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"Regional Environmental Agenda: Port of Baku as a Sustainable Case"- Assessing Port of Baku's Role in addressing the negative impact of port operations and supporting sustainable business practices

Iram Ahmadova, Sabuha Amiraslanova, Ali Mammadov, Ibrahim Hajiyev

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ADA UNIVERSITY

PROGRAM: MA of Diplomacy and International Affairs

STUDENTS' NAMES: Iram Ahmadova

Sabuha Amiraslanova

Ali Mammadov

Ibrahim Hajiyev

APPROVED:

Faculty Supervisor: Lala Jumayeva

Organization Supervisor: Mahammad Aliyev

Dean of the School: Azer Babayev

May 19, 2024

STATEMENT OF AUTHENTICITY

I have read ADA's policy on plagiarism and certify that, to the best of my knowledge, the content of this paper, entitled *Regional Environmental Agenda: Port of Baku as a Sustainable Case"- Assessing Port of Baku's Role in addressing the negative impact of port operations and supporting sustainable business practices* is all my work and does not contain any unacknowledged work.

Signed: Iram Ahmadova

Signed: Sabuha Amiraslanova

Signed: Ali Mammadov

Signed: Ibrahim Hajiyev

May 19, 2024

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UNCTAD- United Nations Conference on Trade and Development .....Error! Bookmark not defined.

SDG-UN Sustainable Development Goals .....Error! Bookmark not defined.

PM-particulate matter .....Error! Bookmark not defined.

UN GC-UN Global Compact .....Error! Bookmark not defined.

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LIST OF ABBREVIATIONS

- ADB – Asian Development Bank
- CAAP – The Clean Air Action Plan
- CDP – Carbon Disclosure Project
- COP29 – Conference of the Parties 29
- CSRD – Corporate Sustainability Reporting Directive
- EPF – The Eco Ports Foundation
- ESG – Environmental, Social, and Governance
- ESPO – European Sea Ports Organization
- EU – European Union
- GHG – Greenhouse Gases
- GRI – Global Reporting Initiative
- IMO – International Maritime Organization
- LNG – Liquefied Natural Gas
- MSCI – Morgan Stanley Capital International
- NOx – Nitrogen Oxides
- PERS – Port Environmental Review System
- PM – Particulate Matter
- SASB – Sustainability Accounting Standards Board
- SDG – UN Sustainable Development Goals
- SOx – Sulfur Oxides
- TAIEX – The Technical Assistance and Information Exchange Instrument of the European Commission
- TCFD – Task Force on Climate-related Financial Disclosures
- UN – United Nations
- UN GC – UN Global Compact
- UNCTAD – United Nations Conference on Trade and Development
- UNFCCC – The United Nations Framework Convention on Climate Change
- VOCs – Volatile Organic Compounds
- WBCSD – World Business Council for Sustainable Development

Abstract

Ports are essential entry points for the flow of marine trade and transportation during fast globalization and the unrelenting movement of products across boundaries. Although ports are essential in global trade and transport, the damage they cause to the environment is also inevitable. The "Green Port" project, which aims to reduce the environmental damage caused by ports, has attracted significant interest as a proactive response to increasing environmental concerns and the need for sustainability in port operations. The Port of Baku, which has a crucial position today in global connectivity, is one of the ports with Green Port certification. Considering that the shift to green port projects is not without difficulties, this research aims to analyze the challenges of implementing green port projects in the Port of Baku. The study has revealed that to carry out green port projects and decrease the negative impacts of port operations, there is a lack of technical advancement, investment, skill awareness, or experts in the field. The study proposes policy solutions for each challenge - an attractive investment climate, implementing skills development and technical advancement standards, private sector involvement in port operations, a standardized approach to sustainability reporting, and Port of Baku performance verification. These solutions are evaluated based on five main criteria: effectiveness, efficiency, equity, feasibility/implementability, and flexibility/improvability. The research drew upon secondary data sources and conducted semi-structured interviews with experts in the field. The analysis and assessment indicate that the Port should implement sustainability reporting frameworks to enhance green port projects. These frameworks are essential for effective sustainability management and for boosting the Port's appeal to investors.

Keywords: Green Port, Port of Baku, Investment, Sustainability, ESG, Environment, EcoPorts, Caspian Sea, Middle Corridor

CHAPTER 1. INTRODUCTION

From the beginning of maritime commerce, ports have been essential to countries' social and economic advancement. “The efficiency of a port directly affects the economies of the countries it serves since more than 80% of global trade is carried by sea. The percentage is even higher for many developing countries” (UNCTAD, 2022). Ports facilitate the passage of products across borders by acting as essential linkages between countries and regions. As the main point of contact for imports and exports, they handle various commodities, from raw materials to completed goods. “Ports directly impact economic growth by attracting businesses and investments. The presence of a well-functioning port can lead to the development of industrial zones and logistics parks, generating employment opportunities for local communities. Ports are essential for establishing efficient transportation networks. They are connected to various modes of transportation, including railways, highways, and pipelines, facilitating the smooth distribution of goods to inland destinations” (World Maritime Academy, 2023).

Nevertheless, because of their potential effects on the environment, they also raise specific questions about their surroundings. Air, water, and land environmental impacts can result from port operations. “Air pollution is a significant concern at port facilities. Mobile sources at ports release pollutants including particulate matter (PM), nitrogen oxides (NOx), sulfur oxides (SOx), volatile organic compounds (VOCs), and air toxics” (U.S. Environmental Protection Agency,

2023). Additionally, the health of marine life and the purity of the water might be significantly affected by port operations. Marine life may be damaged by waste from ships and other port operations, which may cause habitat regions to disappear or deteriorate. GHG emissions from the shipping sector account for many of the world's emissions (U.S. Environmental Protection Agency, 2023).

Therefore, the industry must seek to employ green port projects to lessen its influence on the environment and attain sustainability. These programs cover various topics, from waste management and sustainable fishing methods to utilizing green technologies and renewable energy sources (Identec Solutions, 2023). Sustainable development and green concept operations became crucial as a need and remedy to prevent the environmental degradation of port operations. It takes a collective effort, a long-term goal, and an overwhelming dedication of all port stakeholders to become a green port. Therefore, it is not a simple objective. By reducing its use of energy and emissions, a green port can lessen its adverse ecological effects and carbon footprint. By offering a safer and cleaner workplace, a green port may enhance the health and well-being of its employees.

To achieve a more sustainable environment and decrease the negative impacts of port operations, “The EcoPorts project has been established as a main environmental initiative of the European port sector. It was initiated by many proactive ports in 1997 and has been fully integrated into the European Sea Ports Organization (ESPO) since 2011” (EcoPorts. About, n.d.). In 1997, the concept of EcoPorts first surfaced as a result of the European Community research program ECO-information. ESPO facilitated connections and exchanges with experienced practitioners in the port sector, and other academic and industrial partners joined them. The ECO-information project's goal was to create and test a specific information system that would help port authorities and ports

of all kinds manage their environmental impacts. This system needed to be feasible, economical, and environmentally friendly. Following this, "The Eco Ports Foundation (EPF) was established in 1999 by a group of European ports as a non-profit organization to provide a networked platform for the continuation into the future of the products and services developed through the ECO-Information project and other European cooperation projects on sustainability in ports. In 2002, port administrations took one more step by starting ECOPORTS, a 3-year cooperation project on 'information exchange and impact assessment for enhanced environmental conscious operations in European ports and terminals.' The ECOPORTS project, with 24 partners, was granted an amazing €2.7 million subsidy from DG Transport (project budget €4.1 million)" (EcoPorts.com, 2017). The principal objective was to standardize the environmental management strategy used by port administrations throughout Europe and to share best practices and experiences about environmental challenges related to ports.

"The consortium included over 100 European ports in three years of study. The certification system (Port Environmental Review System) was successfully developed in cooperation with Lloyds Register. The PERS certificate was issued for the first time in 2003 to the Dover Harbour Board, and the first Environmental Code of Practice of the European Seaports Organization ESPO (2003) was largely based on the findings and shared values of the ECOPORTS network. On 1 January 2011, the EcoPorts Foundation dissolved, and EcoPorts was officially integrated into the European Sea Ports Organisation (ESPO) structure. The integration started a new era regarding port environmental management and sustainability in Europe" (Port Technology Team, 2019). Over the years, the European port industry has made significant advances in environmental management, primarily thanks to the long-standing strong collaboration between ESPO and EcoPorts. All concerned parties enthusiastically embraced the new course of action, which was

anticipated to advance environmental conservation and sustainable development by utilizing voluntary self-regulation. “There are 34 EcoPort in Europe, including the most active ports in Rotterdam and Barcelona” (EcoPorts, 2017).

According to an expert on Sustainable Development Initiatives, in 2016, the Port of Baku started working with the EU Flagship Partnership; in the framework of this partnership, the port has implemented 9 TAIEX projects (the Technical Assistance and Information Exchange instrument of the European Commission), enhancing green port operations and Middle Corridor. Especially after the restrictions on the Northern Corridor, COVID-19, and many other unexpected situations, the EU considers the Caspian region, particularly the Port of Baku, a critical element for future operations and sustainability projects. Consequently, the role of the Middle Corridor has increased in the region. The Northern Corridor is under sanction because of the war between Russia and Ukraine, and the Ocean Route is also too long; additionally, right now, the taxes are incredibly high in the Suez Canal, and there are dangers in that route, such as pirate attacks, etc., the Middle Corridor has emerged as a critical element of global connectivity. The trans-Caspian International Route, also the Middle Corridor, spans over 4,250 km of railway lines and 500 km of the seaway connecting Asia to Europe through various countries, including Kazakhstan, Uzbekistan, Turkmenistan, Azerbaijan, Türkiye, the Black Sea, and the Caspian Sea, constitutes excellent importance for new shifts in the world, and Azerbaijan’s Port of Baku is the central part of this connectivity (From personal communication with the specialist on Sustainable Development Initiatives, April 2024).

With the increasing importance and gaining attention from the EU, Baku International Sea Trade Port, located on the ancient Silk Road connecting Europe and Asia, became one of the 34 ports in Europe and “the first port in the Caspian region to receive the PERS – EcoPorts certificate of the

European Sea Ports Organization (ESPO), since 2019. The Harbor Environmental Analysis System (PERS) is a specific standard for raising awareness of the harbor environment in Europe and helping ports achieve sustainable development goals. Baku Harbor closely cooperates with the European Union in operational efficiency, harbor management, environment, and risk management policies. It already has ISO 9001: 2015, OHSAS 18001, and ISO 14001 certifications. In addition, it has incorporated the UN Sustainable Development Goals (SDGs) in business processes and operations" (Port Technology Team, 2019). The Caspian region is a hub for crucial transportation connections and a significant exporter of economic and energy resources. Numerous countries have a strategic interest in the region because of its favorable geopolitical position; as the oldest and largest port in the Caspian region, the Port of Baku also plays a crucial role in the region's maritime trade (Akbulaev, 2019).

Baku Port, as the principal marine gateway to Azerbaijan which has played a significant role in the Caspian trading for more than a century, being the first Eco Port in the Caspian Region, attempts to reduce the risk of accidents by managing factors that are detrimental to occupational health and safety. It also promotes a healthy and secure working atmosphere. Furthermore, it demonstrates that the Port of Baku is a conscientious organization that seeks to maintain both economic growth and the welfare of its employees. "The Port of Baku has completed the implementation of several projects crucial for the development of modern infrastructure and creation of a clean environment, including:

• The Green Port Concept of the Port of Baku was developed;

• The Port of Baku was assisted in obtaining an "EcoPorts" environmental certificate;

• A Road Map and a relevant Work Plan were prepared for the implementation of the Green Port Concept of the Port of Baku;

• Study tours were organized to the member states of the European Union (Netherlands and Belgium) for the staff members of the Port of Baku to familiarize them with the green port practices;

The main goal is implementing a comprehensive quality management system in port facilities by investing in environmentally friendly technologies and sharing knowledge with other ports worldwide" (portofbaku.com, n.d.).

By investing in environmentally friendly and sustainable practices in all aspects of the maritime sector, a green port extends beyond traditional port operations. While every port has its perception of what constitutes sustainable operations, innovative green technologies and low- or zero-carbon alternatives to fossil fuels and energy-intensive terminal facilities are available. Globally, transnational maritime and shipping coalitions bring together supply chain stakeholders to collectively reduce energy consumption and carbon emissions (Buzinkay, 2023).

Within the Partnership with the EU framework, the Port of Baku has developed the climate action plan or the net-zero emission plan by 2035. Based on this action plan, the port has been granted the first Eco-Port certificate in the Caspian region. In 2021 and 2023, the Port of Baku has recertified, which means that every year as a port, you should achieve the goal of getting the recertification once in two years. In August 2022, owning an active member status, the Port of Baku was the first public organization in Azerbaijan to join the UN Global Compact, reaffirming its commitment to responsible and sustainable business practices. The port has targeted 11 SDGs out of 17. The next milestone for the Port of Baku is achieving the ESG strategy assessment in the port's history. The Port of Baku aims to convert into the first public entity from Azerbaijan to create an Environmental, Social, and Governance strategy and achieve net-zero emissions by 2035. The ESG strategy is now the main issue on the agenda of the Port of Baku, which is focused on

environmental, social, and governance strategies. The ESG strategy consists of sustainable finance and investment (From personal communication with the Sustainable Development Initiatives Project Manager, April 2024).

However, transforming into an eco-port is a long and challenging process that brings many obstacles. The Port of Baku, almost newly joined to the EcoPort project, inevitably faces these difficulties, despite its best efforts to implement green port projects to transform itself into an eco-port, which will be covered in this capstone project. Overall, this capstone project would seek to analyze the current green projects and port operations in the Port of Baku and provide relevant recommendations and solutions to the Port based on reliable qualitative data.

1.1. Methodology

This project applies a qualitative research approach and provides sufficient data to analyze and investigate the current problem. The capstone project aims to study the role of Green Ports in decreasing the detrimental effects of port operations, highlighting the case of the Port of Baku. This section provides details of the data collection methods, including the significant constraints and the general structure of the paper.

Three interviews were conducted to learn more about the problem and collect primary data. Considering the fact that the Port of Baku has been green since 2019, there is a lack of expertise in this sector in Azerbaijan. For this reason, all three experts interviewed were representatives of the Port of Baku. The two interviews were conducted with ~~the~~ project management specialist, the environmental engineer of the Port of Baku, and the program manager for the Sustainable Development Initiatives Project in the Port of Baku. The third interview was also conducted with the Infrastructure and Equipment Department Head. A different set of questions was prepared for

that part of the interviews. The first reason was that, to delve deeper into the technological issues, it was necessary to find out the current situation in the world and the port of Baku with an expert in this field. Taking into account the current deficiency of specialists in the field of green port projects in our country in general, the lack of information on green port projects, as well as considering the fact that green port projects both for the Port of Baku and the country are pretty new, it was necessary to fill the gaps in technology-related information in particular.

Once the consent forms were given to the interviewees, the interviews were recorded for transcription and coding, comparison of the information collected with secondary data, and evaluating all views on this topic. All three interviews were conducted in two languages: Azerbaijani and English.

The first set of interview questions was as follows:

1) What is the strategy of the Port of Baku for achieving Green Port goals, and what are the main challenges to achieving them?

2) Could you provide insights into the plans for aligning the sustainability reporting practices with globally recognized standards such as GRI to attract investors and meet the expectations of key stakeholder groups?

3) How does the Port of Baku plan to address the gaps in its sustainability reporting practices, particularly in providing material disclosures such as energy consumption, greenhouse gas emissions, waste generation, and community engagement?

4) To enhance the credibility and reliability of the port's sustainability reporting, what plans does the port have to work with third-party assurance providers in the future?

5) What financial mechanisms has the Port of Baku utilized to fund its transition to a green port (e.g., green bonds), and how effectively have these initiatives attracted investment?

6) Could you provide examples of any awards, certifications, or recognitions the Port of Baku has received for its environmental achievements and commitment to sustainability, highlighting external validation of its efforts?

Questions prepared for the Head of the Infrastructure and Equipment Department are presented below:

1) What limitations in the current infrastructure impede the adoption of green technologies at the Port of Baku?

2) What are the main constraints in integrating renewable energy systems into the Port of Baku's operations?

3) How does the Port of Baku manage the complete electrification of equipment and vehicles at the Port of Baku as a Green Port?

4) Are there any challenges in adopting intelligent and autonomous technologies at the Port of Baku?

5) What are the key issues in achieving and maintaining regulatory compliance due to technological limitations at the Port of Baku?

6) What skill gaps in the workforce hinder the operation and maintenance of advanced green technologies at the Port of Baku?

For secondary data, existing literature on the subject, including academic papers and articles, and reliable websites, was used for this research. In addition, the paper benchmarks the experience of other green ports worldwide. It examines the public information on green port operations to fully understand the drivers and barriers to transforming into green ports.

Regarding the study limitations of this final project, the first difficulty was finding experts to interview, as the Green Port project is an entirely new experience for the country and the Port of Baku itself. Therefore, it endeavored to collect primary data as best as possible. Furthermore, secondary data and previous research were limited as the capstone project focused on an almost newly implemented project for the Port of Baku. In developing this project, problems such as the lack of experts in the fields of green port, sustainability, and environment etc. in the country, the busy schedules of the existing experts, and the scheduling of interview dates were unavoidable.

This final paper consists of five chapters that analyze the main obstacles and look for solutions to attracting foreign investment to the Port of Baku. The first chapter proposes an introduction, which presents the abstract aspects that made the choice of this exact investigation more difficult, as well as the methodological part. Chapter II explains the issue and possible causes of the problem. Chapter III reviews the possible solutions and policy options that could be used to solve this problem. Furthermore, Chapter IV presents the policy options and analyzes which option might be the most appropriate alternative. Finally, Chapter V focuses on the project findings, the overall conclusion, and a suggestion for resolving the problem we are currently facing.

Chapter 2. Problem Description

The contaminants that lead to poor air quality and respiratory problems can be released during port activities, especially from ships, trucks, and cargo-handling equipment. Sustainable technology and practices, such as switching to cleaner fuels, enacting emission control laws, enhancing waste management, and safeguarding natural ecosystems, are necessary to address these environmental problems. Today, as our world struggles with climate change, green ports seem to be one of the most reasonable solutions in the face of global shipping operations that severely damage the environment and the planet's water resources. Therefore, it is imperative to thoroughly examine port development procedures to ensure they align with sustainable practices. In this regard, the Port of Baku's shift towards sustainability encompasses a range of transformations, including the procurement and implementation of new infrastructure, the adoption of electric equipment, and the implementation of waste recycling initiatives. Sustainably conducting these actions necessitates meticulous planning and reporting to mitigate adverse environmental effects (Buzinkay, 2023). The transformation of outdated ports into eco-friendly centers has several difficulties, as shown by the Port of Baku's journey towards becoming a green port. Significant financial resources, technological innovation, and strategic planning are needed for this shift. One significant obstacle is the high initial cost of green technology, which might discourage investment because of its delayed payback times and erratic returns. Obtaining funds from public and corporate sectors and international organizations is essential but complex. Additionally, As the first Green Port in the Caspian, the Port of Baku is dedicated to ESG standards and plans to decarbonize by 2035. Nevertheless, the company's sustainability reporting procedures do not comply with internationally accepted guidelines, and essential metrics, including energy usage,

greenhouse gas emissions, and trash production, are not fully covered. Inconsistent reporting can result in problems with credibility, lost investment opportunities, and charges of greenwashing. This chapter analyzes separately each of those financial and technical challenges and insufficient reporting standards that could prevent the Port of Baku from implementing green port projects, examining the policies and solutions that have been implemented till now and their current status.

2.1. Lack of technological advancement in the Port of Baku

This larger story lays the groundwork for comprehending the difficulties of converting conventional ports into revolutionary, eco-friendly centers. It can be achieved by obtaining insights into the global marine industry's attempts to strike a balance between expansion and protecting the environment through technical innovation and financial optimization by looking closely at the particular tactics used by Baku Port. The methodical, piecemeal approach adopted by Baku Port provides a realistic example of how to build sophisticated infrastructure under budgetary and schedule restrictions; this situation is replicated in port operations globally. With the transition of ports worldwide towards more sustainable operations, known as "green ports," a wide range of technological challenges should be addressed. They encompass several dimensions of port operations and are faced worldwide, albeit with local, national, and international nuances that influence the approach and urgency of implementation efforts. Initially, adapting existing port infrastructure to accommodate and integrate green technologies constitutes a significant barrier. This process often requires extensive modifications to both physical structures and systems to support equipment such as electric cranes and automated guided vehicles, including air emission

reduction targets, along with the deployment of advanced IT systems for operational efficiency in the case of the Port of Los Angeles (EPA, 2021).

Amid such diverse challenges, the aspect of financial support for green initiatives emerges not only as an obstacle but as a fundamental determinant of the pace and scale at which such technological transformations can take place. This narrative is vividly illustrated in the context of the Port of Baku, located in the heart of the Caspian Sea, which reflects the broader global struggle and aspiration to transform itself into a green port.

The first step in this approach involves upgrading and modernizing the port infrastructure to facilitate the incorporation of green technologies. Therefore, while these upgrades require vital changes, updating outdated systems and buildings to adapt them to new technologies remains an arduous process that demands significant financial resources and careful planning (From personal communication with the Head of the Infrastructure and Equipment Department, April 2024). A further critical aspect of technological renewal lies in the transition to renewable energy sources. The Port of Baku, like many others aspiring to sustainability, of course, is exploring the potential of solar, wind, and other clean energy technologies to power its operations. The shift from conventional fossil fuels to renewables is not straightforward; it requires the creation of on-site generation facilities and energy storage and management solutions to cope with the intermittent nature of renewable energy sources (Fekete et al., 2023).

The Port of Baku faces several interconnected challenges as it strategically utilizes petroleum in its operations. First, training personnel to handle sophisticated petroleum-based technologies presents a skill gap, as the current workforce must adapt to new systems and equipment. Selecting and purchasing the right equipment involves balancing cost, performance, and sustainability, which requires strategic foresight and planning. Infrastructure development is also critical,

necessitating significant investments to upgrade existing facilities and build new ones that meet safety and environmental standards. Integrating automation and mechanization into petroleum operations is intended to boost efficiency and reduce human error, but this transition demands substantial financial and technological investment. Furthermore, managing the financial aspects of these initiatives is crucial, as each phase of development requires careful budgeting and a clear understanding of the economic impacts. The Port must navigate these challenges without disrupting its operational efficiency or financial stability, ensuring a smooth integration of new technologies and practices (From personal communication with the Head of Infrastructure and Equipment Department, April 2024). Although this transition appears essential to reduce the carbon footprint of port operations, a solid framework for energy management and a substantial upfront investment are required (WPS, 2021).

Managing and monitoring emissions are crucial in pursuing environmentally friendly port operations. The Port of Baku is responsible for deploying state-of-the-art sensor networks and data analysis platforms. This technical project aims to provide accurate, real-time data on greenhouse gas emissions and other pollutants. Within the environmental strategy the ambitious goal of electrifying port vehicles and equipment forms part of the environmental strategy. This move to electric power, which is in line with the plans of ports such as Hamburg, requires significant grid installations of charging stations and major modifications to the electrical infrastructure. In this case, two challenges must be overcome: ensuring that the infrastructure can handle the added weight and managing the logistics of loading vehicles and equipment in a crowded port (From personal communication with project manager specialist, March 2024).

The switch to electricity at the Port of Baku is a complex undertaking that needs careful planning and significant funding to get beyond monetary and infrastructure barriers. The proactive

deployment of intelligent and autonomous technology may enhance the productivity and security of port operations. Incorporating electric loaders and cranes is the first stage of the electrification program. This step is critical and complex because extensive testing is required to guarantee these new electric units function dependably under the demanding circumstances of port operations. Furthermore, the temporary use of gasoline additives seeks to enhance the functionality of currently operating equipment, posing a unique set of technical difficulties such as compatibility and environmental effect evaluations.

Moving on to the second stage, developing a vast network of charging stations is essential. Here, the difficulty is in planning and putting in place an infrastructure that can grow in the future as more electric equipment is brought online and yet meets the demand as it does now. These charging stations' optimal placement and capacity must be carefully planned to satisfy operating demands without incurring excessive startup expenses (From personal communication with the Head of the Infrastructure and Equipment Department of Port of Baku, April 2024). Recycling and waste management are crucial parts of any environmental plan for a green port. The Port of Baku aims to establish effective systems for handling ballast water, recycling materials, and disposing of waste from ships. This part of port operations requires collaboration with regional and global waste management services alongside creative technical solutions that can grow to meet the demands of a heavily trafficked port. The Port of Baku is dedicated to protecting the environment and has prioritized wastewater treatment in its sustainability plan (From personal communication with project manager specialist, March 2024).

Vital equipment at the Miranda wastewater treatment plant has been upgraded and repaired, enabling the port to meet ecological standards for water purity. Ongoing upgrades and maintenance efforts will maximize the plant's potential and enable it to efficiently convert wastewater into

technical water (From personal communication with the Head of the Infrastructure and Equipment Department, April 2024). When it comes to the transition to fully green port operations, the need for trained personnel capable of handling and using the new technologies makes the transition much more difficult. However, this issue is problematic for the Port of Baku and global environmental transformation. According to Boston Group Consulting, there will be a shortage of approximately 7 million people in the field of green technologies by 2030 (Harnoss, 2023). This highlights a worldwide problem of skills shortages in the labor market, as demand for green technology expertise outstrips supply.

This skill gap results from a mismatch between the workforce's competencies and the sophisticated abilities to operate and maintain new green technology. Implementing cutting-edge, eco-friendly technology at the Port of Baku requires a staff skilled in emerging technological areas, including sophisticated emissions monitoring, renewable energy systems, and electric vehicle maintenance. However, the majority of the labor now in place has traditional skills designed for traditional port operations. Like its global competitors, the Port of Baku must allocate resources to education and training programs to ensure its staff are prepared to handle the complexities of an advanced and environmentally friendly port. It is necessary to close this skill gap to guarantee the effective operation and upkeep of new green technology.

It is possible that the existing curricula do not sufficiently equip workers for the unique requirements of green technology. The current training materials are frequently outdated and do not provide enough attention to new technologies that are increasingly essential to the operations of green ports. The continuously changing technology landscape makes this problem worse by raising the possibility that, shortly, new abilities may need to be added to or replaced by the skills needed today. Another difficulty is luring in a new generation of professionals with the expertise

required for green technology. Young professionals may be more drawn to fields outside typical port operations that are thought to be more creative or provide faster career progression routes. The port has to develop strategies to recruit this younger generation by showing the marine sector—mainly green operations—as an appealing and feasible career path with lots of room for advancement and influence (From personal communication with the Head of the Infrastructure and Equipment Department, April 2024).

The technological challenges facing the Port of Baku, from infrastructure modernization and energy transition to emissions control and innovative technology integration, illustrate the complexity and multidimensionality of the transition to green port operations. Although distinct, each challenge has in common the need for significant financial investments and the search for innovative solutions (Rahmanov et al., 2018).

This demands a concentrated effort to explain the benefits of sustainability in terms of operational efficiency, long-term financial viability, regulatory compliance, and environmental benefits. Despite the apparent direction set by these technical objectives, securing the financing required for green projects becomes a significant hurdle. A significant barrier to adoption is the high upfront costs of green technology, compounded by the fact that the return on investment is sometimes unpredictable and slow to materialize. Securing investment from government entities, private investors, and international organizations is the main barrier to delivering solutions to the technological hurdles in the port of Baku, ranging from energy transition and infrastructure upgrades to emissions monitoring and intelligent technology integration, highlighting the complexity and diversity of the shift towards environmentally friendly port operations. Despite their differences, all these issues have one thing in common: they all require significant financial commitment and creative solutions.

2.2. Lack of investment in the implementation of green initiatives in Port of Baku

The primary goal of turning maritime ports into green hubs represents a challenging and costly process both globally and in the region. The lack of funding is among the main obstacles to green ports' complete transition, development, and maintenance. In addition, the lack of capital in the green port economy has several negative environmental and natural consequences. Though these policies offer an organized approach, many obstacles remain, especially when obtaining adequate external investment to facilitate large-scale sustainable growth in ports such as Baku. Port's primary objective is to meet the ESG targets and effectively complete its requirements and standards. ESG includes many factors affecting a business's capacity to create value over the long run. Investors can evaluate businesses and industries according to their environmental, social, and governance achievements by understanding the ESG framework and its assessment measures (ESG et al.). Substantial environmental, social, and governance performance indicates that a corporation is more competent to deal with the challenges created by climate change and get new opportunities, improving its financial perspective over time (IMD,2024)

Although the Port of Baku managed to gain government support during its initial stages of development, moving on to a level where it must attract substantial outside investments comes with its own set of difficulties. The significant capital expenditure required to initiate and maintain the transition to environmentally sustainable enterprise is at the heart of these issues. This transformation involves various activities, such as adopting renewable energy sources, electrified vehicles, and equipment, implementing advanced waste management systems, and developing infrastructure to accommodate alternative fuels (Lind et al., 2023).

According to the Vietnam case, which is developing an eco-port system, the cost of using a cold ironing system can be pretty high. For example, investment costs in some European ports have been estimated to reach tens of millions of dollars (Nguyen, Le, 2023). Even though European ports possess considerable investment potential, the nature of port developments generally requires external finance. Ports must make significant expenditures to sustain and improve present facilities, build new transportation linkages, and increase the green credentials of their operations (Port Investments Study 2018).

As the world practice shows, infrastructure development in the maritime port industry has also been significantly dependent on public sector funding. National and local governments are setting aside budgets for the green infrastructure of the maritime industry (Green et al. Initiative Final Report – ADB Internal Confidential, 2021). According to various sources, green transformation projects usually do not generate enough income to be financially independent. This creates severe obstacles to obtaining funding for their interests. Green investments, therefore, require significant capital expenditures, which puts pressure on the financial capabilities of ports in general (Green et al. Initiative Final Report – ADB Internal Confidential, 2021). The main challenge to obtaining green funding is the fact that numerous innovations and initiatives are not commercially attractive and, hence, are likely to attract investors only through outside funding with a certain degree of governmental involvement in that process (Green et al. FRAMEWORK REPORT – World Bank; p. 9).

The Port of Baku (located in the Alat district), a maritime trading and transportation hub in Azerbaijan and the Caspian region, is at an essential stage of its development trajectory, especially regarding its environmental impact and the introduction of green innovative technologies (Port of Baku: Sustainability Report 2022). The port's strategic significance, serving as a critical point on

the Middle Corridor and the countries' actions for The 2024 UN Climate Change Conference (UNFCCC COP 29), underscores the importance of its transition to green operations (Port of Baku: Sustainability Report 2022). Despite growing global attention to environmental sustainability in the maritime industry, the port faces several challenges securing the investment needed to transition fully. The lack of funding significantly slows down the adaptation of existing environmental technologies, the acquisition of modern equipment and technology designed to reduce pollution, and the implementation of complex energy structures. The scarcity of financial resources and a lack of stakeholder involvement obstruct environmental initiatives. These issues prevent the port from minimizing its environmental footprint and affect its operational efficiency and global competitiveness. Attempting to place itself as a leading sector in the green port motion of the region, it confronts the challenging task of obtaining the required funds to develop this transformative path (Ziyadov, 2023; Sustainability Report, 2022, p.8). To meet the Goals of Sustainable Development and become a country with a clean environment, the port invests in a green economy with the help of the state. It does not exclude the fact that, to date, the port has invested in several projects that have contributed to developing the sustainability of port operations. This is especially true for the transformation of marine transport equipment and infrastructure. Furthermore, investments in larger projects naturally require more capital. For example, the port recently signed an agreement with the French company Total, which planned to install solar panels on the port's territory. The overall cost of the project was more than $ 10 million. However, due to specific reasons, the project was temporarily suspended (from personal communication with an expert from the Port of Baku, April 2024). However, the port's capital and investment obstacles reflect the maritime industry's challenges, highlighting the overall challenge of reconciling sustainability aspirations with the economic realities of port management. Although

the state's economic situation is improving, it still poses problems in allocating large sums of funds to environmental initiatives in port operations, often seen as long-term investments with gradual returns.

2.3. Lack of standardized approach to Sustainability/ESG reporting and performance verification

As the first Green Port in the Caspian region (Bayramova, 2019), the Port of Baku acknowledges the significance of ESG practices for sustainable business development, both within the Port and for the overall sustainability of Azerbaijan's economy, and the importance of SDGs in shaping a global agenda that aims to create a better world for future generations.

According to the Port's Strategic Roadmap for full decarbonization by 2035 and Climate Strategy, "Port of Baku aims to be the leading green port operator in terms of efficiency and sustainability to achieve the lowest ecological footprint and environmental impact to the region." Furthermore, "Port of Baku's ambitious commitment to achieving net zero emissions by 2035, which is ahead of IMO's target of reducing emissions by at least 50% till 2050", demonstrates that these intentions will be translated into tangible actions, such as "adaptation of new policies and practices" as well as other projects and initiatives within the Climate Action Plan.

While companies can integrate climate-related programs and initiatives, such as those that lead to the reduction of greenhouse gas emissions, it is crucial to share these and other sustainability and ESG-related achievements and progress with stakeholders, as this allows them to assess the company's progress towards its goal and hold it accountable. "Businesses can better understand

the challenges and opportunities they face by creating ESG or sustainability reports that track milestones and progress" (IBM, 2023).

Port of Baku also recognizes the growing interest of various stakeholders, including investors, regulators, customers, employees, and the broader society, in ESG /sustainability-related reporting practices. Traditionally, many investors based their decision-making solely on financial performance. However, they now assess the Company's ESG and sustainability performance for long-term sustainability and risk mitigation. "Insights derived from sustainability reports can help companies move away from traditional linear economic models while investors can avoid companies that might pose a greater financial risk due to their poor ESG performance" (IBM, 2023).

According to McKinsey, in 2022, "more than 90 percent of S&P 500 companies published ESG reports in some form, as do approximately 70 percent of Russell 1000 companies". This transparency not only attracts investors but also builds brand loyalty. Therefore, ESG and sustainability reporting is not just a trend but a necessary practice for businesses aiming for long-term success.

"The rising profile of ESG has also been evident in increasing volume of investments. Inflows into sustainable funds, for example, rose from $5 billion in 2018 to more than $50 billion in 2020—and then to nearly $70 billion in 2021; these funds gained $87 billion of net new money in the first quarter of 2022, followed by $33 billion in the second quarter" (McKinsey, 2022). Moreover, "ESG-focused institutional investment will increase by 84% to US$33.9 trillion in 2026, making up 21.5% of assets under management" (PwC Report, 2022).

Based on the conducted interview with the Port of Baku representatives, we understand that current reporting practices mainly target the UN Global Compact. Every year in June, the UN GC requires

the Port of Baku to send an Environmental and Sustainability Report and a communication progress report (including a questionnaire on various sustainability topics). Thanks to these efforts, the Port of Baku has obtained active membership status. While the Port of Baku has published an Environmental and Sustainability Report, there is a pressing need to adopt a more comprehensive and standardized approach.

Furthermore, presented qualitative and quantitative disclosures are currently limited, as some key indicators (or material topics) such as energy consumption indicators, greenhouse gas (GHG) emissions volume, generated waste, water consumption, health and safety, community engagement, human resources, diversity and inclusion, training and development-related and other material indicators relevant to the Port's business nature and operations are not provided at all or could be more comprehensively addressed.

During personal communication with representatives of the Port of Baku, they expressed interest in many reporting frameworks, such as TCFD[1] and SASB[2] industry-specific standards. However, there are no formal actions to start those initiatives at this stage. Moreover, there is an understanding that GRI Standards mainly focus on social aspects. The Port prefers a combination of standards rather than solely focusing on GRI. That is why they prefer working with the EU and the UN and do not want to depend solely on GRI Standards. However, GRI provides a fundamental and comprehensive approach that supports organizations in evaluating and reporting on all material sustainability topics.

To instill confidence and trust in stakeholders, such as investors, the ESG information reported by the Company should be accurate, complete, consistent, and relevant. Therefore, it is crucial to

[1] TCFD is a framework that helps companies disclose climate-related risks and opportunities. More details are provided in Section 3.3.

[2] SASB provides a series of standards to reporting companies from all sectors. More details provided in Section 3.3.

demonstrate the Port of Baku's commitment to transparency and accountability and its alignment with global standards and frameworks for ESG reporting, such as the Global Reporting Initiative (GRI), the Task Force on Climate-related Financial Disclosures (TCFD), SASB, and others. A sustainability or ESG report that is not prepared according to any recognized standard and does not provide material disclosures can have several drawbacks:

- **Lack of credibility and investment attractiveness:** Without adherence to a recognized standard, the Sustainability Report may lack credibility and may not be trusted by stakeholders, including investors, which can lead to missed investment opportunities.
- **Incompleteness:** If the Report does not provide material disclosures such as energy consumption or greenhouse gas emissions, it may not give a complete picture of the company's sustainability efforts.
- **Inconsistency:** Without a standard to guide the reporting process, such as GRI, TCFD, or SASB Standards, the information presented may be inconsistent, making it challenging to compare performance over time or against other peer companies.
- **Risk of greenwashing (or Reputational risk):** If the Report is not transparent and does not provide material disclosures, the Company may be accused of greenwashing, i.e., presenting an environmentally responsible image without substantiating its claims.
- **Limited usefulness for investors:** Investors increasingly rely on ESG information to make informed decisions. A report that lacks material disclosures may not meet their needs.
- **Gaps in ESG Governance and Reporting:** Not using the well-established reporting frameworks and criteria of ESG agencies may limit the Port's ability to adequately assess its performance and identify gaps in ESG governance and reporting. These gaps may include relevant documentation, disclosures, targets, or strategies.

- **Missed opportunities for improvements:** Ongoing Sustainability/ESG reporting practices, based on best-practice standards, serve as a tool for annual assessments of a company's sustainability performance. This helps identify numerous improvement areas that can increase efficiency, reduce or avoid risks (e.g., reputational damage), and enhance stakeholder satisfaction.

Moreover, the Port of Baku has no ESG/Sustainability-related ratings provided by rating agencies such as MSCI, Sustainalytics, EcoVadis, etc. ESG ratings are becoming increasingly important for investors as they provide a comprehensive overview of a company's sustainability performance, a critical factor in investment decisions. Therefore, not having an ESG rating could make a company less attractive to investors. However, during the interview with the Port of Baku, they informed us that there is an intention to attract rating agencies for the Port's ESG performance assessment.

Lastly, there is also no involvement of any third-party assurance providers, such as Big4 companies, which can audit ESG/sustainability-related indicators provided in the report and review other sustainability practices to ensure that the qualitative and quantitative information provided in the report is reliable. For instance, it is noteworthy that "40% of the reports prepared in compliance with the GRI Standards are subject to assurance processes" (GRI, 2024). This initiative will increase the Port of Baku's attractiveness to investors and increase the credibility of the Report.

While the Port is currently actively implementing various community engagement and green projects and cooperating with international organizations such as EU EcoPort and the United Nations Global Compact, it also needs to comprehensively share progress on those activities and achievements on a standardized basis. It is crucial to increase management awareness of the requirements for an enhanced standardized approach to sustainability and ESG reporting,

including performance verification (sustainability assurance and ESG ratings). These efforts will lead to many benefits for the Port, especially regarding investor attractiveness, receiving a social license to operate, sustainability excellence through identifying gaps in reporting, and sustainability governance procedures, policies, and strategies.

This chapter has analyzed factors including the lack of technical advancement, investment challenges in implementing green initiatives in the Port of Baku's port operations, and the lack of a standardized approach to Sustainability/ESG reporting and performance verification. The following section proposes and analyses possible policy options for each cause.

CHAPTER 3. POLICY OPTIONS

The previous section described the main challenges hindering the implementation of Green Port projects in the Port of Baku. In this section, policy alternatives that can potentially address these barriers will be proposed. In conclusion, it will be suggested that the difficulties in implementing these projects can be solved by changing the deployment strategy of the standardized approach to sustainability/ESG reporting and performance verification, creating a structure for attracting investment in port operations, and building a greener Baku Port focusing on technological and workforce solutions.

3.1. Implementation of standards for skill development and technical advancement in the Port of Baku

To solve the significant technological issues that the Port of Baku faces, a set of strategic solutions that are suited to overcoming the challenges of the energy transition, emissions control, infrastructure modernization, and intelligent technology integration must be proposed. This section provides a methodical strategy that guarantees long-term sustainability and adherence to environmental rules and emphasizes immediate technology advancements. The suggested remedies will prioritize incorporating state-of-the-art technology, improving financial tactics, and reinforcing workforce competencies; the Port of Baku can effectively switch to green port operations by prioritizing these areas and setting a precedent for similar projects worldwide. The objective is to successfully negotiate the challenges of modernizing operations while obtaining the capital and assistance required to realize these aspirations. Considering the financial limitations at

the Port of Baku, it is imperative to take a practical approach to technology advancement. It is best to concentrate on small-scale trial initiatives at first.

Energy requirements for equipment supporting port operations can be met by various fuel sources, including biomass and waste recycling, liquefied natural gas (LNG), hydrogen, biomethanol, and biofuel, referred to as an alternative energy source. When looking at LNG's use in ports, one can observe that it powers the port's ships and is utilized for internal operations and activities. The requirement for substantial infrastructure for storage and bunkering stations is a drawback, even though the decrease in air pollution emissions compared to petroleum-based fuels is considered a benefit (Sifakis & Tsoutsos, 2021). The Port of Baku has demonstrated a proactive approach to environmental sustainability by successfully integrating fuel additives across its operations. Initially, the port conducted a small-scale test with these additives to assess their impact on reducing emissions. After observing significant improvements, the decision was made to expand the usage of fuel additives to all applicable equipment. This strategic phased implementation highlights the port's commitment to innovative practices that lead to substantial reductions in emissions, setting a benchmark for other ports aiming to enhance their environmental performance (From personal communication with the Head of the Infrastructure and Equipment Department, April 2024). Before committing to a broader deployment, these tests enable the port to assess new technologies and the efficacy of methodologies in controlled situations. This methodical approach guarantees that every stage is doable and financially viable. To evaluate their potential and suitability for the particular circumstances of the port, several green technologies and processes are put through a pilot test in the first phase. For instance, small-scale solar panel installations or electric utility vehicle testing can pinpoint crucial areas like waste management and energy efficiency that technology can significantly influence. For instance, The Port of Los Angeles has

been executing a Clean Air Action Plan to enhance air quality and eliminate health hazards associated with port activities. They started pilot projects to test new clean technologies and eventually expanded on successful efforts. This staged strategy allowed them to keep expenses under control while incorporating new technology into port operations and forming collaborations with other stakeholders, such as public agencies and private investors The Clean Air Action Plan (CAAP) is a comprehensive project focused on reducing air pollution and improving air quality around the Los Angeles and Long Beach ports. The strategy, designed by two ports together with several stakeholders, aims to address huge environmental and health issues generated by port-related operations. The CAAP is an essential element of a bigger effort to provide acceptable environmental and sustainability requirements for shipping operations.

The CAAP is a convoluted set of measures aimed at diverse contributors to pollution, including boats, vehicles, freight equipment, port craft, and rail, among others. The major goal of the strategy is to reduce emissions from ships, which are one of the most important contributors to air pollution in the area. The aim is met by requiring the use of cleaner fuels, establishing shore power systems that allow ships to connect to a nearby electrical socket while berthed, and by encouraging the adoption of more efficient and cleaner vessel technology.The request also addresses trucks as a key source.

The CAAP mandates the shift to better vehicle technologies such as LNG and electric trucks, as well as more rigorous emission standards for transport trucks, that carry goods from and to ports. In addition to the new regulations, incentive programs are being established to assist trucking businesses acquire new vehicle fleets that meet the proposed standards. Cargo equipment, such as elevators and forklifts to is a key source tackled by the CAAP. The plan advocates for the

replacement of old, polluting equipment with low-emission solutions. The transformation is aided either financial incentives and technological support.

Since its beginnings, CAAP has made significant advances to regional air pollution diminution, public health improvement, and environmental quality. Some other ports across worldwide have adopted it as their example to demonstrate that broad-based and cost-effective pollution reduction measures are doable. The Clean Air Action Plan is a significant endeavor to lower air pollution and boost air quality around the maritime areas of Los Angeles and Long Beach in California. The CAAP works to make port communities across the globe cleaner, healthier, and more viable through regulatory measures, technology improvements, and joint efforts (Clean Air Action Plan, 2022).

After the pilot programs, the second phase is devoted to assessing and improving these technologies in light of the data gathered. Analyzing performance, cost-effectiveness, and environmental impact are all included in this. Enhancing the technology's incorporation into port operations involves modifications and improvements. In the third stage, a technology is scaled up after demonstrating success on a smaller scale. The Port of Baku can successfully control expenses and execute more broad green measures by gradually expanding. The gradual implementation approach offers prospects for obtaining supplementary funds or collaborations, as first achievements may draw investments from outside parties interested in sustainable development.

The Port of Baku can invest in start-ups or innovative solutions because of this incremental strategy. In addition to addressing its technological issues, the port benefits the larger ecosystem by providing a venue for small-scale entrepreneurs to showcase their potential. Ultimately, this mutually beneficial partnership helps the port fulfill its long-term objective of becoming an

environmentally friendly enterprise by encouraging creativity and hastening the adoption of new technology. The PortXL Accelerator is the Port of Rotterdam's specialized innovation hub. This program helps start-ups and scale-ups with innovative solutions in the marine logistics and energy sectors by connecting them to markets, mentors, and financing possibilities The PortXL Accelerator is an essential component of the PortXL ecosystem, connecting start-ups and small with key stakeholders in the marine and energy sectors. They consist of the world's top maritime firms, port authorities, logistical providers, and energy producers. As a result, accelerator participants have an unusual chance to launch a prototype product, receive useful feedback, and meet with potential consumers or partners. Funding is a vital component of the PortXL initiative. This is made feasible by allowing start-ups and scale-ups to pitch their ideas to a crowd of investors, angel investors, and business partners. As a result, they have the option to make huge investments, helping them to grow up swiftly.

Additionally, the PortXL program contains a course that participants will study during the program. This course will cover business development, sales & marketing, intellectual property, and compliance with laws. Experts in those areas will provide seminars, masterclasses, and one-on-one coaching sessions to help individuals acquire the expertise and skills they need.

Throughout its inception, PortXL has assisted several firms in making considerable progress in bringing their own distinctive concepts to market. This appears in the success of businesses that have completed the PortXL program, which has secured substantial deals from firms around the globe, built foreign offices, and significantly impacted the industry's development. PortXL's primary areas of innovation consist of autonomous shipping, energy-efficient solutions, increased logistics solutions, and smart port infrastructure. The PortXL accelerator has a unique role as it

directly influences digitization and sustainable processes in the marine transportation and energy sectors. All of these sectors face climate change, scarce resources, and the need to identify appropriate solutions for the global supply chain.

To achieve this goal, the PortXL initiative aids in this critical shift. To summarize, the PortXL Accelerator is an important driver of innovation in maritime logistics and energy industries. The accelerator's broad strategy guarantees that start-ups and scale-ups have access to the tools, partnerships, and support they require to compete in this competitive market. As a result, by bringing together industry leaders and business owners, PortXL is altering the future of maritime transport by contributing to the global economy of the internet (PortXl, 2024).

The Port of Baku's talent gap must be closed with a strategic plan that balances short-term and long-term objectives. In switching to green technology, solutions may be split into short-term and long-term plans to bridge this gap successfully. The port can concentrate on improving the abilities of present staff members shortly by sending them abroad for specialized training and courses. The workforce would be able to learn about and experience the newest green technology and practices directly from the source through these training sessions, which would be held in the world's most modern green ports (Nuzhina et al.,2021) to comprehend and put into practice intricate environmental regulations and operational efficiency back home, this exposure is essential. This foreign training program is intended to run for three years to guarantee that the staff members get significant knowledge and understanding.

In the long run, Azerbaijan must construct its training facility. This center would act as a focal point for the local development of "green" professionals, minimizing the need for expensive training abroad and promoting sustainable expertise inside the nation. In addition to reducing long-

term expenses, the Port of Baku creates a steady supply of competent laborers with experience in green port operations by investing in a local training center. In addition to meeting the demands of the Port of Baku, this facility may be used by other Azerbaijani enterprises hoping to raise their operational and environmental standards.

This dual strategy supports the Port of Baku's commitment to environmentally friendly and productive port operations by guaranteeing the quick improvement of the workforce's capabilities and laying the groundwork for long-term skills development in Azerbaijan. Undoubtedly, one of the main obstacles to the Port of Baku's technical progress is financing. However, these limitations offer a chance to innovate by making calculated bets on fledgling businesses and novel projects. The port may successfully control expenses and gradually promote an innovative culture by implementing changes. This helps with current technology issues and benefits the larger ecosystem by allowing entrepreneurs to showcase their efficacy and promise in real-world situations.

Compared to more established solutions, investing in startups and experimental solutions enables the Port of Baku to take advantage of new ideas and technologies that do not require a significant upfront capital investment. This strategy may lead to discovering low-cost techniques and technologies essential to turning the port into an efficient and environmentally friendly operation. Moreover, these expenditures may draw in outside capital or collaborations, strengthening the port's capacity to carry out all-encompassing green projects.

Ultimately, the strategic emphasis on short-term technology breakthroughs and long-term sustainability establishes the Port of Baku as a local and international pioneer in environmentally friendly port operations. In addition to addressing the financial obstacles, this well-rounded plan

ensures that the port stays at the forefront of environmental innovation and stewardship, opening the door to a sustainable and prosperous future.

3.2. Applying the “landlord” model to attract private investors into the Port of Baku

Furthermore, to attract investors in the port's green transformation, it is recommended to implement a landlord model in the Port of Baku, which will not only improve port operations but also address the pressing climate change in this complex interplay between economic sustainability and environmental responsibility. Overall, landlord ports are among the most often used port models worldwide. In this model, the port acts as the owner of the land, but all construction, equipment advancement, safe navigation, and other initiatives are the responsibilities of the private companies. In this situation, the authority or landowner has minimal influence over port activity. The business operator that makes investments in the port will seek innovative marketing techniques as well as profitable and effective means to boost its financial returns. It will improve rivalry within regional hubs, resulting in superior service and more efficient resource usage (What are the Port Models, 2021). Moreover, the involvement of private companies in the port's activities will create fresh perspectives and advancements. The surge in innovation is expected to result in adjustments to port operations as private companies take over operational responsibilities. Adopting a new landlord model in terms of port operations and transport planning, in general, will serve as a differentiator in this revolutionary chain. It will also create a perfect system between port operations and the larger logistics ecosystem. Linking both of these fields results in several benefits, such as improved cargo management, improved shipping, and, most importantly, a reduction in greenhouse gases; all of these lead to a sustainable and more environmentally friendly

standpoint in business (Bondi, 2023). Because the Port of Baku obtained state funding in the first stage of its development, this model may attract private companies on a lease basis to operate port activities and invest more in green initiatives in a certain period. Moreover, by adopting this paradigm shift, the Port of Baku will involve the private sector in its operations and may become the region's first landlord eco-port. The Port is located in the Middle Corridor, connecting Europe and Asia, which benefits the maritime trading and logistics industries.

Referring to the world practice of adopting the landlord model in port, several countries have already implemented this type by adopting the ownership model in port enterprises; one of them is the Port of Rotterdam, which is located in the Netherlands and has a beneficial geographical location, by connecting the North Sea and the delta of Rhine river. The Port of Rotterdam is the enterprise that manages the port's operations, and its principal shareholders are the municipality of Rotterdam (70%) and the Dutch State Government (30%). The port follows the property owner port model, in which the maritime authority operates the port's facilities while leasing the port property to the private operator. Additionally, it seeks to ensure the port's long-term growth, governance, and functioning and the secure and effortless operation of all vessels that call there. Besides, the port constantly aims to become the global hub for the sustainable industry. The Port Authority's income comes from port charges and land fees (Zdravev, 2017). The other example is the maritime hub of Antwerp in Belgium, which is a common landlord harbor. The port administration holds title to the locations in the maritime region, making them accessible to maritime enterprises for operations under license arrangements. Furthermore, DP World, a worldwide terminal operator, has completed the third phase of its €200 million investment plan at the Antwerp hub. The main objective of the operator is to strengthen the Antwerp terminal in an ecologically friendly way and increase capacity and services for its customers (Logan, 2023). The

landlord port model is recommended for the Port of Baku since it offers multiple significant benefits that coincide with the strategic objectives of expanding infrastructure, engaging in investment, and boosting operational effectiveness. Involving the private operators will enable investment in port infrastructure and transportation services, which can provide the necessary funding for the port's development and modernization in an environmentally sustainable manner (Ravi, 2019). Furthermore, this strategy suggests a collaboration between the public and private sectors whereby the port can share the costs for investments in port operations, decreasing the strain on its own and the government's budget. In fact, port officials have minimized influence over port actions so they can concentrate on administrative responsibilities, guaranteeing adherence to protection, environmental, and security regulations without having to cope with operating duties. Considering these benefits, implementing the given model at the Port of Baku may assist it shift into a sustainable, contemporary, and competitive harbor, encouraging environmental growth and strengthening its position as a vital logistical hub in the entire region.

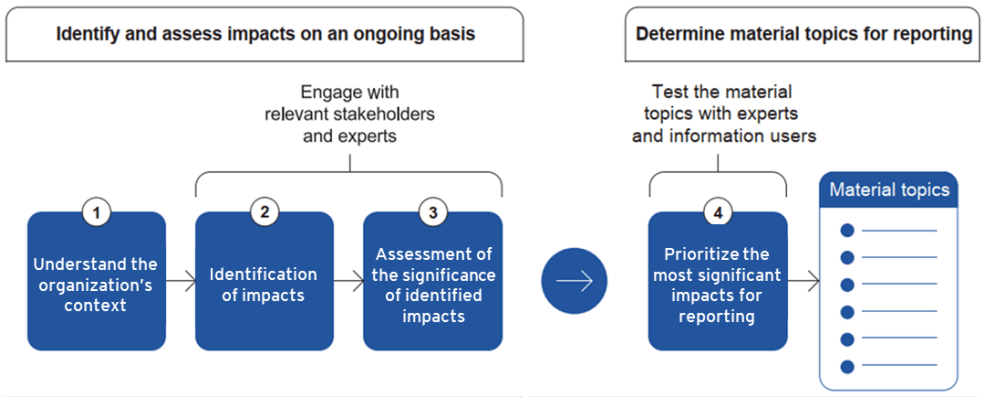
3.3. Introduction of standardized approach to Sustainability/ESG reporting and performance verification of the Port of Baku

Port of Baku has already taken significant steps to increase transparency and ESG awareness for its stakeholders and prospective investors by introducing the first Environmental and Sustainability Report and implementing various sustainability initiatives. Now, there is an opportunity to implement a standardized approach to sustainability/ESG reporting and performance verification, which will support understanding the Port’s strengths, areas for improvement, and opportunities to enhance its sustainable development and ESG performance.

Before adopting any of the sustainability reporting frameworks, it is crucial to identify which topics are most relevant for the Port of Baku. To accomplish this, the Port is required to conduct a materiality assessment. "Materiality assessments play an important role in helping firms to select the environmental, social, and governance (ESG) topics to include in their sustainability report" (Garst et al., 2022). Materiality includes the disclosure of risks and opportunities posed by these issues affecting environmental, social, economic, and governance domains that have potential and actual negative and positive impacts on corporate performance and stakeholders in the short, medium, and long term.

"Material topics represent Port's most significant impacts on the economy, environment, and people, including impacts on their human rights" (GRI, 2024). As a best practice, GRI defines the organization's four steps to determine its material topics (see Figure 1). This process helps the organization determine its material topics and apply disclosures for sustainability reporting.

Figure 1. *The process of determining material topics*



Source: The Consolidated Set of GRI Standards, 2024

The first three steps are conducted independently of the sustainability reporting process, but the information for the final step is built up. In Step 4, the organization prioritizes its most significant impacts for reporting and, in this way, determines its material topics.

The materiality assessment process involves various components, such as:

- stakeholder surveys (e.g., employees, management, financial partners, government);
- interviews with management;
- review of Port's internal policies and procedures;
- benchmarking against peer companies;
- as well as analysis of media resources.

Examples of material topics for ports with well-established ESG practices are provided in the table below:

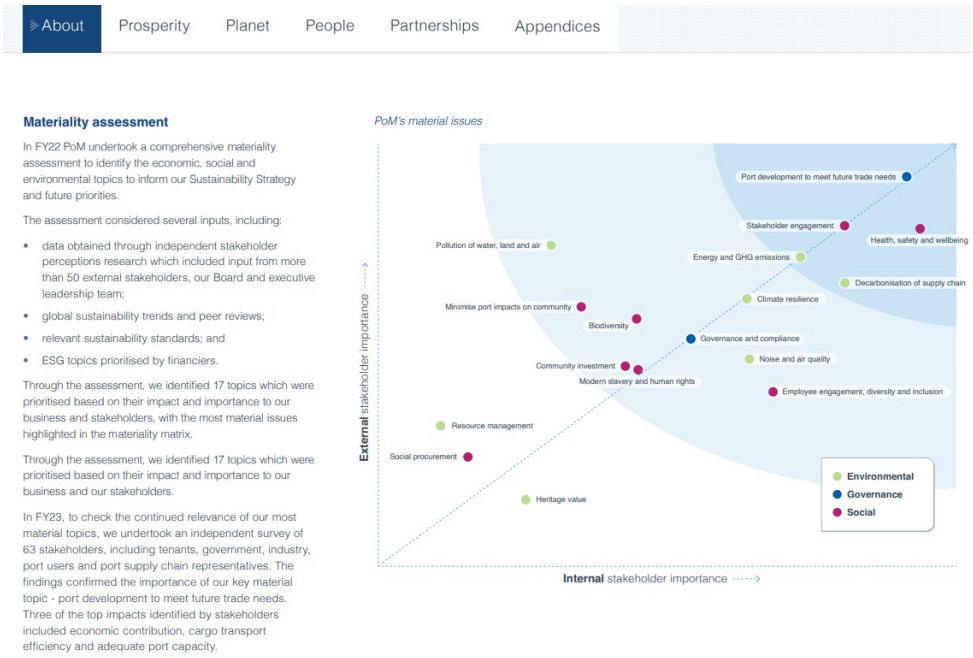
Figure 2. *Material topics of peer companies*

Port of Melbourne	PORT of NEWCASTLE	PEELPORTS GROUP
Port of Melbourne's Sustainability Report 2023	Port of Newcastle's Sustainability Report 2022	Peelports' Sustainability Report 2022
• Social procurement	• Health and wellbeing	• Natural resources
• Resource management	• Diversification and growth	• Climate change
• Community investment	• Decarbonization	• Transparency
• Modern slavery and human rights	• Biodiversity	• Anti-bribery and corruption
• Biodiversity	• Pollution and contamination	• Corporate governance
• Minimise port impacts on community	• Social license	• Risk management
• Pollution of water, land and air	• Local economy	• Community engagement
• Employee engagement, diversity and inclusion	• Community partnerships	• Supply chain
• Noise and air quality	• Collaboration	• Diversity and inclusion
• Governance and compliance	• Communication and engagement	• Social partnerships
• Climate resilience		• Emissions
• Energy and GHG emissions		• Waste management
• Stakeholder engagement		
• Decarbonisation of supply chain		
• Health, safety and wellbeing		
• Port development to meet future trade needs		
• Heritage value		

Sources: Port of Melbourne's Sustainability Report 2023, Port of Neücastle's Sustainability Report 2022, and Peelports' Sustainability Report 2022

The figure below illustrates how the report can present the materiality assessment. It can be either a list of topics or a matrix showing the priority and impact of each topic. However, it should be clear that all material topics are crucial for the company's performance, and relevant information related to each topic should be detailed in the Report.

Figure 3. *Materiality assessment of Port of Melbourne*



Source: Sustainability Report 2023

Below is the structured table of contents for the Port of Melbourne 2023 Sustainability Report, highlighting its main material topics. Each section provides comprehensive information on different sustainability topics, including the port's approach to managing specific areas, its commitment to international and local regulations, internal strategies, policies, procedures, targets, and other qualitative information and statistical disclosures.

Figure 4. *Port of Melbourne 2023 Sustainability Report's table of contents*

Source: Sustainability Report 2023

The provided peer companies structured their reports based on specified material topics, using GRI, TCFD, and SASB Standards.

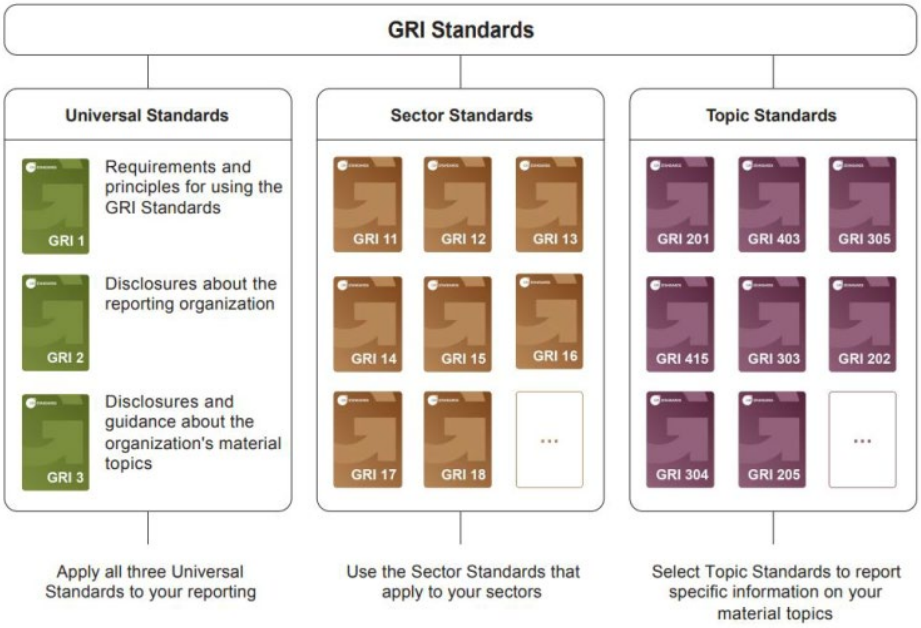
TCFD TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES

GRI

SASB STANDARDS
Now part of IFRS Foundation

1. The Global Reporting Initiative (GRI) standards are the first and most widely adopted global reporting standards on sustainability matters. They are divided into three main parts: universal, Sector, and Topic Standards.

Figure 5. The structure of GRI Standards



Source: The Consolidated Set of GRI Standards (2024).

2. The Sustainability Accounting Standards Board (SASB) helps companies disclose material decision-related information to investors cost-effectively. The SASB Standards are divided into 77 industries in 11 sectors. The SASB Marine Transportation Standard provides a structured approach for companies in the marine transportation sector to report on sustainability matters. **Figure 6.** *Examples of SASB sustainability disclosures for the marine transportation industry*

TOPIC	METRIC	CATEGORY	UNIT OF MEASURE	CODE
Greenhouse Gas Emissions	Gross global Scope 1 emissions	Quantitative	Metric tonnes (t) CO_2-e	TR-MT-110a.1
	Discussion of long- and short-term strategy or plan to manage Scope 1 emissions, emissions reduction targets, and an analysis of performance against those targets	Discussion and Analysis	n/a	TR-MT-110a.2
	(1) Total energy consumed, (2) percentage heavy fuel oil and (3) percentage renewable	Quantitative	Gigajoules (GJ), Percentage (%)	TR-MT-110a.3
	Average Energy Efficiency Design Index (EEDI) for new ships	Quantitative	Grammes of CO_2 per ton-nautical mile	TR-MT-110a.4
Air Quality	Air emissions of the following pollutants: (1) NO_x (excluding N_2O), (2) SO_x, and (3) particulate matter (PM_{10})	Quantitative	Metric tonnes (t)	TR-MT-120a.1
Ecological Impacts	Shipping duration in marine protected areas or areas of protected conservation status	Quantitative	Number of travel days	TR-MT-160a.1
	Percentage of fleet implementing ballast water (1) exchange and (2) treatment	Quantitative	Percentage (%)	TR-MT-160a.2
	(1) Number and (2) aggregate volume of spills and releases to the environment	Quantitative	Number, Cubic metres (m^3)	TR-MT-160a.3
Workforce Health & Safety	Lost time incident rate (LTIR)	Quantitative	Rate	TR-MT-320a.1
Business Ethics	Number of calls at ports in countries that have the 20 lowest rankings in Transparency International's Corruption Perception Index	Quantitative	Number	TR-MT-510a.1
	Total amount of monetary losses as a result of legal proceedings associated with bribery or corruption [1]	Quantitative	Presentation currency	TR-MT-510a.2

continued...

Source: SASB Marine Transportation 2024

3. Task Force on Climate-related Financial Disclosures (TCFD) - Established to promote more effective disclosures, focusing on the financial implications of climate-related risks and opportunities.

Figure 6. *Four pillars of TCFD*

TCFD areas	TCFD Disclosure Guidelines
Corporate Governance	a. The board's oversight of climate-related risks and opportunities.
	b. The management's role in assessing and managing climate-related risks and opportunities.
Strategy	a. The climate-related risks and opportunities identified over the short, medium, and long term.
	b. The impact of climate-related risks and opportunities on the businesses, strategy, and financial planning.
	c. The resilience of the strategy, taking into consideration different climate-related scenarios.
Risk Management	a. The processes for identifying and assessing climate-related risks.
	b. The processes for managing climate-related risks.
	c. How processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management.
Metrics and Targets	a. Used to assess climate-related risks and opportunities in line with its strategy and risk management process.
	b. Scope 1, Scope 2 and, if appropriate, Scope 3 greenhouse gas (GHG) emissions and the related risks
	c. The targets used to manage climate-related risks and opportunities and performance against targets

Source: TCFD recommendations, 2024

The mentioned standards establish a comprehensive foundation for organizations to report on their sustainability performance. These standards can be used separately or together. While some fundamental disclosures, such as 'GHG emissions' or 'Number of occupational injuries' and so on, can be repeated in all standards, it is crucial to focus on each standard's unique and strong points. For instance, SASB Standards are good at providing industry-specific disclosures, while TCFD provides unique guidance on climate-related disclosures, including climate strategy, governance, targets, and risk management.

To understand the difference between the Port of Baku's Environmental and Sustainability Report and those prepared by other companies following the above standards, the following examples of disclosures provided by the Port of Baku are compared with those of peer companies.

Example #1: GHG emissions (Scope 1-2-3)

Peelports' Sustainability Report 2022

Our actions

Port Operations

Comparison with 2020 Baseline

Peel Ports Operations direct Scope 1 (fuels) and Scope 2 (electricity) emissions have now been independently verified for the four years since our baseline in 2019-2020 (FY20).

The independently verified figures for FY23 demonstrate a 32% reduction in Scope 1 and Scope 2 emissions from Port Operations, compared to our FY2020 baseline using a market-based approach. We are on track to meet our net-zero commitment.

Our Scope 1 and Scope 2 GHG emissions from Port Operations are shown below, expressed in tonnes of carbon dioxide equivalent (tCO2e).

Comparison between FY22 & FY23

Scope 1 emissions demonstrate a decrease of 51%, from 20,171 tonnes CO2e to 9,941 tonnes. These emissions reduction have been largely achieved in the "mobile combustion" category of liquid fuels for the port operations, for straddle carriers etc.

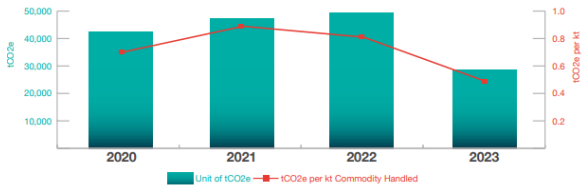
The reported emissions reduction for Scope 2 (electricity use), when calculated using the market-based method of accounting demonstrates a 36% decrease from 29,252 tonnes CO2e to 18,743 t CO2e, a reduction of 10,509 tonnes CO2e.

A proportion of this can be attributed to the FY23 billing of a port customer for electricity supplied in FY22, the effect of which is to make our electricity use in FY23 appear lower, and conversely the use in 2022 appear higher.

BG Freight (Shipping Operations)

The total direct Scope 1 emissions of BG Freight have decreased by **18.5%** between FY22 and FY23.

Performance Tracker; Scope 1 & Scope 2; Market Based GHG Emissions from Port Operations;



Scope 3 emissions

Scope 3 emissions are those for which our business is indirectly responsible. There are 15 categories of scope 3 emissions, covering activities that are both upstream (purchased) and downstream (sold) in our value chain.

As with most businesses, our scope 1 and 2 emissions are dwarfed by our scope 3 emissions. However, gathering accurate data on these emissions is a complex undertaking and we are currently working to create an accurate baseline to allow us to set a credible reduction target.

Scope	Activity Type	2020	2021	2022	2023
Scope 1	Stationary combustion	988	1,007	872	733
	Mobile combustion - BG Freight	174,753	180,472	186,207	151,744
	Mobile combustion - others	17,680	20,482	19,158	9,083
	Fugitive emissions from refrigerants and SF6	116	115	141	125
	Scope 1 - Total Peel Ports Group (PPG)	**193,537**	**202,076**	**206,378**	**161,685**
Scope 2	Purchased electricity - location based	16,707	16,385	17,174	11,096
	Purchased electricity - market based	23,606	25,735	29,252	18,743
	Purchased heat, steam coolth	-	-	-	-
	Scope 2 - Location Based + heat, steam, coolth	16,707	16,385	17,174	11,096
	Scope 2 - Market Based + heat, steam, coolth	23,606	25,735	29,252	18,743
	Total Scope 1 & 2 (Location Based)	210,244	218,461	223,552	172,781
	Total Scope 1 & 2 (Market Based);	217,143	227,811	235,630	180,428
	Total Scope 1 & 2 (Market Based); Ports Only	**42,390**	**47,339**	**49,423**	**28,684**
Activity	Kilo Tonnes Handled (Total)	66,146	58,692	66,685	64,352
	Kilo Tonnes Handled (Shipping)	5,915	5,605	5,791	5,642
	Kilo Tonnes Handled (Port)	60,232	53,087	60,894	58,710
Intensity*	Intensity (PPG; Port & Shipping)	3.28	3.88	3.53	2.80
	Intensity (Shipping)	29.55	32.20	32.15	26.90
	Intensity (Port)	0.70	0.89	0.81	0.49

FY20, FY21, FY22 & FY23 Independently verified to ISO14064-3

*Intensity units tCO2e per kt; Market Based Calculations

Example #2: Employee dynamics

Port of Melbourne's Sustainability Report 2023

WORKFORCE

Profile	Unit	FY21	FY22	FY23
Employee headcount (at 30 June)	#	124	135	144
Male	#	80	84	87
Female	#	44	51	57
Permanent contract	#	120	133	143
Fixed-term contract	#	4	2	0
Casual	#	0	0	1
Contingent worker headcount	#	8	13	15
Male	#	4	8	10
Female	#	4	5	5
Employee FTE	FTE	120.2	132.1	140.5
Full time employees	FTE	113	124	131.6
Male	FTE	75.6	83	83.6
Female	FTE	44.6	49.1	48
Part time employees	FTE	7.2	8.1	9
Male	FTE	1.6	1	1.6
Female	FTE	5.6	7.1	7.4
Under 30 years old	FTE	8	10	7
Male	FTE	5	6	3
Female	FTE	3	4	4
30-50 years old	FTE	66.6	77.1	85.4
Male	FTE	38	45	49
Female	FTE	28.6	32.1	36.4
Over 50 years old	FTE	45.6	45.1	48.1
Male	FTE	32.6	32.1	33.1
Female	FTE	13	13	15

PoM defines contingent workers as temporary workers with a limited tenure that are engaged to do work controlled by PoM and are employed as independent contractors, freelancers or employees of PoM's suppliers. PoM's contingent workers are provided with a workspace and/or tools and may complete mandatory compliance training modules.

Diversity and inclusion	Unit	FY21	FY22	FY23
Female Board directors*	%	20%	29%	27%
Female executive*	%	29%	29%	43%
Female employees*	%	37%	37%	39%
Gender pay gap*	%	19%	20%	10%
CEO to median employee total compensation	Ratio CEO/ median	4.3	5.8	5.1
Aboriginal and Torres Strait Islander employees	%		0%	0%
Culturally and/or linguistically diverse employees	%		40%	35%
LGBTQIA+ employees	%		6%	2%

*At 30 June 2023.

Executive refers to the executive leadership team excluding the CEO. It includes EGM Strategy and Planning, EGM Corporate Relations, EGM People and Culture, EGM Commercial, EGM Operations, Chief Financial Officer and General Counsel and Company Secretary.

Engagement, turnover and development	Unit	FY21	FY22	FY23
Employee engagement score	%	76%	69%	61%
Engagement survey participation rate	%	99%	98%	98%
Employee turnover rate	%	7%	15%	17%
Training hours per employee (headcount)	#	10	13	18
Training investment per employee (headcount)	$	$685	$800	$1,332
Employees covered by collective bargaining agreements	%	23%	18%	9%

FY23 training data excludes contingent workers.

Example #3: Energy consumption

Port of Newcastle's Sustainability Report 2022

FUEL CONSUMPTION

Source	2018	2019	2020	2021	2022
Diesel	33270	36222	23697	32784	36978
ULP	306.5	191	175	239	296
LPG	53	56	8	0	0

*PON uses the National Greenhouse Accounts fuel combustion emissions factors, prepared by the Department of Climate Change, Energy, the Environment and Water, to convert kilolitres of fuel used to gigajoules (GJ).

2022 saw the introduction of a new sweeper vessel called the "Lydia" and the commissioning of two new mobile harbour cranes. Both currently operate on diesel which has resulted in a net increase in fuel consumption for the reporting year.

ELECTRICITY CONSUMPTION

	2018	2019	2020	2021	2022
Non-renewable electricity – grid purchases via Energy Retailers	6145	4878	3414.78	0	0
Renewable energy portion of grid purchases (LGCs) via energy retailers in line with Australia's Renewable Energy Target	0	0	663.71	1298	231

Energy usage per tonne of dredge material has been selected as the organisations energy performance metric since the predominant contributor to PON operational energy usage is maintenance dredging activities.

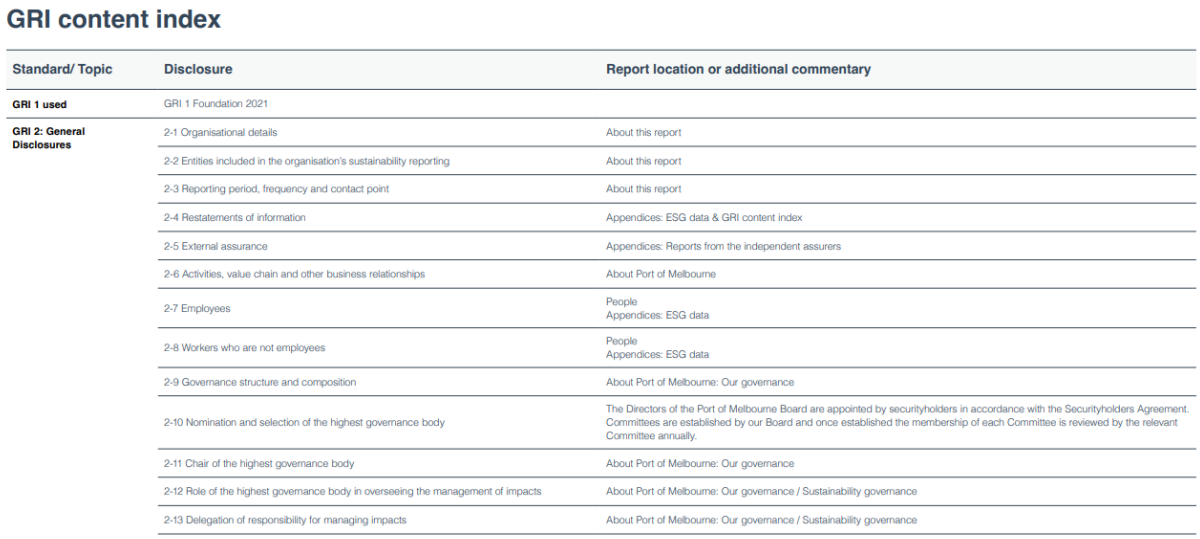
ELECTRICITY PERFORMANCE METRIC

	2018	2019	2020	2021	2022
Total Energy Consumption – Fuel and Electricity (GJ)	39775	41347	27958	34321	37,275
Volume dredge material removed (m3)	389750	364541	151903	237865	115,809
GJ/t dredge material removed	0.10	0.12	0.17	0.16	0.32

The provided examples represent best practices for disclosing material topics, covering a wide range of qualitative and quantitative information relevant to stakeholders. The Port of Baku can use these reports as a valuable reference point for its reporting.

To effectively navigate the Report, the GRI and SASB content index support the readers can find references to all required information disclosed in alignment with the standards:

Figure 7. GRI Content Index



GRI content index

Standard/ Topic	Disclosure	Report location or additional commentary
GRI 1 used	GRI 1 Foundation 2021	
GRI 2: General Disclosures	2-1 Organisational details	About this report
	2-2 Entities included in the organisation's sustainability reporting	About this report
	2-3 Reporting period, frequency and contact point	About this report
	2-4 Restatements of information	Appendices: ESG data & GRI content index
	2-5 External assurance	Appendices: Reports from the independent assurers
	2-6 Activities, value chain and other business relationships	About Port of Melbourne
	2-7 Employees	People Appendices: ESG data
	2-8 Workers who are not employees	People Appendices: ESG data
	2-9 Governance structure and composition	About Port of Melbourne: Our governance
	2-10 Nomination and selection of the highest governance body	The Directors of the Port of Melbourne Board are appointed by securityholders in accordance with the Securityholders Agreement. Committees are established by our Board and once established the membership of each Committee is reviewed by the relevant Committee annually.
	2-11 Chair of the highest governance body	About Port of Melbourne: Our governance
	2-12 Role of the highest governance body in overseeing the management of impacts	About Port of Melbourne: Our governance / Sustainability governance
	2-13 Delegation of responsibility for managing impacts	About Port of Melbourne: Our governance / Sustainability governance

Source: Port of Melbourne's Sustainability Report 2023

Figure 8. SASB Content Index

SASB content index

Standard/ Topic	Metric and code	Report location or additional commentary
SASB Standard - Marine Transportation		
Greenhouse Gas Emissions	Gross global Scope 1 emissions - (TR-MT-110a.1)	Planet: Scope 1 & 2 emissions Appendices: ESG data
	Discussion of long-term and short-term strategy or plan to manage Scope 1 emissions, emissions reduction targets, and an analysis of performance against those targets - (TR-MT-110a.2)	Planet: Climate change
	(1) Total energy consumed, (2) percentage heavy fuel oil, (3) percentage renewable - (TR-MT-110a.3)	Planet: Scope 1 & 2 emissions Appendices: ESG data
	Average Energy Efficiency Design Index (EEDI) for new ships - (TR-MT-110a.4)	Not applicable. Relevant to shipping lines but not within PoM's control. Further, we had no major or reportable pollution incidents on land or water around the port in FY23. For further information on pollution management and incidents see Planet: Pollution and Appendices: ESG data.
Air Quality	Air emissions of the following pollutants: (1) NOx (excluding N2O), (2) SOx, and (3) particulate matter (PM10) - (TR-MT-120a.1)	Not applicable. Relevant to port tenants and shipping lines but not within PoM's control.
Ecological Impacts	Shipping duration in marine protected areas or areas of protected conservation status - (TR-MT-160a.1)	Planet: Biodiversity and habitat management Port of Melbourne shipping channels do not intersect with Marine Protected Areas but do pass adjacent to Port Phillip Heads Marine National Park.
	Percentage of fleet implementing ballast water (1) exchange and (2) treatment - (TR-MT-160a.2)	Not applicable. Relevant to shipping lines but not within PoM's control.
	(1) Number and (2) aggregate volume of spills and releases to the environment - (TR-MT-160a.3)	Not applicable. Relevant to shipping lines but not within PoM's control.
Employee Health & Safety	Lost time incident rate (LTIR) - (TR-MT-320a.1)	People: Health and safety Appendices: ESG data
Business Ethics	Number of calls at ports in countries that have the 20 lowest rankings in Transparency International's Corruption Perception Index - (TR-MT-510a.1)	Not applicable. Port of Melbourne operates a single port in Australia, which is placed in the top 20 highest rankings of the Index.
	Total amount of monetary losses as a result of legal proceedings associated with bribery or corruption - (TR-MT-510a.2)	None

Source: Port of Melbourne's Sustainability Report 2023

Third-party assurance

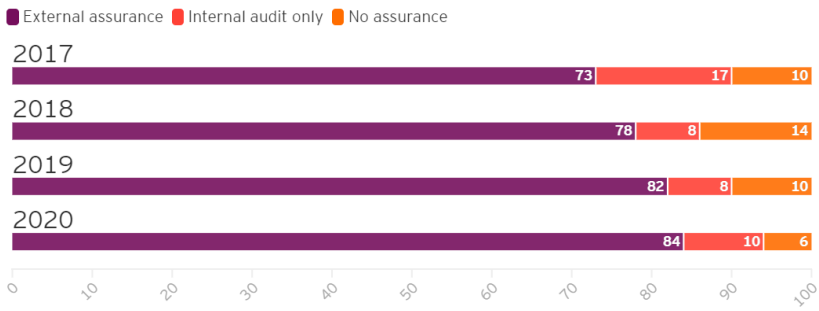
"Assurance adds value because it creates trust in sustainability/ESG reporting" (SGS, 2022). "Building trust through rigorous and transparent reporting and assurance allows companies to meet investors' and stakeholders' needs and provide valuable insights about how your company addresses risks and opportunities" (PwC, 2022).

In April 2021, the European Commission proposed the Corporate Sustainability Reporting Directive (CSRD), which establishes new rules for sustainability reporting in the European Union.

"The CSRD would mandate EU-wide audit under a "limited assurance" requirement, in line with the current capacity of the market to generate ESG information. As other jurisdictions adopt similar or parallel policies, the market for external assurance providers specializing in ESG will also develop faster." (EY, 2021).

"The International Federation of Accountants published that 51% of companies that report on sustainability information provide some level of assurance on it, with 63% of those assurances being provided by Audit or Audit-affiliated companies" (EY, 2021). Although taken on a smaller sample, a recent analysis of a subset of global companies by the World Business Council for Sustainable Development found that rates of assurance on sustainability information were higher, at 84%, and had climbed year on year.

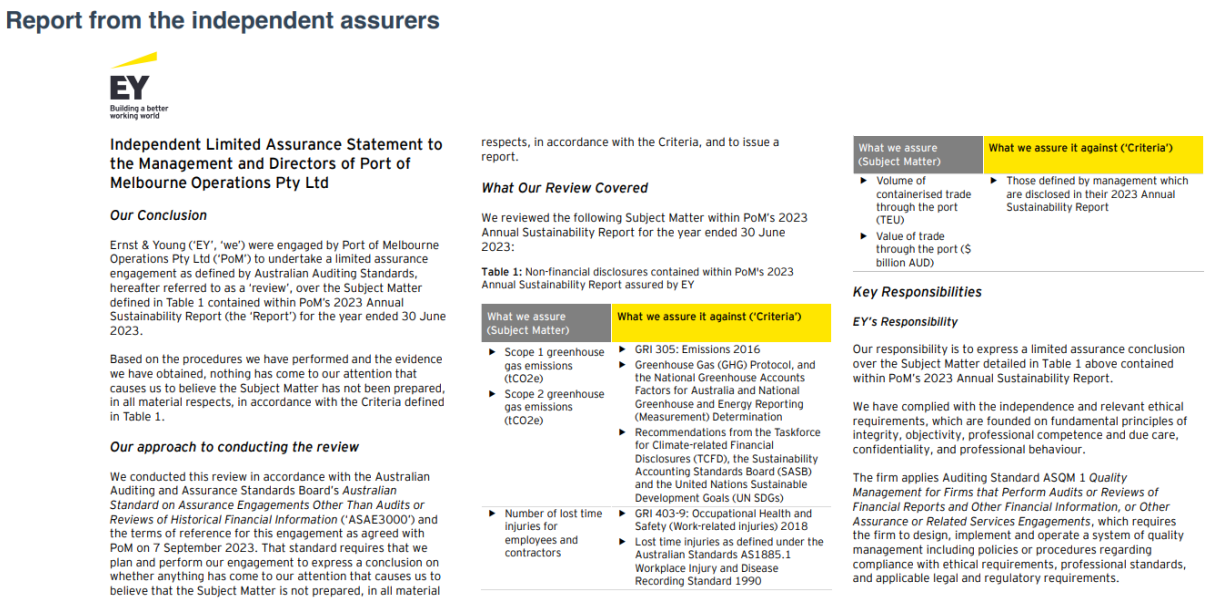
Figure 9. *Share of sustainability reports undergoing assurance*



Source: WBCSD, 2021

Below is an example of a thirty-part assurance report for Port of Melbourne's Sustainability Report. This report provides assurance on selected disclosures, such as Scope 1-2 greenhouse gas emissions, the number of lost-time injuries for employees and contractors, and so on.

Figure 10. *Example of an assurance statement for a Sustainability Report*



Report from the independent assurers

EY
Building a better working world

Independent Limited Assurance Statement to the Management and Directors of Port of Melbourne Operations Pty Ltd

Our Conclusion

Ernst & Young ('EY', 'we') were engaged by Port of Melbourne Operations Pty Ltd ('PoM') to undertake a limited assurance engagement as defined by Australian Auditing Standards, hereafter referred to as a 'review', over the Subject Matter defined in Table 1 contained within PoM's 2023 Annual Sustainability Report (the 'Report') for the year ended 30 June 2023.

Based on the procedures we have performed and the evidence we have obtained, nothing has come to our attention that causes us to believe the Subject Matter has not been prepared, in all material respects, in accordance with the Criteria defined in Table 1.

Our approach to conducting the review

We conducted this review in accordance with the Australian Auditing and Assurance Standards Board's *Australian Standard on Assurance Engagements Other Than Audits or Reviews of Historical Financial Information* ('ASAE3000') and the terms of reference for this engagement as agreed with PoM on 7 September 2023. That standard requires that we plan and perform our engagement to express a conclusion on whether anything has come to our attention that causes us to believe that the Subject Matter is not prepared, in all material respects, in accordance with the Criteria, and to issue a report.

What Our Review Covered

We reviewed the following Subject Matter within PoM's 2023 Annual Sustainability Report for the year ended 30 June 2023:

Table 1: Non-financial disclosures contained within PoM's 2023 Annual Sustainability Report assured by EY

What we assure (Subject Matter)	What we assure it against ('Criteria')
▸ Scope 1 greenhouse gas emissions (tCO2e) ▸ Scope 2 greenhouse gas emissions (tCO2e)	▸ GRI 305: Emissions 2016 ▸ Greenhouse Gas (GHG) Protocol, and the National Greenhouse Accounts Factors for Australia and National Greenhouse and Energy Reporting (Measurement) Determination ▸ Recommendations from the Taskforce for Climate-related Financial Disclosures (TCFD), the Sustainability Accounting Standards Board (SASB) and the United Nations Sustainable Development Goals (UN SDGs)
▸ Number of lost time injuries for employees and contractors	▸ GRI 403-9: Occupational Health and Safety (Work-related injuries) 2018 ▸ Lost time injuries as defined under the Australian Standards AS1885.1 Workplace Injury and Disease Recording Standard 1990
▸ Volume of containerised trade through the port (TEU) ▸ Value of trade through the port ($ billion AUD)	▸ Those defined by management which are disclosed in their 2023 Annual Sustainability Report

Key Responsibilities

EY's Responsibility

Our responsibility is to express a limited assurance conclusion over the Subject Matter detailed in Table 1 above contained within PoM's 2023 Annual Sustainability Report.

We have complied with the independence and relevant ethical requirements, which are founded on fundamental principles of integrity, objectivity, professional competence and due care, confidentiality, and professional behaviour.

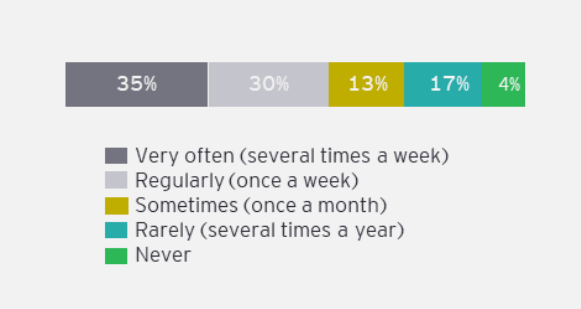
The firm applies Auditing Standard ASQM 1 *Quality Management for Firms that Perform Audits or Reviews of Financial Reports and Other Financial Information, or Other Assurance or Related Services Engagements*, which requires the firm to design, implement and operate a system of quality management including policies or procedures regarding compliance with ethical requirements, professional standards, and applicable legal and regulatory requirements.

Source: Port of Melbourne's Sustainability Report 2023

ESG ratings

"Today, there are more than 600 different ratings and indices in the world that characterize the performance of companies in the field of environmental, social responsibility and corporate governance (ESG aspects)" (SustainAbility, 2020). The growth in the number of ESG ratings reflects the interest of investors in the analysis of non-financial information and the increased motivation of companies to disclose it. According to investors, ESG ratings are one of the most important sources of information they use while making investment decisions alongside direct interaction with companies, studying corporate sustainability reporting, and doing in-house research.

Figure 11. *Frequency of ESG ratings use by investors*



Source: Rate the Raters 2020: Investor Survey and Interview Results, SustainAbility

ESG rating represents the agency's opinion on the company's fundamental business decision-making process level of focus on sustainable development in environmental, social, and governance areas.

Popular ESG ratings

SUSTAINALYTICS

Sustainalytics captures an issuer's exposure to material, industry-specific ESG risks and an issuer's management of those risks.

Source: Deloitte, ESG ratings, 2021

MSCI

The MSCI ESG Rating supports investors in identifying the long-term, industry-relevant ESG risks that companies may be exposed to and assess how effectively they are being managed.

Source: MSCI ESG Rating, 2024

CDP
DRIVING SUSTAINABLE ECONOMIES

The world's economy looks to CDP (Carbon Disclosure Project) as the gold standard of environmental reporting with the richest and most comprehensive dataset on corporate and city action.

Source: CDP, 2024

To conduct ESG assessments of companies, international rating platforms usually use two methods of data collection:

1. **Request to the Company:** Submit questionnaires or survey forms, which include quantitative and qualitative information, such as data on completed projects, key events, management decisions, and measures taken to manage ESG risks and opportunities.

2. **Evaluation of publicly available information:** Companies participating in such ratings must pay special attention to non-financial reporting because this is the primary source of information the rating agencies use. In addition, agencies conduct a media review, company website, and membership to international organizations and programs, such as CDP and other

Implementing a standardized approach to sustainability reporting is crucial for the Port of Baku. This approach will allow the company to identify gaps in sustainability management and reporting that must be addressed before attracting ESG rating agencies, achieving a favorable rating, and increasing the Port's investor attractiveness.

CHAPTER 4. EVALUATION OF POLICY ALTERNATIVES

As a follow-up to Chapter 3, this chapter analyzes and evaluates each policy option according to five criteria: effectiveness, efficiency, equity, flexibility, and feasibility. With these criteria in mind, this capstone project will enable the investigation of the advantages and disadvantages of policy options and find the most appropriate alternative.

Implementation of standards for skill development and technical advancement in the Port of Baku

Firstly, these policy options will be effective since using green technologies to decrease the pollutant effects of ports and experienced staff can be considered the most crucial part of shifting to green ports from conventional ports. Modern technology and small-scale pilot projects (such as solar panels and electric utility cars) are the main focus, and they work very well to cut emissions and boost operational effectiveness. Such initiatives have shown promise for a significant environmental impact and have been successful in other ports (such as the Port of Los Angeles, as mentioned above). A diverse approach to fulfilling energy needs uses LNG, biomass, waste recycling, hydrogen, biomethanol, and biofuel. Although LNG has successfully lowered emissions, its immediate effectiveness may be limited by the significant infrastructure expenditure required. Furthermore, establishing a local training center and sending personnel overseas for training implies that the workforce is equipped to adopt green technologies. This dual strategy supports both long-term sustainability and short-term benefits. Regarding efficiency, launching small-scale projects reduces financial risk and enables efficient resource utilization. By limiting the scaling of unproven technology, this strategy maximizes the return on investment. Encouraging creative start-ups and pilot projects can result in affordable, efficient technologies

that might not need a significant initial expenditure. This strategy controls expenses while promoting an innovative environment. Concerning equity, the situation changes, especially in workforce training and creating local training centers, because it may seem that offering training opportunities both domestically and internationally guarantees that every employee has equal access to the information and abilities required for implementing green technology. However, because not all workers from different categories, according to their age, experience, or capacity to understand new technologies, are the same, adapting those people to new work environments and green technology in the short term could be problematic. Instead, in the long term, with the creation of a training center in Azerbaijan involving more people willing to deal with green technology, the port would achieve an inclusive workplace where all staff members can support and profit from the port's environmental objectives. In addition, small-scale projects are feasible because they offer a chance to test innovations before they are fully implemented and demand less initial cost. This strategy decreases the operational and financial risks connected with widespread implementation. However, LNG and other alternative fuels efficiently lower emissions; their viability may be questioned due to the substantial infrastructure investment required. Careful planning and maybe outside funding are needed for this. Regarding flexibility, once again, adapting to new developments and technologies would be challenging for the Port of Baku in the short term since every port has its capacity to implement and establish new green technologies. Nevertheless, investing money into startups and innovative technology over the long term allows experimentation with many inventive concepts. This strategy may reveal cutting-edge, flexible ways to accomplish sustainability objectives.

Applying the landlord model to attract private investors into the Port of Baku

In terms of effectiveness criteria, implementing landlord model in the Port of Baku will be effective tool to attract more private operators to integrate with the port operations. This strategy will not only help to increase the capital of the port but also widen the scope for further expansion of projects associated with environmental sustainability. Secondly, if we consider the cost-benefit side of the analysis, this model of port management is efficient to apply in port because utilizing this approach will help to minimize expenditure of the port on green infrastructure and let the private companies engage in the process as in the example of Antwerp case. Regarding the equity, the situation changes since the cost and benefit criteria will not be satisfied by applying this model. Because the main objective is not only engaging investors but attract operators that will be interested in ESG. Fourthly, this option is feasible for port investment in the long term, as it will allow the enterprise to engage external investors, but in short term, it is unlikely to be profitable. The port first has to implement this model, first attract investors, then sign agreement, and finally pass on the baton to port operators, which is quite time- a time-consuming process. Ultimately, the given policy option is flexible for the Port of Baku, as the port authority may change the policy of landlord model, make any other upgrades in requirements of investment, or append other criteria in the lease agreement with the companies.

Introduction of the standardized approach to Sustainability/ESG reporting and performance verification of the Port of Baku

Regarding effectiveness criteria, adopting sustainability reporting standards (GRI, SASB, TCFD) guarantees transparency and comparability with comparable organizations by offering a thorough and organized reporting strategy, supporting the location and reduction of ESG risks. Implementing a standardized approach to sustainability/ESG reporting and performance verification can significantly enhance the Port's reputation and credibility among stakeholders,

including investors, customers, employees, and regulatory bodies. Secondly, standardized reporting frameworks such as GRI, SASB, and TCFD can streamline the port's reporting process. The company can efficiently collect, analyze, and report sustainability data by adhering to established guidelines and best practices. This streamlined process saves time and resources and ensures the accuracy and reliability of the reported data, thereby enhancing the efficiency of the Port's operations. Regarding equity criteria, engaging stakeholders in the materiality assessment process is a testament to the Port's commitment to inclusivity and transparency. By involving employees, management, financial partners, and government agencies and benchmarking against peer companies, the company can promote equity in decision-making and address the interests of all relevant stakeholders. This inclusive approach not only fosters trust and collaboration but also ensures that the Port's sustainability strategy aligns with the expectations and needs of its stakeholders. The flexibility to choose between different reporting standards allows the Port to tailor its reporting practices to its specific industry, context, and objectives. By understanding the unique strengths of each standard, the company can select the most relevant frameworks and disclosures to effectively communicate its sustainability/ESG performance. This flexibility enables the Port to adapt to regulatory requirements and market expectations. Implementing standardized sustainability reporting practices is feasible for the Port, given the availability of resources, guidelines, and support services. By following a structured approach to conducting materiality assessments, aligning with reporting standards, and seeking third-party verification, the Port can ensure the feasibility of its reporting practices.

One of the three proposed policies—introducing a standardized approach to sustainability/ESG reporting and performance verification of the Port of Baku—was evaluated and determined to be the best option to put into effect promptly as possible. This is due to the fact that the Port of Baku

will draw investors if it uses a standardized reporting system at first. As a result, financial obstacles to the implementation of green technologies will be removed, and any remaining issues, such as a lack of advancement tools for green technology and skilled labor, will be resolved with ease. Furthermore, as per the aforementioned evaluations, this policy package satisfies all five requirements, so there is no hesitation in implementing them.

Policy Option / Criteria	Effectiveness	Efficiency	Feasibility	Equity	Flexibility
Implementation of standards for skill development and technical advancement in the Port of Baku	✓	✓	✓	-	-
Applying the "landlord" model to attract private investors into the Port of Baku	✓	✓	-	-	✓
Introduction of the standardized approach to Sustainability/ESG reporting and performance verification of the PoB	✓	✓	✓	✓	✓

In summary, Chapter 3 presents three policy options aimed at addressing the technological and financial obstacles related to mitigating the adverse effects of port operations and integrating green technologies in the Port of Baku. Those policies are the followings: Implementing standards for skill development and technical advancement in the Port of Baku, Applying the landlord model to attract private investors into the Port of Baku, and introducing a standardized approach to sustainability/ESG reporting and performance verification of the Port of Baku. Further, in Chapter 4, all proposed policies are evaluated based on five criteria: effectiveness, efficiency, equity,

feasibility/implementability, and flexibility/improvability. Ultimately, one policy alternative, introducing a standardized approach to sustainability/ESG reporting and performance verification of the Port of Baku, is chosen as the most recommended one to implement in the Port of Baku. It will be simpler to handle other issues in the field if this policy resolves all financial concerns in the port first. Furthermore, this policy satisfies all the evaluation requirements.

CHAPTER 5. CONCLUSION AND RECOMMENDATIONS

Aim of study

The capstone project examined the difficulties that the Port of Baku encounters while deploying green technology and minimizing negative environmental consequences. As the marine sector evolves toward sustainability, ports worldwide, including the Port of Baku, face increased pressure to implement environmentally friendly operations. This change raises obstacles, especially in areas where such developments are still in their early stages.

Located in the Caspian area, the Port of Baku is a key marine center that faces unique problems. The investigation revealed important concerns such as a lack of modern green technology, substantial workforce skill gaps, and difficulty obtaining funding for sustainable activities. A key problem is the technological lag in implementing sophisticated green solutions, which is worsened by a significant talent gap among the port's workers. Modern operations needing green technology necessitate a staff that is proficient not just in conventional marine activities but also in new environmental technologies and practices. The initiative emphasized the importance of expanded training and possible relationships with educational institutions in preparing employees for future technology demands.

Furthermore, green technologies are sometimes expensive investments with a long return period, making them difficult to implement in ports with limited budgets or resources. These expenditures, while advantageous to long-term sustainability and operational efficiency, have significant upfront expenses.

Another important challenge is convincing investors to support green initiatives. The Port of Baku's expansion has reached a crucial stage, necessitating significant expenditures to convert to

green operations. This entails implementing new technology and changing the port's whole operating philosophy to conform with global sustainability norms. However, the economic climate and the port's financial model hinder the recruitment of required cash since investors often seek faster returns. However, green technologies frequently require longer gestation periods before becoming financially useful.

To address these issues, the project presented many policy choices that were assessed for their efficacy, efficiency, equality, practicality, and adaptability. These included increasing technological adoption through trial projects, launching worker training programs, and attracting private investment via novel financial structures such as green bonds or public-private partnerships. The most often requested strategy was implementing a uniform approach to sustainability and ESG reporting to increase transparency and attract investors. This strategy immediately addresses the financial capital problem by making the Port of Baku more desirable to potential investors. Improving the port's reporting and openness reassures investors about its commitment to sustainable practices, perhaps facilitating the funding flow required for green initiatives.

In summary, the research concluded that, while the issues are significant, they are solvable via strategic planning and targeted policy. By effectively transitioning into a green hub, the Port of Baku would gain considerable environmental advantages while also increasing operational efficiency and economic viability, presenting it as a model for other ports in the area.

Recommendations

The following suggestions should be collaboratively implemented in order to address the technological, financial, and reporting issues that the Port of Baku's green port initiatives face, as determined by an examination of global practices:

1. Establishment of a Working Group by the Port of Baku to oversee sustainability and ESG reporting by assigning specific responsibilities to its members. Conducting a materiality analysis to identify the most significant ESG impacts of the Port of Baku and preparing a final shortlist of material topics for inclusion in the Report. Performing an ESG gap assessment to identify areas for improvement, developing a roadmap with prioritized actions and resolution timelines, and engaging third-party advisory organizations to assist with the analysis. Collecting relevant quantitative and qualitative disclosures in accordance with GRI, TCFD, and SASB Standards, preparing a Sustainability/ESG Report aligned with these frameworks, and engaging a third-party assurance organization to audit the disclosed information. Finally, attracting a third-party ESG rating agency to assess and assign a rating to the Port of Baku's performance.
2. In order to develop the technological prowess of the Port of Baku that meets financial implications and sustainability aspects, it would be advisable to maintain the strategic phased-based deployment model. Additionally, the expansion of cooperation with technology novice companies with the help of initiatives like PortXL Accelerator could be a more practical and bargain-priced avenue that also provides young ventures with the necessary assistance and opportunities. Moreover, effective short and long-term training programs involving the Port of Baku, the Ministry of Ecology, by creating team development center will be crucial to develop the necessary competencies in green field workers.

3. To optimize implementing a landlord model at the Port of Baku, it is crucial to engage stakeholders such as Ministry of Finance to ensure efficient governance. Enhancing regulatory frameworks will provide clear guidelines for leasing, environmental compliance, and safety. A transparent tendering process is essential for selecting capable private operators, fostering trust, and ensuring fairness. Finally, robust mechanisms for performance monitoring and compliance should be established by the Port, along with capacity-building programs for port authority staff to manage the new operational model effectively, ensuring that environmental and operational standards are maintained.

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