division of the scores is shown in Table 7.

*Table 7. The scores of the maritime sustainability maturity model.*

| Model Level | Min Score | Max |
|---|---|---|
| 0 – undefined | 0.00 | 0.00 |
| 1 – beginner | 0.01 | 25.00 |
| 2 – developing | 26.00 | 50.00 |
| 3 – progressive | 51.00 | 75.00 |
| 4 – matured | 76.00 | 100.00 |

*Source: IV*

The developed maturity model was tested on the Estonian maritime sector and its sub-sectors shipping and ports based on the companies' annual reports in 2021 (IV). The results are shown in Figure 12 (next page). The score of the Estonian maritime sector was 12.37, which places the sector to the first level. The highest score was in general ESRS (52.40), which places the sector in this category at level 3. Shipping and ports sub-sectors both have one listed company, which reflected on the results, as these sub-sectors have more than one category where the results are above the first level of the model. (IV)

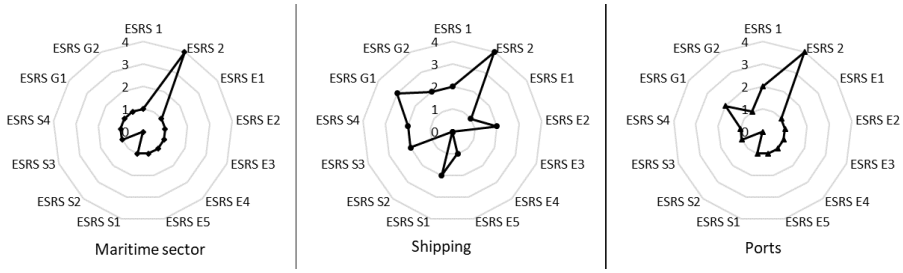


*Figure 12. The sustainability maturity levels of the Estonian maritime sector and two sub-sectors in 2021. Source: IV*

The thesis proposes appropriate steps for policy makers in order to support the sector's development and increase the maturity score depending on the results of the model. The main steps include explaining the differences in policies and action plans of the sector or a group of companies, enhancing current policies based on the result, supporting the responsible commitment of companies, and gathering information on the results and analyzing the progress (IV). The maritime policy that incorporates sustainability goals and actions is a key in every level of maturity.

In the "undefined" level, there is a need to identify sustainability guidelines and possible impacts of recommended actions to achieve sustainable development and increase the funding of research and development on maritime sustainability issues (IV). At the "beginner" level, public institutions should offer training programs to share knowledge and best practices on sustainability matters in every aspect and offer funding for the construction of sustainable infrastructure (IV). At the "developing" level, public institutions should provide self-assessment tools, to ensure that companies could evaluate the performance and make strategic decisions based on the results (IV). It is known, that technological innovation and automotive solutions can help to contribute to the sustainable development (Koilo, 2019), and therefore supporting the digital revolution in maritime sector (e.g. autonomous vessels for serving offshore industry) is fundamental measure in this level. In the final levels, "progressive" and "matured", public institutions should evaluate their progress and offer development programs and organize events when necessary to raise their awareness of recent development in the local and international level (IV).

### 3.3.3 The maritime policy design

The aim of the policy design stage (i.e., agenda setting and policy formulation) in the policy-making process is to offer a variety of alternative policy elements from which decision makers can choose the most relevant and appropriate. The most traditional policy elements are problems, solutions, goals and assessment (Howlett, 2014; III). The proposed framework includes these elements as centre in the maritime policy and suggests policy formulation around those (III). This helps to keep the focus on the main aspects that need to be dealt with when implementing the policy.

The proposed framework includes five pillars that should be as cornerstones in designing a policy. The pillars are: analytical, operational, political, wider local public, and international status. All policy elements should be analyzed using the five pillars (III). The analytical pillar was added to the framework, as effective policy-making is evidence-based (III; Kano & Takehiko, 2022; Bochenski et al., 2021). This means that each policy element should be analyzed based on qualitative and sound information.

Although the availability of statistical information in the maritime sector could be limited or hindered, policy makers should find ways to gather reliable and continuous data.

The operational pillar focuses on the capacity and resources of public administrations and the sector. It includes administrative, financial, and technological resources, and knowledge and skills of the public as well as the private sector (III). The existence of core companies is common in the maritime sector, therefore the operational pillar should be evaluated within the groups of companies based on their cooperation (III). In the political pillar, political interest should be evaluated as this can be an obstacle in later stages of policy-making (III). The wider public and international status pillars include analyzing the perspectives of local habitants and coastal regions, and taking into account the international situation (geopolitical, maritime affairs, EU institutions, etc.) (III).

In the policy design stage, the policy makers have the opportunity to decide the levels of engagement when choosing appropriate support policy instruments. The proposed framework includes a model with intervention levels (IV) (Figure 13). In the first level, "micro level", intervention can be offered to a maritime sub-sector or a group of companies (IV), e.g., helping to gather information, support strategic planning, etc. In the second level, "medium level", the support can be offered to the entire maritime sector or related sectors, e.g., carrying out policy analysis, offering legal tools, etc. In the third level, "macro level", interventions are made through international organizations and EU-level actions to enhance foreign cooperation, participate in working groups and projects for knowledge and experience, etc. (IV)

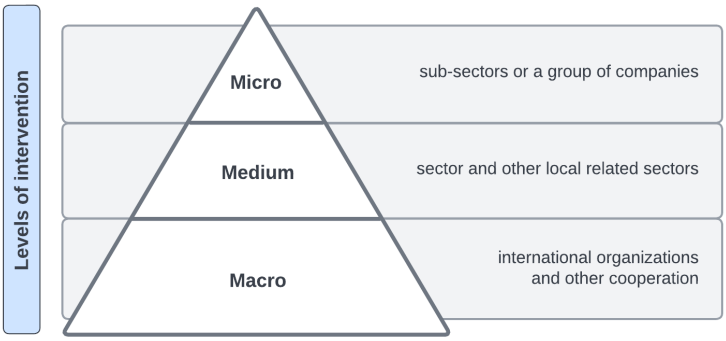


*Figure 13. Levels of intervention for policy-makers to choose appropriate approaches and tools. Source: IV*

The aim of such division is to guide policy makers to analyze alternative solutions and expected activities depending on the actual need to intervene. Not all problems and goals need interventions to the entire maritime sector, the policy might include elements for only small group of companies, or vice versa, engagement that needs international support.

### 3.3.4 Evaluation of the policy design

This PhD research proposes to evaluate the designed policy using ESG indicators developed here before moving on to the next stage of policy-making. Currently, there are no common metrics systems for evaluating the ESG performance (Camilleri, 2015; dos Santos & Pereira, 2022; Huber & Comstock, 2017; III). Therefore, the study presents a list of ESG related maritime policy evaluation indicators. The indicators were tested based on the example of the Estonian maritime policy documents (the Estonian Maritime

Policy 2012–2020 (MKM) and the White Paper on Maritime Policy 2022–2035 (MKM, 2022b)). Compared to the Estonian Maritime Policy 2012–2020, the focus of environmental activities has shifted in the White Paper on Maritime Policy 2022–2035 from public sector activities to business competitiveness, social aspects are dealt with fewer priorities, but more focused, and governance-related indicators have remained similar. In addition, more importantly, greater emphasis has been placed on supporting innovation.[5] The proposed indicators and the example of the White Paper on Maritime Policy 2022–2035 are shown in Table 8 (next page).

The proposed framework includes an effectiveness assessment that should be carried out on the designed policy design (IV). The aim of this evaluation is to analyze the following: how the problems and goals are addressed; what the possible impacts and effects are; what the financial costs of the implementation are; what the most adequate timeframe and technical and operational solutions are; what the policy effects on other connected sectors based on the cluster concept are (IV). In the assessment, all main policy elements (problems, goals, and solutions) should be evaluated (IV). The assessment includes different dimensions, i.e., effectiveness, effects, finances, time schedule, feasibility, acceptability, maritime cluster impact, etc. (IV; Klaus et al., 2019).

[5] The analysis of the Estonian Maritime Policy 2012–2020 priorities was conducted by the author in 2021 and the results are published in the article (Annex 3): Nõmmela, K.; Kõrbe Kaare, K. (2022). Maritime Policy Design Framework with ESG Performance Approach: Case of Estonia. Economies, 10 (4), #88. DOI: 10.3390/economies10040088

*Table 8. ESG indicators proposed for the evaluation of maritime policy design with the example of the White Paper on Maritime Policy 2022–2035.*

| Group | Goals | Metrics | Priorities of the White Paper on Maritime Policy 2022–2035* | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1 - Entrepre-neurship | 2 - Environ-ment and security | 3 - Public sector | 4 - Education and R&D | 5 - Coastal living and culture |
| Environmental | Pollution reduction | Air pollutants management | | | | | |
| | | Waste management | | | | | |
| | Resource efficiency | Energy consumption | | | | | |
| | | Upgrading infrastructure | | | | | |
| | Clean energy | Renewable energy solutions | | | | | |
| | | Clean energy research and technology | | | | | |
| Social | Human well-being | Jobs creation | | | | | |
| | | Work conditions | | | | | |
| | | Labor rights | | | | | |
| | | Safety and security | | | | | |
| | Economic growth | Technological upgrading and innovation | | | | | |
| | | Supported entrepreneurship | | | | | |
| | | Supported access to financial services | | | | | |
| Governance | Strong institutions | Financial performance | | | | | |
| | | Operational performance | | | | | |
| | | Supported local and foreign investments | | | | | |
| | | Ethics and corruption | | | | | |
| | | R&D | | | | | |
| | Quality education | Career development | | | | | |
| | Partnerships | Local and international connectivity | | | | | |

** the contribution is divided as follows: contributing (grid), contributing partially (horizontal), no contribution (dark grey), does not contribute and not applicable (white).*

*Priority 1 – Business environment in the marine sector is entrepreneur-friendly, competitive at the international level, and supportive of innovation; priority 2 – The marine economy is environmentally friendly, sustainable, safe and secure; priority 3 – Public sector policies, activities and services support and ensure the continuous development of the maritime economy; priority 4 – The Estonian maritime education and research and development activities are modern and take into account future competencies and needs; priority 5 – Coastal life and visiting environment are attractive and facilitate maritime tourism and the development of local entrepreneurship and passing the maritime sector's cultural heritage to coming generations.*

### 3.3.5 The concept of maritime cluster impact index

This thesis proposes a concept of maritime cluster impact index that takes into account the draft ESRS, regional policies of the Baltic States, and local aspects. The concept of this index has three main key policy areas (II): economic growth, maritime safety and security, sustainability of cultural heritage, and environmental resources. These areas were selected based on the analysis of the documents on the maritime development plans of the Baltic States. The documents included national maritime policies, development strategies of main ports and national development plans, which were integrated with the EU priorities (II, such as MKM, 2022a; Gailitis & Jansen, 2012; Viederyte, 2014; Port of Tallinn, 2022; Freeport of Riga, 2019; Estonia 2035; Latvia 2030; Lithuania 2030). During the comparative analysis of the documents, the main development directions and goals of the maritime sector of the Baltic States were revealed, which were then combined into three key policy areas (II).

The key policy areas were then combined with the ESRS categories, thanks to which input will be given to the impact assessment with the sustainability performance indicators provided by companies in the adoption of the ESRS. The implementation of policy actions depends on local aspects, such as location and resources, cooperation, knowledge and skills, production and innovation, and governance and legislation, which were also integrated to the index (II). The general concept of the index is presented in Figure 14.

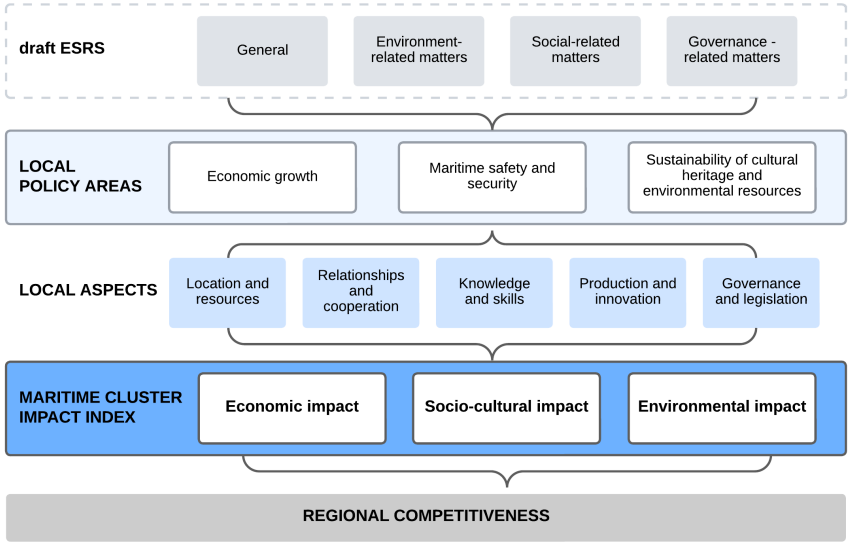


*Figure 14. The concept of the maritime cluster impact index. Source: II, amended by the author*

The index includes economic impact, socio-cultural impact, and environmental impact indicators (II). The evaluation of the economic impact is based on the analysis of the economic performance indicators of maritime cluster companies. The socio-cultural impact of the cluster will be evaluated based on the ESRS reporting results on social values, cultural heritage, and safety and security in the region. The environmental impact indicator assesses the sustainable use of local resources, the use of green technologies, the reduction of potential pollution risks, etc. based on the ESRS reporting results. (II)

This thesis presents a detailed content for the economic impact indicator of the index. The evaluation of the economic impact is based on the qualitative and quantitative information from a maritime cluster of companies. The evaluation includes five indicators (II): added value, business output, personal income, employment, business activity. The results can be compared with cross-regional indicators and with other clusters depending on the choice of users.

The economic indicator of the impact index was tested on the maritime clusters that are geographically located around the three Estonian ports in 2019 (port of Tallinn, port of Sillamäe, and port of Pärnu) (II). The results are shown in Figure 15. Out of the five indicators, the personal income and business activity were the strongest in the cluster around the port of Tallinn. In the port of Pärnu region, the same indicators were also the greatest. The cluster of the Port of Sillamäe region has the strongest economic impact in added value, employment, and business output. (II)

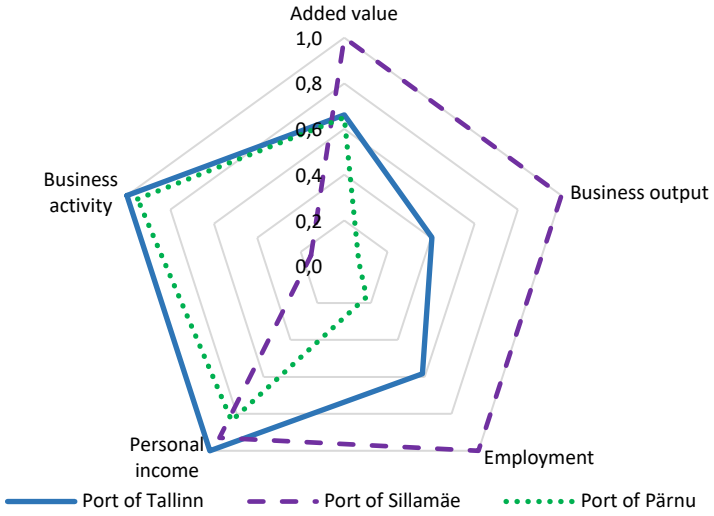


*Figure 15. The maritime clusters' economic impact of the Port of Tallinn, the Port of Sillamäe and the Port of Pärnu in 2019. Source: II*

## 3.4 Limitations

The developed maritime policy-making framework includes some limitations that must be taken into account when applying the framework and the elements. Like any research, this thesis also had specific scope that framed the research object and, consequently, the results. The main limitations include focusing on the example of the Estonian maritime sector, which limits the generalization of the results; the framework does not take into account the resources (time, finances, labour) required to implement the elements in policy-making process; and the entire developed framework has not been tested in real policy-making, which is part of further research.

The thesis focuses on the case study of the Estonian maritime sector because it was possible to collect the most detailed data on the development of the Estonian maritime sector, the most accurate public information is published in the national language, and the local economic and business environment and the resulting opportunities and limitations are best known. As the author of this thesis has been researching the development dynamics over the last decade in a number of local and international studies, the most adequate case study example was to choose the Estonian maritime sector. This limits the generalizability of the results because each maritime country and its situation is different and the results cannot be transferred one-to-one. At the same time, the international maritime sector has characteristics that are common to each region, thanks to which the developed framework can also be used in other maritime countries, taking into account local specificities if necessary.

With the aim of directing the focus of local policy-making to enhancing the sustainable development of the maritime sector, the policy-making process needs additional elements. The developed framework does not currently take into account the real costs (time, finances, labour) that are involved in the implementation of the additional activities. As time and financial constraints can pose significant obstacles to the policy-making process, not analyzing them will prevent the comprehensive immediate implementation of the framework. This limitation of the thesis can be easily removed in further research, as it can be analysed primarily by applying the proposed elements of the framework.

The elements of the framework were tested and experimented on the example of the case study of the Estonian maritime sector, but the entire framework has not been implemented in the actual policy-making process. This limitation can also be addressed in further research as the implementation of the framework takes a long time (possibly more than 10 years based on the general implementation period of the policies). During this time, it is possible to test the elements of the framework in a real process, supplement the elements according to the situation, and analyze the results to further develop the entire framework.

# Conclusion

This thesis introduces a comprehensive framework for maritime policy-making with the aim of contributing to the enhancement of the sustainable development of the Estonian maritime sector. The proposed framework incorporates relevant sustainable development guidelines and agreements, the maritime cluster concept, ESG aspects, specificities of the maritime sector, and the theory of the traditional policy-making process. The research strategy of this thesis follows a traditional scientific research method based on an inductive approach. The three main research topics are: the concept of the maritime cluster, sustainability expectations for the maritime sector, and the concept of the policy-making process, all of which were explored based on a case study of the Estonian maritime sector. A mixed-methods design that combined qualitative and quantitative research methods was used. The thesis proceeds from three research questions: 1. how to incorporate the maritime cluster concept into the local maritime policy-making process; 2. how a maritime policy should be designed to enhance the sector's sustainable development; 3. which components are part of the sustainable development in the maritime policy-making framework.

In order to answer the first research question, "How to incorporate the maritime cluster concept into the local maritime policy-making process?", the thesis explored different maritime cluster concepts and ways to integrate the concept into the local maritime policy-making process. The findings of the research showed that the maritime cluster concept relies on multiple theoretical and methodological approaches, and maritime cluster-related studies carried out as inputs to regional policy-making can be conducted on a variety of bases. Despite the establishment of several joint cluster platforms in the EU and the completion of numerous studies and projects in the BSR to investigate maritime clusters, there is still a wide range of interpretations and approaches in use. This makes the implementation of the maritime cluster concept into regional policy-making rather complex, and the inputs and results are incomparable.

Therefore, this thesis proposes a solution to apply the cluster concept only to the first two stages of maritime policy-making: agenda setting and policy formulation (the process consists of five stages: agenda setting, policy formulation, decision-making, policy implementation, and policy evaluation). The cluster concept can also be used in the last stage of policy-making (policy evaluation), but this reverses back as an input to the first stage, as the policy-making process is continuous (i.e., a circle). The first and second stages necessitate the broadest overview of the sector and involvement of stakeholders. The maritime cluster concept should be implemented through a maritime cluster study based on the cooperation ties of cluster members and not as a usual sector-based study. The study should rely on scientifically recognized researchers' theories and be comparable to other maritime cluster studies in the region. The latter is achievable with regional agreement on the distribution of maritime sub-sectors based on the NACE classification, and national specificities should be added only as appendices to cluster studies.

To answer the second research question, "How should a maritime policy be designed to enhance the sector's sustainable development?", the study focused on the theoretical background of the policy-making process, explored the most relevant sustainability-related guidelines and agreements, analyzed ways to design a maritime policy, and proposed a solution for a maritime policy design. One of the principle aspects of the policy design solution was the maritime sector's division. The thesis proposes dividing the maritime

sector into four main sub-sectors (maritime transport, seaports, maritime industry, and fisheries) and one horizontal dimension (maritime fundamentals) as an input to the maritime policy process. The goal of this division is to maintain the focus on the major subsectors that have the greatest impact on sustainable development and to design separate policies for them to highlight the needs in various sustainability matters. The horizontal dimension of the maritime sector (education and research, safety and security, cultural heritage, coastal life traditions, environmental protection, etc.) should be integrated into national strategies, local development plans, and other sectoral policies by analyzing their interrelationships. The integration of the fundamentals into other development plans and strategies will raise the awareness and responsibility of other sectors in relation to maritime activities.

Designing a policy includes actions taken in the first and second stages of the traditional policy-making process. In the design process, the thesis proposes to concentrate on the main policy elements (problems, goals, solutions, and assessment) and analyze them through five pillars (analytical, operational, political, wider public, and international status). The main policy elements should be developed for all main sub-sectors separately and individually for the maritime fundamentals. As an input for the design process, the maritime sustainability maturity model was developed in this thesis. The maturity model was created using a top-down approach inspired by the UN's SDGs and the draft ESRS. The latter was incorporated into the model through an indicator system. Upon completion of the policy design, an assessment of its effectiveness should be carried out based on engagement levels, ESG criteria, and performance indicators, which were all developed in this thesis. The three-level policy intervention model proposed in this thesis can be used to choose the level of policy activities for the next stages of policy-making.

To answer the third research question, "Which components are part of the sustainable development in the maritime policy-making framework?", a systematic and coherent maritime policy-making framework to enhance the sustainable development of the maritime sector was developed. The framework is based on the five stages of the traditional policy-making process, which were supplemented with appropriate components. The previously developed maritime cluster concept solution and policy design solution were also integrated into the framework in the first and second stages of policy-making.

In the third stage (decision-making) of the framework, the thesis proposed to highlight two features: (1) prioritization of objectives, resources, and schedule and (2) creation of a maritime cluster as a legal body. Prioritization allows us to balance what was agreed, to distribute the available resources according to the possibilities, and to prepare actions and timetables for the policy drafts. A maritime cluster as a legal body should be established to increase the involvement and responsibility of the stakeholders. The strengths of the cluster as a legal body are agreeing on the distribution of activities, enhancing the possibilities of cooperation, and being a strong partner for policymakers.

The fourth stage (policy implementation) of the framework included the modified maritime governance structure. The thesis proposed changing the sector's governance to the responsibility of a single governmental institution. At the same time, the policy activities should still be divided among different institutions at multiple levels (ministries, institutions, local governments, interest groups, etc.). The division should be set forth in a legal act that gives the responsible ministry a basis for management and control.

In the fifth stage (policy evaluation), the thesis proposes using the maritime cluster impact index developed in this study as a policy evaluation metric. The cluster index takes into account relevant policy areas and is based on the draft ESRS. This result of the impact index can be considered an input to the first stages of policy-making. As there are numerous policy evaluation methods, the thesis did not attempt to design a new one but rather offered specific methods for evaluating the effects of the maritime cluster in relation to policy objectives and sustainability aspects.

Sustainable development requires stable and focused policy interventions that combine bottom-up (from the sector to policymakers) and top-down (from transnational organizations to local stakeholders) approaches. The findings of this thesis prove that there is a possibility to develop a maritime policy-making framework that would contribute to the enhancement of the sector's ability to achieve sustainability goals and meet ESG-related expectations. Thus, the established hypothesis was proven. The proposed maritime policy-making framework with appropriate components and recommendations to use new methods and techniques allows policy-makers to design, make decisions, implement, and assess maritime policy while focusing on sustainability goals, ESG-related aspects, and the maritime sector's specificities. The framework includes methods and tools that would have important effects on current maritime policy-making activities and policy outputs. This research is contributing to the concepts, methods, and techniques for comprehensive maritime policy-making related to sustainable development and ESG areas. The work contributes to the Estonian maritime policy-making process by offering new opportunities for focusing on sustainable development, helps to supplement existing policy documents according to the results of case studies, and presents other maritime countries a reference point when developing their maritime policy documents.

## Further research

There are several ways to further develop the maritime policy framework proposed in this thesis. In order to support the sustainable development of the maritime sector, it is important to have a stable policy-making that goes along with the changing ESG-related demands and expectations. Therefore, one possibility for further research is to develop a common framework for defining and identifying maritime clusters in the Baltic Sea region with the aim of ensuring the existence of uniform policy-making bases regardless of the changing conditions of development. The framework of this study offers a maritime cluster study as one of the main inputs to maritime policy; however, as a result of the research it is clear that all researchers conduct cluster studies with their own approach. To ensure consistency and flexibility in a region with common regional and international goals, policy inputs must be comparable.

Policy-making is a continuous activity that has no beginning or end and it must be ready to change development directions and goals if necessary. The maritime cluster impact index proposed in this thesis takes into account local policy areas and evaluates the economic impact of the maritime cluster. Based on the current proposed index, further research can elaborate on the socio-cultural impact and the environmental impact of a maritime cluster in a region with joint policy-making. In addition, the results of the index can be combined with already existing international sustainable indices as part of further research. There are several internationally recognized indices for which the proposed index would be suitable as an input if further developed.

As part of further research, the possibilities of applying the developed policy-making framework to other economic sectors should be analyzed. For example, most industries also have high expectations for sustainable development, so it could be likely that the framework, or at least some elements of it, could be used in other areas as well. Although the elements of the framework have been developed considering the specificities of the maritime sector, industries often have similar challenges, e.g. limited public resources, strict regulations, huge investments, etc.

Finally, as further research, the suggested framework should be applied, at least partially, in real policy-making. Considering the changing circumstances in ensuring sustainable development, this framework should be modified and further developed in accordance with the changes. This last action is possible based on real implementation conditions.

# List of figures

# List of tables

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## Acknowledgements

My greatest thanks go to my supervisor, Assoc. Prof. Dr. Kati Kõrbe Kaare, for her support, inspiration, sharing her knowledge and experience, and for finding a free moment at any time of the day or night to discuss and guide me on the journey of this doctoral thesis.

I would also like to thank my previous supervisors, Prof. Dr. Alari Purju and Dr. Jelizaveta Janno, for believing in me and motivating to start and proceed the preparation of the doctoral thesis.

I would like to thank Prof. Dr. Ott Koppel, Prof. Dr. Tauno Otto, and Prof. Dr. Dago Antov for their cooperation and valuable feedback.

Special thanks to my family, especially to my 1-year-old son Kenneth, who agreed to take his naps in my arms so that mommy could finish writing her doctoral thesis.

# Abstract

## Enhancing sustainable development of the Estonian maritime sector through policy-making framework

The doctoral thesis poses a question if there is a possibility to develop a maritime policy-making framework to contribute to the enhancement of the fulfilment of sustainable development goals, using the Estonian maritime sector as a case study. The global sustainable development goals (SDGs) agreed upon at the initiative of the United Nations and environmental, social, and governance (ESG) aspects have become important guidelines for the development of the global economy. The European Union (EU) considers sustainable development as one of the core principles and has integrated sustainability goals and related activities into internal and external policies, setting new requirements for companies as well. At the same time, it is known that the SDGs are not achievable by the time established, which is 2030. In order to enhance the achievement of the goals, local policy-making should incorporate sectoral sustainability aspects into policy-making taking into account specificities and using a comprehensive approach.

The maritime sector has an important role in achieving sustainable development considering the sector's large contribution to world trade. Therefore, the doctoral thesis focuses on supportive policy-making from the perspective of the maritime sector. While the integration of the SDGs into policy-making has been at the centre of international politics in recent years, ESG aspects have rather been overlooked. Considering the important contribution of the private sector necessary to achieve the SDGs, the doctoral thesis focuses on the peculiarities of the maritime sector, the integration of the SDGs and ESG criteria in the maritime policy-making process, and the new EU standard for sustainable reporting by maritime companies.

The goal of the doctoral thesis is to develop a maritime policy-making framework that is contributing to the enhancement of the sustainable development of the Estonian maritime sector. The work is based on three main research questions: 1. how to incorporate the maritime cluster concept into the local maritime policy-making process; 2. how a maritime policy should be designed to enhance the sector's sustainable development; 3. which components are part of the sustainable development in the maritime policy-making framework.

The doctoral thesis is based on four published scientific articles, in the preparation of which the author of the doctoral thesis was the main author. The articles address the research topics of the maritime cluster concept in policy-making and maritime policy-making process to support sustainable development. The research articles were published between 2021 and 2022. The main research strategy of the doctoral thesis is a case study based on the Estonian maritime sector and combined research methods were used.

The findings of the doctoral thesis confirmed the established hypothesis. The hypothesis stated that it is possible to develop a maritime policy-making framework that is contributing to the enhancement of the sustainable development of the maritime sector. The findings showed that a maritime policy-making framework with appropriate components and recommendations by use of new methods and techniques allows policy-makers to design, implement, and assess the maritime policy while focusing on sustainability goals, ESG-related aspects, and the maritime sector's specificities.

The framework includes methods and tools that would have important effects on current maritime policy-making activities and policy outputs.

The novelty and practicality of the doctoral thesis are expressed in the relevance of the research topic, both in achieving the goals of international sustainable development and in supporting the development of the Estonian maritime sector through policy-making. The findings of this thesis include new methods and techniques for integrating sustainability-related aspects into maritime policy in such a way that they take into account the specificities of the maritime sector. The proposed policy-making framework can be applied to the policy-making of Estonia and other coastal countries. For the Estonian maritime sector, the direct value of the doctoral thesis consists of policy-making methods suitable for practical use to support the maritime sector, and the indirect value is in the connection of Estonia's identity as a maritime country with activities through maritime policy-making.

# Lühikokkuvõte

## Eesti merendussektori jätkusuutliku arengu toetamine läbi poliitikakujundamise raamistiku

Doktoritöö uurib merenduspoliitika kujundamise võimalusi, et toetada jätkusuutliku arengu tagamiseks seatud eesmärkide täitmist Eesti merendussektori näitel. Ühinenud Rahvaste Organisatsiooni algatusel kokkulepitud globaalsed jätkusuutliku arengu eesmärgid (ingl *Sustainable Development Goals*, SDGs) ning keskkonna, sotsiaal- ja valitsemise (ingl *environmental, social, and governance*, ESG) valdkonna aspektid on saanud olulisteks juhisteks maailma majanduse arengus. Euroopa Liit (EL) peab jätkusuutlikku arengut üheks põhiprintsiipiks ja on integreerinud sellega seotud eesmärgid ja tegevused sise- ja välispoliitikasse seades uusi nõudeid ka ettevõtetele. Samas on teada, et praeguse arengu juures, ei ole SDG-d aastaks 2030 eesmärgipäraselt saavutatavad.

Merendussektoril on väga oluline roll jätkusuutliku arengu saavutamisel arvestades sektori suurt panust maailma kaubandusse, mistõttu keskendub doktoritöö toetava poliitikakujundamise võimaluste uurimisele merendussektori vaatest. Kui SDG-de integreerimine poliitikakujundamisse on viimastel aastatel olnud rahvusvahelise poliitika keskmes, siis ESG aspektid on jäänud pigem tahaplaanile. Arvestades SDG-de saavutamiseks vajalikku erasektori olulist panust on doktoritöö keskmes merendussektori eripärad, SDG-de ja ESG kriteeriumide integreerimine merenduspoliitika kujundamisse ja ELi uus standard jätkusuutliku arengu raporteerimiseks merendusettevõtete poolt.

Doktoritöö eesmärgiks on välja töötada poliitika kujundamise raamistik, mis panustaks Eesti merendussektori jätkusuutliku arengu toetamisse. Töö lähtub kolmest uurimisküsimusest: 1. kuidas integreerida merendusklastri kontseptsioon kohalikku merenduspoliitika kujundamise protsessi; 2. kuidas peaks olema merenduspoliitika disainitud, et see toetaks sektori jätkusuutlikku arengut; 3. millised on jätkusuutliku arengu komponendid merenduspoliitika raamistikus.

Doktoritöö põhineb neljal publitseeritud teadusartiklil, mille koostamisel on doktoritöö autor olnud põhiautoriks. Teadusartiklid käsitlevad uurimisteemasid, milleks on merendusklastri kontseptsioon poliitikakujundamises ja merenduspoliitika kujundamine jätkusuutlikku arengu toetamiseks. Teadusartiklid on publitseeritud aastatel 2021 kuni 2022. Doktoritöö peamiseks uurimisstrateegiaks on juhtumiuuring Eesti merendussektori põhjal ning töö viidi läbi kasutades kombineeritud uurimismeetodeid.

Doktoritöö tulemusena said kinnitust püstitatud hüpotees, millest kohaselt on võimalik koostada spetsiaalselt merendussektorile poliitika kujundamise raamistik, mis panustab sektori jätkusuutlikku arengu toetamisse arvestades SDG-sid, ESG aspekte, ELi uut jätkusuutliku arengu raporteerimise standardit ja merendussektori eripärasid. Välja töötatud raamistik sisaldab merendussektorile sobivaid komponente ja meetodeid ja põhineb traditsioonilisel poliitikakujundamise protsessi teoorial.

Doktoritöö uudsus ja praktilisus väljendub töö uurimisteema aktuaalsuses nii rahvusvahelise jätkusuutliku arengu eesmärkide saavutamisel kui Eesti merendussektori arengu toetamisel läbi poliitikakujundamise. Töö raames töötati välja raamistik koos uute meetodite ja tehnikatega, kuidas integreerida jätkusuutlikkusega seotud aspektid merenduspoliitikasse selliselt, et see arvestaks merendussektori eripärasid ja oleks samal

ajal dünaamiline arvestamaks kohalikke ja globaalseid arengumuutusi. Töö tulemusena pakutud raamistikku saab rakendada nii Eesti kui teiste mereäärsete riikide poliitikakujundamises. Eesti merendussektori jaoks seisneb doktoritöö otsene väärtus praktiliselt kasutamiseks sobivad poliitikakujundamise meetodid merendussektori toetamiseks ning kaudne väärtus on Eesti kui mereriigi identiteedi ühendamine tegevustega läbi merenduspoliitika kujundamise.

# Appendix

**Publication I**

**Nõmmela, K**.; Kõrbe Kaare, K. (2021). Strategic Development of Maritime Related Industries: The Role of Maritime Cluster Researches. In: Proceedings of the 32nd International DAAAM Symposium 2021 (0500−0507). DAAAM International. (DAAAM Proceedings; 1). DOI: 10.2507/32nd.daaam.proceedings.072

DOI: 10.2507/32nd.daaam.proceedings.072

# STRATEGIC DEVELOPMENT OF MARITIME RELATED INDUSTRIES: THE ROLE OF MARITIME CLUSTER RESEARCHES

Kaidi Nommela & Kati Korbe Kaare

**This Publication has to be referred as:** Nommela, K[aidi] & Korbe Kaare, K[ati] (2021). Strategic Development of Maritime Related Industries: The Role of Maritime Cluster Researches, Proceedings of the 32nd DAAAM International Symposium, pp.0500-0507, B. Katalinic (Ed.), Published by DAAAM International, ISBN 978-3-902734-33-4, ISSN 1726-9679, Vienna, Austria
DOI: 10.2507/32nd.daaam.proceedings.072

**Abstract**

Maritime clusters have an important impact on the development of regional industry. A well-functioning maritime cluster can enhance social and economic benefits and innovation on entire surrounding region. The European Union has placed cluster concept to the centre of region's strategic policy planning. Joint implementation of the maritime cluster concept is a way to meet challenges and achieve strategic development goals to increase the competitiveness of industries in a region. At the same time, cluster concept can have different meanings and there are different ways to analyze maritime cluster and it's positive impacts. Researches of maritime cluster related studies in the same area are using different approaches and frameworks. A coherent approach to cluster research has not yet been developed for the maritime sector; such research is incomparable and cannot be used as input for integrated policymaking. The aim of this study was to examine different approaches and monitoring frameworks that describe maritime clusters in the Baltic Sea Region which maritime activities make a significant contribution to the EU's maritime economy. The results of the study emphasize the need to develop a coherent framework of indicators to research and monitor maritime cluster performance as a basis for regional strategic policymaking.

**Keywords:** maritime industries; cluster performance; policymaking; Baltic Sea Region.

## 1. Introduction

Maritime sector have major impacts on the development of maritime related industries in the Baltic Sea Region (BSR) with considerable contribution to the entire economy of the region. Traditional maritime activities and emerging new areas are determining the regional competitiveness and international trade [1]. Maritime sectors offer a significant opportunity for economic growth and the development of the regional industries that rely in particular on cluster concept and innovation driven by green revolution and digital development. The digitalization process has changed the development of the economy through digital technologies affecting the business operations [2]. Enterprises together with regional policymakers are searching for opportunities to improve their performance in order to increase the competitive advantage of the region [3]. In addition, special empathizes in the BSR has also placed on sustainability goals, it is important to plan and be prepared for the future to support maritime sectors as a whole in the European Union (EU), incl. in the BSR [4].

The EU's Integrated Maritime Policy [5] sets strategic maritime objectives for the Union, i.a. maximizing the sustainable use of seas, building knowledge and innovation, improving the quality of life in coastal regions, etc. The Policy identifies maritime cluster as one of the most important instruments for achieving these goals. Although, maritime clusters in the EU are separate clusters, which often compete with each other, joint implementation of the maritime cluster concept is a way to meet the challenges and to increase the competitiveness of the region [6]. In addition, the concept of cluster in policymaking provides an opportunity to achieve jointly the global environmental goals for greener and more sustainable shipping sector as well as EU's target to develop prosperous maritime and related activities in an environmentally sustainable way.

According to Ketels [7], there are different ways to analyze maritime cluster and to explore its advantages and relatedness. Several authors have indicated that cluster concept can have different meanings and it may vary according to context of the study, economic sector, geographical scope, dimensions of a study, etc. [8], [9], [10]. Among cluster concept researchers, there is a well-known fact that common definition of a cluster has not yet been agreed [8], [11], [12], [13] and the debate on what constitutes a cluster is an on-going process in economic research [14]. Consequently, maritime cluster related studies of the same region use different approaches and frameworks for researching and monitoring maritime clusters and these studies are therefore incomparable and cannot be used as a basis for common policymaking to shape strategies and joint goals.

The aim of this study is to examine different methods and monitoring frameworks that describe maritime clusters in the BSR. This study identifies the need for a common methodology to maritime cluster research and monitoring frameworks that could help to achieve joint strategic goals and increase the competitiveness of the region through integrated maritime clusters and policymaking. A comparative analysis was carried out to establish the most relevant aspects and characteristics, which differentiate maritime cluster related studies. Analysis was applied to the maritime cluster related studies of seven Baltic Sea countries: Denmark, Estonia, Finland, Germany, Latvia, Lithuania and Sweden. The focus was to determine the following aspects of the studies revealed from literature review: the main aim of the study, applied cluster definition, study object, methods and main focus area of the study, and to identify differences in approaches and implementations of these aspects in the selected studies.

## 2. Background – The concept of the maritime cluster in European Union's policymaking

In the EU's economy, the implementation of a cluster concept has been an important way of analyzing economic developments and planning future strategies. However, the implementation of the concept is multifaceted, depending on the approach of implementation and the chosen economic theory. Different authors apply different theories in understanding the cluster concept, and the multidirectional knowledge and understanding has also reached to policymaking. The following is a brief background overview of the development and implementation of the maritime cluster concept in EU's policymaking.

In economics, clusters became known in the late 20th and early 21st centuries, when globalization had peaked and economic theories introduced ways to promote geographically concentrated communities to strengthen regional development. So far, there is still no universally recognized standard definition of a cluster [8], [11], [12], [13] and the debate on what constitutes as a cluster is an on-going process [14]. One of the leading academic authorities in this area [12] Professor Michael E. Porter defined clusters as "*geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities. The geographic scope of clusters ranges from a region, a state, or even a single city to span nearby or neighbouring countries.*" [15] Since Porter, several authors has built the definition of a cluster on Porters' concept with own additions, regardless of the study field, aim etc.

The implementation of a cluster concept as a basis for policy has been supported and valued by international associations: the European Union [5], [16], [17]; the World Bank [18]; the Organisation for Economic Co-operation and Development [19], etc. After the EU launched an integrated policy approach to maritime related issues with a focus on cluster concept in the early 2000s, maritime cluster related researches have been carried out throughout the EU, including in the BSR, through various programs, projects and other actions. Although several joint cluster platforms have been set up, and several researches and projects have been carried out to study maritime clusters in the region, they all take a relatively different approach to the concept of a maritime cluster. As a result, there is no common methodology for researching and monitoring maritime clusters that can be used as a basis for creating political strategies. Instead, the research process starts each time from the beginning according to a specific goal, and leads to single-purpose work.

The concept of a cluster first appeared in EU's maritime policy documents in the early 2000s. The European Commission's (EC) Green Paper on towards a future Maritime Policy for the Union (2006) identified clustering as one way to increase the competitiveness of maritime sector, given its high degree of interaction [20]. The Paper emphasized the need for intra-sectoral knowledge sharing, joint research and innovation activities, harmonization of education and training, sharing of innovative technologies and methods, and joint marketing and advertising activities, especially in sectors with a complex supply chain such as logistics and maritime sector. The Integrated Maritime Policy Document (2007) placed maritime cluster at the centre of EU's maritime policy [5]. The Policy encouraged the creation of cross-sectoral clusters and regional maritime centres of excellence and promoted the creation of European network of maritime clusters. The EC Staff Working Document on Maritime Clusters (2007) emphasized the need to integrate regional and national clusters with maritime and environmental aspects in order to contribute better quality and higher standards of European maritime products and services [16].

In 2009, the EC compiled an overview of European maritime clusters with the aim of gathering information on the size, specialization and focus of maritime sectors or clusters in the EU [21]. The paper defined cluster as a part of the maritime sector or region, which was divided into the traditional maritime sector, coastal tourism and recreational activities, and fisheries. This paper highlighted the need to analyze cluster policy and the success of the sector to provide an overview of how the implemented cluster policy has affected the development of the maritime sector. Since this project, the preparation of maritime cluster analysis became popular in the EU Member States, incl. in the BSR countries, although a number of different approaches were used.

The EU's first Smart Guide to Cluster Policy [22] was issued in 2016. The Guide explained the definition of clusters, the economic relevance of clusters and cluster policy, the process of creating a cluster policy, possibilities for monitoring and evaluation of cluster policy, etc. The Guide defined cluster as "concentration of economic activities in groups of related industries in a specific location that are connected through multiple linkages and spill-overs" and highlighted five main characteristics of a cluster: critical mass, related industries, location, linkages and the fact that vast majority of cluster cases are not 'created' [22]. Although the Guide covered all the necessary topics related to cluster policy, it did not contain precise instructions for identifying the existence and the performance of a cluster, but referred instead to the database of the European Cluster Observatory [23], where e.g. only 25 maritime related institutions from Estonia are represented (as of February 2021).

The EU's new Smart Guide to cluster policy was issued in 2020 with the focus on monitoring and evaluating a cluster policy [24]. This Guide defined cluster using Porter's [25] definition: "*geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions ... in particular fields that compete but also cooperate*". The Guide emphasized the complex system of clusters, which rely on formal and non-formal interactions and the multiple variations of cluster policy forms, and highlighted the fact, there is no simple guide to monitor and evaluate cluster policies and each situation needs separate guidance how to deal with challenges in different scenarios [24].

The concept of cluster entered the European maritime policy documents in the early 2000s and since then, its implementation has taken place in different directions. Although the EU has encouraged Member States for the last twenty years to implement the cluster theory and concept in policymaking, different approaches and methodologies have made the process diverse and the results incomparable. The same has happened in the Baltic Sea region, where regional specificities and joint challenges need a coherent approach to regional policymaking, supported by the integrity of the implementation of the cluster concept.

### *2.1 The Baltic Sea Region's maritime sector in the EU*

The Baltic Sea is located in the northern part of Europe and it is one of the densest shipping areas in the world, with around 2,000 ships operating at the same time [26]. The EU's countries around the Baltic Sea are Sweden, Finland, Estonia, Latvia, Lithuania, Poland, Germany and Denmark (see Figure 1, the gross weight of Germany's goods includes only the Baltic Sea part). There are more than 400 seaports on the Baltic Sea, of which more than 90 are of international importance.

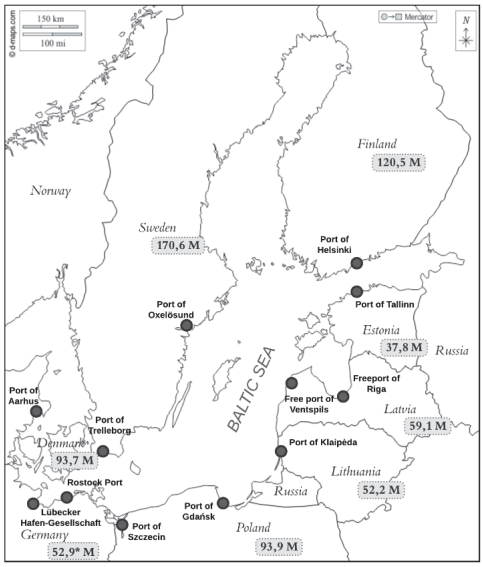


Fig. 1. Map of the Baltic Sea Region with states, major ports and gross weight of goods handled in all ports in 2019 (million tons). Source: d-maps.com [27], Eurostat [28], amended by the authors.

Shipping and other related maritime activities are essential for the BSR development and international trade [1]. The development of the maritime sector in the BSR has always been an important part of the entire EU maritime sector. The BSR is a considerable cargo transit corridor for north-south and east-west traffic. In 2019, the total gross weight of goods handled in BSR main ports was over 586 million tons, which accounted almost 15% of all European cargo traffic through seaports in the same year. Compared to previous ten years (2010–2019), the BSR share of cargo traffic through the main seaports has remained stable (see Figure 2) [29]. In 2019, the total number of passengers transported to and from BSR main ports (both national and international) was over 100 million people, which accounted for 42% of all European passenger traffic through seaports in the same year. Compared to previous ten years (2010–2019), the BSR share of passenger traffic through the main seaports has also remained stable (see Figure 2) [30].

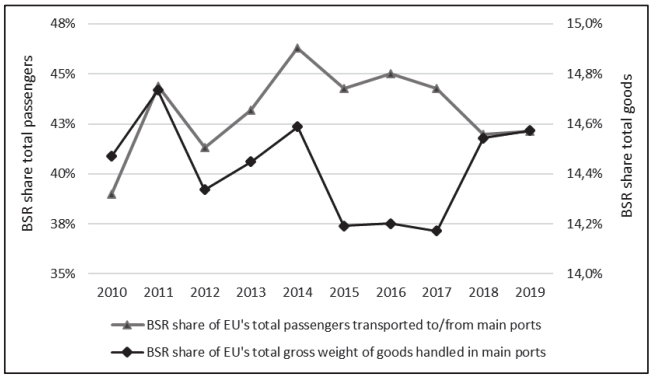


Fig. 2. BSR share of EU's total goods and passengers transported in main ports in 2010 – 2019
Source: Eurostat [29], [30], compiled by the authors

The BSR maritime sector accounts for a significant share of EU maritime affairs. Therefore, it is important that EU's policymaking process takes into account the challenges and development opportunities of the region. The application of the cluster concept in regional policymaking can be of greater value in regions where the development is affected by similar trends. Consequently, it is necessary to identify different methods of defining the existence and describing the current state and performance of maritime clusters in the BSR to increase the competitiveness through integrated maritime clusters and policymaking.

## 3. Methods

The research design of this work is based on the premise that there are several possibilities and different ways to approach a research of maritime cluster, depending on the research object, theme, study objective, methodology, etc. However, to achieve the goals of a coherent policy and to increase the competitiveness of the region, a common approach and monitoring framework to maritime clusters is important. In this work, we compare maritime cluster related studies conducted in the BSR in order to examine different approaches and explore the need for a common methodology to maritime cluster research, which can be a basis for policymaking in maritime sector. Nine maritime cluster related studies were included to this analysis. The maritime clusters related studies in the BSR selected for this analysis are:

- Competencies in the Danish Maritime Cluster: A benchmarking-analysis [31],
- Maritime Cluster Research of Estonia [32],
- The Finnish Maritime Cluster 2004 [33],
- The Finnish Maritime Cluster 2008 [34],
- The Finnish maritime cluster towards the 2020s [35],
- A Differentiation Framework for Maritime Clusters: Comparisons across Europe [36],
- Development of the Latvian Maritime Policy; A Maritime Cluster Approach [37],
- Lithuanian maritime sector's clustering economic impact evaluation [38],
- Maritime Clusters in Västra Götaland [39].

Based on literature review of cluster economic concept, a comparative analysis framework to distinguish main differences between selected maritime cluster related studies was created. A combination of dimension of cluster research was used for the analysis. This framework included different comparison dimensions: 1. main aim; 2. cluster definition; 3. study object; 4. main methods; 5. main focus area of the study. The last contained main characteristics of a cluster proposed by different authors in literature review: workforce (workforce structure and needs); relationships between members; competition; competitiveness; geographical scope; geographical orientation; structure of members; number of members [15], [25], [40], [41].

## 4. Comparative analysis of maritime cluster related studies

A comparative analysis was carried out in order to examine different approaches and monitoring frameworks used in maritime clusters related studies in the BSR. The aim was to identify the main differences and links between the used approaches and the need for a common methodology to maritime cluster research and monitoring frameworks that could be valuable input to policymaking and evaluation in the region. A comparative analysis allows to find out differences in approaches across the main dimensions of cluster analysis and thus explain the impact of the used approaches on the results of the researches. Overview of the results of the comparative analysis is shown in the following table (see Table 1).

| Comparison dimensions | Differences between maritime cluster related studies |
|---|---|
| Main aim | Different in all studies, incl.:<br>• describe the current state and extract main characteristics;<br>• assess future prospects and growth areas, evaluate the economic impact of the cluster;<br>• outline a strategy or plan to further developments of the cluster;<br>• compare the cluster with international maritime clusters, define maritime cluster networks, ensure the continuity of research. |
| Cluster definition | • Porter's definition (1998, 1999);<br>• authors' own definition (mostly, based on different theories and authors). |
| Study object | • In all studies: shipping and shipping related areas, maritime industry (incl. shipbuilding and repair, equipment industry), ports and port operators;<br>• in most studies: maritime related services (transport services, companies related to shipping, maritime logistics, classification institutions, finance and insurance, etc.), public sector (authorities, education, science);<br>• in few studies: fishing and aquaculture, maritime tourism and recreation, offshore technology and marine energy, maritime construction, blue (marine) biotechnology. |
| Main methods | • Literature review, incl. internet research, reports, books and scientific articles;<br>• quantitative analysis of maritime related companies' data, and qualitative analysis, incl. interviews with actors, workshops, seminars, etc.;<br>• benchmarking-analysis. |
| Main focus area | • In most studies: quantitative overview of the cluster, incl. contribution to national economy, number of employees, turnover, number of ships, etc.;<br>• in few studies: current state and overview of the cluster, incl. historic overview, development prospects, future opportunities, growth prospects of the cluster. |

Table 1. Overview of the results of the comparative analysis

All analysed studies had different main aims and focus in certain respects. Majority of studies main aim was to study and describe the current state of maritime cluster in the region based on an overall overview or focusing on specific characteristics. Describing the current situation was generally a common first step in examining a cluster. Multiple studies focused on identifying future possibilities and prospects and providing an analysis for the future growth areas. Other studies were compiled with the aim to outline a strategy or to initiate an action plan for further development strategy or maritime policy. Fewer studies were conducted to describe and evaluate the economic and social impact or value of a cluster. Least studies were conducted to compare maritime cluster of a region with international maritime clusters, to define maritime cluster networks or to ensure the continuity of research (i.e. were a follow-up research to previous cluster researchers).

In defining the cluster, the analysed studies used mainly two approaches: 1. the definitions issued by M. E. Porter in the late 1990s; 2. the authors formulated an appropriate definition themselves (usually, based on different theories and authors). The authors defined cluster mainly as a unit or concentrations of companies that uses maritime related know-how and that interaction are proven to produce advantages. Other authors included to the definition other actors (in addition to companies), such as public authorities, organisations and research institutes. One study defined cluster within a specific regional area, and another defined cluster as geographically concentrated economic activities that are interconnected. As a result, the interpretation of a cluster varies widely in different studies.

Traditional maritime areas have been included to the research object in all analysed studies. These traditional areas include shipping with related fields, ports and port operators and maritime industry, such as shipbuilding and ship repair and marine equipment industry. Most studies also considered as a research object maritime related services, such as maritime logistics, transport services, classification institutions, finance and insurance, etc. Half of the studies included to the research object public sector (authorities, education and science institutions), fishing and aquaculture, maritime tourism and recreation and offshore technology, incl. marine energy. The inclusion of the latter depended in particular on the development of the sector in a specific region. Only few studies included maritime construction and marine (blue) biotechnology to the research object.

The level of description of the research methodology differed in all analysed studies. Most studies referred to literature review and different quantitative and qualitative methods as main data collection methods. The sources of literature review were mainly internet based, reports and scientific literature. Economic data from companies were mainly described as the source of quantitative analysis and interviews with actors and workshops as the source of qualitative analysis. Some studies mentioned benchmarking as the main method of analysis, but the majority did not mention any specific method.

The main focus areas of the studies were also different and depended mostly on the main aim of the study. In most cases, the focus area was a descriptive overview of the current state and historic development of a cluster, or quantitative overview of a cluster's contribution to the national economy, incl. number of members, number of employees, total turnover, number of ships, etc. Mostly used indicators to analyse focus areas were geographical scope and competitiveness of a cluster, which was generally presented in a descriptive way. Workforce and geographical orientation were also used as analysis indicators, but in different level of detail. Relationships between members, structure and the concept of intra-cluster competition was the least analysed indicators in these studies.

The comparison of maritime cluster related studies of the BSR countries showed that there are different approaches to maritime cluster research and monitoring frameworks depending on the main aim of the study, applied cluster definition, research object, methods and focus areas. Majority of studies were carried out to describe the current state of maritime cluster in the region based on an overall overview. Other studies were designed to explore a specific narrow topic. In defining the concept of a cluster, the Porter's definitions or the authors' own interpretation of various explanations of the concept were mainly used. Studies that used Porter's definition took more similar approach to the cluster concept, but the studies that used the authors' own definitions had broader difference in the interpretation of the concept. The research methods varied greatly and did not depend on the purpose or focus of the study. At the same time, the focus area and analysed characteristics depended on the main topic of the study. Geographical scope and competitiveness of a cluster were the most analysed indicators, although they were examined in different ways and mainly descriptively.

All these differences in the approaches and frameworks hinder the use of cluster research in international regional policy-making. The diverse application of the aspects of cluster research described in economic theory makes the results of cluster research incomparable and, consequently, unsuitable input for joint policymaking in the region.

## 5. Conclusion

In the BSR, maritime clusters have an important impact on the development of regional industry. Although, clusters often compete with each other, they also face similar challenges and opportunities at the same time, which can be addressed through joint strategic policymaking. The EU has set common policy goals for the region to enhance the interaction of maritime clusters and policymaking. Although a number of maritime cluster studies have been carried out in the BSR over the years, these studies have used multiple theoretical and methodological approaches, as there is no right or wrong way to apply cluster concept. The results of this study revealed that there are different approaches and monitoring frameworks to maritime cluster research in the region and that these researches cannot be considered as comparable for policymaking. The aim of most researches was to study and describe the current state of maritime cluster in the region based on an overall overview or focusing on specific characteristics. Some studies also had the goal to identify future possibilities and growth areas of the maritime cluster.

As the main purpose of the studies differed, so did the applied cluster definitions, methods and focus areas and analysed characteristics. Many authors defined cluster with Porter's definition from the late 1990s or used their own interpretations of different definitions. Studies that used similar definition (e.g. Porter's definition) took more similar approach to the cluster concept, but the studies that used own interpretations had broader difference. The focus areas of the studies and analysed characteristics mostly depended on the purpose of the work. Although literature review highlights main characteristics describing a cluster, the analysed studies gave an overview of those characteristics that were related to the purpose of their work and did not address other characteristics of a cluster. As a result, there was a lack of a comprehensive understanding of the region's maritime clusters on the basis of cluster characteristics.

One of the dimensions that were similar in most analysed studies was the object of research that depended on the geographical location of a cluster or the national economy rather than on the research approach. As maritime sector is one of the traditional sectors in coastal nations' economy, which covers areas of activity with a long history, thus maritime cluster related studies often examine similar maritime activities as a research object. Most of the studies covered maritime activities, such as shipping, ports and port operators, maritime industry (incl. shipbuilding and ship repair) and maritime related services (incl. maritime logistics, transport services, classification institutions, finance and insurance). Less was studied public sector (incl. authorities, education and science institutions), fishing and aquaculture, maritime tourism and recreation and offshore technology (i.a. marine energy) and marine (blue) biotechnology.

Several joint cluster platforms have been set up, and multiple researches and projects have been carried out to research maritime clusters in the EU and in the BSR. However, due to the wide range of interpretations of the cluster concept, different approaches are still in use. This makes it difficult to implement the cluster concept and its potential benefits and opportunities in policymaking due to the lack of a comprehensive understanding of the current situation and future opportunities of the maritime clusters in the region. Consequently, the authors of this work emphasize the need for a coherent approach to maritime cluster research in the regions where common strategic policy objectives are set and common challenges and opportunities lie ahead.

Although the results of this work have shown that it is necessary to create a common approach and framework for conducting maritime cluster related studies to ensure their comparability, the main aim and focus of the studies are always the decision of the researchers and/or clients. A common framework would not prevent the different aims and focus themes of the studies, but would ensure the comparability of the maritime cluster dimensions and research components, their use as input for policymaking and the possibility of follow-up researches.

As a follow-up to this study, the authors plan to carry out a comparative analysis of the region's maritime clusters based on previously developed monitoring frameworks in order to compare the results of different analysis techniques. Such analysis would provide necessary and comparative overview of the BSR maritime clusters and serve as a basis for identifying competitive advantages of clusters, development trends and future scenarios affecting the region, which will be an important input for cluster policymaking. In addition, the authors also have started to develop a common framework for defining and identifying maritime clusters, which can be used as a basis for analyzing maritime related industrial clusters.

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**Publication II**

**Nõmmela, K**.; Kõrbe Kaare, K. (2022). Evaluating Maritime Cluster Economic Impact: The Maritime Cluster Impact Index. In: Reliability and Statistics in Transportation and Communication (556−565). Springer, Cham. (Lecture Notes in Networks and Systems; 410). DOI: 10.1007/978-3-030-96196-1_51

# Evaluating Maritime Cluster Economic Impact: The Maritime Cluster Impact Index

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**Abstract.** Clusters as an instrument for business and economic growth are playing an important role in the competitiveness of logistics sector, especially in maritime sector. Regional policies, such as the European Union's Integrated Maritime Policy [1] have placed the implementation of cluster concept at the centre of public interventions to promote industries, support their competitive advantages and achieve strategic goals. Different regions interpret maritime cluster concept differently and therefore the role of a cluster in shaping regional policies varies. There are multiple approaches of analyzing maritime cluster and its competitiveness through economic impact [2]. These results are often used as an input to policymaking. The aim of this study in to purpose a new conceptual framework for the evaluation of maritime cluster impact. The core of the proposed concept is maritime cluster impact index that is developed from previous studies on maritime economics and analysis of the Baltic States maritime related policy documents. The index is a tool for policymakers presenting scientific, validated and comparable data on how a maritime cluster affects the strategic performance of a region. The value of the proposed index is the dynamism and its relevance to regional policies and overall strategic objectives. The index includes three indicators: economic impact, socio-cultural impact, and environmental impact. In this work, the economic impact evaluation is carried out as an example based on the Estonian maritime cluster data. The results present how a coherent framework can be implemented in different regions, taking into account the joint policymaking.

**Keywords:** Maritime Cluster, Evaluating Framework, Economic Impact.

## 1 Introduction

Public interventions have major effect on regional economic performance and competitiveness. Regional policies shape the business environment, the conditions for operating and entering, the availability of skilled labour, the export opportunities, etc. Therefore validated and comparable scientific models enable to interpret the structure of the economy, changes in it and the potential impact of policies on regional performance.

One important feature of modern economy is clusters. Clusters are an economic unit consisting of a network of firms (and other related institutions), which are different from sectors or industries. [3] Several economists have studied the impact of clusters on the regional economic performance and reached to a fairly consistent conclusion – clusters drive the productivity and innovation in a region [3-7]. However, regional economic policymaking often overlooks the existence and potential of clusters due to several reasons [3]. The seldom reason is the diverse interpretation of cluster concept and theory among scientists and policymakers.

Maritime sector is part of the logistics sector and presents a complex system, unique development dynamics and international dimensions. The European Union (EU) placed the implementation of cluster concept at the centre of the EU's Integrated Maritime Policy to promote industries and to support their competitive advantages [1]. Whereas the EU has set regional joint goals for the development of the Union's maritime economy, the diverse interpretation of cluster and multiple possibilities for economic performance analysis have led to incomparable and uneven input for joint strategic development plans and policy actions. In order to carry out maritime cluster impact evaluation on a common basis and with comparable results as input for policymaking and evaluation, it is necessary to establish a coherent framework for the impact evaluation of maritime clusters in regions with joint strategic economic goals, such as the EU and the Baltic Sea Region (BSR).

The aim of this study is to propose a new conceptual framework for the evaluation of maritime cluster impact as an input and evaluation for policymaking. The concept of the purposed maritime cluster impact index is based on previous studies on maritime economics and analysis of the Baltic States maritime related policy documents. The index includes three main indicators: economic impact, socio-cultural impact, and environmental impact.

The study presents the policymaking in the Baltic States – Lithuania, Latvia and Estonia. The economic impact evaluation is carried out based on data of the Estonian maritime cluster. The outcome of this work is an important input to further maritime cluster impact research for policymaking in a region with joint strategic goals. The results present how a coherent framework can be implemented in different regions, taking into account joint policymaking.

## 2 Cluster-based Economic Policymaking

Regional economic competitive advantages in modern economy rely mostly on local aspects, such as knowledge and skills, relationships and cooperation, motivation, and productivity with innovation [9]. The governments and public interventions have a major role in shaping these aspects through improving the business environment, fostering entrepreneurship and economic growth, enhancing the competitiveness and supporting the growth of productivity. Economic policy traditionally focuses on two dimensions: improving the general business environment that affects all firms, and benefiting the competitiveness of individual firms and workers [3]. The third dimension is clusters, which allows economic policymaking to be based on the benefits of cooperation and

networking that would affect the whole economy. However, the use of the cluster concept in policymaking is complicated due to its versatility and different interpretations, which make it difficult to evaluate the size of a cluster-based economy and how much policy support for cluster members affects the rest of the economy [10].

Clusters create economic benefits through mainly three dimensions: higher productivity, knowledge spillover, and new business formation [6, 9]. Higher productivity is achieved due to large number of companies and institutions located in the same area [7], which helps to lower cost of inputs to production and increases the output through technological developments driven by cooperation and competition [3]. Proximity allows cluster members to have better access to inputs, employees and suppliers, specialized information, technology, and public goods [9]. Higher economic performance are also supported by knowledge spillover and interaction between cluster members [11]. These are achieved due to the proximity of companies, the connections of firms and research institutions, and close interactions with customers and service providers [6, 7,12]. As cluster members have access to all factors necessary for entrepreneurship, it encourages the formation of new businesses [6, 9]. Cluster often have significant local market and demand on which new companies can build their business models, and therefore, the risks of entry and failure are lower [9]. The emergence of new companies amplifies the clustering benefits and motivates existing companies to improve productivity and increase their competitive advantages.

Developing a cluster-based policy is similar to classical policymaking that consists of five stages [13]: agenda setting, policy formulation, policy adoption, implementation, and evaluation. When traditional sector or industry-based policymaking starts with identifying the problem and setting the goals, the public policy at a cluster level should start with mapping of existing clusters and collecting information about the cluster structure, members, employment and performance [3, 6]. As clusters are not permanent units, but constantly changing communities which development depends largely on the existence and strength of cooperation, the gathering information is a critical step of policymaking. Unlike sectoral or industrial policies, cluster-based policy never tries to solve a problem or achieve a goal in one specific field, but is neutral with regard to economic field or type of activity [3]. Cluster-based policy should aim to leverage all local assets, incl. economic environment, geographic location, infrastructure, labor market, etc. which are open to all clusters in a region [6].

As clusters include not only companies but also institutions from other economic fields, incl. public authorities, schools, banks, insurance companies, etc. [9], the adoption and implementation of policy requires approval of a larger number of authorities. In classical policymaking the evaluation is carried out as final step with the aim of providing feedback to decision makers about the selected policy actions and their impact and to compare the expected and actual results. [13] In cluster-based policymaking the evaluation process should start already at the beginning, after mapping the existing cluster and gathering information about it. The purpose of cluster evaluation should be to specify the conditions of a region where a cluster-based policy is to be implemented and to evaluate the impact of the present and emerging clusters on the economy [6].

There are wide variety of public actions or initiatives that can be implement through policymaking which could benefit the potential of clusters. These initiatives can be leveraging clusters, strengthening clusters, or creating clusters [6]. Leveraging clusters improves the efficiency of regional economic policies through various loan and grant opportunities (e.g. for building industrial parks or upgrading technology) or through labor skill development programs to increase the availability of qualified workforce [6]. Strengthening clusters improves the competitiveness [6] through removing obstacles and relaxing constraints in regulations, and eliminating inefficiencies that impede productivity and innovation in a cluster [14]. The governments should not try to create entirely new clusters by force, instead they should create the business conditions that support the formation of new clusters [9]. This could be achieved through investing in infrastructure, supporting local demand and foreign investments, etc. [6]. Leveraging, strengthening or creating clusters in policymaking never focuses on narrow field, but instead it will benefit numerous cluster members and thus the wider economy [3].

## 3 Methodology

### 3.1 The Concept of Maritime Cluster Impact Index

The aim is to propose a validated and comparable concept of the maritime cluster impact index. The main difference between the proposed index and the World Bank's Logistics Performance Index [15] or the Maritime Cluster Performance Index [8] is the dynamism of the index and its relevance to regional policies and overall objectives.

The successful implementation of a cluster concept in policymaking requires a detailed overview of a cluster's impact on regional policy areas. In this study, the authors analyzed the Baltic States maritime related policies (see chapter 3.2), and grouped the key policy areas into three: economic growth, maritime safety and security, sustainability of cultural heritage and environmental resources. The implementation of policy actions depends on local aspects, such as location and resources, cooperation, knowledge and skills, production and innovation, and governance and legislation [9].

Depending on the policy areas and local aspects, the purposed maritime cluster impact index for the Baltic States maritime economy consists of three indicators: economic impact, socio-cultural impact, and environmental impact. *The economic impact* of the maritime cluster on the performance of a region is based on an analysis of the economic performance indicators of maritime cluster companies: added value, business output, employment, personal income, business activity. *The socio-cultural impact* of the maritime cluster on the social values and cultural heritage of the region will also assess the impact of the maritime cluster on regional security. The evaluation is based on an analysis of the socio-cultural performance indicators of maritime cluster members: number of accidents, results of population welfare survey, unemployment rate, number and diversity of cultural assets, etc. *The environmental impact* of the maritime cluster on the sustainability of the region assesses the sustainable use of local resources, the use of green technologies, the reduction of potential pollution risks, etc. The evalu-

ation uses indicators that assess the environmental behaviour of cluster members according to the environmental factors (e.g. air quality, waste management, pollution control, and water resources, etc.). This study focuses on the part of economic impact of the index.

The evaluation of the economic impact will be carried out based on qualitative and quantitative information in a complementary manner. The impact evaluation is an analysis of the economic performance indicators of maritime cluster companies. These indicators are:

- *Added value* – measure of the value of productivity.
- *Business output* – measure of the productivity through net sales turnover.
- *Personal income* – measure of the personal income per employee in a cluster.
- *Employment* – measure of the number of jobs in a cluster.
- *Business activity* – measure of the attractiveness of the business environment.

The general model of maritime cluster impact index is presented in the following figure (see Figure 1).

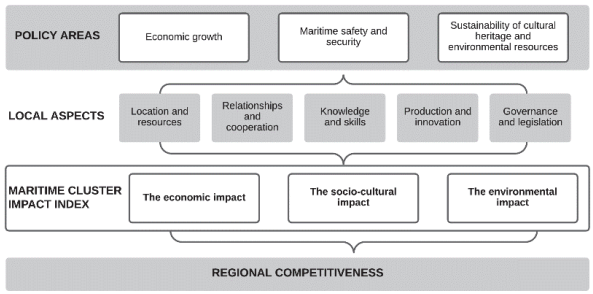


**Figure 1. The model of maritime cluster impact index, compiled by authors**

The results of the economic indicators are compared with cross-regional indicators and with other clusters. The first step of calculating the index includes comparing the results of the economic indicators of clusters with the results of the entire economy in five categories (added value, business output, employment, personal income, business activity). The base value is the average value of the economy. The results are then multiplied by equal weights. As a second step, the results are compared with other clusters, which were analysed with the same economic indicators. The base value is selected among themselves as the highest. All values are then divided by the base value. The results are the economic impact values of analysed clusters in five categories ranging from 0 to 1, where 1 is the highest impact and 0 is the lowest impact.

### 3.2 Case Study

The Baltic States – Estonia, Latvia and Lithuania - are located in the eastern coast of the Baltic Sea. The three countries have long history in maritime field. The largest ports in the Baltic States are Port of Klaipeda (Lithuania), Freeport of Riga (Latvia) and Port

of Tallinn (Estonia). These ports are among the 30 largest ports of the EU in terms of cargo volume with annual cargo turnover 46.3 M tons (Port of Klaipeda), 32.6 M tons (Freeport of Riga) and 19.9 M tons (Port of Tallinn) in 2019 [16-19].

The Baltic States have complied national strategies for the development of the countries' economy and maritime sector. In addition, the EU's development visions are also integrated to these strategies. Based on the documents the main focuses of the development of the maritime fields in the Baltic States are economic growth, competitive business environment, innovative technologies in port operations and in transport security, the well-being of people and their living environment, and the sustainable and environmentally friendly business activities. The regions aim to achieve high living standard and sustainable knowledge based economic growth. These key policy areas were the input for the concept of maritime cluster impact index (see chapter 3.1).

A case study of economic impact evaluation for the purposed maritime cluster impact index is carried out based on the economic data of the Estonian maritime sector with the focus on the clusters around the three largest ports: the Port of Tallinn, the Port of Sillamäe and the Port of Pärnu based on the total cargo volume in 2019. The evaluation concept relies on the cluster theory [9, 15], where companies operating in the same region have closer connections. The results are compared with the Estonian business sector, the Estonian maritime sector as well as with each other.

The analysis includes the economic results of the companies in the Estonian maritime sector based on the national classification of economic activities (EMTAK 2008). The Estonian maritime cluster includes companies with the main economic activity of shipping, ports, maritime service, shipbuilding and repair, yachting and recreation, construction of water projects, and fishing and aquaculture [20]. The evaluation is based on the economic performance analysis of the selected companies located in the same region as the ports. The research period for the economic performance analysis is 2012 until 2019. The economic impact index is calculated for the year 2019.

## 4 Results: The Economic Impact Evaluation of the Estonian Seaport Clusters

The economic impact of the maritime cluster impact index helps to evaluate the economic performance of a cluster in a region as well as in the country. This allows policymakers to take the results into account when developing strategic development plans and evaluating them. Estonian maritime cluster consists of ca. 600 active companies whose main activity during the research period has been related to maritime sector. The main activity in maritime sector has gathered around the Port of Tallinn in Harju County. 71% of maritime sector companies are located around the Port of Tallinn.

The average value added per employee of the Estonian maritime sector is more than twice as high as the national average. The value added of the maritime cluster in the Port of Tallinn region is in correlation with the entire maritime sector's indicator, as the majority of companies are located around the Port of Tallinn. The largest increase in value added growth has been in the Port of Sillamäe region, which has been with the highest added value since 2016. The maritime cluster in the Port of Pärnu region has

also shown growth in recent years, reaching higher than the maritime sector or the Port of Tallinn region in 2019. The economic impact of the Estonian maritime cluster measured through value added per employee is presented in the following figure (see Figure 2).

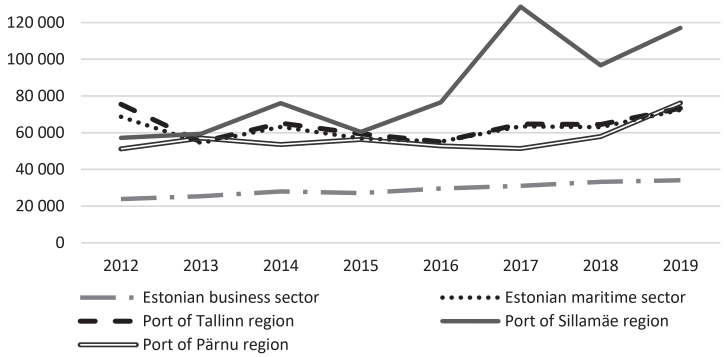


**Figure 2. Added value per employee in 2012-2019, €/year. Source: [21], complied by authors**

The gross income per employee of the Estonian maritime sector is ca. 1.5 times as high as the national average. The personal income of the maritime cluster in the Port of Tallinn region is also in correlation with the whole maritime sector, as the majority of companies are located around the Port of Tallinn. The Port of Tallinn region has the highest income per employee in 2012 until 2019, except in 2018. The indicators of the maritime cluster in the Port of Sillamäe region and in the Port of Pärnu region are generally lower than in the maritime sector, but still on about 1.4 times higher than the national average. The economic impact of the Estonian maritime cluster measured through gross income per employee is presented in the following figure (see Figure 3).

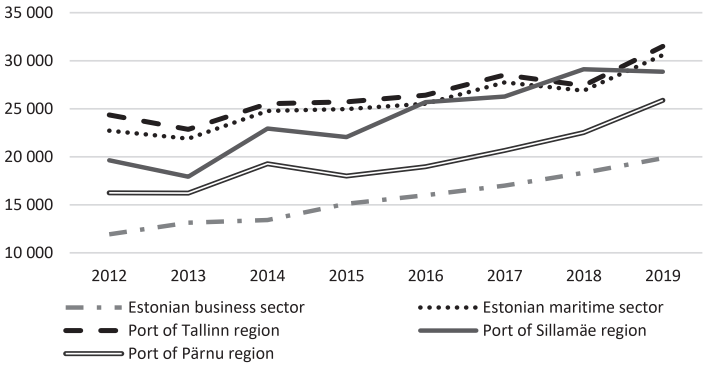


**Figure 3. Gross income per employee in 2012-2019, €/year. Source: [21], complied by authors**

The share of business output of the Estonian maritime sector is on average 2.5% of the Estonian business sector. The share of business output of the maritime cluster in the Port of Tallinn region is ca. 1.7% and the dynamics is in correlation with the whole maritime sector. The business output of the maritime clusters in the Port of Sillamäe region and in the Port of Pärnu region are lower, accounting for an average of 0.06% each. The total number of employee in the Estonian maritime sector is around 6 000 in a year. It represents on average 1.5% of the total number of employees in the Estonian business sector. The maritime cluster around the Port of Tallinn includes on average 80% of the employees in the Estonian maritime sector. The total number of employees in the Port of Sillamäe and in the Port of Pärnu region are significantly lower.

Taking into account the results of the economic indicators, the maritime cluster impact index are calculated for the maritime clusters around the three largest ports in Estonia in five categories. The maritime cluster around the Port of Tallinn has the greatest economic impact in terms of personal income and business activity in 2019. The maritime cluster in the Port of Sillamäe region has the greatest economic impact in terms of added value, business output and employment in the same year. The economic impact of the Port of Pärnu region is slightly lower. The results of the economic impact evaluation of the clusters around the Port of Tallinn, the Port of Sillamäe and the Port of Pärnu in 2019 based on the maritime cluster impact index concept is presented in the following figure (see Figure 4).

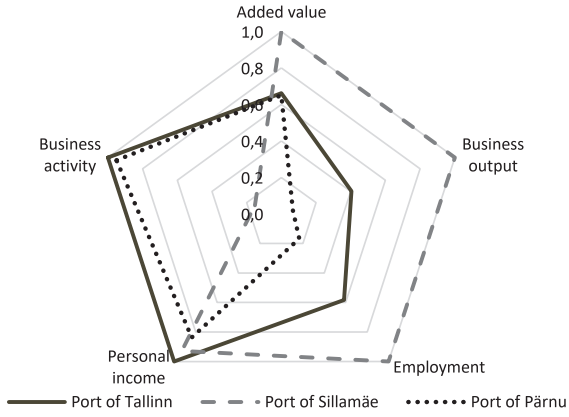


**Figure 4. The economic impact of clusters around the Port of Tallinn, the Port of Sillamäe and the Port of Pärnu in 2019 based on the maritime cluster impact index concept, compiled by authors**

The maritime cluster impact index makes it possible to find measurable values for the economic impact of a cluster in the desired policy areas. In this case study, values were found for the economic impact of the Estonian maritime seaport clusters in five areas: added value, business activity, personal income, employment, and business output. The results of the economic impact assessment show in which policy areas the effects of

maritime clusters are stronger or lower. These results can be used as input in policy-making in different policy areas (e.g. economy, employment, regional, etc.).

## 5 Conclusions

The concept of maritime cluster has different meanings and implementation possibilities. Regional policies, such as the EU's Integrated Maritime Policy emphasize the integration of the cluster concept into policymaking, but due to the different interpretations, the role of a cluster in shaping regional policies varies greatly. In order to make common strategic development plans in regions with joint policymaking, it is necessary to establish a coherent framework for applying the concept of maritime clusters into the policymaking and policy evaluation. This study aims to purpose a new conceptual framework to assess the maritime cluster impact as an input and evaluation for policy-making. The purposed maritime cluster impact index helps policymakers to develop maritime policies based on validated and comparable information on how a maritime cluster affects the performance of a region in terms of strategic development objectives.

The proposed index consists of three indicators: economic impact, socio-cultural impact, and environmental impact, which have been selected on the basis of an analysis of the main policy areas of the Baltic States policy documents related to maritime economics. These indicators allow to evaluate the impact of a cluster performance compared to the existing strategic policy objectives, which makes the index dynamic and relevant to national development plans. The methodological side of the index is based on previous studies of cluster concept and maritime economics research.

The case-study proved that the economic impact part of the index provides a detailed overview of the economic performance of the maritime cluster in different regions according to the selected policy areas. As an example, the impact of maritime clusters around Estonia's three largest ports was compared. The results depicted the extent of the impact of the clusters around the ports in five policy area. This will allow to take into account the impact of the regional performance in policymaking. The results can be used both for maritime policymaking and for setting broader sectoral objectives (e.g. employment, regional development, social affairs, etc.).

Based on the current purposed framework further research can be carried out to study in more detail the socio-cultural impact and the environmental impact of a maritime cluster in a region with joint policymaking. A comprehensive concept of the maritime cluster impact index would allow policymakers to assess the impact in all policy areas and with the common framework. The latter provides an input on an equal basis and with comparable results for cross-regional policymaking, such as at the EU level.

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**Publication III**

**Nõmmela, K**.; Kõrbe Kaare, K. (2022). Maritime Policy Design Framework with ESG Performance Approach: Case of Estonia. Economies, 10 (4), #88. DOI: 10.3390/economies10040088

economies

MDPI

*Article*

# Maritime Policy Design Framework with ESG Performance Approach: Case of Estonia

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**Abstract:** In policy-making, the design of a policy is considered to be one of the most significant steps. A well designed policy will be able to solve sectoral problems across stakeholders as well as support the competitive development of the entire economy. Enterprises of the maritime sector have been influenced by environmental, social, and governance (ESG) changes with the push coming from financiers, insurers, regulators, and customers. To meet the ESG challenges and utilize the benefits ahead, they need to be addressed in the new policy design processes. The specificities of a maritime sector as well as science-based policy-making framework are the fundamentals of successful maritime policy development. Estonia is located on the eastern border of the EU, and has always aimed to be a maritime state. National maritime policy has been adopted (2012–2020) and currently, the Estonian Transport and Mobility Master Plan incorporates maritime aspects. Actors of the maritime sector have remained dissatisfied and advocate the reinstatement and redevelopment of Estonian maritime policy. The aim of this study was to present a framework for the design of maritime policy that uses maritime economics, ESG performance goals, and policy design analyses as inputs. As a result, a maritime policy design framework is proposed.

**Keywords:** policy design; maritime policy; ESG concept; policy framework



**Citation:** Nõmmela, Kaidi, and Kati Kõrbe Kaare. 2022. Maritime Policy Design Framework with ESG Performance Approach: Case of Estonia. *Economies* 10: 88. https://doi.org/10.3390/economies10040088

Academic Editor: Helmi Hamdi

Received: 17 February 2022
Accepted: 6 April 2022
Published: 8 April 2022



## 1. Introduction

Sustainable development with environmental, social, and governance (ESG) aspects has become increasingly important (Egorova et al. 2021), and societies need to be able to adapt to these changes. This requires a joint effort by stakeholders including policy makers, actors from public and private sectors, economic experts, scientists, etc., so that the economic environment can remain competitive (Bochenski et al. 2021). A dynamic and forward-looking policy process plays an important role in creating that environment. Over the years, different theoretical and practical approaches in policy formulation have been developed (e.g., rational model, incremental model, policy output analysis, political system theory, group model, and elite model, etc.) (OECD 2013; Nisa et al. 2021). Given the rapid changes and increasing demands in the ESG aspects in the maritime field (Lee et al. 2019; Koilo 2019; Woo et al. 2018; Lee and Lam 2017), there is a need for a new approach for a policy design framework. This study presents a framework to the policy design process in the maritime sector.

The maritime sector includes shipping, shipbuilding, ports, and fisheries as key maritime activities, and additional activities such as offshore energy, coastal and maritime tourism, etc. (EC 2007). In line with the concept of sustainability, the integration of ESG aspects into policy-making should also consider all areas of the blue economy in the maritime sector. The European Union (EU) has defined the blue economy's sectors as (1) marine-based activities (such as marine living resources, marine minerals, marine renewable energy, desalination, maritime transport, and coastal tourism), and (2) marine-related activities (such as seafood processing, biotechnology, shipbuilding and repair, port

activities, technology and equipment, digital services, etc.) (EC 2021). The EU's Integrated Maritime Policy was launched in 2007 with the invitation to the Member States to draw up national integrated maritime policies following a set of guidelines proposed by the European Commission (EC).

In recent years, the ESG aspects have drawn the attention of policy makers, especially in sustainable finance, to align with social and environmental-related objectives (OECD 2021). Although sustainable development has been one of the key priorities for policy-making for decades, its integration into local policy-making has remained somewhat deficient, as there are no specific requirements at the EU level in relation to the indicators that can be included in policy-making (Camilleri 2015; dos Santos and Pereira 2022). The changes in the ESG sphere have forced stakeholders in different fields (i.e., banking, insurance, investors, customers etc.) to take these aspects into account when making strategic choices. The same has happened in maritime sector—the maritime industry has been increasingly forced to understand the environmental and social consequences of their activities (Lee et al. 2019; Koilo 2019; Lee and Lam 2017). As the maritime sector is aa high capital investment industry, the companies' ESG profile may be crucial for investors in making investment decisions. The strong implementation of the ESG concept has become one of the key aspects for strengthening competitiveness, both at the company and regional level. In order to strengthen the macroeconomic competitiveness of the region, it is necessary to integrate the ESG concept into local policy-making.

Estonia, a country located on the eastern border of the EU by the Baltic Sea, adopted its national maritime policy based on EU guidelines in 2012 after consultation with stakeholders in the maritime sector (Ministry of Economic Affairs and Communications 2012a). After the end of the policy implementation period in 2020, several representatives of the Estonian maritime sector including seafarers, were still dissatisfied with the sector's situation in Estonia and the results of the policy implementation. Currently, the concept of maritime transport policy is annexed to the Estonian Transport and Mobility Master Plan 2021–2035, but the maritime sector advocates the reinstatement of Estonian maritime policy.

The development of a new autonomous Estonian maritime policy should be based on a systemic policy-making framework. The aim of this study was to present a framework for the design of maritime policy with a focus on ESG compliance and maritime economics. In order to develop this framework, the study analyzed the Estonian maritime policy 2012–2020 as a case study. The study resulted in the maritime policy design framework, which can be used as a basis for policy design in the maritime sector, taking into account the ESG concept. The study is an important step in designing successful policies in the maritime sector and thereby contribute to the sustainable development of the maritime economy. The results of this work can be used for the further development of frameworks for the next steps in the maritime policy-making cycle.

## 2. Background

### *2.1. The Concept of Maritime Policy Design*

A maritime state should be able to optimally utilize its potential resources including natural, human, political, and cultural resources as well as potential from a strategic geopolitical environment (Rochwulaningsih et al. 2019). Achieving this will require consistent cooperation between maritime actors (Bochenski et al. 2021) that should be based on a new approach to a policy-making framework.

In different maritime policy analyses, authors have used a variety of approaches in defining the concept of maritime policy. Braid (2005) reviewed Scotland's maritime policy and defined maritime policy as decisions covered by resources that could influence the development of maritime activities. The author stated that maritime policy is usually an outcome of different public policies, and societal, economic, defense, and other interests. Al-Bisher et al. (2012) studied the concept of integrated national maritime policy and its application to Saudi Arabia, and explained the concept as a constellation of interrelated ideas. According to Al-Bisher et al. (2012), the main aim of an integrated maritime policy is

"*to integrate strategic, security, economic and environmental factors in order to deal more effectively with maritime problems and opportunities by a systemic change in the thinking behind maritime governance*". Bochenski et al. (2021) studied the development of major seaports in the context of national maritime policy in Poland and viewed maritime policy as a component of economic policy that enables state authorities to identify major development goals and find measures to achieve them. Kivalov (2021) studied Ukrainian maritime policy and defined maritime policy as program documents such as maritime doctrines and strategies that consolidate the main streams of the development of the maritime sector. Despite the different approaches, the word 'policy' means i.a. a definite course of action with a clear statement of directions including discussions over the pros and cons of solutions to the problems to allow policy-makers to decide on the best way forward. A policy should lead to an outcome being dynamic at the same time to adapt to changing circumstances (EU 2017; Northern Ireland Executive 2016).

The maritime sector is a unique sector that differs from other economic sectors in many ways. Different authors have identified the specificities of the maritime sector that affect maritime policy-making and are important in shaping the policy design framework. These specificities include (Braid 2005; Al-Bisher et al. 2012; Van de Voorde and Verhoeven 2016; Bochenski et al. 2021; Kivalov 2021):

- The maritime sector is interdisciplinary, covering a wide range of sectors including public service, science, economics, technology, sociology, etc., which makes policy-making influenced by the interests of different sectors;
- The maritime sector's solutions should balance the aspects of environmental, economic, social, and governance dimensions, and conflicting interests of the stakeholders;
- The implementation of the maritime cluster concept has an important role in increasing the competitiveness of the maritime sector, thus, the policy should support it through various initiatives;
- The maritime sector includes not only industry, services, and goods but also the living environment of people in coastal areas, the cultural heritage, and historical traditions;
- The maritime sector is a strictly regulated area, both nationally and internationally;
- Activities in the maritime sector are managed not only by public administrations but also by supranational organizations such as the EC, International Maritime Organization, United Nations, etc.;
- The maritime sector has an international dimension that is sometimes in conflict with national interests;
- The maritime sector has an impact on the surrounding area, especially the geographically concentrated area around ports, which makes regional development goals and also impacts an important part of policy-making;
- Marine resources generally belong to the public so their management is the responsibility of governmental entities rather than private entrepreneurs; and
- In the EU, the EU rules must be taken into account when planning maritime activities to ensure any possible support from the EU.

The maritime sector uses long-term and large-scale investments such as shipbuilding or port construction. In theory, a five-step model is usually used to describe the policy-making process in any sector (Figure 1) (Howlett and Giest 2015). The first step is agenda setting, where problems are defined and possible solutions are suggested. The second step is policy formulation, where options are analyzed from different perspectives and possible solutions are selected. As a third step of policy-making, a final formal policy of actions are compiled and preferred solutions are selected by the decision makers. The fourth step is the implementation of a policy that means the implementation of the developed operational program by various parties. The last step is policy evaluation or maintaining the policy, which includes monitoring the results and deciding the necessary next steps (e.g., implementing changes, developing a new policy, etc.) (Howlett and Giest 2015). According to policy analysis, the first steps that include designing the policy are the most important in a successful policy-making process (Walker 2000). The same policy-making cycle can be

applied to maritime policy-making, but given the specificities of the maritime sector, the content of each step could be adapted.

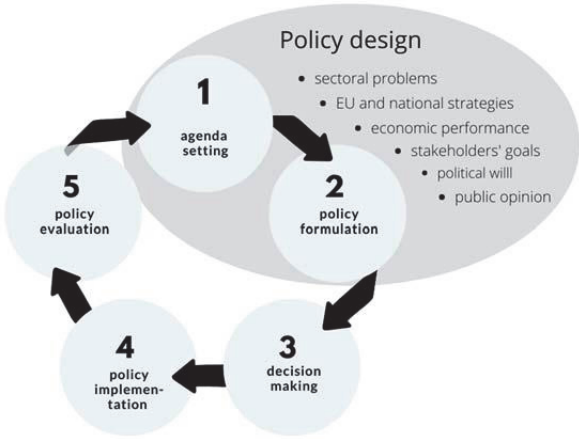


**Figure 1.** Policy design in the policy-making cycle with main inputs (Adapted from (EU 2017); modified by the authors).

Policy-making can be problem-oriented as well as goal-oriented. In a problem-oriented approach, the focus of the policy design is on the persistence of the problem (Bali et al. 2019). Policy design seeks to create different alternatives to policy actions in order to solve identified problems (Howlett 2014). In policy design, the need for policy-making arises when defining and negotiating a problem and different alternatives for addressing it (Haelg et al. 2019). The effectiveness of policy implementation often depends on the accuracy of the problem definition (Walker 2000). Therefore, the effectiveness of the policy results should be the basis of any design (Bali et al. 2019).

The purpose of a policy design is to find alternative combinations from various policy elements that would be the most effective in solving problems and achieving policy objectives (Howlett 2014). There are different policy elements to incorporate (e.g., problems, goals and aims, policy means, tools and instruments) (Howlett 2014; Howlett and Cashore 2009). Policy goals and aims mean what the policy seeks to achieve, and policy means, tools, and instruments are ways that help achieve these goals (Haelg et al. 2019). Analyzing potential policy elements and their impacts on the policy implementation phase is a crucial step in policy design (Howlett 2014). From potential solutions developed during policy design, policy makers choose a complex package to be implemented as policies.

### *2.2. Expectations on Sustainability*

Sustainability has become increasingly important both at the global level and a number of sustainability agreements have been approved internationally. The United Nations Sustainability Development Goals (SDGs) were set in the context of the 2030 Agenda for Sustainable Development (UN 2022). In this document, 17 SDGs were defined addressing the global challenges for sustainable development. Reductions in emissions to limit the global temperature rise to 1.5 °C was agreed at the United Nations Climate Change Conference in 2021 (COP26) (UK Government 2021). The European Commission has proposed cutting greenhouse gas emissions by at least 55% by 2030 in order to become climate neutral by 2050 (EC 2022). All this means that additional regulations for economic activities to cut greenhouse gas emissions and create green jobs are required.

The ESG concept is one of the modern methods of evaluating a company's sustainability aspects through ESG performance indicators (dos Santos and Pereira 2022). The concept can also be used as input for policy-making in order to achieve environmental goals, increase social values, and maintain high quality governance. The ESG topic is at an

early development stage (dos Santos and Pereira 2022) and there are no specific requirements for the ESG performance indicators at the EU level (Camilleri 2015; dos Santos and Pereira 2022). The concept is strongly rooted in the financial and banking sector in decision-making and strategic planning. In these sectors, companies are encouraged to only make investment decisions after fully considering all factors related to the ESG (Tan and Zhu 2022; Egorova et al. 2021; dos Santos and Pereira 2022). The ESG aspects of management have a positive impact on a company's value and competitiveness (Egorova et al. 2021).

The ESG aspects also influence the activities of the maritime sector (Lee et al. 2019; Koilo 2019; Woo et al. 2018; Lee and Lam 2017), but the implementation of the concept is rather deficient (dos Santos and Pereira 2022). Out of the three, environmental and social aspects have received the most attention in policy-making as well as in the literature (Lee et al. 2019). Over the past 30 years, international bodies have paid great attention to the impact of the maritime sector on the environment and provided a number of regulations to protect it (Koilo 2019; Woo et al. 2018; Lee et al. 2019). Due to the proximity of ports and other maritime related services to cities and residential areas, the social aspect has also become a major point of policy focus (Lee et al. 2019). In addition, as the governance of maritime industry, especially seaports, have also gone through major transformations over the past decades (Lee and Lam 2017), the governance aspects also need more attention in policy-making. Therefore, there is an opportunity in policy-making to increase the competitiveness of both companies and the economic sector through the implementation of ESG criteria in strategic decision-making, taking into account the existing regulations and requirements.

The ESG concept recommends companies develop and implement management methods and tools that allow them to measure ESG performance goals (Egorova et al. 2021). For example, the Norwegian Shipowners' Association has published guidelines for ESG reporting in the shipping and offshore industries (Norwegian Shipowners' Association 2021) with proposed indicators to measure the performance of operating in the field. The guidelines suggest that the ESG report should be included in the annual report and additional information can be provided on the company's website. dos Santos and Pereira (2022) proposed a method to quantify the ESG performances of international ports including over 20 metrics to evaluate the ESG score for ports. A similar ESG performance indicator system should be included in the development of any maritime policy, as it concentrates on environmental, social, and governance issues as wide-ranging goals, and at the same time, focuses on local regional issues.

## 3. Materials and Methods

This study was based on the research of policy design and document review of Estonian maritime policy. The work was divided into three stages: (1) data and information collection; (2) literature review; and (3) development of the policy design framework. In the first stage, the most relevant contributions from the literature about policy design and the ESG concept were gathered. Both theoretical works from the scientific literature related to policy-making and policy design and ESG concept, and practical recommendations from the EU and other institutions were used as background information. The stakeholders' views were mapped using publicly available sources. Information was collected from the databases of scientific journals and from the official websites of the EU institutions, and it was summarized and analyzed systematically according to the policy design features. As a result, the possible steps and elements of the policy design framework and their content were shaped. In addition, input was collected related to the case study. Publicly available information was collected from the Estonian e-consultation system and from the websites of the institutions.

The analysis of the gathered documents and the case study was carried out. The prepared initial stages and elements of policy design were compared with those contained in the Estonian maritime policy 2012–2020. The structure and content of the Estonian maritime policy were analyzed based on the main document as well as additional materials (explanatory statement, material for approval, operational program, etc.). The results of the analysis were compared with the theoretical information of policy design, the ESG concept, and the recommendations of the EU institutions.

As a final step, a concept for maritime policy design framework was developed based on the background, the practical recommendations, and the example of the Estonian maritime policy. This policy design framework includes the main elements from the generally used policy-making cycle, adding different components from policy design and ESG theory and maritime sector specificities. The ESG indicators proposed in this study were based on the UN SDGs and background research. Connecting the design concept to the ESG concept ensures that policy design framework is linked to changes in the global economy and frames the overall policy design.

This paper contributes to the body of literature of maritime policy design and implementation of the ESG concept in the maritime sector. The results contribute to the body of literature of maritime policy design in two ways. First, the study contributes on relations between steps of the generally used policy-making cycle and detailed overview of the policy formulation process, and second, by proposing a more precise framework with steps and indicators for maritime policy design. The results also contribute to the implementation of the ESG concept in the maritime sector with the suggestion of ESG performance indicators to evaluate the contribution of the policy to the ESG goals.

## 4. Results

### *4.1. Case Study: The Estonian Maritime Policy*

The EU's Integrated Maritime Policy launched by the European Commission (EC) in 2007 invited Member States to draw up national integrated maritime policies following a set of guidelines. The EC encouraged Member States to establish their own integrated national maritime policies, create internal coordinating structures for a governance framework, allow all maritime stakeholders to participate in the policy-making process, develop cross-border coordination, and share information between Member States (EC 2007). Estonia, a country located on the eastern border of the EU by the Baltic Sea, was one of the Member States who followed the recommendation.

The role of maritime transport in Estonia's economic growth and competitiveness is significant. In 2019, Estonian companies, whose main activity was directly related to maritime sector, had more than 6700 employees and a total turnover of more than €1.2 billion (Estonian e-Business Register 2021). Estonian ports play an important role in the north–south and east–west transit corridors of the EU. In terms of total seaborne goods, Estonia ranked 19th in Europe in 2020 (Eurostat 2021a). Estonia's largest seaport, the Port of Tallinn was, in 2020, the 28th largest port in Europe in terms of gross weight of goods, which accounted for ca. 21.2 million tons (19.6 million in 2019) (Eurostat 2021b), and the 8$^{th}$ largest port in Europe in terms of passengers embarked and disembarked in the port accounted for ca. 4.3 million passengers in 2020 (10 million in 2019) (Eurostat 2021c). The number of active companies and added value per employee of the Estonian maritime sector in 2012–2019 are presented in the following figure (Figure 2).

The official process of the development of the Estonian maritime policy that took into account the EU guidelines lasted from 2009 to 2012. The main goal of the policy was to use and maintain Estonia's marine resources as much as possible and contribute to the development of the maritime sector. The specific activities of the policy aimed to support the development of maritime businesses, improve the safety of shipping and other maritime activities, and protect the marine and coastal environment and cultural heritage (Ministry of Economic Affairs and Communications 2012a). The policy claims to have the maritime issues and their solutions closely interlinked and addressed in a coordinated

manner. In addition, the document included the indication that the EC's Communication on the Integrated Maritime Policy for the EU was also taken into account in the policy-making process (Ministry of Economic Affairs and Communications 2012b). Elements of the Estonian maritime policy document is shown in the following figure (Figure 3).

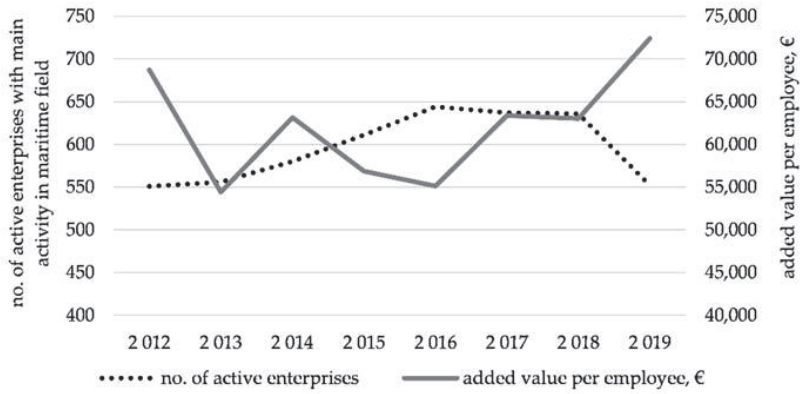


**Figure 2.** The number of active companies and added value per employee of the Estonian maritime sector in 2012–2019 (Estonian e-Business Register 2021, created by the authors).

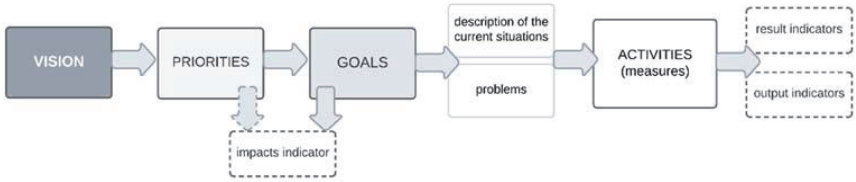


**Figure 3.** Elements of the Estonian maritime policy 2012–2020 (based on Ministry of Economic Affairs and Communications (2012a), created by the authors).

The policy included ambitious priorities, which covered aspects related to the whole sector. For example, the first priority was that the entrepreneurship environment in the marine sector should be entrepreneur-friendly and competitive at the international level. The objectives were also comprehensive and provided a relatively misleading impression that achieving the objectives would guarantee achieving the priorities. The detailed activities under the objectives included specific problems that the policy actually addressed. The document missed an analysis on how the implementation of the quite narrow activities would achieve both the objectives and the priorities.

The policy included different sets of indicators: impact indicators; result indicators; and output indicators. Impact indicators evaluated the effect of priority or objectives. This indicator was the broadest. The policy used result indicators as a description of quantitatively measurable results for policy activities (e.g., turnover growth, value added, number of cargo ships, etc.). Output indicators were also set to assess the implementation of activities (e.g., analysis has been carried out, a situation has been reviewed, contracts have been concluded, a concept has been developed, etc.). The indicator system was unevenly defined, and not all priorities and objectives were covered with indicators, which made the evaluation of the effectiveness of policy more complicated, and could give the stakeholders misleading hope for the overall improvement.

The EU has placed a maritime cluster concept at the center of the EU's integrated maritime policy (EC 2007). According to the EU, the integration of the maritime cluster concept into the national maritime policies is one of the most important instruments (EC 2007). Although there is currently no coherent approach in applying the maritime

cluster concept into the policy-making process, linking the concept to policy-making helps to achieve strategic development goals (Nõmmela and Kaare 2021). The Estonian maritime policy also contained a chapter on a cluster-based approach to maritime affairs, but there was no understanding on how the cluster concept was taken into account in setting priorities, goals, or activities. There was also no overview of the interrelationships among problems, which would provide an idea of how the situation of the sector will improve if the goals are met.

One of the major shortcomings of the policy document is the lack of impact analysis of objectives and activities in relation to other areas and alternative sectors and transport modes. Although the document contained a chapter on links with other national development plans, it mainly included a list of other sectoral development strategies. As a result, a number of activities were not fully implemented due to a lack of agreement between government agencies from different sectors. In addition, although the policy operational program had some changes during the implementation period including cancelling some activities as well as adding new activities, the general directions were not changed during the period. However, given the changing international situation during the implementation period (e.g., the change in Russian transit services after 2014), the policy should have been more dynamic, taking into account of changing circumstances and adapting to these changes (EU 2017).

### *4.2. The Maritime Policy Design Framework*

The maritime policy design framework proposed in this work is based on a problem-oriented approach to policy-making, which means that the definition of a precise problem is at the center of successful policy design (Bali et al. 2019). The more precisely the problems are defined, the more accurately it is possible to design goals and solutions. The key elements of the proposed framework are commonly used policy-making steps, but with an emphasis on sequence and content related to the specificities of the maritime sector. These elements are problems, goals, solutions, performance indicators, and assessment (Figure 4). The framework proposes to evaluate all elements with assessment indicators to measure the overall effectiveness of policy design. The ESG indicators are used as an input to show the performance of the maritime sector in the ESG areas. The same indicators are also used as an output to clarify the compliance of the designed policy to the ESG criteria.

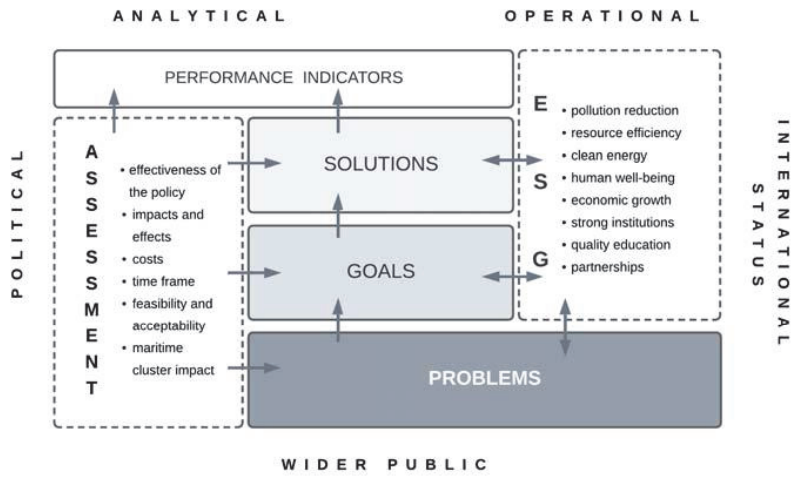


**Figure 4.** The maritime policy design framework (created by the authors).

The maritime policy design framework includes the following steps:

1. Define problems: All stakeholders of the maritime sector must be involved in defining the problems including those operating in other fields but whose activities are maritime related (e.g., financial institutions, insurance companies, etc.). The problems should be divided into what can and cannot be solved by the policy taking into account a particular maritime legal system and requirements of supranational organizations. Problems that can be solved by the policy should then be distributed into what is known how to solve, and what is not known how to solve, involving research and development institutions to interlink cross-sectoral problems. The ESG indicators could be used to evaluate the maritime sector performance to the ESG criteria, which helps to balance environmental, economic, social, and governance dimensions of the problems. The ESG indicators proposed in this study are described below and are shown in Figure 4 and Table 1;
2. Design goals: The second step is to design goals (i.e., what could be the situation in the sector after the policy implementation period has ended). Goals should take into account the interdisciplinarity of the sector and its impact on non-economic aspects of the sector such as the coastal living environment, cultural heritage, maritime historical traditions, etc., and also the international dimension. The goals should also follow the objectives of the ESG concept and the UN SDGs;
3. Design solutions: Solutions should be based on the potential direct and indirect effects of the maritime sector's developments in different areas, particularly environmental, social, and economic. The possible impact of the solutions in geographically concentrated areas should also be taken into account considering the regional development goals. The capacity and content of the investment program is also important in selecting solutions resulting from the characteristic of maritime investments. The solutions should also follow the ESG criteria, as this helps to monitor the potential impact of solutions on the ESG areas. All alternatives that have the potential to solve problems should be considered when defining solutions;
4. Set performance indicators: Performance indicators should be selected according to the level of designed goals; they should not go beyond or diminish the objectives, otherwise the measurement of the policy effectiveness will be distorted. Indicators should be able to accurately measure the achievement of the goals over the policy implementation period. This means setting measurable quantitative or qualitative performance indicators. The system of indicators should be redesigned as part of the design of each policy as indicators need to be directly linked to the goals designed in the current policy; and
5. Assessment of policy design: The last step of policy design is the assessment of the designed policy. The assessment should evaluate whether the policy addresses the problems sufficiently and is able to achieve goals. The assessment indicators proposed in this study are described below and are shown in Figure 2.

The ESG concept is influencing maritime enterprises worldwide and these issues will not fade in the near future. Therefore, it has the strong potential to be a consistent framework for policy design. As the performance of the ESG is assessed by different actors with different metrics (Camilleri 2015; Huber and Comstock 2017; dos Santos and Pereira 2022), a common measurement system should be developed as a basis for maritime policy. This system should be linked to the UN SDGs. This study proposes a list of topics and metrics as measurement indicators for policy design in the maritime sector (as shown in Table 1 with the assessment of the Estonian maritime policy priorities' contribution to the indicators, adapted from the research).

**Table 1.** Estonian maritime policy 2012–2020 priorities contribute (grid), contribute partially (horizontal), no contribution (dark grey), does not contribute, and not applicable (white) to the ESG indicators proposed in this work.

| Group | Goals | Metrics | Priorities of Estonian Maritime Policy [1] | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 |
| Environmental | Pollution reduction | Air pollutants management | | | | | |
| | | Waste management | | | | | |
| | Resource efficiency | Energy consumption | | | | | |
| | | Upgrading infrastructure | | | | | |
| | Clean energy | Renewable energy solutions | | | | | |
| | | Clean energy research and technology | | | | | |
| Social | Human well-being | Jobs creation | | | | | |
| | | Work conditions | | | | | |
| | | Labor rights | | | | | |
| | | Safety and security | | | | | |
| | Economic growth | Technological upgrading and innovation | | | | | |
| | | Supported entrepreneurship | | | | | |
| | | Supported access to financial services | | | | | |
| Governance | Strong institutions | Financial performance | | | | | |
| | | Operational performance | | | | | |
| | | Supported local and foreign investments | | | | | |
| | | Ethics and corruption | | | | | |
| | | R&D | | | | | |
| | Quality education | Career development | | | | | |
| | Partnerships | Local and international connectivity | | | | | |

[1] Priority 1—Entrepreneurship environment in the marine sector is entrepreneur-friendly and competitive at the international level; priority 2—Maritime sector is safe, secure, and contributes to diminished environmental pollution load; priority 3—Public sector activities support the development of the marine sector; priority 4—Maritime education, R&D activities meet the contemporary level requirements; priority 5—Coastal life and visiting environment are attractive and facilitate maritime tourism and the development of local entrepreneurship and passing the maritime sector's cultural heritage to coming generations.

The policy design effectiveness assessment should indicate the quality criteria for final policy decisions by the policy-makers. The assessment should evaluate the main elements of the designed policy and include at least the following dimensions (Klaus et al. 2019, modified by the authors):

- Effectiveness of the policy;
- Impacts and effects;
- Costs;
- Time frame;
- Feasibility and acceptability; and
- Maritime cluster impact.

The effectiveness shows how well the policy addresses the problems and which changes occur compared to the initial situation and the achievable situation. The impact analysis clarifies what the effects of the policy are for different aspects of the stakeholders including different interests. Under effects, both the intentional effects and unintended effects should be explained. The financial costs and cost-effectiveness of the policy including hidden costs also need to be identified. It is also necessary to assess whether the policy can be implemented within the set timeframe, and whether it is technically and operationally feasible and acceptable for the stakeholders. Finally, the designed policy

should be assessed based on the potential impact of maritime cluster to policy areas and the economic development of a region. In order to evaluate this impact, the maritime cluster impact index (Nõmmela and Kõrbe Kaare 2022) can be used. The index is a tool for policy-makers with validated and comparable data on how a maritime cluster affects the strategic performance of a region in selected policy areas, and how policies can guide the development of a maritime cluster (Nõmmela and Kõrbe Kaare 2022). The input–output model of the framework is shown in Figure 5.

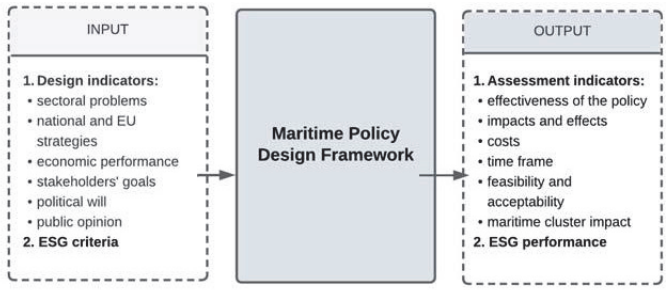


**Figure 5.** Input–output model of the maritime policy design framework (created by the authors).

The policy design framework was based on five pillars: analytical, operational, political, wider local public, and international status. This means that all steps of policy design should be analyzed in each of the five pillars. This part does not differ from any other sector's policy design concept, but validates the need to implement this step, as the context of the pillars are fundamental in the maritime sector. The analytical pillar means that each step should be based on qualitative and sound evidence. There is a consensus among various authors that successful policy-making should be evidence-based (Kano and Hayashi 2021; Bochenski et al. 2021; Northern Ireland Executive 2016), therefore, it is important that each policy design step is analyzed based on high-quality information. In the maritime sector, the availability of detailed reliable information could be a major concern for policy-makers as well as for researchers. Official statistical sources only usually provide aggregated information about regional developments in the maritime sector, and little is known about the situation of shipping companies, port operators, and other maritime actors. Company-based information is only available on the basis of nationally mandatory annual reports, but other information is generally sensitive (Marzano et al. 2020; Ben-Akiva et al. 2016). Although the collection of reliable data is time consuming (e.g., through interviews and surveys) and thus prevents effective policy-making (Marzano et al. 2020), this pillar is fundamental for successful maritime policy design.

The operational pillar ensures that the policy takes into account the capacity and resources of public authorities and private sector to implement the policy. As focused and independent public administration is crucial for successful maritime policy design (Braid 2005; Kivalov 2021), the analysis of the design operational pillar helps to ensure this. The operational pillar includes administrative, financial, technological, and legal capacity, and the level of knowledge and skills of the public and private sectors. In addition, the operational pillar can be analyzed at three levels: individual (institution or company), organizational (public or economic sector), and systemic (the entire region or country) (Wu et al. 2017). In the maritime sector, there are often core companies around which other smaller companies are concentrated. In this case, the operational capability must be assessed both within the group and individually.

In the maritime sector, the marine resources are generally in the public domain and the management is the responsibility of governmental entities rather than private entrepreneurs (Al-Bisher et al. 2012). The maritime sector is a traditional industry that operates in a coastal country without major interventions, but each economic field often needs a policy intervention to overcome challenges, especially in light of strict environmental

requirements. Additionally, as the maritime sector is governed not only by national but also by supranational organizations (Braid 2005), the political aspect is vital for successful policy design. In the political pillar, the policy-makers should analyze and evaluate the design from the perspective of the political situation in a country. In the maritime sector, the lack of political interest can be a major obstacle in policy implementation.

People living in coastal areas are commonly included in maritime sector economic development. In addition to the employment in the sector, traditions and practices in coastal areas make up an important part of the maritime sector's welfare. Therefore, maritime policy has the ability to connect the coastal and maritime area to national needs (Al-Bisher et al. 2012). A successful policy design should always include a wider public pillar with an analysis of perspectives of coastal habitants and their living conditions in a country or a region. Coastal residents should be involved in policy-making given that they are directly or indirectly involved in potential outcomes.

Taking into account that the maritime sector is an international economic field, as the last pillar, a policy design should analyze the steps from the perspective of an international status. As the world's seas are open to all, the maritime sector is governed by international laws and conventions (Bochenski et al. 2021), which must also be taken into account in local policy-making. In the EU, the EU Structural Funds can also have an important influence on policy design (Van de Voorde and Verhoeven 2016; Northern Ireland Executive 2016). In addition, the geopolitical environment should also be analyzed when designing a policy. Unlocking geopolitical potential is essential for a strong maritime state (Rochwulaningsih et al. 2019). The following table (Table 2) indicates the proposed maritime policy design framework and shows some examples of the possible content.

**Table 2.** The maritime policy design framework with examples of content.

| | | **Environmental, Social, and Governance (ESG)** | | | | |
|---|---|---|---|---|---|---|
| | | **Analytical** | **Operational** | **Political** | **Wider Public** | **International Status** |
| Environmental, Social, and Governance (ESG) | Element | Examples of content | | | | |
| | Problems | Extent of the problem | What are the origin and causes? What are the links of the problem? How is the compliance to ESG criteria? | | | |
| | Goals | accessibility; forecast | How are the goals achievable? What needs to be done to achieve the goals? What are the implications of achieving the goals? | | | |
| | Solutions | input to solution development | What are the requirements for implementing? What are the obstacles to implementing? | | | |
| | Performance indicators | accessibility; forecast | How can the achievement of indicators be supported? | | | |
| | Assessment | effectiveness of the policy; impacts and effects; costs; time frame; feasibility and acceptability; maritime cluster impact | | | | |

The policy design framework suggests following the concept of a maritime cluster when defining problems and designing policy goals. All members of a maritime cluster, not just those in maritime sector, should be involved in the policy design process. While the sectoral approach takes into account only the actors in the sector, the cluster approach includes all stakeholders whose activities are related to the sector. These stakeholders mainly include government agencies; shipping companies with partners; ports, cargo handling and shipbuilding companies; academic institutions; local governments; local communities and environmental groups; trade unions; citizens; and media (Branten and Purju 2014). The cluster approach makes it possible to identify sectoral problems and find solutions more effectively as it covers all possible influencing factors (Nõmmela and Kaare 2021).

## 5. Conclusions

The present study examined the concept of policy design in the policy-making cycle and the expectations on sustainability areas in the maritime sector. The increased global focus on environmental, social, and governmental aspect in a well-designed maritime policy process is an effective tool to implement internationally adopted sustainability goals and enhance business development. This study proposed a framework for maritime policy design and explored the integration of ESG criteria in the policy design process by analyzing the Estonian maritime policy 2012–2020 as an example.

This research studied steps of a commonly used policy design process based on a literature review with a focus on sequence and content related to the specificities of the maritime sector. The latter were explained by emphasizing the sector's interdisciplinary and international dimension, the importance of the maritime cluster concept, the strict regulation of the sector, and governmental responsibility, etc. The proposed framework offers policy-makers guidance through the maritime specificities in each step when designing a policy.

The proposed framework is linked to the ESG concept in the maritime sector and the UN SDGs in order to guide the compliance of the designed policy to the ESG criteria. The study presents an example on the evaluation of the policy compliance to the ESG criteria based on the Estonian maritime policy using the ESG indicators proposed in this research. The example shows the contribution of the policy priorities and highlights the points where contribution was weak or missing. The ESG indicators can be used as input to show the performance of the maritime sector in the ESG areas. As a result, the second important policy implication is the replication of the policy compliance example in other countries' national maritime policy design.

In summary, the study adds to the existing literature a new approach to a maritime policy design framework with focus on the ESG performance and maritime economics. The study demonstrated a way to use ESG indicators for the evaluation of the policy's ESG compliance. These indicators can also be used for strategic planning in the maritime sector. The findings of this study highlight the need for a systemic policy-making framework in the maritime sector with emphases on maritime specificities, sustainability aspects, and adopted international goals. For further research, a follow-up analysis for the next steps in the maritime policy-making process could be carried out with a focus on changing demands in sustainability aspects and future challenges in the maritime sector.

**Author Contributions:** Conceptualization, K.N. and K.K.K.; Funding acquisition, K.K.K.; Investigation, K.N.; Methodology, K.N. and K.K.K.; Resources, K.K.K.; Supervision, K.K.K.; Validation, K.N. and K.K.K.; Visualization, K.N. and K.K.K.; Writing—original draft, K.N.; Writing—review & editing, K.N. and K.K.K. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research was funded by the Tallinn University of Technology.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** Not applicable.

**Conflicts of Interest:** The authors declare no conflict of interest.

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**Publication IV**

**Nõmmela, K**.; Kõrbe Kaare, K. (2022). Incorporated Maritime Policy Concept: Adopting ESRS Principles to Support Maritime Sector's Sustainable Growth. Sustainability, 14 (20). DOI: 10.3390/su142013593

*sustainability*

MDPI

*Article*

# Incorporated Maritime Policy Concept: Adopting ESRS Principles to Support Maritime Sector's Sustainable Growth

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**Abstract:** The international maritime sector plays an important part in contributing to the global sustainable economy and plays a significant role in achieving sustainable development goals. A variety of regulations and standards power the sustainability management of the global maritime sector, including the United Nations' Sustainable Development Goals and the European Union's new draft European Sustainability Reporting Standard. Limited research on the potential contribution of maritime policy-making to support sustainable development has led the sector to face multiple challenges. In this study, we analyzed how local policy-making can impact international goals and global sustainable development based on comprehensive datasets of 143 maritime companies. The study recommends the incorporation of sustainability dimensions of the maritime sector into all levels of policy-making and supporting the policy implementation with the local maritime governance structure. A maritime country should have strategic planning objectives that embrace maritime affairs and use the interactions identified between local development and the maritime sector. We propose a framework for maritime policy-making that supports sustainable development. A maturity model for sustainable development in the maritime sector was developed. The results can be used as guidelines for policymakers in planning sustainable development in a maritime country.

**Keywords:** maritime sector; sustainable development; policy framework; European Sustainability Reporting Standard; SDGs; ESG; maturity model

**Citation:** Nõmmela, K.; Kõrbe Kaare, K. Incorporated Maritime Policy Concept: Adopting ESRS Principles to Support Maritime Sector's Sustainable Growth. *Sustainability* **2022**, *14*, 13593. https://doi.org/10.3390/su142013593

Academic Editor: Alessandro Farina

Received: 20 September 2022
Accepted: 19 October 2022
Published: 20 October 2022



## 1. Introduction

In today's world, sustainability is one of the main competitive drivers [1] for economic, environmental, and social welfare. As one of the major contributors to world trade [2–4] and employment [5], the international maritime sector plays a significant role in facilitating sustainable development [3,4,6,7]. Integration of the sustainable development concept into corporate strategies has been inevitable, as the urgent pressure from the environment and growing attention from the social sphere are significant. Sustainable development includes decision making that takes into account the current situation as well as a long-term focus and ensures a fair distribution of the costs and benefits of the development [8]. In the maritime sector, more flexibility is required in managing processes and balancing strategic development and operations with changing demands and increasing expectations.

The maritime sector is unique, differing from other economic sectors due to its specificities [9,10] and special sectoral issues and priorities [5]. Compared to other sectors, the maritime sector stands out primarily for its [5,9–11]:

- Interdisciplinarity.
- Multiplicity of interests.
- International dimensions.
- Volatility due to global demand and supply.

- Strict regulations.
- Strong relations with environmental and social impacts.
- Use of limited and public marine resources.
- Huge and long-term capital investments.
- Management by national and international institutions.
- Dynamism due to complementarity between different transportation modes.

Although the increase in seaborne trade has a positive effect on local economic growth, it also significantly impacts environmental and social aspects [3,4,11,12]. At the same time, there has been limited research on the potential contribution of local maritime policy-making to support sustainable development [9].

The maritime sector has critical value in people's lives and the economy, and it is a major component of the local and regional logistics and transportation system [3,11]. In 2019, blue economy activities (marine living and non-living resources, marine renewable energy, ports, shipbuilding and repair, maritime transport, and coastal tourism) contributed 1.5% in terms of gross value added and 2.3% in terms of employment to the European Union's (EU) economy [13]. Maritime countries are highly dependent on the development of the maritime sector, as it provides resources, offers transportation opportunities, promotes tourism, generates the use of renewable energy, etc. [3]. The main social impacts of the sector are employment and people's material wellbeing, communities' self-identification, and changes in the natural environment that impact local participants [14]. In this research, 'a maritime country' is defined as a country bordering the sea whose economic and social welfare is dependent on the use of the sea, including transport, tourism, food, national security, and other maritime-related activities. In the study, 'the maritime sector' includes maritime-related activities: Shipping, ports, the maritime industry (including shipbuilding and repair), maritime services, and fishing.

The authors of this study recommend incorporating the sustainability dimension of the maritime sector into all levels of policy-making, and supporting the policy implementation through the multi-level structure of the local maritime governance based on a business management style. A maritime country should embrace maritime affairs by identifying the connections and effects between local development and the maritime sector and incorporating them into strategic planning. The framework proposed in this study relies on the concept of a maturity model, which is a management assessment tool with guidance on how to improve the current status. With appropriate approaches and tools, policymakers have the opportunity to lead the sustainable development of a maritime country with successful maritime policy-making.

A much better understanding of maritime impacts on local sustainable development and other sectoral activities is needed for environmental preservation, social satisfaction, and economic prosperity. This approach can unlock new opportunities for sustainable growth by changing the previous ways of sectoral policy-making and dilemmas and aligning national policies with international goals. Currently, the maritime sector is often treated in policy-making as any other economic sector is, which has significant importance in the economic development of the country. However, in a maritime country, the maritime sector extends beyond sectoral boundaries and should be included in all national strategic interests.

The aim of this study is to propose a framework for maritime policy-making to support sustainable development. The study focuses on the most relevant guidelines regulating sustainability development, which are the United Nations' (UN) Sustainable Development Goals (SDGs) and the EU's new draft European Sustainability Reporting Standard (ESRS). In order to achieve the aim, the current status of sustainability reporting of Estonian maritime sector companies was analyzed based on the detailed datasets of 143 maritime companies. We used content analysis and text classification techniques together with a scientific literature review. As a result, a maturity model for sustainable development in the maritime sector and a framework for policy-making to support sustainable

development were developed. The key beneficiaries of the proposed framework are policymakers, including government officials and politicians, maritime interest groups, and researchers. The results can be used as guidelines for policymakers in planning sustainable development and as a basis for further research in maritime sustainability-related studies.

The article is organized as follows: Section 2 presents the general background of sustainability expectations on an international level, focusing on the UN's SDGs and the EU proposals, and highlighting the multiplicity of guidelines. Section 3 provides a literature review of sustainability maturity models and how to incorporate the sustainability concept into strategies. Section 4 describes the methods used in this study. Section 5 presents the findings, i.e., the current status of sustainability reporting in the Estonian maritime sector, the maritime sustainability maturity model, and the framework for maritime policy-making. The findings are discussed and summarized in Section 6.

## 2. Background

To enhance sustainable development, a variety of international sustainable strategies, goals, and standards have been agreed upon at all levels of governance. Local stakeholders and businesses are required to report their sustainability progress in order to evaluate the achievements of these agreements. Businesses that operate globally, including the maritime sector, often face difficulties in choosing and implementing appropriate sustainable management protocols and reporting standards. To achieve the agreed-upon international goals and gain economic growth while maintaining ecosystem services and a healthy environment and society, strong cooperation between all major stakeholders and support from local governmental institutions are required [15–17].

Members of the UN have committed to pursuing coherent policies for sustainable development with the aim to achieve the SDGs, which are the focus of realizing Agenda 2030 [15,18]. The 17 SDGs, with 169 associated targets, set high expectations for all business sectors, including the maritime sector. The responsibility of the maritime sector is primarily seen in SDG 14 "Life below water", but the development of the maritime sector is highly relevant to all other SDGs, for example [19]:

- Contributing to the reduction of maritime-related pollution (SDG 3 "Good health and well-being").
- Minimizing dumping and waste disposal at sea (SDG 6 "Clean water and sanitation").
- Guaranteeing supportive and healthy work environments for seafarers and other workers (SDG 8 "Decent work and economic growth").
- Controlling emissions from the shipping sector and the maritime industry (SDG 13 "Climate action").
- Ensuring safe, secure, and environmentally protective maritime businesses (SDG 16 "Peace, justice and strong institutions").

To perceive the status of sustainable development progress, a variety of sustainability reporting standards, frameworks, and guidelines are in use. According to the European Financial Reporting Advisory Group [20], the most used are different national standards, the Global Reporting Initiative Standards, the United Nations' SDGs and guidelines, the Task Force on Climate-related Financial Disclosures recommendations, the International Labour Organization guidelines, the Organization for Economic Cooperation and Development (OECD) guidelines, etc. In the EU, sustainability-related non-financial statement reporting has received considerable attention since the adoption of Agenda 2030. To increase transparency and improve the quality of the environmental, social, and governmental (ESG) information provided by companies of all sectors, the European Commission (EC) set detailed requirements for non-financial reporting. Large companies and large groups of companies (reporting on a consolidated basis) representing public-interest

entities with an average of 500 employees during the financial year were obligated to include a non-financial statement in their annual management report. This statement included minimum information about the company's development, performance, and position, and the impact of its activity related to environmental, social, and employee matters and respect for human rights, anti-corruption, and bribery matters [21]. The EC recommended that companies may rely on different frameworks when reporting data—national, Union-based, or international frameworks [21].

In 2021, the EU adopted a new proposal regarding corporate sustainability reporting [22]. According to the EC, the current legal framework did not ensure the required information for users, as the reported information was often insufficiently reliable and incomparable between companies, or not provided at all by companies. The primary users of sustainability information (investors, non-governmental organizations, social partners, and other stakeholders) did not receive enough necessary information for decision-making. Furthermore, companies that had to report found it difficult to decide what information to provide because of a lack of precision in the requirements and differences between international and private standards. The proposal recommended extending the scope of the reporting requirements to additional companies, including all large companies and listed companies (except listed micro-companies) [21].

In 2022, the EU proposed a draft for mandatory ESRS. The architecture of the draft ESRS has three layers (sector agnostic, sector specific, and entity specific), three reporting areas (strategy, implementation, and performance measurement), and three topics (environmental, social, and governance). All companies under the scope of the proposal would have to report in compliance with the ESRS. At the time of preparation of this paper, the draft ESRS was in public consultation [23]. The first report complying with the standard by the companies is expected to be issued in 2024 with reference to the reporting year of 2023 [21].

The OECD has developed guidelines for creating coherent policies for sustainable development in order to help to achieve the SDGs globally [15]. As stated in the guide, the main mechanisms for coherent policy development are (1) political commitment, including whole government and foreign affairs; (2) policy coordination and interactions between sectoral policies; (3) a systematic approach to policy effects; (4) involvement of major stakeholders; and (5) monitoring and reporting systems. The OECD's proposed framework is designed for country-specific policies to avoid or minimize the negative spillover effects of various policies between countries [15]. The proposed framework consists of an analytical framework for analyzing coherent issues and identifying interactions among the SDGs and targets, an institutional framework for aligning mechanisms for policy coherence to the 2030 Agenda, and a monitoring framework for tracking the progress of the policy.

As the maritime sector is regulated both on international and local levels, it is obligated to follow cross-sectoral agreements and legislations [9]. In order to manage the expected sustainable development, support from local policy-making is needed. Designing a policy by linking the ESG objectives of the maritime sector in a balanced way plays an important role in supporting sustainable development [15,24]. The absence of such a supportive and incorporative maritime policy will transform the expected sustainable development into separate local and international legal provisions without real results [8].

## 3. Literature Review

### *3.1. Sustainability Maturity Models*

Sustainability requires both internal and external self-evaluation and systematic management from both the private and public sectors [1]. To evaluate the current sustainable status of the maritime sector, which is necessary for policy-making, a structured process and a matrix of practices can be used to define the as-is state and offer guidelines for

decision making [25,26]. In business performance management, the maturity model concept has been widely adopted [25], but there are gaps in the literature in terms of maturity model use in maritime policy-making in relation to sustainability.

As the maritime sector's unique aspects have to be taken into account when developing a maturity model, previous studies provide useful insight into the model components in a different context. There are mainly two types of model levels found in the literature. Firstly, there are levels that combine research content and activities to achieve goals. Housni et al. [27] developed an environmental sustainability maturity system for maritime port managers with five levels: (1) Initial; (2) framework; (3) monitoring and stakeholders; (4) review; and (5) environmental sustainability. Boullauazan et al. [28] introduced a maturity model for smart ports including five levels: (1) Silo (port being fragmented); (2) integration (smart port enabled); (3) supply-chain (digitized); (4) port (intraconnected); and (5) inter-port (inter-connected system). Lütkemeyer et al. [1] developed a maturity model for sustainability in product development. This model includes five levels based on the awareness and use of the sustainability concept: (1) The organization does not know and does not use the concept; (2) the organization knows but does not use the concept; (3) the organization has initial projects or a pilot project that includes this concept; (4) the organization implemented this concept partially or in some areas; and (5) the organization implemented this concept fully or completely in all areas.

Secondly, the literature review reveals model levels that are based on the stages of sustainable development progress. Santos et al. [29] proposed a maturity model for sustainability in the supply chain with five levels: (1) Nonexistent; (2) conscious or aware; (3) intermediate; (4) advanced; and (5) sustainable. Vasquez et al. [30] proposed a sustainability maturity model for micro, small, and medium-sized enterprises with four levels: (1) Insufficient; (2) basic; (3) developing; and (4) consolidated. These levels are more generally used in different contexts and easily adaptable due to changing conditions (e.g., changes in regulations, changing social pressures, emerging new challenges and crises).

The second main component of the maturity models is the dimensions that describe different aspects of the maturity assessment. The most common feature in the dimensions of previously developed sustainability maturity models is an environment-related aspect, e.g., energy and environment, environmental sustainability goals, environmental knowledge management, etc. [1,27–30]. Other dimensions are mostly based on factors focused on in previous research. A few studies have also included the design of policies and strategies among the dimensions of the models [1,27,30]. The results of the literature review supported the development of the maturity model as part of the maritime policy-making framework by demonstrating how a maturity model could provide guidance to successfully achieve sustainability goals, generate a more comprehensive vision, and help address sustainability efforts and actions [1,27–30].

### *3.2. Incorporating Sustainability into Strategies*

The integration of the sustainability concept and the reporting system into maritime policy-making and corporate strategies has been time-consuming [5,16]. While a number of international regulations and guidelines for marine protection have been adopted [7,16], there is still a lack of governance structures for achieving the SDGs [16]. Wang et al. [19] identified two main challenges that are associated with the SDGs implementation into the private sector's actions. Firstly, the SDGs consist of various goals with different relevance in business contexts, and secondly, SDGs are mutually dependent, which makes it difficult to incorporate them into specific business plans and strategies [19]. Consequently, it is important to provide support to the maritime sector through the policy-making framework of government institutions.

The literature review showed that most of the research is focused on sustainable development actions in the private sector and few studies pay attention to policy-making in the maritime sector regarding sustainability matters [6,7]. Nõmmela and Kõrbe Kaare [9]

studied how to design a maritime policy with the ESG approach and proposed a framework for policy design that is the first step of the policy-making cycle. They also exemplified the evaluation of policy compliance to the ESG criteria using the ESG indicators proposed in the same research [9] and proposed an index for the maritime cluster impact assessment as input for policy-making. This index included three indicators: Economic impact, socio-cultural impact, and environmental impact [31]. The literature review also highlighted the importance of integrating multiple intervention levels and dimensions into sustainable development strategies. Different dimensions have a distinct influence on the ability to integrate sustainability into the maritime sector [6], and a multiplicity of levels could be considered important in order to develop more efficient policies supporting a more sustainable maritime sector.

The results of the literature review revealed that the international maritime sector has an important contribution to each SDG [19]. Wang et al. [19] analyzed how the maritime industry can meet the SDGs, and as a result, proposed a framework for the assessment of the SDG implementation status in the maritime industry. Neumann et al. [32] focused on SDG 14 "Life below water", and the results showed that it is necessary to develop various underlying normative approaches, principles, and objectives [32].

## 4. Methods

This study was divided into two main stages: (1) Developing the sustainability maturity model for the maritime sector and testing it on the reporting results of the Estonian maritime sector and (2) developing the framework for maritime policy-making to support sustainable development (Figure 1). The stages were carried out sequentially as the sustainability maturity model was an important input in the policy-making framework.

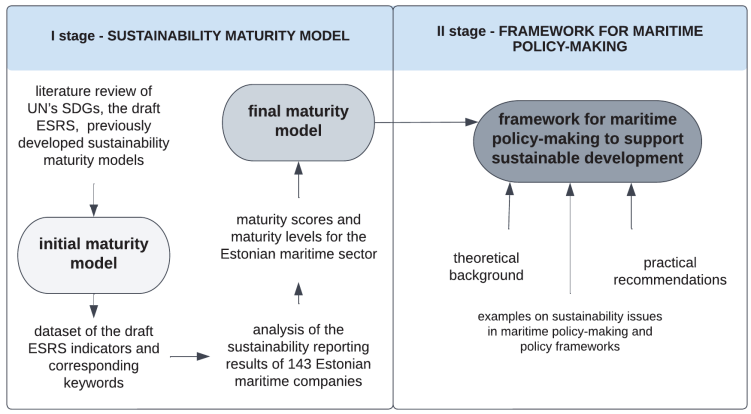


**Figure 1.** The development process of the research.

In the first stage, we focused on the literature review of sustainable development in the maritime sector, including the UN's SDGs and the draft ESRS and examples of previously developed sustainability maturity models. Based on the findings, an initial maturity model was developed. The initial model was tested on the sustainability reporting results of Estonian maritime companies, which were analyzed based on their annual reports. We chose Estonian maritime companies whose main or secondary activity was related to maritime activities in 2021 or 2020 (depending on the submission of the annual report by the company) according to the Estonian Business Register [33]. In cases of secondary activity, at least 20% of the sales revenue of the reporting year had to be from maritime activity in order to be included in the study. The Estonian maritime sector was divided into five sub-

sectors based on the Estonian Classification of Economic Activities, which is the national version of the international NACE classification:

- Shipping.
- Ports.
- Marine industry.
- Maritime business services.
- Fishing.

A sample from the maritime companies was selected that proportionally included large (2.8% of the total sample), medium (16% of the total sample), small (43.4% of the total sample), and micro (37.8% of the total sample) size companies using the number of employees as the criterion (based on the EC recommendation concerning the definition of micro, small, and medium-sized enterprises [34]). The total number of employees of the sampled companies was 5903, of which 23.4% were employees of large companies, 46.8% were employees of medium companies, 24.9% were employees of small companies, and 4.9% were employees of micro-companies. A total of 143 companies from maritime sub-sectors were included in the study (Table 1).

**Table 1.** Characteristics of the sample by sub-sector.

| Maritime Sub-sectors | No. of Companies Included | Total no. of Employees |
|---|---|---|
| shipping | 6 | 739 |
| ports | 32 | 2286 |
| marine industry | 63 | 1980 |
| maritime business services | 34 | 767 |
| fishing | 8 | 131 |

The annual reports of all 143 maritime companies were analyzed using content analysis and manual text classification techniques. The results were entered into a dataset of draft ESRS indicators and corresponding keywords. Each main indicator of the draft ESRS (a total of 13 main indicators) was associated with keywords, thereby creating a system of ESRS indicators (Table 2).

**Table 2.** The draft ESRS categories and main indicators with associated keywords [23], authors' additions.

| ESRS Category | | Main Indicators | Associated Keywords |
|---|---|---|---|
| general | ESRS 1 | general principles | sustainability policy/actions/plans/target, environmental policy/action/plans/targets, etc. |
| | ESRS 2 | general, strategy, governance and materiality assessment | activities, value chain, business model, clients, investors, government, politicians, management, management structure, sustainability impacts/risks/opportunities, etc. |
| environment-related matters | ESRS E1 | climate change | climate change, climate, energy, fuels, energy consumption and intensity, GHG, emissions, etc. |
| | ESRS E2 | pollution | pollution, pollution incident/risks, etc. |
| | ESRS E3 | water and marine resources | water resources, marine resources, water intensity performance, etc. |
| | ESRS E4 | biodiversity and ecosystems | biodiversity, ecosystems, biodiversity-friendly consumption and production, etc. |
| | ESRS E5 | resource use and circular economy | resources, circular economy, waste management, etc. |
| social-related matters | ESRS S1 | own workforce | workforce policy, employees, employment, training, skills, health, safety, etc. |
| | ESRS S2 | workforce in the value chain | value chain workforce/employees, etc. |
| | ESRS S3 | affected communities | communities, surroundings, interest groups, locals, etc. |
| | ESRS S4 | consumers and end-users | consumers, users, clients, etc. |

| | | | |
|---|---|---|---|
| governance—related matters | ESRS G1 | governance, risk management and internal control | governance, nomination process, risk management, control system, etc. |
| | ESRS G2 | business conduct | business conduct/behavior, corruption, competitive, ownership, payments, etc. |

After filling the dataset with our analysis results, the maturity scores were calculated using the following equation:

$$Average_{I,II,III} = \sum_{i=1}^{n} A_{I,II,III}/n_{I,II,III} \quad (1)$$

where *I* is the entire maritime sector, *II* is each main indicator of the draft ESRS, *III* is each maritime sub-sector, *A* is the total score of *I*, *II*, and *III*, and *n* is the maximum score of *I*, *II*, and *III*. The levels of the maturity model were based on the literature review of previous research on sustainability maturity models and the analysis results of the Estonian maritime companies' annual reports (Table 3).

**Table 3.** Explanations of the scores in the sustainability maturity model.

| Model Level | Min Score | Max |
|---|---|---|
| 0—undefined | 0.00 | 0.00 |
| 1—beginner | 0.01 | 25.00 |
| 2—developing | 26.00 | 50.00 |
| 3—progressive | 51.00 | 75.00 |
| 4—matured | 76.00 | 100.00 |

After calculating the maturity scores and finding the maturity levels of the Estonian maritime sector, the final maturity model was proposed with guidelines on how to increase the maturity score with support of policy-making and increase the level while taking into account the peculiarities of the maritime sector.

The second stage of the study included collecting and systemizing information on previous studies of sustainability matters in maritime policy-making. In this stage, the theoretical background from the literature review and practical recommendations from the international organizations' reports were compiled on the policy-making role in sustainable development. By combining the knowledge from previous studies, theoretical and practical background, and the results of the proposed maturity model, a framework for policymakers to support the maritime sector was developed.

This study directly contributes to the literature on sustainability matters in the maritime sector and maritime policy-making. First, the study contributes to the literature by proposing a maturity model for sustainable development in the maritime sector. The model can be used to calculate the maturity levels of the maritime sector in different countries, or as a basis for further research on maritime sustainability maturity models. Secondly, the study contributes to the literature on policy-making by proposing a framework on how to support the maritime sector in sustainable development. This framework can be used as a guide for policy-making in the maritime sector and for further research on the role of policy-making in achieving international and national sustainability goals.

## 5. Results

### *5.1. Current Status of Sustainability Reporting in the Estonian Maritime Sector*

The overall score of sustainability reporting in the Estonian maritime sector based on the analysis was 12.37. With this score, the maritime sector qualifies for the first level of the proposed sustainability model. This was an expected result as the companies with under 500 employees and no public interest are not obligated to report ESG-related indicators or information in Estonia. For each of the main categories of the ESRS (general ESRS, environmental ESRS E, social ESRS S, governance ESRS G), the Estonian maritime

sector had a score of 52.40 in general ESRS and the rest of the scores were below 25.00 (Figure 2). The score of 52.40 places the Estonian maritime sector at level 3 with a general overview of maritime companies' activities. This is due to the obligation from the Estonian jurisdiction according to which, in the annual management report, all companies must disclose their main areas of activity, most significant investments, significant projects and events, etc. [35].


**Figure 2.** The sustainability maturity levels of the entire Estonian maritime sector and sub-sectors of shipping and ports in the distribution of the draft ESRS categories.

Among the maritime sub-sectors, only shipping had a score above the first level—32.05. The scores of the other sub-sectors (ports, marine industry, maritime business service, and fishing) corresponded to the first level. Both the shipping and ports sub-sectors have one company with public interest, which means they have the obligation to report significantly more information on ESG-related matters.

### *5.2. Maritime Sustainability Maturity Model*

Based on the results shown in the previous section (Section 5.1) and the literature review, a sustainability maturity model for the maritime sector was developed (Figure 3). The model has five levels: (0) Undefined; (1) beginner; (2) developing; (3) progressive; and (4) matured. It also has three dimensions: (1) Environmental; (2) social; and (3) governance. In the following, each maturity level of the maritime sector is described, and guidelines for how to increase the maturity score and maturity level are provided.

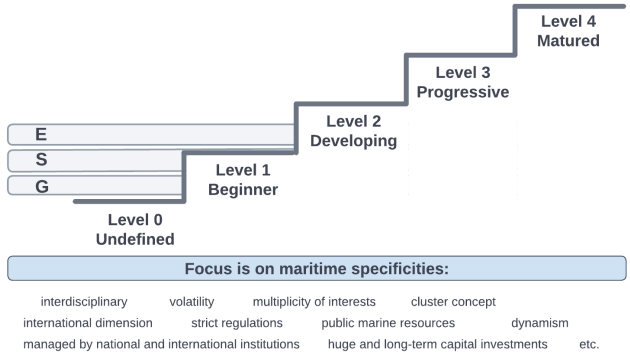


**Figure 3.** The proposed sustainability maturity model for the maritime sector.

The sustainability maturity model is part of the policy-making framework for the maritime sector (Section 5.3). The main steps in increasing the maturity score include (1) explaining the gaps in current policies and action plans; (2) defining the sustainability goals of the maritime sector; (3) designing new or enhancing existing policies; (4) creating commitment by all stakeholders; and (5) reporting and analyzing the progress. As the

maritime sector differs from other economic sectors [9], it is important to take into account the specificities of the sector when choosing the steps to increase the maturity level.

In the 'Undefined' level, the maritime sector has not defined sustainability-related goals and measurable targets or there is a missing reporting system. The sector consists mainly of companies that have not set development plans for sustainable development nor contribute to local and international goals. The reporting results show no progress in the development. In order to increase the maturity score and start contributing to sustainable development, there is a need to identify all international and regional regulations that guide sustainability activities in the maritime sector. As the sector is strictly regulated, both nationally and internationally, and operates in the global market, the rules and standards strongly impact the possible development directions. It is important to use a cluster approach when analyzing the effects of the sector's development as this enables the identification of all possible impacts on the related economic sectors and the surrounding area. Involving all major stakeholders to create a mutual understanding of the actions, needs of the parties, and goals of the sector and the maritime country is the most time- and resource-consuming aspect. The stakeholders should increase the funding of scientific research on sustainability matters in the maritime sector as this creates a basis for development plans and strategic decisions. The next step is designing new and enhancing existing policies with maritime sustainability goals and actions and enacting a reporting system that would help to understand the progress. The final step at this level should be implementing renewed policies and related legal regulations, which change the sectors' obligations related to sustainable development and reporting requirements.

At the 'Beginner' level, the maritime sector has started to take steps toward contributing to sustainable development, and the reporting results show minimum actions. At this level, public institutions have the possibility to support maritime companies by offering training programs in order to raise the awareness of companies' teams and other major stakeholders of sustainability procedures, management's options, impacts, strategic planning, reporting advantages, etc. The public sector should make an effort to involve the highest management teams of the companies in training programs as well as in all main discussions and actions related to sustainable development. As the maritime sector is interdisciplinary, covering a wide range of sectors [9], the companies should be fully aware of the possible interactions and effects of development decisions. When setting strategic plans (e.g., the use of new solutions or technology), the companies as well as supporting public institutions should take into consideration the international dimensions of the maritime sector that sometimes conflict with national interests [9]. It is important that the government funds the construction of sustainable infrastructure as this supports companies to implement the development plans. Therefore, it is possible to direct the companies through changes in the tax structure; however, this requires further research.

In the 'Developing' level, the maritime sector has integrated the sustainability concept into activities and is developing toward sustainable goals with great balance. This means that the majority of companies have set strategic plans and are taking actions to contribute to achieving sustainability goals. The reporting results show constant progress. To increase the sector's maturity score, the public sector should introduce self-assessment tools to the companies. The aim of this step is to encourage the sector to evaluate the results and thereby make necessary changes according to the evaluation. The self-assessment tools should also be able to evaluate the companies' development effects on other economic sectors and surrounding areas. This is especially important for seaport companies located in a geographically concentrated area. The self-assessment tools should support the sustainability reporting systems, as companies can use the results to their advantage as learning tools.

In the 'Progressive' and 'Matured' levels, the sector has gained remarkable awareness of its actions and achieved strong results in sustainable development. The reporting results show progressive findings. The companies' sustainability management programs are functioning, and the planned actions are fulfilling their aims. To support the sector's

development, public institutions should keep evaluating the reporting results in different categories to be aware of the possible shifts and ensure consistent overviews. In order to help the sector, institutions should have development programs for companies whose reporting results show gaps in progress. These development programs should include specific guidelines for designing management processes, strategic planning, operating performance, etc., for the maritime sector. As the sector includes not only industry, services, and goods but also cultural heritage, historical traditions, and coastal life [9], the programs should interact with all these aspects. Public institutions should organize sustainability-related events to keep the awareness level at the maximum and promote the interests of major stakeholders. Although the fourth level is the highest possible level, as the sustainability dimensions change constantly, the sector should be flexible to new development directions.

### *5.3. Framework for Maritime Policy-Making*

This study proposes a new way to achieve sustainable development in a maritime country by incorporating maritime policy into all levels of policy-making (Figure 4). Maritime-related interactions should be included in long-term national strategies, local regional policies, and sectoral policies, and policy implementation should be supported by the multi-level structure of local maritime governance. In a maritime country, the development of the maritime sector has a significant effect on the entire country's economic and social performance, as the dimensions of maritime activities reach beyond the economic sector.

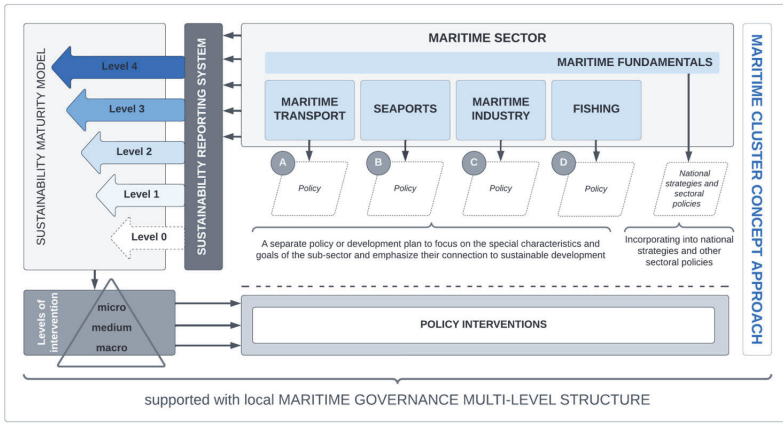


**Figure 4.** The proposed framework for maritime policy.

In the proposed framework, the maritime sector is divided into five components:

1. Maritime transport—sea and coastal freight and passenger water transport.
2. Seaports—ports and waterways operation services and cargo handling.
3. Maritime industry—shipbuilding and repair, offshore industry, including marine renewable energy and marine support activities for oil and gas, engineering, and mining.
4. Fishing—marine fishing and aquaculture.
5. Maritime fundamentals—historical traditions, cultural heritage, coastal life, marine environment protection, etc.

The division is based on previous maritime cluster research in the Baltic Sea region [36] and the economic data of the Estonian maritime sector [33]. The maritime fundamentals are a horizontal dimension of the entire maritime sector that includes the basics of the

maritime sector. The division of the maritime sector into four main economic sectors and one horizontal dimension enables one to design a separate policy or development plan for each sector that focuses on their specificities. The maritime fundamentals should be incorporated into national strategies and local and sectoral policies (e.g., education, science, food, agriculture, energy, security, etc., policies).

The framework proposes supporting the implementation of the policy through the multi-level structure of the local maritime governance, the management of which is coordinated by one responsible institution, but tasks and responsibilities are divided among structures at different levels (ministries, local governments, sub-institutions, etc.). This structure is based on a business management style, and the main benefit is to be able to adapt to changes on an ongoing basis. As government institutions have multiple roles in facilitating SDGs (create expectations and visions; build networks and manage resources; gather knowledge and support learning; support the implementation of activities and policy renewal) [18], the systematic division of tasks and responsibilities between different stakeholders enables one to focus narrowly on achieving the goals. The horizontal and vertical multi-level interdependence created by this approach is an important feature in ensuring the overall sustainable development of a maritime country. In addition, the implementation of this approach benefits from the involvement of a wide range of stakeholders, not only in the policy-making process but throughout the entire implementation, and the dynamism that arises when applying the business management style in the implementation of the policy that is able to adapt to changes on an ongoing basis [37].

To support the maritime sector in sustainable development and to achieve sustainability goals, the public sector has the opportunity to engage on multiple levels (Figure 5). Depending on the level, they can choose from different appropriate approaches and tools. In the proposed framework, the first level is the micro level where support can be offered directly to a sub-sector or a group of companies. In this case, intervention measures can be, e.g., helping to collect information (economic, financial, or strategic assessment, impact assessment and evaluation, modelling, etc.), strategic planning with visioning future scenarios, conflict management, etc. The aim of the support on the micro level is to help companies and groups to understand the impacts and consequences of sustainability-related actions and plans. The second level is the medium level, which includes actions taken by national institutions to support the entire maritime sector and related sectors through local policy planning and mechanisms. The appropriate approaches and tools include policy analysis, engagement of citizen actions, legal tools, etc. The aim of the second level is to establish a political system supporting the improvement of sustainability, which includes specific tools and action proposals. The third and final level to support maritime companies is the macro level. On this level, the policy-makers are able to support local companies through cooperation with international organizations, EU-level actions, and the promotion of foreign cooperation. The appropriate approaches and tools include active support activities in international working groups and projects, preliminary work in the EU decision processes, and other activities beyond local actions.

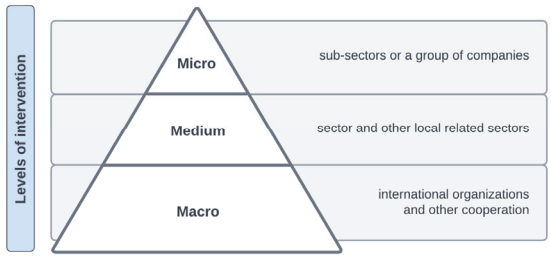


**Figure 5.** Levels of intervention for policy-makers to choose appropriate approaches and tools.

In the proposed framework, first, the maritime sector is incorporated into all levels of policy-making by finding out and understanding the local and international sustainability-related development possibilities and plans, including integrating the SDGs at the national level, existing and possible new regulations, new technology development directions, science and innovation achievements, etc. As the maritime sector is widely regulated at an international level, integrating international sustainability goals into local actions can be a challenge. This means not only incorporating the goals into policy papers and plans but also listing the related activities in year-based action plans and finding ways to support the implementation. This requires reviewing the existing policies and strategic plans to identify the possible gaps and areas that need to be changed or promoted toward sustainability actions. The revision of policies can be performed using the ESG indicators proposed by Nõmmela and Kõrbe Kaare [9] for the assessment of the contribution of maritime policy priorities to the ESG criteria. These indicators measure how the chosen policy priorities and actions contribute to the achievement of ESG criteria related to the SDGs.

To incorporate the maritime sector into all levels of policy-making, setting specific appropriate national and local sustainability goals for each level is required. These goals should be inclusive of the SDGs. This means that maritime-related aspects should be included in all levels of sustainable plans, as the dimensions affect the development anyway. Setting specific and achievable but ambitious targets is an important step, as the final aim should be fully understandable and acceptable by all parties. This step is the most time- and resource-intensive step as it requires a number of strategic analyses and impact assessments and the engagement of all parties, including citizen actions. Setting targets that all parties agree to and understand is one of the cornerstones in the successful achievement of the expected results.

Depending on the sustainable goals, there might be a need to design new policies or change the existing ones corresponding to the agreed sustainability actions. For the four main maritime economic sectors (transport, ports, industry, and fisheries), in the proposed framework, a specific policy or development plan is designed. The maritime fundamentals should be incorporated into existing national, local, and sectoral policies with a focus on sustainable development. As the maritime sector has a number of specificities that affect the policy design process, it is recommended to use the policy design framework that takes this uniqueness into account. Nõmmela and Kõrbe Kaare proposed a specific framework for designing maritime policy with the ESG approach [9]. The assessment part of this framework should be amended using the draft ESRS indicators in order to achieve common and interconnected measurement results. This reduces the possibility of multiple reports by the companies. With the incorporated policies, legal tools and guidelines should be developed in order to direct the sector in the agreed sustainable direction.

The sustainability maturity model developed previously in this research helps to analyze and guide the sector depending on the maturity score and level. After the new or changed policies have been adopted and legal instruments established, the companies have the possibility to amend their corporate strategies and reporting systems according to the plans. If companies have trouble implementing the new recommendations, the public sector has the possibility of supporting their actions according to the maturity level. It is important to motivate companies to make a joint effort. Otherwise, if the companies only report indicators to fill the obligation from the legal action, the actual contribution will remain minimal, and the overall level of sustainability will not change.

One of the important parts of the proposed framework is the cluster approach. By dividing the maritime sector into four main economic sectors and one horizontal dimension, it supports the implementation of the cluster approach in maritime policy-making. When the maritime sector is divided into components that are directly connected but have different specificities and must incorporate them into related national and sectoral policies, the sectors are united and the interactions between otherwise separate sub-clusters are identified. Although the cluster concept can have different meanings and interpretations, there is a need for a common framework with the cluster approach in the maritime

sector that takes into account the similarities in international cluster concepts [36]. In addition, added-value in supporting the maritime sector's development exists by creating a maritime cluster as a legal body based on the cluster concept, which would consist of the largest possible share of maritime sector companies, including core companies, maritime research and educational institutions, creators of innovation, state institutions, etc. The creation of a legal-based maritime cluster can significantly increase the entire sector's potential through cooperation and common knowledge and understanding of sustainable development.

The proposed framework recommends moving policy-making beyond sectoral policies, which could be a reason to separate the maritime sector from other national interests. The novelty is that the maritime sector should be seen as not only one separate economic sector that has a significant effect on a country's economic performance, but also a well-connected component of every maritime country's functioning and achievements. The framework supports the improvement of a maritime country's sustainable development performance since the division of the maritime sector into components in policy-making makes it possible to focus on the specificities of these sub-sectors in relation to sustainable development when setting goals and implementing policy, and the integration of maritime fundamentals into national strategies and other policies maintains maritime as one of the core values of a maritime country at the center of planning all strategic development directions.

## 6. Discussion and Conclusions

In a maritime country, the effects of the maritime sector's development are beyond one economic sector's boundaries, and the role of the sea and related activities are much more profound. Taking into account the specificities and special priorities of the sector, sustainable development requires stable and focused policy interventions that combine bottom-up (from sector to policymakers) and top-down (from transnational organizations to local stakeholders) approaches. The variety of sustainability-related regulations, standards, and guides have made strategic planning and sustainable development management in the maritime sector a great challenge. Currently, sectoral policy-making has been widespread in the maritime sector, but in order to achieve sustainability goals, the adoption of an advanced approach is required. Our proposal is a policy-making framework that would support sustainable development in the maritime sector of a maritime country.

The principal aspects of the proposed framework are the maritime sector's division, applying the cluster approach, and supporting implementation with the multi-level structure of the local maritime governance. Firstly, the study proposes dividing the maritime sector into four main economic divisions (maritime transport, seaports, maritime industry, and fisheries) and one horizontal dimension (maritime fundamentals). This enables one to focus on the main sub-sectors that have the largest effect on sustainability issues and design appropriate policies and assess the implementation results. In practice, the main sub-sectors should be covered with necessary information (e.g., sectoral priorities and goals, economic data, non-financial statements, thematic discussions, etc.) using the cluster approach. The recommendation is to design separate policies or development plans for each main sub-sector to highlight the special needs of the sector in different aspects in order to achieve sustainable development. The horizontal dimension of the maritime sector (cultural heritage, historical traditions, coastal life, marine environmental protection, etc.) should be integrated into national strategies and other sectoral policies by analyzing their mutual effects and connections, thus keeping them in focus as core values in the country's development. In practice, maritime fundamentals may not be fully covered by quantitative information to carry out an assessment of sustainable development progress with the maturity model, but their integration into general strategic plans and priorities of other sectors will also be reflected in the development results of these plans and sectors. The latter also highlights the cluster concept in policy-making.

The multi-level structure of the local maritime governance proposed in this study to support the policy-making process aims to divide the activities and responsibilities related to maritime development such that a broad national commitment to the performance of maritime affairs is ensured while keeping the focus on the set goals and those responsible for their implementation. The strategic development of the maritime sector should be coordinated by one responsible government institution, and tasks and responsibilities should be divided among structures at different levels (ministries, local governments, sub-institutions, etc.). It is important to emphasize that, in practice, the division of activities can lead to responsible fragmentation, but to avoid this, special positions should be created at all levels of the governance structure, all of which would be coordinated by one main institution. This structure is also supported by the integration of maritime fundamentals into national strategies and sectoral policies as it increases the importance and awareness of maritime matters in the country as a whole.

The sustainability maturity model developed in this study is a way to evaluate the results of the maritime sector's sustainable development. The model is designed using the top-down approach from different international sustainability-related guides and agreements, including the UN's SDGs. The draft ESRS is incorporated into the model through an indicator system, which makes the model practical when reporting the results both at international and national levels. When the ESRS is fully completed and adopted, the indicator system can be further modified. The model is practically usable as the maturity scores can be calculated in different categories depending on the needs of the policy-makers. Different maturity levels describe the current situation in the category and the aim is to reach the final level and stay there. The study provides suggestions on how to support the maritime sector at each maturity level. The list of suggestions can be further amended by further studies of maritime sustainability.

The study also provides a three-level policy intervention model on how policy-makers can intervene in the development of the maritime sector and support its activities. The model includes micro, medium, and macro levels. Each of the levels has different intervention recommendations, but the list could be amended by further studies. The aim of the proposed model is to separate the policy interventions as the different levels have dissimilar appropriate approaches and tools. Differentiating the levels provides policy-makers with multiple options to find supporting methods depending on the needs.

Although the results of this study can be incorporated into policy-making practices immediately, the study has limitations that should be taken into account. As the concept of sustainability is wide, the maturity model proposed in this study covers only the most important issues based on international agreements, the draft ESRS, and the UN's SDGs. The sample of the maritime companies included only a limited number of firms because not all companies in Estonia are yet obliged to submit sustainability-related indicators. If the obligation arises, it is possible to increase the number of participants and thereby obtain more information to test the model. The proposed framework has not been tested in real policy-making processes; however, this could be performed in further research.

This study proposes novel practical approaches to supporting the maritime sector in sustainable development to contribute to international sustainability goals. For further research, the proposed framework should be implemented in a maritime country and amended based on the results. Much practice time is required, but it is a valuable next step in maritime sustainability-related research. It is also possible to carry out research in different parts of the proposed framework in separate studies.

**Author Contributions:** Conceptualization, K.N. and K.K.K.; methodology, K.N.; formal analysis, K.N.; investigation, K.N.; writing—original draft preparation, K.N. and K.K.K.; writing—review and editing, K.N. and K.K.K.; visualization, K.N.; supervision, K.K.K.; funding acquisition, K.K.K. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research was funded by the Tallinn University of Technology.

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** Not applicable.

**Conflicts of Interest:** The authors declare no conflict of interest.

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# Curriculum vitae

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**Education**

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| 2014– | Tallinn University of Technology, PhD (maritime transport) |
| 2012–2014 | Tallinn University of Technology, MA (international relations and European-Asian studies), *cum laude* |
| 2012–2014 | Estonian Maritime Academy and Tallinn University of Technology, MSc (maritime studies), *cum laude* |
| 2008–2012 | Estonian Maritime Academy, professional higher education (port and shipping management), *cum laude* |

**Work experience**

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| 2018– | University of Tartu, Johan Skytte Institute of Political Studies, Centre for Applied Social Sciences, project manager-analyst |
| 2015–2018 | Ministry of Education and Research, Adult Education Department, head expert |
| 2014–2015 | Estonian Maritime Academy of Tallinn University of Technology, Research and Development Centre, coordinator of research projects |
| 2011–2013 | Estonian Maritime Academy, Research and Development Centre, researcher |

**Language skills**

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| Estonian | Mother Language |
| English | C1 |

**Publications**


- Nõmmela, K.; Kõrbe Kaare, K. (2022). Incorporated Maritime Policy Concept: Adopting ESRS Principles to Support Maritime Sector's Sustainable Growth. Sustainability, 14 (20). DOI: 10.3390/su142013593
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- Nõmmela, K.; Kõrbe Kaare, K. (2022). Incorporated Maritime Policy Concept: Adopting ESRS Principles to Support Maritime Sector's Sustainable Growth. Sustainability, 14 (20). DOI: 10.3390/su142013593
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ISSN 2585-6901 (PDF)
ISBN 978-9949-83-965-0 (PDF)