Interreg
Baltic Sea Region

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BLUE ECONOMY
Blue Supply Chains

Industry best practices in Europe for greening activities in ports and terminals

- July 2024

EXECUTIVE SUMMARY

This document offers a comprehensive overview of environmental best practices implemented by ports and terminals across Europe, aiming to mitigate climate change and enhance sustainability in the freight sector. It is part of a broader initiative to identify and promote green investment opportunities and to provide actionable insights for ports and terminals looking to improve their environmental performance.

Objectives and Methodology:

The primary goal is to compile a resource that catalogues effective greening strategies, legislative frameworks, and successful initiatives in the maritime sector. The document supports the BSC project's goal of promoting climate change mitigation and identifying potential areas for green investment. The report is structured into three main tasks, with the first focused on identifying and analysing best practices in greening initiatives at ports and combined transport (CT) terminals. It draws on contributions from key stakeholders and analyses case studies of major ports and terminal operators to illustrate successful approaches.

Key standard-setters in the maritime sector:

- **International Maritime Organisation (IMO)**: Sets global standards for reducing greenhouse gas emissions and other pollutants in the maritime industry, utilising tools like the Energy Efficiency Design Index (EEDI) and the Carbon Intensity Indicator (CII).
- **International Association of Ports and Harbours (IAPH)**: Promotes global best practices and provides tools like the Environmental Ship Index (ESI) to help ports and terminals improve their environmental performance and operational efficiency.
- **European Sea Ports Organisation (ESPO)**: Focuses on sustainable development within EU ports, offering guidelines and programs such as the Green Guide and EcoPorts to help ports develop tailored environmental roadmaps.
- **Green Marine Europe**: An NGO dedicated to improving environmental sustainability in the maritime sector, particularly through initiatives aimed at reducing emissions and managing environmental impacts.

Case Studies:

The document presents in-depth case studies of four leading European ports—Rotterdam, Antwerp, Genoa, and Marseille—and four terminal operators—CFL Terminal, Interporto Bologna, Contargo, and Terminali Italia. These case studies highlight the strategic plans and specific greening initiatives undertaken by these entities, offering a practical reference for others in the sector.

Port of Rotterdam: To become a CO_2-neutral by 2050, the port initiated significant investments in hydrogen production and carbon capture and storage (CCS) projects, the Implementation of smart logistics systems to reduce inefficiencies and emissions, or even promoted recycling and reuse of materials within the port area, to name a few.

- **Port of Antwerp**: The port is focused on becoming climate-neutral by 2050, with a strong emphasis on hydrogen as a key element of its strategy. The port's sustainability efforts are categorised into Economy, Climate, and People & Environment, addressing connectivity, climate action, and environmental protection respectively.
- **Port of Genoa**: Genoa's port is advancing rail infrastructure projects, increasing intermodal accessibility, and transitioning to green energy through solar, wind, and wave power. The port is also actively involved in environmental preservation efforts, such as pollution prevention, waste management, and noise reduction initiatives.
- **Port of Marseille**: Marseille Fos is a promoter of the implementation shore power connections for ships, reducing emissions significantly. The port also emphasises modal shifts to rail and inland waterways, biodiversity conservation, and innovative projects to foster sustainable shipping. They aim to be fully electric by 2025 and are involved in LNG bunkering and hydrogen fuel technologies.

Terminal Operators:

The report also examines the role of intermodal terminals in reducing carbon emissions, with case studies highlighting various sustainability practices:

- **CFL Terminal**: CFL Terminal is committed to achieve carbon neutrality by 2050, in line with European Union targets. It invested in automation and digitalisation with the use of semi-automated cranes to improve operational efficiency, safety, and reduce energy consumption. It also invests in green technologies and infrastructure, such as the electrification of terminal equipment.
- **Interporto Bologna**: Aims to create a zero-impact logistics hub and transition towards self-sufficiency in energy, aligning with local and national sustainability goals. It is committed to expand its railway facilities with new rail-mounted gantry cranes, supported by renewable energy from planned photovoltaic systems, focusing on low-impact vehicles and sustainable infrastructure, it also initiated projects to become a self-powered community, utilising renewable energy generated on-site .
- **Contargo:** The group is committed to achieving climate neutrality by 2045, with a target to reduce emissions by 20% by 2030 compared to 2020 levels. Some of its initiatives involve a shift from road transport to more sustainable rail and barge options, better use of energy-efficient technologies like Raspberry Pi computers, LED lighting, and electric/hydrogen-powered reach stackers or the development of electric-powered barges and testing of catenary hybrid trucks under the ELISA Project .
- **Terminali Italia**: Integrates sustainability in its operations through energy efficiency and waste management. Its initiatives involve introduction of cranes with advanced technology for fuel efficiency and emissions reduction, and increased use of hybrid engines for shunting by 2031, the use of 100% renewable energy for specific operations, like at Verona Quadrante Europa and contracts with specialised firms for efficient waste disposal and employee training on proper waste handling.

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Objective and methodology

In the context of the WP1 on preparing solutions, UIRR has been mandated to compile the maritime sector's best practices, innovation and legislative framework in several catalogues to support the BSC project in its identification of climate change mitigation measures and green investment potential in maritime ports and inland Terminals. In order to carry out this first activity, UIRR has divided WP1 into three independent subtasks. This report covers the task 1.1 on providing best practices for greening ports and CT terminals.

The overall objective of UIRR was to create a catalogue that serves as a resource for ports, not by providing a comprehensive set of guidelines, but rather by compiling potential sources of inspiration for developing guidelines or implementing green initiatives. It seeks to identify key stakeholders who can either issue guidelines themselves or possess programmes that incentivise environmentally friendly practices in transshipment facilities such as ports and terminals. This task is also to identify initiatives that have been achieved by European Ports and Terminals outside the Baltic Sea Region. They have been selected based on their scale and access level to data and documents.

Initially, we identified the following crucial players in the field:

- The International Maritime Organisation (IMO) - as a target-setting international organisation.
- The European Sea Ports Organisation (ESPO) - offering a continental perspective and a guide for creating guidelines (up to date version 2021)
- The International Association of Ports and Harbors (IAPH) - serving as the main trade union for Ports and Harbors and leading the UN-backed World Port Sustainability Program.
- Green Marine Europe - an NGO providing solutions for the environmental sustainability of ports.

From this selection, we have identified organisations serving diverse purposes across various levels. IMO and IAPH operate on an international scale, while ESPO and Green Marine Europe predominantly focus on the European level. The objectives outlined for port environmental initiatives within the EU are documented in the catalogue dedicated to European legislation.

To begin with, we introduce the organisations in question, the ambitions they promote for the sector, and their suggestions. This helps us better understand what is expected from ports and to gain a comprehensive overview of the reasons driving ports to become more environmentally friendly, as well as the assistance available to develop ports' greening plans. We elaborate on all these elements to achieve a comprehensive theoretical understanding.

In a subsequent phase, the catalogue dives into concrete examples initiated by four ports authorities: the Ports of Rotterdam, Antwerp, Genoa and Marseille, as well as four terminals' companies: CFL Terminal, Interporto Bologna, Contargo, Terminali Italia. We categorise these examples according to each Port's authorities' strategic plan, and compare it to the axles developed by the selected international and European organisations. This analysis is supplemented by interviews and concrete innovative projects transcribed in the annexes. As this catalogue is focused on freight transportation, greening of ports and terminals, certain aspects of a greening of ports plan have been set aside as they fall out of the scope set for this research activity.

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Chapter 1 –
Ports authorities greening strategy

International Maritime Organisation (IMO)

Description [1]

The establishment of the International Maritime Organisation (IMO) in 1948, later known as IMO, aimed to enhance maritime safety through universally followed international regulations. The IMO Convention, enforced in 1958, outlined the organisation's objectives, which include promoting cooperation among governments for regulatory practices concerning technical aspects of shipping engaged in international trade and fostering the adoption of high standards in maritime safety, navigation efficiency, and marine pollution prevention.

Initially focused on safety, IMO's early efforts led to the adoption of significant treaties such as the International Convention for the Safety of Life at Sea (SOLAS) in 1960. However, the emergence of pollution as a pressing issue, prompted IMO to address environmental concerns alongside safety regulations. The International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) emerged as a crucial measure, covering various forms of pollution including oil, chemicals, sewage, and rubbish. IMO continued to address environmental issues with conventions targeting marine biosafety, anti-fouling systems, ballast water management, and ship recycling in the 2000s.

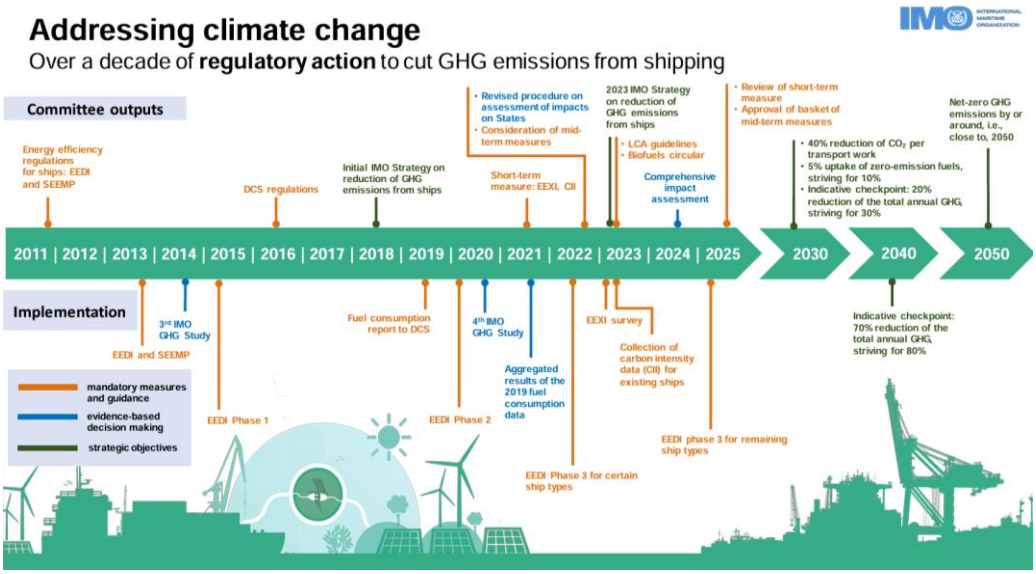

Figure 1 - IMO's regulatory action to cut GHG emissions from shipping

In more recent years, the urgency of tackling greenhouse gas (GHG) emissions from shipping became a prominent concern, aligning with UN Sustainable Development Goals and the 2015 Paris Agreement. IMO engaged on initiatives to improve energy efficiency and reduce GHG emissions, culminating in the adoption of the Initial IMO GHG strategy in 2018 and a revised Strategy on Reduction of GHG Emissions from Ships in 2023.

Strategy on Reduction of GHG Emissions from Ships[2]

In 2018, IMO adopted its Initial Strategy aimed at reducing greenhouse gas (GHG) emissions from ships and phasing them out as soon as possible. IMO subsequently approved a follow-up programme

[1] https://www.imo.org/en/About/HistoryOfIMO/Pages/Default.aspx
[2] https://www.imo.org/en/MediaCentre/PressBriefings/pages/Revised-GHG-reduction-strategy-for-global-shipping-adopted-.aspxv

to the Initial Strategy, outlining plans to meet its timelines up to 2023. Taking stocks of the results of the initial strategy, the IMO adopted a revised IMO Strategy on Reduction of GHG Emissions from Ships, in accordance with the agreed program of follow-up actions.

The 2023 IMO GHG Strategy sets out a vision for international shipping, aiming for a 40% reduction in carbon intensity by 2030 and striving for a 10% uptake of zero or near-zero GHG emission technologies by the same year.

To achieve these goals, the strategy identifies various levels of ambition, including enhancing energy efficiency for new ships, reducing CO_2 emissions per transport work, increasing the uptake of zero or near-zero emission technologies, and ultimately reaching net-zero GHG emissions.

The strategy also introduces indicative checkpoints to monitor progress, such as reducing total annual GHG emissions from shipping by at least 20% by 2030 and striving for 30%, and further reductions going up to 70-80 % by 2040 compared to 2008 levels.

Targets on other pollution sources

On January 1, 2020, the "IMO 2020" regulations took effect, aimed at reducing sulphur content in fuel oil used aboard ships operating outside designated emission control areas to 0.50% m/m (mass by mass), a significant decrease from the previous limit of 3.5%. Former regulations had already enforced stricter limits (0.10%) within specific designated emission control areas (ECAS), such as the North Sea and Baltic Sea, since January 1, 2019. The enforcement of this new limit followed an amendment to Annex VI of the International Convention for the Prevention of Pollution from Ships (MARPOL), which came into force on January 1, 2019.[3]

Additionally, the IMO is engaged in several global projects[4] to support the GHG strategy, including capacity-building initiatives, funding support, and technology development to facilitate the transition to low and zero-carbon fuels.

Levers used to achieve greening targets[5]

Energy Efficiency Design Index (EEDI)

The Energy Efficiency Design Index (EEDI) sets a crucial benchmark for new ships, requiring a minimum level of efficiency and greenhouse gas (GHG) emission reduction. Its goal is to drive innovation across ship design, aiming to lower emissions from the outset. Implemented in 2013, it mandates a gradual reduction in emissions, with a 30% reduction required for applicable ship types after 2022.

[3] https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/Res_MEPC_286(71)_Tier%20III%20ECA%20and%20BDN.pdf
[4] https://www.imo.org/en/OurWork/TechnicalCooperation/Pages/ITCP.aspx
[5] https://marine-digital.com/article_eeoi , DNV https://www.dnv.com/maritime/insights/topics/eexi/index.html#:~:text=The%20Energy%20Efficiency%20eXisting%20ship,technical%20design%20of%20a%20ship, https://www.imo.org/en/ourwork/environment/pages/data-collection-system.aspx

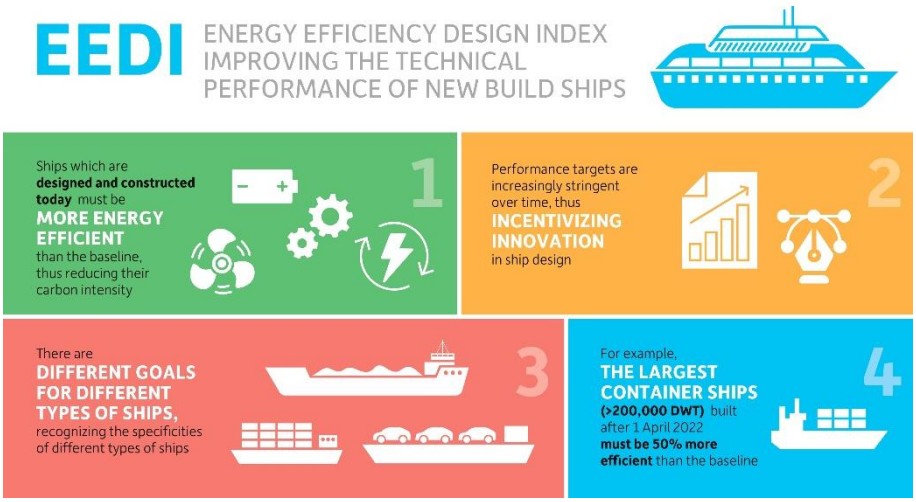

Figure 2 - The EEDI index improving the technical performance of new build ships

Energy Efficiency Existing Ship Index (EEXI)

The Energy Efficiency Existing Ship Index (EEXI) is an IMO measure aimed at reducing greenhouse gas emissions from already existing ships by addressing their technical design. Ships must achieve EEXI approval at least once in their lifetime, with the first periodic survey required by 2023 at the latest.

The required EEXI value is determined based on factors such as ship type, capacity, and propulsion principle, representing the maximum acceptable attained EEXI value. Each ship falling under the regulation must calculate its attained EEXI.

Figure 3 – EEXI index for improving the technical performance of existing ships

For statutory compliance, the digital tool enables ship owners to calculate, compare, generate, and submit EEXI technical files for approval. Changes requiring documentation submission can be processed through the alteration portal, with subsequent verification during surveys.

Final implementation involves verifying compliance with EEXI requirements during annual, intermediate, or renewal surveys after January 1, 2023, as part of the IAPP survey scope. Early compliance can be demonstrated through voluntary statements. For complex cases or personalised consultations on EEXI implementation and fleet optimisation, DNV's Advisory team offers technical support.

Ship Energy Efficiency Management Plan (SEEMP)

The Ship Energy Efficiency Management Plan (SEEMP) complements the EEDI and EEXI by overseeing the efficiency and greenhouse gas emissions of existing shipping fleets. SEEMP employs strategies such as speed optimisation, weather-based course adjustments, hull maintenance, and heat recovery methods to enhance vessel efficiency and operational performance.

SEEMP consists of three main components:

- A ship management plan aimed at improving energy efficiency, made mandatory for all ships above 400 gross tonnes (GT).
- A plan for collecting ship fuel oil consumption data, involving ships above 5,000 GT as part of the Data Collection System (DCS).
- A plan for managing ship operational carbon intensity for ships subject to the Carbon Intensity Indicator (CII).

Carbon Intensity Indicator (CII)

The Carbon Intensity Indicator (CII) serves as a metric for a ship's energy efficiency, expressed as grams of CO_2 emitted per cargo-carrying capacity and nautical mile.

Beginning in 2024, ships must calculate and report their CII to the Data Collection System (DCS) verifier, along with aggregated DCS data from the previous year. This includes any correction factors and voyage adjustments, with the deadline for submission remaining fixed at March 31 each year.

The CII, along with an environmental rating ranging from A to E, based on the ship's performance, will be documented on the DCS Statement of Compliance (SoC), which must be kept on board for five years.

Figure 4 - CII rating for improving the operational performance of existing ships

Ships receiving a D rating for three consecutive years or an E rating must update their SEEMP Part III with a corrective action plan, verified before the SoC issuance. This plan should analyse why the required CII wasn't met and propose a revised implementation strategy.

The CII calculation involves "grams of CO2 emitted per cargo-carrying capacity and nautical mile," with correction factors and voyage adjustments applied as needed. The IMO recommends using the Energy Efficiency Operational Indicators (EEOI) to help comply with the CII requirements.

Mandatory Data Collection System (DCS)

The IMO ship fuel oil consumption system (IMO DCS), adopted in October 2016 (MEPC.278(70)), mandates ships of 5,000 GT and above to record and report fuel oil consumption data to inform GHG reduction measures. Data submission timeline includes reporting to flag States by May 31 and to IMO Ship Fuel Oil Consumption Database by June 30 annually. The database is accessible via GISIS, with confidentiality ensured. MEPC developed guidelines for SEEMP, administration verification, and database management to ensure uniform implementation. Additionally, circulars provide guidance for non-party States and compliance confirmation. The IMO Secretariat issues user guidance for the GISIS module.

Energy Efficiency Operational Indicators (EEOI)

The implementation of EEOI emerges as a strategy to combat global warming. This monitoring tool is disseminated to shipping enterprises through the Ship Energy Efficiency Management Plan (SEEMP) to oversee the efficiency performance of their ships and fleets over time. A simplified perspective on EEOI equates it to the quantity of CO_2 emitted per unit of work performed by a vehicle. Currently, many large ships are becoming more energy-efficient per tonne of cargo transported, with 400,000 DWT bulk carriers demonstrating approximately 50% greater energy efficiency per tonne of freight compared to 180,000 DWT Capesizes.

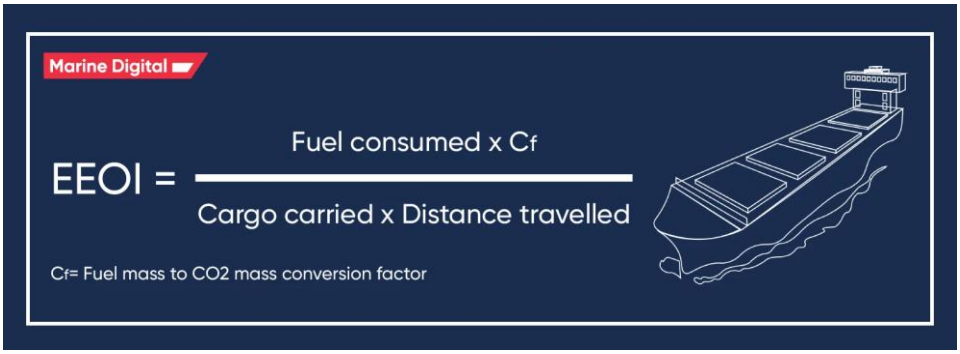

Figure 5 - The EEOI calculation method

Development of alternative fuels

The exploration of alternative fuels is vital for the shipping industry's sustainability goals. Various options like liquefied natural gas (LNG), liquefied biogas (LBG), methanol, hydrogen, hydrotreated vegetable oil (HVO), ethanol, and ammonia are being considered. To meet the International Maritime Organisation's greenhouse gas reduction targets by the middle of the century, carbon-neutral fuels need to contribute 30–40% of the total energy for international shipping. Selecting future marine fuels requires careful assessment of factors such as environmental impact, technical performance, availability, cost, and infrastructure.

To that end, IMO has triggered a mapping exercise[i] which revealed areas where additional regulatory efforts may be necessary, both by the International Maritime Organisation (IMO) and potentially other standardisation and certification bodies. These areas include enhancing safety guidelines for using alternative fuels onboard, ensuring the quality of alternative fuels, addressing lifecycle greenhouse gas (GHG) emissions, establishing engine standards, and assessing the risks of spills from alternative marine fuels.

International Association of Ports and Harbours (IAPH)

Description

The International Association of Ports and Harbors (IAPH), established in Tokyo in 1955, serves as a global representative for port authorities and operators. With 177 ports and 147 port-related businesses across 84 countries, it oversees over 60% of the world's sea-borne trade and container traffic. IAPH advocates for its members' interests in regulatory affairs at international forums such as the International Maritime Organisation, engages with alliances like the Global Maritime Forum, and holds consultative status with UN bodies like UNCTAD and UNEP. As an industry benchmark, IAPH aims to disseminate best practices from leading ports worldwide.

Levers used to achieve greening targets

Audit Tool[6]

The IAPH has created a model for accrediting LNG bunker suppliers, which ports can adopt as a framework for their own accreditation systems. Ports can establish a set of qualification criteria that LNG bunker suppliers must meet before they can apply for a license to operate LNG bunkering services within their jurisdiction.

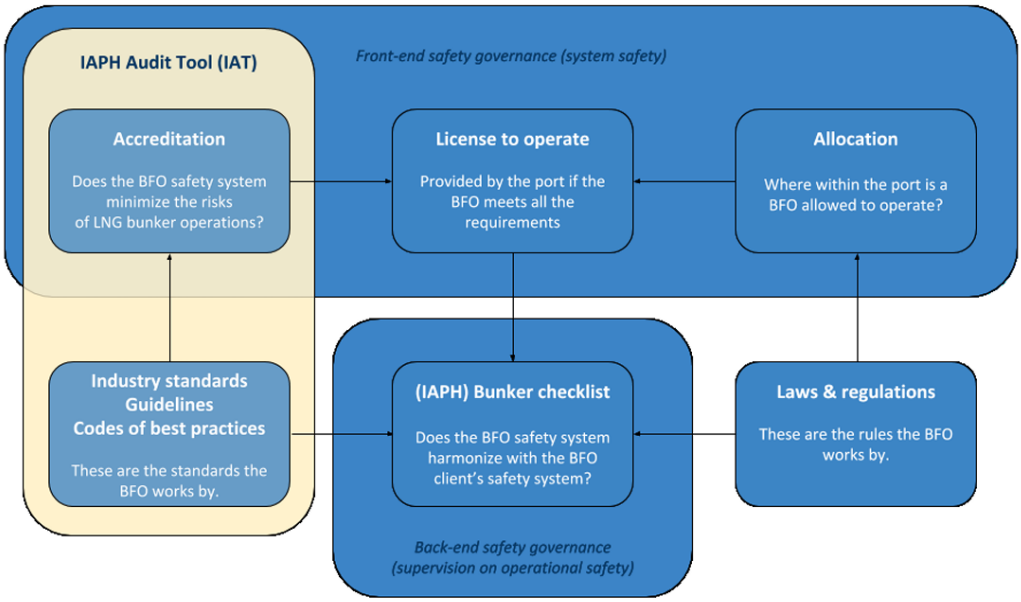

Figure 6 - IAPH Audit Tool and Bunker checklist

Bunker checklists

The organisation has developed a bunkering checklist tailored for alternative fuels like LNG, hydrogen, ammonia, or methanol. This checklist reflects the additional requirements necessary for bunkering operations within port environments. Its aim is to prevent incidents and pollution that could occur during such operations. Additionally, it facilitates better compliance with diverse rules and regulations that are applied in various ports.

[6] https://www.iaphworldports.org/clean-marine-fuel-cmf/

IAPH world Ports sustainability awards[7]

The IAPH World Ports Sustainability Program, now in its third year, was created to support ports in implementing the United Nations' 17 Sustainable Development Goals. This initiative aims to strengthen and streamline sustainability endeavours across global ports while promoting international collaboration with supply chain partners.

The IAPH port industry incentive scheme – ESI[8]

Since 2011, the IAPH Environmental Ship Index (ESI) has provided data on merchant vessel environmental impact, it recognises seagoing vessels that exceed current emission standards set by the IMO in reducing air pollutants. Ports use this to reward ships showing emission improvements. The ESI is widely adopted, with 6,700 ships and 60 incentive providers globally, including ports in North America, Brazil, Oceania, and Europe. A majority of the ports situated in the Baltic Sea Region are represented.

Figure 7 - ESI participating incentive providers

European Sea Ports Organisation[9]

Description

The European Sea Ports Organisation (ESPO), created in 1993, represents the port authorities, port associations and port administrations of the seaports of 21 Member States of the European Union and Norway at EU political level. ESPO also has observer members in Albania, Iceland, Israel, Montenegro, Ukraine and United Kingdom. Based in Brussels, the European Sea Ports Organisation ensures that seaports have a clear voice in the European Union. ESPO represents the common interests and promotes the common views and values of its members to the European institutions and its policy makers.

[7] https://www.iaphworldports.org/iaph-wpsp/
[8] https://www.environmentalshipindex.org/
[9] https://www.espo.be/

ESPO urges every port authority to create a tailored plan for sustainable development, considering the unique resources and situations of each port. To aid in this endeavour, the Green Guide offers a checklist outlining essential factors for ports to contemplate when crafting or revising their ambitious green roadmap. Though not comprehensive, this checklist serves as a valuable starting point for port authorities to embark on their journey towards a greener future.

Figure 8 -ESPO: the Top 10 Environmental Priorities 2023

EcoPorts[10], a business-led environmental initiative has become assimilated into the European Sea Ports Organisation as of 2011. At its core, EcoPorts aims to establish environmental equity among ports by fostering collaboration and knowledge exchange. To achieve this goal, EcoPorts offers its members access to two established tools : Self Diagnosis Method (SDM) and a Port Environmental Review System (PERS), certificate assessed by LRQA Nederland B.V.

Levers used to achieve greening targets[11]

The Green Guide 2021

The development of the Green Guide forms the foundation of ESPO's initiatives to assist its members in enhancing their environmental management and performance.

The evolving legislative and environmental landscape since 2012 has led to the implementation of new requirements and frameworks, transforming some proactive environmental initiatives into mandatory obligations for ports. Directives such as the Alternative Fuel Infrastructure Directive, the Port Reception Facilities Directive, and the EU Sulphur Directive exemplify this shift.

[10] https://www.ecoports.com/
[11] Further details on the tools to be used to implement this process can be found in the EPSO Green Guide 2021 pp 27-31

The ESPO Green Guide 2021 aims to support port authorities in their environmental endeavours by providing them with tools and best practices to enhance their performance. The guide offers a comprehensive manual for greening ports, presenting a unified vision of port authorities' role in contributing to a sustainable European future. It sets forth ambitions for port authorities to progress towards 2050 and beyond, allowing each port authority to tailor their approach through a port-specific roadmap. Additionally it outlines various tools available to port authorities to aid in achieving their environmental objectives.

The following ambitions serve as a declaration of intent, a commitment from ESPO's member ports, which should guide and provide directions to ports when drafting their individual port roadmaps. The first theme outlines the ambitions set for the European port authorities whereas the second one provides the ambitions aimed at the port area.

Theme I – Ambitions for European port authorities

The ambitions for the European port authorities, detailed below, are categorised in two target deadlines (2025 and 2030) and an open-ended objective (continuous efforts). This roadmap is indicative and includes the promotion of ESPO's own standards, but overall, this still provides an interesting framework for the elaboration of a greening plan.

- **By 2025: setting the course for a green future mitigating externalities and strengthening the EcoPorts Network**
    - European port authorities should aim to make an inventory of GHG emissions within the remit of the port authority, setting a baseline for monitoring and mitigation efforts. European port authorities should compile an inventory of port relevant legal environmental and climate obligation and means of compliance.
    - European port authorities should aim to have individual port specific roadmaps in place.
    - ESPO EcoPorts Network should cover ports from all EU maritime Member States, as well as ports from neighbouring European countries.
    - 80% of ports could have an Environmental management system in place, and at least a third of EcoPorts member should have the port specific environmental certification PERS Verification. Using other international standards such as ISO 14001 should also be encouraged.
    - The EcoPort Environmental Management Index (EMI), measuring environmental review system should rate ports over 8/10.
    - The EcoPort self-diagnosis method (SDM) and port environmental Review System (PERS) will be periodically reviewed to align their tools with the ambitions set in this Guide and the changing legislative context for environmental and climate issues.
- **By 2030**: **setting the course for a green future mitigating externalities**
    - Port authorities should aim to be net zero emitters by greening their own activities and operations within their own remit.
- **Continuous efforts**

- Port authorities should include energy efficiency and green considerations when making purchases and investments related to port authority infrastructure and operations.
- Port authorities should also consider energy efficiency and green considerations for their own vessels and develop a green plan for the port authority which could include avoiding single use plastics incentivising green staff mobility biking or car-pooling and reducing paper use. As part of port developments, EU port authorities will apply an active policy for biodiversity in the port waters and in protected areas near the remit.
- European port authorities commit to adopting a strategic plan for their communication and to step up efforts to address different target groups (stakeholders, local community, visitors) Based on this communication plan, European port authorities undertake to communicate their environmental policy to all relevant stakeholders.
- Together with port stakeholders, European port authorities commit to having their environmental policy publicly available on the port's website.
- European Port authorities will step up their use of social medias as part of a dedicated strategy and other means of communication (newsletters, physical information points/ moments) in order to interact with, engage and continuously update local communities and stakeholders.

Theme 2: Ambitions aimed at the port area

The ambitions aimed at the port area are detailed similarly to the categorisation defined under theme 1.

- **By 2025: reducing environmental impacts of the port area**
  - European port authorities will develop an overview of the emissions of all stakeholders in the port area in close cooperation with these players. European port authorities seek to encourage and where possible incentivise the mitigation of externalities (air pollution, noise) in the port area.
  - Encouraging the greening of the port area (2030) European port authorities call on shipping companies to lower CO_2 emissions at berth by at least 50%, building on forthcoming European legislation for 2030 and beyond.
  - European port authorities call on operators in the port area to help improve air water and soil quality and to reduce noise. European port authorities will work towards coalitions or framework agreements with shipping companies and other maritime stakeholders.
- **By 2030 Encouraging the greening of the port area**
  - European port authorities call on shipping companies to lower CO_2 emissions at berth by at least 50% building on forthcoming European legislation for 2030 and beyond.
  - European port authorities call on operators in the port area to help improve air water and soil quality, and to reduce noise.

- European port authorities will work towards coalitions or framework agreements with shipping companies and other maritime stakeholders.
- Together with port and city stakeholders, European port authorities will strive to encourage efficient and sustainable waste management onboard vessels.
- Together with port and city stakeholders will seek to reduce waste and the use of plastics in the port area.

- **Continuous efforts Positively contributing to a green future :**
  - European port authorities will be a catalyst for greening by encouraging green activities by port stakeholders (offshore, blue growth and circular economy) by facilitating pilot projects and through attracting green investments.
  - European port authorities pursue an active strategy to facilitate the greening of the whole port area.
  - European port authorities engage to actively contribute to and facilitate research in relevant fields European port authorities will stimulate port stakeholders to deliver an improved modal split.
  - European port authorities will encourage circularity in the port area.
  - European ports authorities commit to being part of renewable energy solutions.

Port-specific roadmap

ESPO encourages each port authority to develop a port-specific roadmap, which provides a path towards their green future, whilst taking account of the port's resources and circumstances. To assist port authorities in this work, a checklist for ports has been elaborated. Although it is not exhaustive, the checklist provides some key aspects for ports to consider when developing or updating their port-specific and ambitious roadmap for greening. The check list is divided into eight to-dos (see annex II for the details).

Ecoport's Self Diagnosis Method (SDM)

The Self Diagnosis Method (SDM) comprises three key components: the SDM checklist, SDM Comparison, and SDM Review. Firstly, completing the SDM checklist grants access to the EcoPorts network, allowing ports to assess and reflect on environmental risks. This data is then used to establish a benchmark of environmental performance across the sector. Secondly, ports can compare their SDM scores with the European average, enabling self-evaluation and priority setting for environmental actions. Finally, ports can opt for an SDM Review, receiving expert analysis, including a gap and SWOT analysis, along with customised recommendations based on their top priorities for action. These tools not only enhance environmental performance but also facilitate knowledge-sharing and networking within the EcoPorts community.

ECOPORT's Port Environmental Review System (PERS)

The Port Environmental Review System (PERS) stands out as the sole environmental management standard tailored specifically for the port sector. Developed by ports themselves, PERS not only integrates fundamental requirements from recognised environmental management standards like ISO 14001 but also addresses port-specific needs, aligning with ESPO recommendations. Administered through independent review by LRQA Nederland B.V., PERS certification, valid for two years, offers various benefits including user-friendliness, alignment with sustainable development

goals, and enhanced reputation. To utilise PERS, ports can access documentation and guidelines on the EcoPorts website, follow implementation guidelines, apply for certification through an online form, and undergo evaluation by LRQA Nederland B.V., culminating in the issuance of a Certificate of Verification.

Green Marine Europe[12]

Description

Green Marine Europe constitutes an environmental certification program tailored to the European maritime sector, offering a voluntary framework for participants to enhance their environmental practices beyond regulatory requirements. Addressing critical concerns regarding air, water, and soil quality, the initiative engages 25 ship owners, focuses on 11 key indicators, and involves 2 shipyards.

Green Marine Europe's certification process emphasises rigour and transparency, requiring participants to fulfil all certification requirements. Participants conduct an annual self-evaluation, rating their performance on a 1-to-5 scale using guidelines provided by Green Marine Europe and submitting a signed report to the organisation. Every two years, results undergo external verification by an accredited verifier, based on documentation provided by the participant. Certification is granted only after an external review of the first self-evaluation. Results, along with certification status, are published on Green Marine Europe's website. Participants must continually improve, achieving Level 2 for at least one indicator in the first year and progressing annually until Level 2 is reached for all relevant indicators. The Green Marine Europe certification logo identifies compliant participants, who receive annual certificates. Detailed criteria and issues targeted by the program are available on the Performance Indicators page.

Levers used to achieve greening targets

Community Impacts[13]

Shipyards strive to reduce community exposure to nuisances like noise, dust, and light resulting from their operations. With urban populations encroaching on port areas, fostering harmonious coexistence is vital for maintaining ports' social license to operate. Green Marine Europe promotes integrating innovative equipment, technologies, and best practices to mitigate these impacts,

Greenhouse Gas Emissions[14]

Ship owners and shipyards seek to cut greenhouse gas (GHG) emissions. Despite shipping's efficiency, it accounts for over 2% of global GHG emissions, ranking as the 6th largest emitter in 2015, with ongoing growth expected. Green Marine Europe urges specific actions to enhance efficiency and reduce emissions. Its 5-level performance indicators include inventory, management plans, and reduction targets. Levels 4 and 5 necessitate ship owners to achieve annual GHG intensity reductions of 1% and 2%, demonstrating leadership in emissions reduction.

[12] https://greenmarineeurope.org/en/
[13] https://greenmarineeurope.org/en/certification/performance-indicators/community-impacts/
[14] https://greenmarineeurope.org/en/certification/performance-indicators/greenhouse-gas-emissions/

Pollutant Air Emissions Nox[15] & Pollutant Air Emissions Sox & Pm[16]

Green Marine Europe aims to cut air pollutants emitted from ships, targeting nitrogen oxides (NOx), sulfur oxides (SOx), and particulate matter (PM). Shipping emits pollutants via fossil fuel combustion, impacting air quality, notably in urban ports. Ship owners are urged to adopt cleaner engine technologies and exhaust gas containment systems to reduce NOx emissions. Moreover, the initiative advocates for lower sulphur fuels and advanced technologies to curb SOx and PM emissions while also striving to lower overall fuel consumption.

Underwater Noise[17]

Ship owners aim to reduce underwater noise from ship operations to protect marine mammals. This involves minimising disruptions in saltwater environments through best practices and new technologies.

Spill Prevention and Stormwater Management[18]

Green Marine Europe aims to prevent spills and leaks of pollutants while managing stormwater to minimise environmental contamination. The program's performance indicator focuses on preventing spills and leakages from shipyard operations by implementing best management practices and prevention measures. Participants are encouraged to adopt pollution prevention plans for water and land, enact preventive maintenance programs for facilities and equipment, and install effective stormwater management systems to treat runoff before discharge into the environment if it has come into contact with contaminated areas.

Oily Discharge[19]

The Oily Discharge performance indicator focuses on reducing oil discharged or offloaded during vessel operations. At Level 2, best management practices emphasise inspecting, maintaining, and operating oily water separators and other equipment using oil and water, ensuring they function properly. Oily water from bilges must be treated to 15ppm before discharge at sea to prevent pollution. Level 3 includes an inventory and guidelines for environmentally friendly cleaning products, while higher levels require structural measures such as an Integrated Bilge Treatment System (IBTS). Proposed to the International Maritime Organisation in 2011, IBTS separates fluids at the source, reducing the volume of oily water needing treatment.

[15] https://greenmarineeurope.org/en/certification/performance-indicators/air-emissions-nox/
[16] https://greenmarineeurope.org/en/certification/performance-indicators/air-emissions-sox-pm/
[17] https://greenmarineeurope.org/en/certification/performance-indicators/underwater-noise/
[18] https://greenmarineeurope.org/en/certification/performance-indicators/spill-prevention-and-stormwater-management/
[19] https://green-marine.org/certification/performance-indicators/oily-discharge/

Port Authorities: four case studies

Ports represent vital hubs of economic activity, facilitating the movement of goods and fostering trade relationships on both local and global scales. Beyond the cranes, decks and quays, generally pictured, ports are complex ecosystems bringing together numerous organisations that fulfil different purposes. Coordinating these undertakings is the responsibility of a single entity: the Port Authority.

Port authorities play multifaceted roles (landlords, regulators, operators, and community builders), which gives them various levers to implement governance measures and ensure operational efficiency. Yet, this pivotal position does not offer them direct control over the entities operating within their jurisdiction.

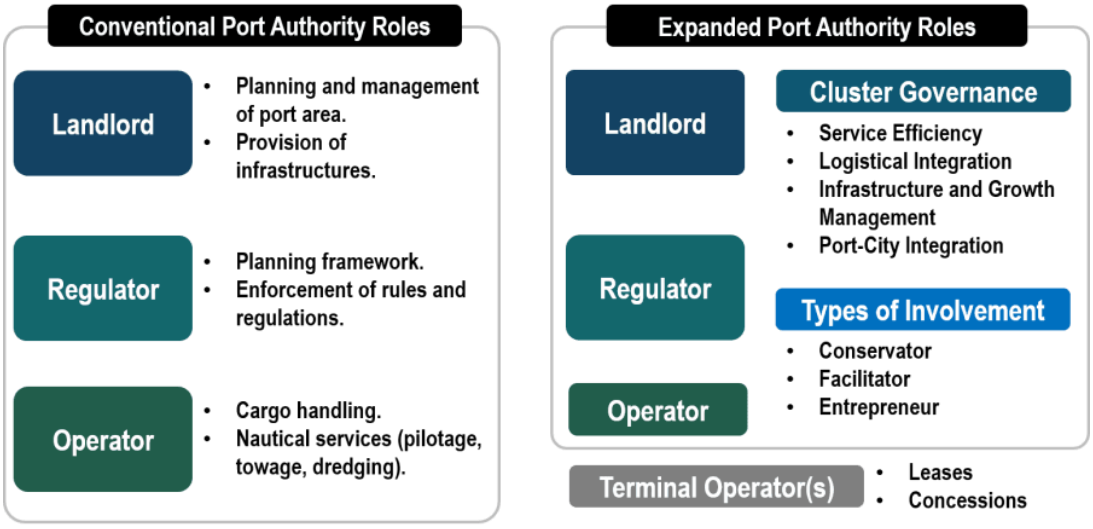

Figure 9 - The role of a port authority

As **landlords**, port authorities oversee the allocation of concessions to companies seeking to establish a presence within the port. Through an evaluation process, they select projects that align with predefined criteria. This relationship necessitates continual dialogue between the port authority and concessionaires, fostering collaboration and alignment of visions.

With their **regulator role**, port authorities establish clear guidelines and agreements to govern port activities, prioritising safety and environmental stewardship. Leveraging innovative technologies, they monitor compliance and enforce adherence to established standards, ensuring the well-being of personnel and the surrounding ecosystem.

As **operators**, port authorities strive to optimise efficiency and safety in port operations. Through ongoing adjustments and advancements in infrastructure, they aim to deliver top-tier services while minimising environmental impact and remaining competitive in the global market.

Lastly, as **community builders**, port authorities build partnerships between port stakeholders and surrounding communities. By prioritising the development of energy-efficient infrastructure and efficient services, they aim to serve not only the economic interests of the port but also the welfare of the communities they operate within.

Port Authorities levers for governance

Example: the Rotterdam Port Authority (RPA)

The Port of Rotterdam, the biggest in Europe, prepares for an expected surge in shipping activity, in the coming years. With projections indicating a substantial portion of this growth converging upon its docks, Rotterdam's strategic vision not only includes adaptation to growing volumes of shipment, but also to the installation of infrastructures and practices adapted to a sustainable future.

As part of its expansion plans, the port invests in **infrastructure** improvements, such as terminals, railways, and depots, to accommodate projected growth. Simultaneously, efforts are made to integrate innovation into operations, such as implementing autonomous container movement within terminals, despite constraints due to regulatory considerations. Additionally, the port plans the **construction of rail track**s for container transportation in order to reduce reliance on less sustainable modes of transport, like trucks.

In terms of **regulations** and **incentives**, the port adopts a proactive approach to promote sustainable transport options. Mandating the use of Euro 6 fuel for vehicles within the port area and facilitating charging infrastructure for electric trucks are examples of initiatives aimed at reducing emissions and encouraging cleaner transportation methods. However, the effectiveness of these measures relies on **collaboration with stakeholders** and overcoming challenges such as enforcement and convincing inland communities of the benefits of green initiatives.

As a **landlord**, the Port of Rotterdam's development process reflects a comprehensive strategy that encompasses various aspects of sustainability. For instance, when considering new projects such as distribution centres, the port conducts thorough assessments to determine their necessity and potential environmental impact. This includes evaluating factors like location suitability and resource requirements, ensuring that developments align with greening objectives.

In measuring CO_2 emissions, the port collaborates with major industrial players who are mandated to report their emissions as part of **licensing agreements**. While the responsibility for reporting lies with these companies, the port plays a crucial role in ensuring compliance and promoting transparency. Additionally, the port actively promotes greening investments by showcasing the viability of innovative solutions, such as electric barges, and aligning projects with sustainability goals.

Despite these efforts, the port faces challenges such as public opinion and balancing economic interests. Protests and movements advocating for environmental conservation highlight the need for faster transitions towards sustainability. Balancing economic growth with environmental concerns requires careful navigation, particularly in densely populated areas where environmental impact is more pronounced. Nonetheless, the port remains committed to achieving sustainability goals while addressing the needs of both the public and its clients, reflecting a holistic approach to greening endeavours.

In the following section, we dive into the manifold levers used by port authorities, focusing on the initiatives endeavoured by them to enhance environmental protection. As this report is more oriented to be a practical tool for the greening of ports, the social, economic, or community-building missions of port authorities will only be partially tackled. Through comprehensive analysis and case studies, we seek to uncover best practices and innovative approaches driving the evolution of port governance and operations in the pursuit of a greener and more resilient future.

In the following section, we have cited four European ports as examples: the Port of Rotterdam, which is the largest in Europe and one of the top 10 in the world; the Port of Antwerp, the second largest in Europe, also situated in the North Sea like Rotterdam; the Port of Marseille for the Mediterranean region, and the Port of Genoa, also located in the Mediterranean, respectively ranked as the 15th and 24th largest in Europe. With this sample, we encompass various regions, seas, and port sizes, enhancing the diversity of the sample. Each of these ports has developed a long-term strategy for greening their activities, which they have made available on their respective websites. In the following section, we will discuss the strategies implemented by each port. Further information on the project mentioned in this section are laid down a summary table of their initiatives, in annex IV.

Port of Rotterdam

The Port of Rotterdam in the Netherlands is one of the largest seaports in Europe. It is considered to be a strategically important distribution point in Europe as it is surrounded by Europe's highly-populated and industrialised centres.

The Port of Rotterdam occupies 12,470 hectares (ha) with industrial sites covering an area of 4,400ha, and infrastructure and water surface covering the remaining area. The length of the port is 42 km, while its quay length is 76 km and it has 126 jetties. The port also includes 1,500km of pipelines. The port has 14 container terminals to handle short-sea, deep-sea and inland shipping, and 20 container depots. With a maximum water depth of 24 meters, the port of Rotterdam can accommodate the vessels with the deepest draughts. Shipping, inland shipping, rail, road and pipeline modes meet in the port. In 2023, 27,886 seagoing vessels and 89,175 inland vessels called at the port. The container throughput decreased by 6.8% to 130.2 million tons (2022: 139.7 million tonnes). The port of Rotterdam is a dynamic, international environment where around 193,000 people work every day.

Figure 10 - Key figures of the Port of Rotterdam (2023)

The Port of Rotterdam Authority is dedicated to generating economic and social value while pursuing sustainable growth. It has drawn a plan to allow the combination of both elements with primary focus is on maintaining the safety, health, and attractiveness of the port and its surrounding area. The port is also engaged in addressing climate change while ensuring that the port remains a significant contributor to prosperity and employment in the Netherlands. Its efforts are centred around three main themes:

- **Ensuring a Safe and Healthy Environment**: Safety is designated as paramount within the port, and the authorities strive to create a healthy and appealing living environment for all.
- **Addressing Climate Change and Energy Transition**: The authorities are committed to combating climate change, with the port of Rotterdam serving as a focal point for the ongoing energy transition.
- **Fostering People and Employment**: The authorities are dedicated to promoting socially responsible employment practices and creating opportunities for sustainable employment within the port community.

The three themes allow the port to concentrate its investments efforts. For the purpose of this report, only the two first, which are directly link with greening measures of EU, are tackled.

Safe, healthy port and surroundings[20]

Recognising the inherent impact of port activities on the surrounding ecosystem, the port is committed to enhancing the quality of life for all stakeholders, be it local residents, port personnel, businesses, or leisure seekers. It aims at cultivating a safe, healthy, and inviting atmosphere—a milieu where companies thrive, communities flourish, and biodiversity thrives harmoniously.

Pollution

Central to this vision is the port's effort to mitigate emissions, thereby mitigating our environmental footprint and safeguarding the climate. Through ongoing innovation and collaboration, the authorities endeavour to make the port operations smarter, more efficient, and inherently more sustainable. Concurrently, addressing the carbon footprint of freight transportation constitutes a pivotal focus area, with collaborative initiatives aimed at ushering in a more climate-friendly logistics landscape.

Moreover, the port's commitment extends to **reduce both air pollution and noise disturbances**. The Port is monitoring this pollution via an extensive network of e-noses which enable real-time assessment of air quality, while investments in shore power infrastructure allows ship generators and auxiliary engines to be turned off during docking periods, thereby curbing noise pollution. Collaborating closely with the municipality, the port strives to strike a balance between port development and residential tranquillity, incentivising noise-conscious ship practices through tangible contributions.

Additionally, transparency is integral to the authorities' approach, with both e-nose and air monitoring networks accessible online, enabling stakeholders to track and assess regional air quality comprehensively.

[20] https://www.portofrotterdam.com/en/building-port/sustainable-port/safe-healthy-port-and-surroundings

Waste

Recognising the detrimental impact of litter on both ecosystems and maritime activities, the Port of Rotterdam Authority is also committed to preserving the cleanliness of the port, both on the ground and in the surrounding waters.

Within Rotterdam's port, litter often accumulates near motorway junctions, quaysides, and areas frequented by large volumes of visitors. To counter this, the port maintain a robust infrastructure of rubbish bins and waste receptacles on land, frequently emptied and maintained to prevent overflow. The port also counts on the utilisation of technologies like the BuitenBeter App, enabling rapid response to reported instances of litter accumulation within the port.

Each year, the port's dedicated efforts result in the collection of nearly 1.3 million kilograms of waste, the equivalent of 43 fully laden trucks. Of this volume, approximately a quarter comprises litter retrieved from the shore. On the seaside, the Port's commitment to cleanliness extends beneath the surface, with the retrieval of over 100,000 kilograms of debris, including plastic, wood, refrigerators, mattresses or rope salvaged from the port's waters.

Environmental management programme PERS (Port Environmental Review System)[21]

The Port of Rotterdam Authority is committed to sustainability and a safe and healthy living environment. The actions taken by the Port Authority on environmental management, following the ESPO Environmental Code of Practice (2004), are found in the PERS report. PERS is based on an internationally recognised port-specific system developed by ports, for ports.

Climate and Energy Transition[22]

The Port of Rotterdam Authority's Climate and Energy Transition plan is organised in four-pillar. This program aims to bolster industrial efficiency, fortify infrastructure, transition to renewable energy sources, and advance the circular economy. Several concrete projects embedded in those pillars are presented in the Port's website.

- **Pillar 1: increasing the efficiency of existing industry, and building (extra) infrastructure for heat, CO_2, electricity and hydrogen[23]**

Pillar 1 charts a course towards bolstering industrial efficiency and fortifying infrastructure, with a keen focus on harnessing heat, CO_2, electricity, and hydrogen to power the port's operations. Initiatives like CO_2 capture and storage beneath the North Sea exemplify Rotterdam's endeavour, while plans to utilise industrial heat for residential and commercial heating underscore its efforts to integrated sustainability.

CO_2 is captured and stored under the North Sea. Heat produced by industry in the port is used to heat homes and this will soon be extended to offices and greenhouses. More wind energy will be landed,

[21] https://www.portofrotterdam.com/en/building-port/sustainable-port/safe-healthy-port-and-surroundings
[22] https://www.portofrotterdam.com/en/port-future/energy-transition/strategy-and-research
[23] Projects: https://www.portofrotterdam.com/en/port-future/energy-transition/ongoing-projects#pillar1

while industry is preparing to make industrial processes more sustainable, including through the use of hydrogen.

In the years to come, these developments will require a lot of new infrastructure and the capacity of the power grid must be increased. As a result, Rotterdam plan to emphasise its role as an energy port in North-western Europe with the import and transit of sustainable energy carriers and products.

Key projects include Porthos, Delta Corridor, the Hynetwork Services and WarmtelinQ.

- **Pillar 2: renewing the energy system by switching from fossil fuels to green electricity and hydrogen[24]**

Pillar 2 displays a shift in the port's energy landscape, pivoting from fossil fuels to renewable alternatives like green electricity and hydrogen. The Port of Rotterdam Authority and its partners are working on blue and particularly green hydrogen to be used in hard-to-electrify industry and transport.

The Rotterdam hydrogen system includes three main visions. Firstly, a collaboration between Hynetwork Services and the Port of Rotterdam Authority is developing a new hydrogen pipeline, connecting to national and international networks. Secondly, a conversion park on the Maasvlakte will produce green hydrogen from offshore wind electricity, with projects like H2-Fifty aiming to supply industries and transportation. Lastly, Rotterdam's port envisions to a key role in the European energy system, expected to import significant amounts of green hydrogen by 2050, with ongoing projects to establish hydrogen imports.

The port is also capitalising Carbon Capture and Storage, and plans to capture blue hydrogen emissions to store them in depleted gas fields under the North Sea via an underground pipeline.

- **Pillar 3: moving to a new materials and fuel system[25]**

In line with the circular economy goals of Pillar 3, Rotterdam is advancing towards a materials and fuel system that prioritises resource efficiency and eliminates carbon emissions.

The Netherlands has set forth an ambitious goal to achieve a carbon-neutral energy system and fully circular industry within the next 30 years, eliminating the use of oil, natural gas, and coal. The Port of Rotterdam Authority is aligned with this vision and is committed to the resource transition. This shift is driven by the understanding that the availability of resources is limited, and their extraction causes significant environmental damage globally. Additionally, the inevitable conversion of fossil fuels into CO_2 or microplastics presents further ecological concerns. To address this, the focus is on extracting carbon and hydrogen from alternative sources such as CO_2, green hydrogen, 'waste,' and biomass.

This transition will have a significant impact on current cargo flows and industries, as a considerable portion of cargo in Rotterdam consists of fossil fuels. However, to ensure the port's future economic viability and maintain employment, the authority finds it imperative to develop new, circular production processes.

To this end, the Port of Rotterdam Authority engages in infrastructure investment, collaboration and partnership, support for R&D, promotion of circular business models, incentivises through tax breaks,

[24] Projects https://www.portofrotterdam.com/en/port-future/energy-transition/ongoing-projects#pillar2
[25] https://www.portofrotterdam.com/en/port-future/energy-transition/ongoing-projects#pillar3

supports demonstration projects that showcase innovative circular production technologies and collaborates with international partners to exchange best practices and lessons learned in circular production.

- **Pillar 4: making transport more sustainable**

Projects under Pillar 4 of the Port of Rotterdam's sustainability strategy focus on transitioning towards a CO_2-neutral port. Initiatives include adopting sustainable fuels and propulsion, implementing shore-based power for inland shipping, developing green and digital corridors, and enhancing transport operations' efficiency.

1. Shore-based power initiatives aim to reduce vessel emissions by transitioning to sustainable energy sources, with plans to have a high percentage of sea-going vessels plugged in at the quay by 2030. For inland shipping, ZES introduces emission-free sailing with exchangeable battery containers and charging stations.
2. The Port also collaborates with GoodShipping to offer CO_2-reduction certificates for Scope 3 Emissions, promoting sustainability in the shipping industry. International collaborations are established to create green corridors for sustainable fuel deployment on specific routes, integrating sustainability and digitalisation efforts.
3. Truck charging stations at Waalhaven Truck Park cater to electric truck drivers, aiming to electrify all secure truck parks in the area. The Port aims to support carriers and supply chain parties in their sustainability initiatives, providing assistance and subsidy options for charging infrastructure.

Port of Antwerp[26]

The port of Antwerp is the second largest in Europe, encompassing the ports of Bruges and Antwerp, situated on the North Sea. It serves as a crucial hub for the economy of Northwestern Europe. The port ambitions to deliver on UN sustainable development goals thanks to its strategic plan spanning from 2022 to 2025, which delineates a comprehensive approach to greening. The measures undertaken by the port are outlined in its "Sustainability Summary Port of Antwerp-Bruges" report. It carries out concrete actions rooted in a comprehensive, long-term strategy readily accessible for information. The strategy revolves around three themes:

- **Economy** which focuses the creation of value for customers, more connectivity etc.
- **Climate**: the port aims to become climate neutral by 2050, using greening measures for the port authority and platform and strong focus on hydrogen.
- **People & environment**, for a safe clean and healthy port, with a focus on protecting nature and environment.

The presentation of the summary is organised into ESG (Environmental, Social, and Governance) chapters, highlighting the key aspects related to sustainability and responsible business practices.

[26] https://media.portofantwerpbruges.com/m/129c2c2427c802ba/original/PUBLICATIE_Sustainability_summary_ENG_2023.pdf

Environment

The port prioritises sustainable growth as a fundamental aspect of its strategy, emphasising the transition to a circular economy to minimise waste and optimise resource use, but also biodiversity preservation. Recognising the importance of reducing carbon emissions, the port also invests in the energy transition, integrating renewable energy sources into its operations. This commitment to climate action is demonstrated through concrete initiatives engaged thanks to its regulatory and supporting leverage.

"Green Concession"

As a landlord port overseeing areas in Antwerp and Zeebrugge, the port manages land and grant concessions to companies through a tender process. Candidates must submit project proposals, evaluated against criteria emphasising future orientation and sustainability, aligning with the port's ambition to lead in reconciling economy, people, and climate. The port prioritises projects that contribute to a circular and low-carbon economy, assessing their environmental and climate impact, energy and water management, and commitment to monitoring and adjustment. Concession agreements formalise ambitions and commitments, ensuring compliance with legislative frameworks while promoting sustainable practices.

Air and water pollution

In collaboration with the Flanders Environment Agency (VMM), the port actively monitor and manage environmental factors within the port area, employing a range of innovative techniques and partnerships to ensure sustainability. The port's efforts encompass air quality monitoring through a network of smart sensors (eNoses), integrated into a digital twin for real-time assessment. Soil and groundwater quality are diligently monitored, with a goal to remediate all historical contamination by 2036, guided by comprehensive surveys identifying contaminated areas and assessing associated risks. Notably, the port has successfully redeveloped severely contaminated sites, such as Fort Sint-Filips, into functional spaces like sheep pastures.

Additionally, the port addresses substances of high concern like PFAS through collaborative efforts with port companies, employing innovative treatment methods and rigourous monitoring. Water quality is a key focus, with measures in place to combat salinisation and rising temperatures, including the establishment of fish spawning areas and structural improvements in docks to support aquatic fauna. Active removal of TBT-contaminated waterbeds is another vital initiative.

Furthermore, the port prioritises sustainable water management practices, optimising stormwater usage and implementing policies to minimise plastic pollution. OItsur comprehensive approach extends to policy development, with initiatives like the water strategy program and participation in the zero pellet loss charter to reduce plastic waste entering waterways. Innovations like the vacuum cleaning robot "Nul-O-Plastic" also underscore the port's commitment to environmental stewardship, with solutions for fragile ecosystems.

Biodiversity

In parallel of environmental conservation efforts, biodiversity preservation is a central focus. Collaborative programs with organisations like Natuurpunt aim to protect and nurture the diverse plant and animal species within the port area, while fostering sustainable development opportunities for local businesses. Ecological infrastructure networks serve as vital corridors, connecting natural habitats and promoting biodiversity.

Moreover, initiatives like the agricultural innovation fund support farmers in adopting nature-inclusive practices, aligning agricultural activities with biodiversity goals while ensuring economic viability. These multifaceted approaches underscore the port's dedication to fostering a sustainable and biodiverse ecosystem within the port, balancing environmental protection with economic growth.

Climate

The Port Authority monitors emissions from its own operations as well as the port platform as a whole (scope 3 emissions), aiming for climate neutrality by 2050 through projects in cooperation with other entities.

CO2 Emission reduction

To reduce CO_2 emissions across its operations, the port has implemented strategies focused on five key areas.

1. Fleet: Upgrades include more efficient tugs, such as Methatug and Hydrotug, along with increased charging points for vessels.
2. Buildings: Renovation plans for all buildings, use of exclusively renewable electricity since 2011, and pilot projects for hydrogen heating.
3. Vehicle fleet: Transitioning to an 85% electric pool car fleet, increasing efficiency of utility vehicles, and expanding vehicle charging infrastructure.
4. Commuting employees: Offering mobility budgets, greening salary cars, providing bike leasing options, and installing bike charging points.
5. Travel policy: Adopting stricter policies for business travel, prioritising digital meetings, and favouring public transport, electric pool cars, or bikes for travel, with carbon offsetting for unavoidable flights.

One key aspect of the Port effort to reduce its CO_2 emissions is prioritising electrification wherever feasible and support alternative energy sources such as hydrogen, which holds promise as a clean and renewable fuel. The port plans to capture and export CO_2 emissions, leveraging its industrial and logistical ecosystem and expertise to become a hub for green energy.

Alternative fuels

In line with this commitment, the port is investing in infrastructure to support alternative fuels and technologies. This includes integrating shore power facilities, allowing vessels to plug into the electrical grid while docked, reducing the need for onboard generators and further decreasing emissions. The port is also actively pursuing more efficient vessel operation strategies to minimise energy consumption and emissions.

Port of Genoa

The Port of Genoa holds significant historical and strategic importance as one of the most vital maritime hubs in Italy and the Mediterranean region The Port of Genoa stands as Italy's primary port, boasting a diverse range of activities and expertise. From cargo and passenger handling to ship construction and repair, along with specialised consultancy and administrative services, the port serves as a hub for maritime activities in the Mediterranean.

Its significance is underscored by its pivotal role in Italy's transportation network, with 70% of companies in Northern Italy relying on it and a third of national container traffic passing through its terminals. Notably, it handles a substantial volume of cargo, including 66.2 million tons overall, with 14.6 million tons of general cargo, 24 million tons of dry and liquid bulk, and 2.8 million TEU containers. As the foremost container port in Italy and the sixth-largest in Europe, the Port of Genoa holds a central position in the region's maritime transport infrastructure.

Recognising the challenges posed by Climate Change and its responsibility to bolster environmental initiatives in the area, the Port Authority has decided to elaborate a sustainability report which was first released in 2022. This plan offers an overview of the port's performance in sustainability and corporate social responsibility and aims to amplify the positive impacts of port activities.

The report is organised in four pillars:

1. Economic sustainability: Fostering enduring value for stakeholders within the port cluster and surrounding region.
2. Environmental sustainability: Balancing development with environmental conservation, constructing resilient, low-emission, and competitive ports.
3. Social sustainability: Enhancing community relations while ensuring the health and safety of port workers.
4. Organisational sustainability: Enhancing customer service, encouraging innovation and procedural simplification, optimising internal organisation, and prioritising staff welfare and professional development.

The Port of Genoa has adopted a systematic approach to its sustainability strategy, starting with the assessment of its current sustainability performance, as a foundational steps decision-making process. The assessment includes four key areas:

a. Health and safety in the port,
b. Market development
c. Energy efficiency
d. Simplification and digitisation

Following discussions among internal departments, 18 material themes were identified which are embedded in the four types of sustainability categories that the Ports aim to put in place. For the purpose of this report, only the themes related to environmental sustainability (sometimes intertwined with economic sustainability) are presented.

Environmental Sustainability

The objective of the Port of Genoa is to integrate port development with environmental conservation, creating competitive and resilient ports with minimal environmental impact and the ability to adapt to climate change. This is achieved by installing technologies that reduce energy consumption and emissions within the port, but also by enforcing an environmental policy which is integrated across all levels of planning. The port can also count on its pivotal role to engage with various stakeholders to ensure alignment with the following themes.

Energy Efficiency and Emissions Reduction

The Port of Genoa aim to achieve significant reductions in greenhouse gas emissions. Targets include a 25% reduction in CO_2 equivalent emissions, an 83% reduction in NOx emissions, and a 75% reduction in particulate matter emissions.

In order to reach these targets, the Port of Genoa have set up an energy efficiency program, called the Port Environmental Energy Plan (PEAP), aimed at monitoring and reducing their carbon footprint cross strategic guidelines, and improving overall energy management. It is flexible and adaptable to real-time energy and environmental requirements, ensuring projects are completed within specified timeframes.

This initiative, partially funded by Italy's Recovery and Resilience Plan, encompasses a range of measures designed to enhance energy efficiency and sustainability within the port system.

Key components of this program include:

Technological Innovation

The Port of Genoa are leveraging technological innovation to optimise energy management and reduce environmental impact. Smart management systems are being deployed to monitor and control the ports' electricity grids, enabling real-time optimisation of electricity production, consumption, and storage. By harnessing advanced technologies, the ports can enhance energy efficiency and sustainability while minimising costs and environmental impact.

On shore power supply

The Port of Genoa are planning to install electric power converters onshore at 6 passenger berths. This initiative aims to decrease air and noise pollution by offering ships the option to power down their onboard generators while docked in the port.

Renovation of Electrical Installations

As part of the energy efficiency program, the Port of Genoa are undertaking the renovation of port electrical installations. This initiative aims to modernise infrastructure, improve energy efficiency, and optimise energy use throughout the port system. For instance To further reduce energy consumption, traditional lamps are being replaced with low-energy LED lights in public lighting infrastructure.

Accurate monitoring of energy consumption

The Port Authority is creating a detailed database to track consumption patterns and identify areas for improvement. Additionally, the plan aims to progressively replace fossil fuels with alternative renewable sources like biomass fuels and LNG to reduce CO_2 emissions and improve air quality.

Buildings Energy Efficiency

An analysis of the Port Authority's buildings has been made, to assess energy usage and undertake restructuring works aimed at improving energy efficiency. Technologies being evaluated include solar panels, biomass use, wind power, and geothermal energy.

Electric Vehicle Fleet

In line with the transition to greener transportation, the Port Authority plans to replace its vehicle fleet with electric vehicles gradually. Fast-charging stations will be strategically installed within the port area to support this initiative.

Modal shift

The Port of Genoa are dedicated to promoting modal shift through various rail infrastructure enhancement projects, and the increase of Intermodal Accessibility notably in the Port Basin of Pra'. This nationally significant project involves constructing a new 3-lane viaduct with several objectives: improving landside access to the Port Basin of Genoa Pra', Italy's primary container gateway terminal, and the motorway network; installing six 750-meter on-terminal rail tracks; and implementing sound barriers and green spaces to mitigate noise and visual pollution.

Moreover the Rugna Rail Yard in the Calata Sanità Area is undergoing upgrading and expansion, featuring nine tracks to serve the container terminal in the Old Port of Genoa. This yard will be linked to the national rail network via the Molo Nuovo Tunnel, benefiting terminals such as Bettolo Genoa Mediterranean Gateway Terminal and PSA SECH. The project also includes the installation of RMG cranes and specialised equipment, facilitating operations for liquid bulk hub services (Saar/ENI/Esso/Getoil)

Transition to Green Energy

Recognising the environmental impact of fossil fuel usage, the Port of Genoa are actively working to reduce reliance on such sources. Efforts include studying ways to increase production of green energy through solar, wind, and wave power. Additionally, participation in research on new green fuels aims to promote cleaner energy alternatives and reduce overall emissions from port operations.

Environmental Preservation and pollution prevention

The Port of Genoa are committed to preserving the environment for future generations through a comprehensive range of initiatives aimed at mitigating pollution, promoting waste management, protecting coastal areas, and reducing reliance on fossil fuels. These efforts not only safeguard the marine ecosystem but also contribute to broader environmental sustainability goals.

Pollution Prevention and Debris Collection

To protect the sea from pollution, the Port of Genoa deploy boats and innovative tools to collect plastic and debris floating in port basins. Specialised systems are also in place to respond to accidents that may release pollutants into the water, minimising environmental damage and preserving marine biodiversity.

Waste Management & circular economy

Efforts to optimise waste management also include partnering with specialised companies to ensure optimal collection and disposal of waste generated at the docks. The ports prioritise separate waste collection and promote the transition to a circular economy to reduce the environmental impact of waste and prevent pollution of soil and air.

Water and sediment management

The ports are dedicated to preserving clean waterways through robust water quality management practices. This involves regular monitoring and analysis of water and sediment quality to detect potential sources of pollution and implement appropriate remediation measures.

Coastal Protection

To protect biodiversity and the coastline, the ports implement structural measures to defend against coastline erosion and safeguard streams flowing into the area to reduce the risk of flooding. The ports aim to do so while increasing capacities at the same time. For example, such initiatives are taken with the dredging in the Genoa Sampierdarean Basin and Passenger Port, which involve also relocation of the new breakwater and upgrading of quaywalls. Dredging activities near the Sampierdarena cargo terminals and passenger port will enable Genoa to safely accommodate Ultra Large Container Vessels (ULCVs) and the next generation of cruise ships.

Noise pollution

To mitigate the impact of port activities on surrounding communities, the Port of Genoa are also actively working to reduce noise pollution. This includes implementing shielding measures and soundproofing technologies to minimise noise emissions from port operations.

Port of Marseille

The port of Marseille Fos holds significant economic importance in Europe as one of the largest and busiest ports in the region. Its strategic location on the Mediterranean coast makes it a vital hub for international trade, connecting Europe with Africa, the Middle East, and beyond. Recognising the imperative of environmental sustainability, the port has undertaken a comprehensive sustainability plan, reflecting its commitment to excellence in environmental stewardship.

The strategic project for 2020-2024, encapsulated in the motto "A green port serving the blue economy," underscores the port's dedication to environmental excellence while ensuring competitiveness and economic attractiveness. This commitment is realised through collaborative efforts with institutional partners and stakeholders within the port community, including shipowners, industries, and logistics providers.

Air Quality

The port has implemented concrete actions to improve air quality and facilitate the reduction of emissions from maritime activities. Initiatives include incentivising compliance with stringent fuel regulations and fostering voluntary commitments among shipping companies to exceed regulatory standards.

Shore Power Connection (CENAQ)

Marseille Fos is pioneering shore power solutions, becoming the first port in France to offer electrical connections for ships at berth. This initiative aims to reduce emissions from vessels and promote renewable energy sources but also lays the groundwork for future expansion to accommodate larger vessels and promote renewable energy generation through solar infrastructure. Marseille Fos Wants to Be Mediterranean's 1st Fully Electric Port by 2025.

Liquefied Natural Gas (LNG) Hub

With a focus on sustainable energy alternatives Marseille Fos has positioned itself as a hub for liquefied natural gas (LNG) in the Mediterranean. Collaborative efforts with industry partners facilitate LNG bunkering operations, supporting the transition to low-emission shipping and aligning with global decarbonisation goals. Gravithy is the establishment of a steel manufacturing plant using a process where iron ore reacts with hydrogen, an innovative and eco-friendly method. Gravithy is a company created by a consortium of industrialists, aiming to reduce the impact of metallurgy by producing and using green and low-carbon hydrogen. The plant will save 4 million tons of CO_2 per year. Investments amount to 2.2 billion euros. The project is scheduled to commence construction in 2024, with operations expected to start in 2027.

Modal Shift

To mitigate road congestion and carbon emissions, Marseille Fos advocates for modal shift strategies, promoting the transfer of cargo from road to rail or inland waterway transport. Investments in railway and river transport infrastructure underscore the port's commitment to multimodal solutions and sustainable logistics. For this purpose, the port has drawn up a reference document that includes general information, conditions of access to the network, a description of the Infrastructure, capacity allocations, special measures in the event of disruption and pricing arrangements.[27]

Dialogue and Engagement

The port prioritises ongoing dialogue and collaboration with local communities and stakeholders to ensure alignment with regional development objectives. Mechanisms such as the Council of Development and the Ville-Port Charter foster transparency, participation, and shared decision-making, fostering trust and consensus.

Biodiversity Conservation

Marseille Fos is dedicated to preserving biodiversity by managing and protecting natural habitats within its territory. Through habitat restoration projects and partnerships with scientific organisations, the port strives to balance economic activities with environmental conservation, promoting ecological resilience.

Innovative Projects

Initiatives such as the RÉPONSES program and the Environmental Ship Index (ESI) demonstrate the port's commitment to innovation and environmental leadership, rewarding eco-friendly practices and fostering sustainable shipping.

Natural Heritage Management

The port integrates environmental considerations into its planning and operations through frameworks like the Schéma Directeur du Patrimoine Naturel (SDPN). Collaborative efforts support initiatives to restore ecosystems and promote biodiversity conservation, ensuring the effective management of natural resources for future generations.

[27] https://www.marseille-port.fr/plaquettes/documents-de-reference/document-de-reference-du-reseau-ferre-portuaire-rfp-2024

Summary of best practice

1. Strategy Structure
2. Strategy Content
3. Use of "international guidelines"

In conclusion, each of the four ports presented has developed its own strategy to decarbonise its activities. While all of them utilise available levers to implement their strategy, it remains unclear whether the two smaller ports employ their landlord capacity similarly before offering a concession. Due to their size, they may not have access to the same resources. However, what is particularly interesting is how they have developed their strategy, organised their priorities, and presented them to stakeholders.

The Port of Rotterdam showcases its activities on its website as a collection of initiatives encouraged by the implementation of rules, along with the installation of infrastructure to support overall innovation in maritime transport. These initiatives are scattered across the website and are not systematically presented under the control of one of the pillars that the port establishes to unify its initiatives.

Meanwhile, the Port of Antwerp presents an overview of its initiatives in a single coherent report, outlining its initiatives within specific themes.

As for the Ports of Genoa, the authority uses a brochure to explain not only how it developed its strategy but also outlines its port projects, although it mentions very few specific projects compared to the first two ports. The complete strategy is only available in Italian, which has hindered the study of the port's measures.

Finally, the Port of Marseille, initiatives are presented on their website and in their report without being organised into multi-stage strategies like the other ports, making the elaboration of a summary more complex.

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BLUE ECONOMY
Blue Supply Chains

Chapter 2 -
Terminals greening strategy

Terminals: four case studies

The second part of our study is dedicated to hinterland intermodal Terminal greening strategies.

If the nature of intermodal terminal activities implies CO_2 emission reduction for their customers' transport operations, some equipment or infrastructure in use in the terminals might not entirely avoid sources of pollution.

In the following section we will explore the state of play of best practices elaborated by the sector to become more sustainable.

The terminals chosen for this study are members of the International Union for Road Rail Combined Transport (UIRR). They differ in several aspects, including the nature of their ownership (self-owned, part of a bigger group etc.), in size and technologies used for their activities. 4 out of 25 terminals companies have been selected not only for the availability of data, that can be found in their annual report or webpage, but also their difference in size, locations, and technologies. For terminal owned by bigger entities, the part dedicated to their sustainability strategy was also analysed. It is to be noted that the encompassing greening strategies of those entities often set the frames of initiatives taken at a terminal level.

Chemins de Fer Luxembourgeois (CFL)

The société nationale des Chemins de Fer Luxembourgeois (CFL) is the national railway company of Luxembourg. It operates both passenger and freight services and manages the railway infrastructure in the country.

CFL cargo and its sister company CFL multimodal are service providers covering the entire multimodal supply chain. With a European presence of 11 companies located in 5 countries, they offer a comprehensive range of transport and logistics services. These services include combined and conventional rail transport, wagon maintenance, road transport, chartering, warehousing, tailor-made logistics, and customs agency support. In Luxembourg, CFL terminals, a subsidiary of CFL multimodal, operates the intermodal terminal at Bettembourg-Dudelange, located North Sea-Mediterranean Freight Corridor. This public terminal, accessible to all, spans 33 hectares dedicated to multimodal logistics. It has an annual capacity of 600,000 Intermodal Transport Units, advanced security features, and regular rail shuttles connect it to major European ports and industrial areas. It is also equipped to handle various types of intermodal transport equipment.

Commitment

The CFL as set itself objectives to achieve carbon neutrality by 2050. In this context, the CFL has initiated a major operation to measure its carbon footprint, the first results of which were obtained in mid-2022 (for the period 2019-2021). The CFL has conducted an annual estimate of the greenhouse gases directly emitted by its activities and the emissions produced at a distance for the energy consumed. In addition, the CFL has also carried out a more in-depth exercise for the year 2020, in which all the greenhouse gas emissions indirectly linked to its activities were estimated, such as the purchase of equipment and materials, the realisation of construction projects, etc. The analysis of this information helped the CFL identify its priority actions taking shape in the UN Sustainable Development goals:

CFL commitment to UN development goals

Initiatives

CFL is engaged in several initiatives that are laid down in its Annual Report and its website. Most of them encompass the activities undertaken by the whole group rather than the terminal. The activities that related to the increase of modal shift through means that fall outside the scope of terminals were disregarded.

Investment in green assets[28][29]

In September 2022, CFL multimodal commissioned a new semi-automated crane that features remote operation capabilities. This new crane, along with two earlier models installed in 2015, enhances the terminal's handling capacity and operational safety.

Furthermore, CFL multimodal has received support from the European Union for upgrading their intermodal terminal as part of the PULSE project. This initiative focuses on capacity increase, automation, digitalisation, and decarbonisation strategies. The project aims to improve the terminals' efficiency and reduce CO_2 emissions, with significant investments in clean transshipment equipment and innovative ICT solutions.

"We act green" Challenge

The CFL invited their employees to participate in the **We Act green Challenge** from September 27th to October 17th, 2021. The participants could choose from 45 different actions to reduce their carbon footprint through small daily gestures in their professional and private lives.

Some of the challenges that the CFL employees took on included getting up, having a vegetarian breakfast, and going to work on foot or by public transport. The idea was to commit to the environment as a team, while also doing something good for oneself and completing as many actions as possible to win the challenge with one's team.

Each week, the participants and their teams were encouraged to set goals and carry out the sustainable actions behind the challenge. The aim was to collect as many points as possible via a dedicated app. The 45 actions of the challenge were based around the following themes:

- Food
- Mobility
- Resources and Waste
- Energy
- Team Spirit
- Learning

[28] https://www.transportadvancement.com/railway/long-term-cooperation-with-kuenz-brings-highest-quality-and-safety-for-cfl-multimodal/
[29] https://www.hellenicshippingnews.com/with-the-support-of-the-european-union-cfl-terminals-invests-in-the-upgrade-of-the-intermodal-terminal-bettembourg-dudelange/

- Innovation and Role Modeling

Some of the activities that the participants could choose from included calculating their ecological footprint, taking the stairs instead of the elevator, and limiting the number of printed copies.

Energy Savings and consumption

CFL commits to the energy-saving efforts requested by the Luxembourgish government as part of the **Zesumme spueren - Zesummenhalen** campaign launched in September 2022. The campaign aims to reduce energy consumption, particularly by businesses, in the context of the transition to energy independence and carbon neutrality.

These measures include:

- The replacement of several hundred incandescent bulbs with LEDs for signalling along the railway tracks.
- Optimisation of energy use when trains are stationary. CFL's action plan covers all of its activities, including trains, stations, buses, and buildings, and is based on the involvement of its employees to identify the measures applicable to their jobs.
- Use of a "fuel spiral" on trucks, buses, and diesel locomotives to improve combustion and reduce fuel needs.
- Electricity use derived 100% from renewable sources.

Biodiversity

CFL is also implementing measures to compensate for the impact on nature as part of new infrastructure projects, such as the relocation of Rodange lizards to Leudelange and the planting of 1.5 hectares of trees in Kockelscheuer.

To raise awareness, the CFL Group has also organised **Biodiversity Frescoes** and technical workshops for personnel working in the following sectors: general activities, passenger activities, infrastructure, freight activities, and real estate. These discussions, as well as an analysis of the practices in place at the CFL Group and among its main partners, have enabled the identification of priority actions in favour of biodiversity. These Biodiversity Frescoes have complemented the twenty or so Climate Frescoes that have been organised for senior executives since 2021, to enable them to acquire the skills and scientific knowledge essential for action in a professional and personal context.

Noise Reduction[30]

The CFL considers its responsibility in the vicinity of stations and stops and has installed noise barriers that are systematically included in the specifications for new projects. This has been the case in the past for the Pulvermühle viaduct, the Luxembourg-Sandweiler-Contern section, the Bettembourg-Dudelange intermodal terminal, and the Pfaffenthal-Kirchberg stop.

Certifications

In order to measure the progress of its sustainable development approach and to strengthen it, the CFL Group has undergone several external evaluations specifically measuring the degree of corporate social responsibility (CSR). CFL taking part into the following initiatives:

EcoVadis

The CFL Group obtained the EcoVadis silver medal in 2021 Corporate Social Responsibility (CSR) , rewarding environmental, social, and ethical performance. EcoVadis helps over 130,000 companies navigate CSR challenges by providing tools to manage regulations, improve performance, and showcase CSR credentials.

IMS - Inspiring More Sustainability Luxembourg

IMS - Inspiring More Sustainability Luxembourg is a leading network promoting corporate social responsibility (CSR) and sustainability in Luxembourg. It aims to inspire and support organizations in adopting sustainable practices and integrating CSR into their business strategies. IMS provides resources, training, and networking opportunities to help companies enhance their environmental, social, and ethical performance, fostering a more sustainable and responsible business community in Luxembourg.

International Union of Railways (UIC) sustainable development platform

The UIC Sustainable Development Platform promotes sustainable practices in the global railway sector. It provides a collaborative space for UIC members to share knowledge, support research, advocate for policies, offer training, and monitor sustainability performance. The platform aims to enhance the environmental, social, and economic performance of rail transport, positioning railways as key players in global sustainability efforts.

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[30] https://groupe.cfl.lu/getmedia/327259e3-6572-4a6f-b8b7-2a21c2439of8/CFL-rapport-annuel-2022-web.pdf.aspx#page=96

ISO 14001:2015

ISO 14001:2015 is an international standard guiding organisation to establish effective Environmental Management Systems (EMS). It aims to help organisations manage their environmental responsibilities in a systematic manner. Key objectives include minimising environmental impacts, complying with regulations, improving environmental performance, and integrating environmental considerations into business decisions. The standard uses a Plan-Do-Check-Act cycle for continuous improvement and is applicable to organisations of all sizes and sectors globally. Compliance can be demonstrated through self-assessment or certification by external bodies.

Railsponsible

Railsponsible is an initiative promoting sustainability in the railway industry supply chain. It engages suppliers to adopt sustainable practices, conducts assessments and audits, facilitates collaboration, provides training and resources, and promotes transparency. The goal is to continuously improve sustainability across the rail sector.

SQAS

SQAS, developed by Cefic, is a globally recognised assessment system for logistics service providers and chemical distributors. It evaluates safety, environmental, security, health, quality, and corporate social responsibility, promoting supply chain excellence and continuous improvement in chemical logistics. The assessment covers five modules: Transport Services, Rail Operators, Tank Cleaning Stations, Warehouses, and Chemical Distributors. The process involves a pre-assessment document, onsite assessment by independent assessors, sharing of assessment reports in a central database, and an improvement period based on identified areas for enhancement. Assessments are repeated every three years to ensure ongoing compliance and improvement.

Interporto Bologna (IPBO)[31]

Interporto Bologna is an extensive intermodal logistics hub located in Bentivoglio, about 20 kilometers from Bologna's city centre in Italy.

With more than 163000 Intermodal Transport Unit handled in 2023, IPBO serves as a key centre for various logistics activities, including the storage, handling, distribution of goods and maintenance and repair of Intermodal Transport Unit & wagons. The facility supports multiple modes of freight transportation, integrating road, rail, and sea links. Interporto Bologna spans a total area of 4,100,000 m². It features three intermodal terminals and 665,000 m² of railway facilities.

Unlike a single terminal, IPBO operates similarly to a port authority, serving as landlord, infrastructure owner and operator while also coordinating various activities within its premises. The hub also provides customised inter-modal transport services tailored to clients' diverse needs. They offer both Door-to-Door services, which transport goods from the originating warehouse to the destination warehouse, and Terminal-to-Terminal services, which move goods from the originating rail terminal to the destination rail terminal.

[31] https://www.interporto.it/en/sustainable-mobility-e63

Commitment

Within its third Sustainability Report, and in line with the provisions of the Corporate Sustainability Reporting Directive (CSRD), Interporto Bologna SpA has outlined its commitment to align with the United Nations Sustainable Development Goals (SDGs) (see below).

IPBO commitment to UN development goals

In parallel, with this effort, IPBO is a signatory of the Metropolitan Charter for Ethical Logistics in Bologna, an initiative that promotes sustainable and ethical practices within the Bologna metropolitan area's logistics sector. This charter outlines principles and guidelines to ensure that logistics operations are environmentally friendly, socially responsible, and economically sustainable.

Interporto Bologna's commitment to fight climate change is also encapsulated in the Interporto Bologna Site Protocol that the company has signed in collaboration with trade associations and public authorities. This pact engages IPBO to evolve towards the creation of a **zero-impact logistics hub**, as well as the coveted goal of networking energy supply and demand, creating an energy condominium.

Initiatives

Investment in green assets[32]

In July 2023, the company signed a contract with the Austrian manufacturer Künz to supply and commission two rail-mounted gantry (RMG) cranes. These cranes are part of a major expansion project for Interporto Bologna's railway area, co-financed by the Italian Ministry of Infrastructure and Transport. This project aims to expand the railway area by 115,000 square meters, equipped with five 750-meter tracks. The new RMG cranes are scheduled to be operational by the end of March 2025.

Mobility

As part of the Metropolitan Charter for Ethical Logistics IPBO launched a comprehensive initiative aimed at decarbonising transportation and logistics. Central to this endeavour is the goal of transitioning the vehicle fleet towards low environmental impact vehicles, leveraging national and regional incentives, and spearheading experimental projects to explore alternative energy sources. Additionally, interporto bologna fosters the construction of sustainable infrastructure which boast over 50 car recharging stations, cycling paths or even buses that serves the freight village.

[32] https://www.interporto.it/en/gantry-cranes-on-their-way-to-bologna-s-freight-village-a943

Energy

As part of its **Pact for Work and Climate,** Interporto aims to become a **self-powered community.** This involves assessing the renewable energy already produced on-site and implementing solutions to ensure that the energy consumed within the infrastructure does not exceed the energy generated internally. This initiative also aligns with the Metropolitan Charter for Ethical Logistics.

A study was conducted for the construction of new photovoltaic systems on unused areas such as land and rolling tanks, as well as on roofs of warehouses, offices, and car park shelters. The total estimated potential is around 50 MWh. Part of the energy produced by these new systems will be used to power the gantry cranes to be installed during the expansion of the railway terminal between late 2024 and spring 2025.[33]

The site at Interporto has also flanked its internal and external green areas with 12 MWh of photovoltaic systems installed, with an additional 40 MWh of potential currently under construction. Interporto is also installing entirely LED public lighting.

Assets Management

The sources of Interporto's GHG emissions are mainly related to Scope 2, i.e. electricity purchased, natural gas to fuel heating systems and diesel for locomotives, however according to Interporto's sustainability report, they are not sufficiently impactful to require reduction measures.

Nevertheless, Interporto Bologna still encourages companies to invest in sustainable and environmentally friendly practices.

A prime example is Prologis Italy S.r.l., which has commissioned the construction of three new logistics buildings within the Bologna Freight Village which will be LEED Silver certified. LEED, or Leadership in Energy and Environmental Design, is a globally recognised green building certification system which indicates that the buildings meet high environmental performance standards. This includes efficient use of energy, water, and other resources, as well as reducing greenhouse gas emissions and improving indoor environmental quality.

Circular economy

Interporto Bologna SpA conducts differentiated waste collection as mandated by the Municipality of Bentivoglio. The company provides bins for plastic and paper, while bins for undifferentiated waste are supplied by Interporto. These bins are regularly emptied by the cleaning company. Printer toners are disposed of in special bins in the Customs Building corridor. Within the interporto area, each company and office are equipped with appropriate containers, and larger removable containers are used for warehouse waste. The waste collection service, included in the local Tari tax, is managed by a company on behalf of the Municipality of Bentivoglio.

Miscalenous

As part of its Bologna Site Protocol IPBO is also installing committed to install soundproof asphalts and noise barriers, special water tank for the recovery and monitoring of rainwater.

[33] https://www.interporto.it/interporto-bologna-spa-ha-pubblicato-il-report-di-sostenibilita-2023-a994

Certification[34]

ISO 14001:2004

Interporto Bologna has been awarded certification ISO 14001:2004[35] is an international standard that provides a framework for organisations to establish, implement, maintain, and continually improve an environmental management system (EMS). The standard is designed to help organisations manage their environmental impact effectively by considering various aspects related to their operations as well as bringing about a label that can convey competitive advantage compared to competitors.

To obtain this certification, organisations must define their commitment to environmental protection and set specific objectives which involves identifying significant environmental aspects (such as emissions, waste generation, energy consumption) and assessing their impact.

Upon identification, organisations are to create procedures and processes to address environmental aspects in which they allocate resources, train employees, and communicate environmental responsibilities. A regular monitoring and measurement ensure compliance with objectives is then applied to allow corrective actions to be taken when deviations occur.

Contargo[36]

Contargo was founded in 2004 by the merger of several companies that were already active in container logistics and inland transport. The goal was to create a stronger, integrated network of terminals and services. In recent years it expanded its network and services across Europe, focusing on improving its trimodal transport capabilities, enhancing infrastructure, and increasing its market presence. It also diversified its service offerings to include not only container transport but also logistics solutions tailored to customer needs.

Currently Contargo operates a network of 24 terminals across Europe and transport connections throughout Europe. The company managed to position itself as a key player in the trimodal logistics sector, offering efficient and sustainable transport solutions across road, rail, and waterway routes. Contargo notably owns its own truck fleet to cover the road legs of its intermodal transport operations.

Commitment

Contargo's commitment to sustainability is articulated through several key principles and actions, as highlighted in their sustainability report. They have chosen to focus on seven out of the seventeen SDGs where they can have the greatest positive impact, and particularly SDG 7 (Affordable and Clean Energy) SDG 8 (Decent Work and Economic Growth) and SDG 9 (Industry, Innovation, and Infrastructure) and SDG 13 (Climate Action).

[34] https://www.interporto.it/en/certifications-e47#collapse-345
[35] https://www.tuvsud.com/en-in/landing/asmea/iso-14001-environment-management-system-certification?gad_source=1
[36] https://www.contargo.net/en/about-us/sustainability/sustainability-report/

Contargo commitment to UN development goals

In essence, Contargo aims to reduce emissions by 20% by 2030 compared to 2020 levels, aligning with German climate targets, and eventually to reach climate neutrality by 2045.

To that end, Contargo systematically calculates its carbon dioxide equivalent (CO_2e) emissions across their operations, which is crucial for understanding its impact on climate change. So far, as is transitioned its transport modes from direct trucking to more sustainable options like rail and barge, the group has achieved substantial reductions in emissions, up to 63% in some cases.

Initiatives

All terminals owned by Contargo are bound to comply with the Group's sustainability strategy.[37] However, the extent and nature of initiatives endeavoured by individual terminal is tailored to their individual sizes and services.

Energy

Regarding efficient energy management Contargo uses technologies like Raspberry Pi single-board computers to reduce electricity consumption by up to 94% compared to conventional PCs. The group also prioritises the use of Rail Grantry cranes over diesel Reach Stackers whenever possible.

In addition, Contargo has replaced traditional lighting with energy-efficient LED lights throughout its facilities. As LED lights consume less energy and have a longer lifespan, this contributes to a more environmentally friendly terminal environment.

Mobility [38]

Contargo promotes sustainable commuting options among its employees. Initiatives include encouraging biking, using public transport, and car-pooling through activities like the annual competition **Contargo gets on its Bicycle.**

[37] https://www.contargo.net/fileadmin/Unternehmen/Downloads/Nachhaltigkeit/NHB-2022-DE.pdf
[38] https://www.intermodal-terminals.eu/news/

Contargo is also exploring and adopting alternative fuels and eco-friendly vehicles by introducing electric and hydrogen-powered reach stackers, which have significant potential to reduce emissions compared to diesel-driven models.

Finally, the group owns a fleet of electric cars for its employees as well as electric trucks which the group uses for its operations (see innovation). Consequently, terminals need to progressively install charging stations to power these assets.

Innovation

The company is advancing its green transportation initiatives by testing electric-powered barges using batteries and hydrogen cells, with operational deployment started in 2023. In rail transport, efforts are focused on electrifying "last mile" transports and transitioning main runs to green electricity. For trucking, the company is expanding its fleet of electric trucks for local transport, planning to add 28 new e-trucks in 2023, and is also testing e-drives and hydrogen drives for direct trucking.

Medi Box - Sustainable Transport Solution: Contargo developed the Medi Box, a system that optimises container capacity usage by combining four 10ft containers into a single 40ft unit. This system helps to reduce CO_2e emissions associated with inefficient container use, particularly beneficial in the context of increasing smaller consignments from online trade.

Catenary Hybrid Trucks (ELISA Project): As part of the ELISA Project, the company is testing catenary hybrid trucks on major routes. These trucks use overhead lines for power, offering flexibility while reducing emissions significantly compared to conventional diesel trucks.

Training

In 2021, Contargo launched the **Sustainability Tour**, an initiative designed to bring sustainability discussions directly to various company locations. The tour serves as a central hub for employees to engage in conversations about environmental practices and provide feedback for Contargo's Sustainable Solutions department. This hands-on event effectively encouraged employee participation and highlighted the company's commitment to sustainability.

Additionally, Contargo hosts an annual **Sustainable Solutions Workshop** that allows employees from diverse roles to collaboratively discuss and promote sustainability. The workshop focuses on identifying personal motivations for sustainable actions and sharing these motivations across the company, fostering a culture where every contribution to sustainability is recognised and valued.

Contargo also supports the **RhineCleanUp Initiative**, promoted through the "RhineCleanUp Container", which aims at reducing plastic pollution in the Rhine and its tributaries. With the help of RhineCleanUp, Contargo helps mobilise over 30,000 volunteers each year to collect plastic waste, thereby raising awareness about waste management and environmental stewardship. Their colourful container along the Rhine serves as a focal point for encouraging community involvement, and their collaboration with Prof. Dr. Andreas Fath from Furtwangen University provides scientific support by assessing water quality and microplastic levels.

Certification

Climate Neutrality (PAS 2050)

Contargo adheres to the PAS 2050 standard for climate neutrality. This commitment includes implementing a robust carbon management system, aiming for annual reductions in compensated CO_2e emissions. They offer customers the opportunity to achieve long-term climate neutrality for their SCOPE 3 emissions.

DIN EN ISO 9001:2015

Contargo strictly adheres to the DIN EN ISO 9001:2015 standard for its Quality Management System (QMS). This standard is designed to ensure that organisations consistently meet both customer and regulatory requirements.

DIN EN ISO 14001:2015

The Environmental Management System (EMS) standard is designed to help organisations manage their environmental impacts effectively.

DIN EN ISO 50001:2018

The DIN EN ISO 50001:2018 standard for its Energy Management System (EnMS). This standard aims to improve energy performance and efficiency within the organization.

DIN EN 16258

The DIN EN 16258 standard for calculating and reporting greenhouse gas emissions. This standard provides guidelines for assessing carbon footprints in transport and logistics operations.

ISO 14001

The ISO 14001 environmental management system helps the organisation plan and implement environmental measures at certified sites to minimize environmental impact. It ensures compliance with environmental standards and supports sustainable practices while balancing economic, social, and political considerations.

SQAS

SQAS, developed by Cefic, is a globally recognised assessment system for logistics service providers and chemical distributors. It evaluates safety, environmental, security, health, quality, and corporate social responsibility, promoting supply chain excellence and continuous improvement in chemical logistics. The assessment covers five modules: Transport Services, Rail Operators, Tank Cleaning Stations, Warehouses, and Chemical Distributors. The process involves a pre-assessment document, onsite assessment by independent assessors, sharing of assessment reports in a central database, and an improvement period based on identified areas for enhancement. Assessments are repeated every three years to ensure ongoing compliance and improvement.

SQAS
Safety and Quality Assessment System

Terminali Italia [39]

Terminali Italia is a significant manager of intermodal freight terminals, handling over 850,000 Intermodal Transport Units in 2023. Founded in 2008, the company is a wholly-owned subsidiary of Rete Ferroviaria Italiana (RFI). Terminali Italia was established to provide integrated terminal services within RFI's intermodal networked freight terminals.

In the 2022 financial year, Terminali Italia achieved a net profit of 2.14 million euros. For the first time, its operating revenue exceeded 50 million euros, reaching 52.33 million euros compared to 44.82 million euros in 2021. This growth was significantly boosted by the expansion of the scope of terminals operated, particularly through the development of the Marzaglia terminal.

Commitment

RFI has elaborated an integrated policy issued on November 2022 that aims to set out sustainability objectives for the company in terms of Environmental Policy, the Occupational Health and Safety Policy and the Train and Railway Operations Safety Policy.

Overall, RFI's Environmental Policy aims to balance social, environmental, and economic needs, promoting sustainable and environmentally-friendly mobility. As part of its Environmental Management System (EMS) adopted in 2013, RFI strives to improve annually on key indicators: energy consumption, CO_2 emissions, waste recycling/disposal, and water usage. However, no specific measurable goals or targets with defined timeframes have been established.

RFI's environmental objectives include:

- Rational use of natural resources and promoting renewable energy.
- Designing and managing processes to minimise environmental impacts considering the entire life cycle.
- Increasing energy efficiency and reducing consumption through technological advancements.
- Safeguarding local areas and biodiversity with restoration and redevelopment measures.
- Developing organisational, managerial, and technical skills focused on environmental sustainability.
- Enhancing environmental awareness internally and externally by prioritising the Environmental Management System for decision-making on environmental issues.

Initiatives

Energy consumption [40]

In 2023, RFI's Terminali Italia purchased a total of 0.48 TWh of electricity, split in two categories:

- 4.4% of the total electricity purchased is procured through the Energy Service operator. This electricity is used for both "internal uses" within RFI's operations and for railway traction. The composition of energy sources (renewable/non-renewable) in this segment reflects the national energy mix.

[39] https://www.terminaliitalia.it/en/sustainability--safety-and-quality/environment-and-intermodality.html
[40] https://www.rfi.it/en/about-us/Sustainability/Environment/Energy-Accountability.html

- 3.2% of the total purchased amounting to 0.2 TWh is acquired through a specific supply contract. This contract ensures that all electricity purchased under it is covered by Guarantees of Origin (GO), certifying its renewable origin.

Additionally 2020-2023, the company signed a contract for 100% renewable energy to meet the power requirements of Verona Quadrante Europa.

Energy efficiency[41][42]

Terminali Italia recently purchased four new cranes, with three deployed in Segrate and one in Marzaglia. These newer cranes incorporate advanced technology that improves fuel efficiency and reduces emissions compared to older models.

Terminali Italia also aims to increase the use of hybrid engines for shunting in non-electrified terminals by 2031. Machines equipped with an energy storage system, so that the use of fossil fuels is limited to the point of exclusion.

Waste Management

To facilitate efficient waste management, Terminali Italia has established contracts with authorised waste collection companies and a specialised waste management firm.

Recognising the importance of staff competence in waste management, Terminali Italia conducts regular training sessions for its employees. These sessions focus on proper techniques for the storage and preservation of waste, ensuring that all team members are well-equipped to handle waste materials safely and responsibly.

In terms of maintenance and raw materials management, Terminali Italia has implemented strategies aimed at optimising resource utilisation and minimising waste production. Outsourcing maintenance services has resulted in significant savings in raw materials and a notable reduction in the production of special hazardous waste. Maintenance technicians are assigned responsibility for managing waste generated during their activities, including its transportation, recovery, and disposal in accordance with legal requirements.

Certifications

ISO 14001:2015

ISO 14001:2015 is an international standard guiding organisation to establish effective Environmental Management Systems (EMS). It aims to help organizations manage their environmental responsibilities in a systematic manner. Key objectives include minimising environmental impacts, complying with regulations, improving environmental performance, and integrating environmental considerations into business decisions. The standard uses a Plan-Do-Check-Act cycle for continuous improvement and is applicable to organisations of all sizes and sectors globally. Compliance can be demonstrated through self-assessment or certification by external bodies.

[41] https://www.fsitaliane.it/content/dam/fsitaliane/en/Documents/sustainability-report-2022/july23/Schede_Societarie_2022_A4_web_ENG-singole.pdf
[42] https://www.terminaliitalia.it/content/dam/terminali_italia/tmi-eng/annual-report/Bilancio%20di%20esercizio%20TMI%202022_EN.pdf

Summary of best practices

As they set objectives to increase the sustainability of their operations, terminals can leverage several key strategies encompassing energy efficiency, water management, waste reduction, green building design, transportation and logistics optimisation, community and employee engagement, digitalisation, pollution control, and supply chain sustainability.

To that end, terminals often invest in energy-efficient machinery, renewable energy sources, and energy management systems, to significantly reduce their energy consumption and carbon footprint. Implementing water recycling systems and efficient fixtures can also help conserve water resources, while comprehensive recycling programs and the reduction of single-use plastics can minimise waste. Green building practices, such as aiming for LEED certification and using sustainable materials, enhance the environmental performance of terminal infrastructure.

On a bigger scale, terminal can leverage electrification and modal shifts can make freight transport reduce emissions and fuel consumption. They can also engage employees and the community in sustainability initiatives to foster a culture of environmental responsibility and promotes broader societal benefits. Digitalisation, including the adoption of paperless operations and smart technologies also improves operational efficiency and reduces resource use. Pollution control measures, such as emission reductions and proper handling of hazardous materials, help protect air and water quality. Finally, sustainable sourcing and regular supplier audits ensure that the entire supply chain contributes to the terminal's overall sustainability goals.

General Remarks

There seems to be a close link between the importance of a terminal in terms of volume, and its endeavour to reduce the environmental footprint of its activities. Contrary to ports, Terminal's annual reports refer to greening initiatives to starkly different extent.

An interesting feature of terminals is the widespread use of certification scheme and their less structured greening strategy and objectives compared to ports. This trend probably reflects the difference in the power-at-play that encourages terminals or ports to elaborate greening measure. Contrary to Ports, where international organisations, the EU, and private sector all encourage investments efforts as well as the elaboration of structured strategies and greening objectives, hinterland terminals escape similar pressure. Instead, one can interpret the terminal's widespread use of certification scheme as evidence that greening measures are mostly driven by their customers' interest in certifying their own decarbonation efforts. If this holds true, the terminals' interests in scaling their efforts beyond the criteria set forth by certification schemes are low. Such hypothesis is evidenced by the tone of pledges between ports and terminals : Virtually all ports analysed in the first part of this study expressed their willingness to be at the forefront of the sector's decarbonation efforts, not only by offering a wide range of new services, but also by investing massively in infrastructure work and enforcing appropriate rules in their area. Conversely, the ambitions levels of terminal companies appeared quite uneven.

Yet, it is worth noting that the role of a port authority and that of a terminal operator is also different, just like the level of competition and scale of the market, as well as the resources needed and the complexity of reducing the environmental footprint of terminal operations. As we saw in the previous sections, investments in lighting, employee mobility and installation of noise barrier (to name a few) appear less complex than promoting investment in hydrogen technologies and installing on-shore power supply.

In addition, while mentions of investments were not detailed in most available sources, the survey results showcase a strong commitment from the sector to invest in new equipment aimed at reducing the terminal operations' environmental footprint.

Annex I : References

Third IMO GHG Study (2014)

https://www.imo.org/en/MediaCentre/Pages/WhatsNew-1841.aspx

Investigation of appropriate control measures (abatement technologies) to reduce Black Carbon emissions from international shipping (2015)

Study of Emission Control and Energy Efficiency Measures for Ships in the Port Area (2015)

Studies on the feasibility and use of LNG as a fuel for shipping (2016)

Emissions toolkits: https://greenvoyage2050.imo.org/download-publications/

GMN technical documents: https://gmn.imo.org/technical-documents/

The existing shipping fleet's CO_2 efficiency -2015 (study prepared by the UCL Energy Institute) (includes comparison with other freight transport modes)

https://www.portsofgenoa.com/en/sustainability-en/sustainability-report.html

https://www.marseille-port.fr/sites/default/files/2024-04/BG_2024_FR.pdf

https://www.portsofgenoa.com/components/com_publiccompetitions/includes/download.php?id=4582:report-genoa-investment-programme-january-2024.pdf

https://www.portofrotterdam.com/sites/default/files/2021-06/factsheet-port-of-rotterdam-building-a-sustainable-port-en-2019.pdf

https://boskalis.com/press/press-releases-and-company-news/boskalis-commissions-2-gwh-shore-power-facility-in-rotterdam

https://www.portofrotterdam.com/en/news-and-press-releases/the-port-of-rotterdam-is-working-on-shore-power

https://www.portofrotterdam.com/en/news-and-press-releases/port-of-rotterdam-and-port-of-gothenburg-kick-off-green-corridor-initiative

https://www.portofrotterdam.com/en/news-and-press-releases/maritime-and-port-authority-of-singapore-and-port-of-rotterdam-to-establish

https://www.portofrotterdam.com/en/news-and-press-releases/zero-carbon-shipping-center-launches-partnership-to-establish-european

https://www.portofantwerpbruges.com/en/our-port/people-and-environment/clean-port/water

https://media.portofantwerpbruges.com/m/129c2c2427c802ba/original/PUBLICATIE_Sustainability_summary_ENG_2023.pdf

https://www.portofantwerpbruges.com/en/our-port/climate-and-energy-transition/antwerpc

https://www.portofrotterdam.com/en/news-and-press-releases/restoring-nature-and-reef-worldwide-with-a-sea-of-3d-prints

https://www.egtc-rhine-alpine.eu/files/2021/12/Emanuele-Profice-RA-Talks-03.12.2021.pdf

https://www.marseille-port.fr/projets/h2v-fos-et-le-port-de-marseille-fos

https://www.ship2shore.it/en/article/bunkering-a-new-operator-in-the-port-of-genoa/84975

https://newsroom.portofantwerpbruges.com/sustainable-rail-vision-for-port-of-antwerp

https://www.portofrotterdam.com/sites/default/files/2021-05/port-environmental-review-system-pers-april-2020_0.pdf

https://totalenergies.com/fr/medias/actualite/communiques-presse/TotalEnergies-realise-la-1ere-operation-de-soutage-de-GNL-dans-le-Port-de-Marseille-Fos

https://www.isprambiente.gov.it/contentfiles/00002400/2402-c2143-m3-u2.pdf

https://groupe.cfl.lu/getmedia/327259e3-6572-4a6f-b8b7-2a21c24390f8/CFL-rapport-annuel-2022-web.pdf.aspx#page=96

Annex II: roadmap for greening activities in ports

TO-DO'S	HOW TO PROCEED?
1. MEASURE *Make an inventory of the environmental status of the port*	A. Identify the emissions, externalities, and environmental footprint of the port authority activities to the degree possible B. Do the same (or contribute to such an exercise) for the wider port area to the degree possible C. Take stock of existing sources of information D. Identify the main practical and technical challenges
2. PRIORITISE *Identify environmental, climate, and sustainability priorities (challenges and opportunities)*	A. Discuss outcome of step 1 on the technical level, involving all relevant departments (infrastructure, commercial department, communication/public affairs, harbourmaster, etc.) B. Elevate discussions to the managerial level C. Based on inventory, make choices and prioritise, using the ESPO Top 10 Environmental Priorities as a reference
3. SET YOUR TARGETS *Identify what you want to achieve and set targets accordingly*	A. For each of your priorities identified in step 2, consider current legal obligations on the international, European, national level and possible forthcoming legislation (see Annex) B. Consider ESPO Green Guide ambitions C. Set ambitious, measurable targets for the identified priorities
4. TOOLS AND TASKS *Identify tools, stakeholders and measures*	A. Plan a budget and investments (considering cost efficiency and social benefits) B. Consider mitigation and possible positive contributions to greening and business cases for individual projects/investments C. Identify possible tools (see the Green Guide section on greening tools) taking into account budget and available full-time employees/responsibilities
5. SHARE *Share your plan and make it part of the DNA of the port*	A. Mainstream and explain green priorities and strategy through internal communication across all departments and activities B. Motivate work to introduce, update or improve roadmap
6. TIME IT *Develop tangible steps*	A. Develop a timeline and milestones for each of the priorities/ targets – when to achieve what B. Map the stakeholders involved and their responsibilities – who should do what
7. MONITOR *Monitor implementation, follow up, and communicate results internally*	A. Measure progress in relation to milestones and tangible steps, and communicate progress internally B. Identify problems and discuss improvements/solutions C. Communicate shortcomings or obstacles transparently D. Monitor what has been achieved, and use this as a basis to update the roadmap
8. COMMUNICATE *Engage in external communication*	A. Identify and reach out to stakeholders in the port area, as well as the community around the port, adapting communication means and language to the addressed audience B. Communicate priorities, progress and failures transparently (share good practices and problems, and their background) C. Share positive contributions and green business cases

Annex III- Interview Framework Questions

UIRR Interview Guidelines with ports and terminals in the context of the INTERREG project BSC

Introduction

Blue Supply Chains (BSC) is a project financed by the EU Baltic Sea interregional fund that aims at supporting port authorities and port operators to decarbonise port operations by advancing electrification, providing alternative fuels strategies and setting up green transport chains. The project was officially launched under the leadership of the Port of Hamburg Marketing in January 2023 for a duration of 36 months. The consortium consists of 21 organisations, a mix of port authorities, port operators, business operators, research institutes and industry associations.

More information on https://interreg-baltic.eu/project/bluesupplychains/

UIRR's assignment

UIRR – the Industry Association for Road-Rail combined transport in Europe (www.uirr.com) represents the interests of the Combined Transport Operators and Terminal Managers in Europe.

We have been mandated by the BSC consortium to conduct a study on the best practices for greening ports and continental terminals outside the Baltic Sea Region.

Our intention is to collaborate with key stakeholders involved in sustainability initiatives. In this context, we are conducting interviews and surveys to gather first-hand information on the strategies and practices implemented or planned to be adopted by the European ports and terminal community. UIRR will compile the collected best practices and document them in the comprehensive report on 'Industry best practices in Europe for greening in ports and terminals'.

We have elaborated these interview guidelines as a preparatory document that we would serve as a basis for the direct interview. Please find the key questions in the next section.

1. Could you provide an overview of your port's current greening strategy and initiatives including key performance indicators such as reductions in carbon emissions, water usage, alternative energy sources and waste generation?
2. What specific measures or initiatives has your port implemented to reduce its environmental impact? Is there a priority set? E.g rules on ships' behaviour, investment on infrastructure …
3. How does your port integrate sustainability into its day-to-day operations?
4. What challenges or obstacles has your port encountered in implementing its greening strategy?
5. How does your port collaborate with stakeholders, such as government agencies, businesses, and local communities, to advance its greening initiatives?

6. Can you share any notable successes or milestones achieved as a result of your port's greening efforts and what KPIs were instrumental in demonstrating these achievements?
7. What investments has your port made in renewable energy and other eco-friendly technologies?
8. How does your port address concerns related to air and water pollution, waste management, and biodiversity conservation. What KPIs are used to measure improvements in these areas?
9. How does your port address concerns related to noise?
10. Are there any ongoing research or development projects related to sustainability and environmental protection within your port?
11. How does your port engage with neighbouring ports and international organisations to share best practices and collaborate on environmental initiatives?
12. If you are part of any international initiative or EU project, to what extent do they support you in your endeavour?
13. What are your motivations to pursue this effort. Is there for example a pressure from your clients, a legislation, or economic incentives that convinced you to trigger this effort?
14. Can you provide insight into the economic benefits associated with your port's greening strategy, such as cost savings, improved efficiency, or enhanced competitiveness and what KPIs demonstrate these benefits?

Interview with Hans Nagtegaal, Head of Customer Sustainability Service at the port of Rotterdam

1. Could you provide an example of how you include your greening endeavours in your development process?

If someone were to approach the port and request 10 hectares for constructing a distribution center, we would first assess the necessity of such centres. Once confirmed, we would evaluate the proposed location according to . Building on prime ground with ample water connections might not be suitable for a distribution centre, as they typically don't require water connections for instance. If the assessment indicates that a distribution centre is unnecessary, we wouldn't proceed with its construction.

We're expanding terminals, railway infrastructure, and depot projects, as we're projecting that around 60 to 65% of additional volumes induced by forecast economic growth will end up in Rotterdam. We're confident in our capacity to manage this influx, but challenges will arise for the hinterland, particularly in handling the increased volume of trucks, trains, feeders, and barges.

As we develop our infrastructure, we're trying to keep the pace with innovation and we try to build new connexions. For instance, a train can drop containers at Terminal A, which then they can be moved autonomously to other terminals, although implementing fully autonomous moves within the terminal has proven challenging due to legislative constraints.

We're also trying to convince the government to building rail tracks for container transportation to and from Rotterdam towards other countries in Europe. But this can sometimes prove to be challenging, so se justify this by emphasising Rotterdam's hub function and logistic position, which necessitates such infrastructure.

We also face concerns about increased truck traffic and its impact on roads, pollution, and local communities.

2. What kind of regulations or incentives the port uses to make inland transport sustainable?

While rail and barge transportation are more sustainable for long distances, trucking technology is improving, raising questions about regulations and vehicle standards. As an authority managing the area, we're considering strategies to address these issues, including potential regulations on trucking companies and vehicle types. For instance, the port currently, mandate the use of Euro 6 fuel as the minimum requirement for vehicles traveling within the port. The main problem with the mandate to use Euro 6 is its enforcement. Road hauliers must register their vehicles before they're allowed to come in the Port. There can be dead angles to this enforcement policy, but it is the most efficient one they've implemented. In addition, the port facilitates charging for electric trucks. Road hauliers must register their vehicles before they're allowed to come in the Port.

The port also has a program for battery barges and electric containers. However, the challenge lies in convincing parties in inland locations to support these initiatives. Small towns in the Netherlands or Germany may not see the immediate benefits of hosting such facilities. Hence, discussions need to occur both at the terminal and with local communities. Often, terminals may resist installing charging infrastructure. This necessitates efforts from both ends to convince stakeholders. Therefore, collaborations with for instance ports in the Baltic, become crucial for influencing and implementing such initiatives and to create more synchrony.

3. How can the port authority influence infrastructure construction, in its area?

Within the port area, there are various parties involved. While the port doesn't handle road construction directly, it manages the secondary network connections to ferry sites. Similarly, it can oversee railway infrastructure through different program. However, the infrastructure's manager funding limitations sometimes require extra investment from the port. As for electric trucks, we're pushing for their adoption, especially to phase out diesel usage in Rotterdam. Last-mile electrification is a priority in this regard. Leand lease and port use

Regarding the imposition of electrification standards, it's challenging because the port's direct customer relationship lies with the parties leasing land from the port and the parties that use the port. So there's a weak influence on modalities and a very indirect relationship with shippers and forwarders.

4. How does the port measure CO_2?

In terms of industry, sectors like oil, gas, and coal are already mandated to report their emissions. For instance, in 2022, the Port published data showing 22.5 million tons of CO_2 emissions in the port area, with approximately 90% attributed to major industrial players. These companies are required to report their emissions as part of their licensing agreements, although it's not directly measured by us but by the companies themselves, in compliance with MRV regulations.

When granting licenses to companies, we're typically involved in around 99% of cases. However, environmental licenses are issued by the city. Even if the Port allocate land for a distribution centre,

the company must still obtain operational permits from the city's environmental services. These permits assess factors such as noise and air pollution, proximity to residential areas, and traffic impact. If concerns arise, assessments are conducted, and input may be sought from the province, national government, and even the EU.

5. How do you convince your partners to bolster greening investments?

We're actively promoting new solutions such as electric barges. Our approach is to demonstrate their viability as a product. Once proven successful, we'll transition it to the market. For example, with zero-emission electric barges, we're establishing a joint venture company to absorb the initial losses, showcasing its functionality. Eventually, we aim for the market to adopt and sustain these innovations independently.

For example, when constructing a quay wall, we strive to make it as CO_2-neutral as possible. We incorporate features like coral blocks to provide habitats for marine life. We're committed to environmental conservation and consider the marine ecosystem in our projects. Achieving our objectives requires influencing multiple stakeholders to ensure alignment with our goals, not only as regards the nature of the construction work but also the materials used and the construction operation.

6. How do you choose which investments should be performed by you and your partners?

We used to have a specialised department focused on exploring sustainability solutions. We had experts dedicated to areas like shore power, energy transition, and assisting for instance Oil companies with retrofitting their factories and adopting new energy sources. Over the last two years, there's been a significant shift. Sustainability is now integrated across departments and is a more prominent topic in discussions with our customers. Special programme for Oil producers, CO_2 intensive industries accounts are taken apart because can't be tackled the same way.

As a major bunker fuel port, we're adapting to changes in the deep-sea carrier industry by ensuring that all new bunker fuels can be easily bunkered in Rotterdam through ship-to-ship transfers.

Additionally, we've set internal targets to further reduce our emissions. Despite advancements like LNG, there's still room for improvement, and we're working towards making our operations even more sustainable.

7. What are the reasons for the Port of Rotterdam to deliver on these greening endeavours?

Ensuring a sustainable supply chain is crucial for greening or achieving sustainability. If we fail to address this issue, the entire supply chain will be affected. Currently, there's a noticeable trend in Europe, although less so in America and Asia, where consumers are questioning the environmental impact of products transported across long distances on polluting vessels and roads. We strongly believe that in the near future, each product will come with a sticker indicating its carbon footprint, allowing consumers to make informed choices. This transparency will empower consumers to support environmentally-friendly products, driving positive change in the market. So we believe that to maintain our position as the main hub, it's essential to prioritise sustainable infrastructure.

While economic output was the focus in the past, our current goal is sustainability. We aim to establish a robust infrastructure network connecting inland locations more efficiently, enabling us to fulfill our role as a central hub effectively.

Besides, European ports have is the requirement to meet sustainability targets by 2050. However, the challenge lies in convincing companies to transition sooner rather than later, especially when

equipment needs to be written off before making the switch. Companies often weigh the cost of immediate investment against potential benefits, such as utilising solar panels and batteries. The port is focused on providing companies with insights into their sustainability potential, even offering to finance external consultations to help them understand their options.

There's ample funding available for sustainability initiatives, making it easier to secure investment, particularly when presenting a strong business case. Private equity firms are increasingly interested in investing in such projects, which can ultimately strengthen trade positions. However, it's crucial to balance investments with viable business cases, ensuring that resources are allocated efficiently. Our department, consisting of approximately 50 to 75 individuals, is dedicated to fostering sustainability initiatives and collaborations with various stakeholders.

8. **What are the main challenges to your Port's greening endeavours?**

I believe there's a risk of public opinion turning against logistics, especially with movements like Extinction Rebellion gaining traction. We're seeing protests in various regions, including Belgium, where the focus is often on the impact of Ports. The slow pace of transition can be frustrating, as some companies delay sustainability efforts until they're compelled to act. Negotiating regulations, such as IMO's emissions reduction targets for container vessels, can take years. The challenge lies in meeting public demands for faster change while balancing the economic realities and concerns of our clients, who may find rapid transitions costly. It's a delicate balance between sustainable growth and economic interests. Some citizens advocate solely for sustainability, while clients prioritise economic growth. We must navigate this conflict and find solutions that satisfy both parties. It's crucial to address concerns about environmental impact, particularly in areas with dense populations, unlike our more remote locations. Ultimately, our goal is to achieve sustainability while meeting the needs of both the public and our clients

Interview with Dorien Van Cauteren, Sustainability Manager & Gilles Decan, Program Manager Hydrogen at Port of Antwerp-Bruges

1. **Can you provide an overview of your port's current sustainability strategy? What are the main initiatives you're looking to implement to make your activities more sustainable?**

We focus on four strategic pillars to transition our port ecosystem towards sustainability. First, we aim to enhance energy efficiency across our operations and industries within the port. Second, we're accelerating the adoption of green energy, including wind and solar, and expanding into hydrogen energy. Third, we're promoting green feedstocks like biomass to reduce reliance on petroleum-based products. Finally, we're working on carbon capture and storage to mitigate emissions. These efforts involve close collaboration with port stakeholders to facilitate and support their sustainability initiatives.

2. **Do you have key performance indicators (KPIs) for carbon emissions and water usage? What are your broader targets in these areas?**

We monitor our carbon emissions comprehensively, focusing on both direct and indirect sources. Our targets align with science-based criteria and include scope 1, scope 2, and scope 3 emissions. Water usage and other environmental metrics also feature in our sustainability reporting, aligning with international frameworks and stakeholder expectations.

3. **How does your port incentivize companies to adopt sustainable practices?**

While we don't enforce emissions reductions directly on port companies, our concession agreements incorporate environmental clauses related to noise, water usage, and storage. We offer incentives through extended contract terms for companies investing in green technologies or infrastructure like charging stations for electric vehicles. Additionally, we facilitate access to funding and expertise for green technology projects through our funding desk, supporting companies in navigating complex regulatory and financial landscapes.

There is also a discount on services provided for ships calling in that comply with high environmental standards.

4. **What motivates your port's sustainability efforts—is it primarily legislative pressure, client demands, economic incentives, or competitive positioning?**

Our sustainability initiatives are driven by a mix of responsibilities—from legislative compliance (CSRD) to meeting stakeholder expectations and maintaining economic relevance. We aim to lead in sustainability within our industry, ensuring our operations align with evolving regulatory standards while enhancing our competitiveness and attractiveness as a sustainable port. But the Port of

Antwerp Bruges didn't wait for the CSRD or other legislations to trailblaze greening of operations. Five or ten years ago the port made one of the first sustainability reports. And then if we take the species protection program in the port as an example, you can definitely see that it's not the legislation type of thing because it's actually the first species protection program that is made for a whole area.

5. **Can you elaborate on your initiatives to transform your port into a hub for hydrogen and other renewable energies?**

Given the significant energy needs of our industries, particularly those that cannot fully transition to direct electrification, hydrogen and its derivatives are crucial. We're expanding our infrastructure to support hydrogen terminals, pipelines, and conversion units within the port. These initiatives are driven by industry investments, with whom we collaborate closely to align market developments with policy goals and technological advancements.

6. **What role does your department play in ensuring compliance and fostering sustainability within the port?**

Our department focuses on regulatory compliance, particularly in terms of biodiversity, water quality, and emissions reporting. We oversee the implementation of our sustainability strategy, ensuring alignment with international standards and stakeholder expectations. This includes setting and monitoring KPIs, managing sustainability reporting, and facilitating partnerships and infrastructure projects that promote environmental stewardship within the port. I'd say also that from our point of view, one of the strong aspects of our company is that sustainability is not confined to a single department; instead, it is a shared expertise integrated across all departments.

7. **When you want to implement your greening strategies, what are the main challenges you face?**

Our department does a lot of work complying with new legislation, which demands significant resources. This focus often shifts attention away from actual green actions to meeting regulatory requirements and setting targets.

8. **How does your department collaborate with stakeholders such as government agencies and other ports?**

We engage in regular discussions with other ports on various topics like energy and climate transition. We also participate in sustainable dialogues with NGOs and government bodies quarterly.

9. **How many companies operate within your port and how do you manage their compliance and actions?**

There are approximately 1,400 companies in the Port of Antwerp. We manage their compliance through stakeholder management and regulatory alignment, ensuring they adhere to legislative changes.

10. **Can you highlight any notable successes or unique initiatives that set your port apart?**

We are particularly proud of our species protection program, which involves maintaining protected areas within the port. This initiative stands out as unique among ports worldwide.

11. **Could you elaborate on any renewable energy initiatives apart from windmills?**

Besides windmills, we co-invest in solar panels on the Left Bank in Antwerp. Additionally, companies within the port are encouraged to invest in renewable energy on their own assets.

12. **How does your port address concerns related to pollution, waste management, biodiversity, and noise beyond monitoring?**

We have dedicated experts who oversee pollution control, biodiversity conservation, and noise complaints. We collaborate with government bodies to ensure environmental compliance.

13. **Are there ongoing research or development projects related to sustainability in your port?**

Yes, we collaborate with universities on projects like ship emissions modeling, plastic pollution research, and biodiversity studies. We also initiated projects like the pellet shifter to tackle specific environmental challenges.

14. **Do you participate in European projects, or do you focus on internal initiatives and collaborations with local universities?**

While we primarily focus on internal initiatives and collaborations with local universities, we occasionally engage in European projects related to sustainability.

UIRR Survey on Greening Strategies in CT Terminals

The dataset contains survey responses from multiple terminal operators regarding their greening strategies in CT terminals.

Respondent 1

- **Organisation Name**: CFL terminals s.a.
- **Greening Strategy**: Yes
  - **Main Aspects**: The strategy is reflected in our corporate priorities.
  - **Weblink**: N/A
- **Environmental Sustainability Initiatives**: Yes
  - **Specific Initiatives**: Various initiatives to increase sustainability.
- **Barriers**: Operational constraints.
- **Alternative Power Sources**: No
- **Electric Handling Equipment**: No
- **Energy Efficiency Practices**: Yes
  - **Practices**: Implementation of energy-efficient measures.
- **Zero Emission Vehicles**: No
- **On-site Renewable Energy**: No
- **Staff Training**: Yes
  - **Type**: Environmental awareness and sustainability practices.
- **Envisioned Future**: N/A
- **Interview Interest**: No

Respondent 2

- **Organisation Name**: John G Russell (Transport) Limited
- **Greening Strategy**: Yes
  - **Main Aspects**: All electric gantry cranes.
  - **Weblink**: N/A
- **Environmental Sustainability Initiatives**: Yes
  - **Specific Initiatives**: Implementation of electric gantry cranes.
- **Barriers**: Economic feasibility.
- **Alternative Power Sources**: No

- **Electric Handling Equipment**: Yes
- **Energy Efficiency Practices**: No
- **Zero Emission Vehicles**: No
- **On-site Renewable Energy**: No
- **Staff Training**: No
- **Envisioned Future**: N/A
- **Interview Interest**: No

Respondent 3

- **Organisation Name**: ROCOMBI S.A.
- **Greening Strategy**: No
    - **Main Aspects**: N/A
    - **Weblink**: N/A
- **Environmental Sustainability Initiatives**: Yes
    - **Specific Initiatives**: More electric handling equipment needed.
- **Barriers**: Technological limitations.
- **Alternative Power Sources**: Yes
- **Electric Handling Equipment**: No
- **Energy Efficiency Practices**: Yes
    - **Practices**: Adoption of energy-efficient equipment.
- **Zero Emission Vehicles**: No
- **On-site Renewable Energy**: No
- **Staff Training**: No
- **Envisioned Future**: Developing more handling solutions.
- **Interview Interest**: No

Respondent 4

- **Organization Name**: METRANS, a.s.
- **Greening Strategy**: No
    - **Main Aspects**: N/A
    - **Weblink**: N/A

- **Environmental Sustainability Initiatives**: Yes
    - **Specific Initiatives**: e-Trucks, e-Machinery in general.
- **Barriers**: Regulatory challenges.
- **Alternative Power Sources**: No
- **Electric Handling Equipment**: No
- **Energy Efficiency Practices**: Yes
    - **Practices**: Implementation of e-machinery.
- **Zero Emission Vehicles**: No
- **On-site Renewable Energy**: No
- **Staff Training**: Yes
    - **Type**: Training for using e-machinery.
- **Envisioned Future**: Working on plans for the future.
- **Interview Interest**: No

Respondent 5

- **Organization Name**: Duisburger Hafen AG
- **Greening Strategy**: Yes
    - **Main Aspects**: Detailed in corporate press releases.
    - **Weblink**: Duisport Press Releases
- **Environmental Sustainability Initiatives**: Yes
    - **Specific Initiatives**: Various sustainability initiatives.
- **Barriers**: Financial constraints.
- **Alternative Power Sources**: No
- **Electric Handling Equipment**: No
- **Energy Efficiency Practices**: Yes
    - **Practices**: Implementation of energy-saving technologies.
- **Zero Emission Vehicles**: No
- **On-site Renewable Energy**: No
- **Staff Training**: Yes
    - **Type**: Environmental training programs.
- **Envisioned Future**: N/A

- **Interview Interest**: Currently not interested.

Interview with Kristin Kahl, Sustainable Solutions Management, CONTARGO Trimodal Network

1. Could you provide an overview of your terminal(s)' current greening strategy and initiatives, including key performance indicators such as reductions in carbon emissions, alternative energy sources, or waste generation?

All terminals share the same greening strategy, tailored to their individual sizes and services. The overarching goal for the group is to achieve decarbonization by 2045, encompassing Scope 1, 2, and 3 emissions. Specific objectives include transitioning to green electricity for Scope 2 by 2045 and implementing electric technologies for Scope 1.

2. What specific measures or initiatives has your terminal(s) implemented to reduce its environmental impact? Is there a priority set?

Key measures include increasing the use of green electricity, favouring cranes over reach stackers where feasible, and transitioning to LED lighting across terminals. Other initiatives involve workshops to promote sustainability among administrative and terminal staff, aiming for paperless offices and biodiversity preservation through container cleaning and maintenance.

3. How does your terminal(s) integrate sustainability into its day-to-day operations?

Efforts include promoting biking to work and embedding sustainability practices into daily routines, detailed in the sustainability report.

4. What challenges or obstacles has your terminal(s) encountered in implementing its greening strategy?

The primary challenge is the cost of investments, particularly in charging infrastructure for electric vehicles. Despite readily available electricity, the infrastructure for zero-emission trucks is limited, necessitating significant investments.

5. How does your terminal(s) collaborate with stakeholders to advance its greening initiatives?

Terminals in Germany often receive subsidies from the government. Collaboration with port authorities and other stakeholders is crucial for sharing initiatives, discussing investments, and addressing concerns such as handling dangerous goods and promoting hydrogen use.

6. How does your terminal(s) address concerns related to noise pollution, biodiversity conservation, and CO_2 emissions? What KPIs are used to measure improvements in these areas?

Efforts include noise-reducing measures like walls and vegetation, biodiversity enhancements such as sponsoring bee colonies and installing insect hotels, and managing CO_2 emissions through cleaner technologies.

7. Are there any ongoing research or development projects related to sustainability and environmental protection within your terminal(s)?

Initiatives include garbage collection walks and participation in river clean-up activities.

8. How does your terminal(s) engage with other terminals or international organizations to share best practices and collaborate on environmental initiatives?

Engagement includes participation in forums like the European Clean Trucking Alliance to discuss and implement alternative trucking solutions.

9. What are your motivations to pursue this effort? Is there, for example, pressure from clients, legislation, or economic incentives driving this effort?

Motivations include reducing emissions, supporting customer needs for decarbonisation, and emphasising the importance of sustainability in business practices.

10. Can you provide insight into the economic benefits associated with your terminal(s) greening strategy, such as cost savings, improved efficiency, or enhanced competitiveness, and what KPIs demonstrate these benefits?

Currently, there are no economic benefits identified, but future competitiveness may improve due to unique product offerings like electric trucks, which may incur additional costs for customers.

Annex IV: Ports initiatives

Port of Rotterdam	On shore power supply	The City and Port authorities have drawn up a five-year programme with three pillars to upscale shore power realisation. The target for 2030 is to provide the public quays in urban areas with shore power with a utilisation rate of at least 90%. The aim is to have at least 90% of Roll-on/Roll-off, offshore, ferries and cruise vessels using shore power during visits by 2030. The target with the largest container vessels (ULCS) is 50%. Example of project: Cruise Port Shore Power is actively working towards transitioning to shore-based power. The project is scheduled to be implemented between the summer of 2023 and mid-2024. The Municipality of Rotterdam and the Port of Rotterdam Authority are collaborating on a joint strategy and development program to expedite and expand the availability of shore-based power for seagoing vessels.
	Flood Risk Management	Rotterdam's port area is situated several metres above New Amsterdam Water Level (NAP) and it is protected effectively from flooding. Global climate change is leading to sea-level rise. The Port engages studies of the associated risks, impact and possible solutions. There appears to be no significant increase in the flood risk.
	Discount for clean Shipping	Sea-going vessels that comply with standards above the statutory requirement (as recorded in the **Environmental Ship Index**) qualify for a discount of up to 20% on port dues. Inland vessels receive a discount when they are cleaner than the current standards or when they have a Green Award Certificate.
	Nature in the Port	When developing port areas or building infrastructure, we take into account the quality of the living environment, design with nature in mind (nature inclusive) and prevent and, where necessary, compensate damage to protected nature.
	Air quality management / E-Noses	To track down noxious or hazardous emissions in time, hundreds of electronic sensors (known as e-noses) have been installed throughout the port area to prevent problems like odour nuisance. Two of the Port Authority's patrol vessels have also been fitted out with an e-nose.
	Wind and Solar power in the port	There is a pilot study in progress with floating solar panels at the Slufter, the silt depot for Maasvlakte 2, and the lights on the bollards that line Caland Canal are powered by the sun. What's more: Rotterdam's port area is providing the room needed for wind power: generating capacity was 200 megawatts (MW) in 2016 and planned capacity for 2020 is 300 megawatts
	CONDOR H2	The CONDOR H2 project, stemming from the RH2INE initiative, aims to facilitate zero-emission transport in inland waterways. By 2030, it targets having 50 zero-emission vessels operational, cutting CO2 emissions by 100,000 tonnes annually. CONDOR H2 offers hydrogen storage and fuel cells with a battery pack on a pay-per-use basis, making it easier for ship owners to transition to zero-emission. Hydrogen will be provided in interchangeable 'tank-tainers' for longer voyages. Those containers are directly replaced after being unloaded from ships and delivered to a green hydrogen producing facility that will recharge the fuel-cells for a next ship.
	Business.gov.nl	Cargo shippers or freight forwarders in road transport may qualify for the Modal Shift subsidy if they transition to transport via inland waterway or railway. This transition can lead to reduced road traffic and CO2 emissions. The subsidy offers €20 per moved container or unit. To qualify, the following conditions must be met: The applicant must be a cargo shipper or freight forwarder. The primary mode of transport must shift from inland road to inland waterway or railway. The shift must contribute to the modal shift and be integrated into the business structure. At least 3 containers or equivalent units must be transported per day on average, covering 250 sailing days per year, over a distance of at least 35 kilometers from road to water or road to railway. The activity must be conducted on routes between the port of Rotterdam and Germany, via the regions Arnhem-Nijmegen (East corridor) and/or via Venlo (South-East corridor), and the route Amsterdam to Antwerp (South corridor). For shifts to railway transport, subsidies are available outside these routes.

	Eco-friendly tender for infrastructure project	In 2023 consortium comprising Hakkers, Van Oord, and De Klerk began the construction of the tugboat quay along the Yangtzekanaal. The project entails the development of a 500-meter quay wall, providing twelve berths. The selection of this consortium aligns with the Port Authority's commitment to sustainable port advancement. Hakkers, Van Oord, and De Klerk are dedicated to enhancing the sustainability of the construction site by employing electric equipment, thereby significantly reducing CO2 emissions throughout the construction phase. Additionally, the consortium has demonstrated its ability to add substantial value through the implementation of measures aimed at minimising disruption and damage.
	Innovation project for alternative materials	A trial with geopolymer concrete is currently underway in the Eemhaven by the Port of Rotterdam Authority. Geopolymer concrete, which excludes cement, is being tested for the first time in a maritime setting. This initiative would restul in a reduction of 50% CO2 emissions for building work.
	PORTHOS	Porthos is a Carbon Capture and Storage project aimed at transporting CO_2 from industries located in the Port of Rotterdam and storing it in depleted gas fields beneath the North Sea. Porthos stands for Port of Rotterdam CO_2 Transport Hub and Offshore Storage.
	Alternative fuels bunkering ship to ship	During its maiden voyage, the vessel sailed on green methanol, which it also bunkered in Egypt. Maersk will be deploying the vessel between Northern Europe and the Baltic Sea. It will run on methanol, but it will also be able to switch to low-sulphur fuel oil. The new 2,100 teu vessel is a stepping stone towards a much larger order of methanol vessels to be placed by Maersk. In 2021 and 2022, the shipping company ordered eighteen container ships – also from Hyundai – of about 16,000 teus for the Asia-Europe Route. They are set to become operational in 2024 and 2025.
	Hynetwork Services	Hynetwork services, in collaboration with the Port of Rotterdam Authority is developing a new hydrogen pipeline (formerly HyTransPort). In the future, the pipeline will be connected to the national and international hydrogen network. This will provide a connection to Chemelot in Limburg, North Rhine-Westphalia in Germany and other European regions.
	H2-Fifty project	On the Maasvlakte, 24 hectares have been earmarked for the conversion park that will convert green electricity from offshore wind farms into green hydrogen using electrolysis. Several plots in the park have already been reserved, including by Shell. Nobian, BP and the Port of Rotterdam Authority are working together on the H2-Fifty project to develop a 250 MW electrolyser by 2025. The aim is to eventually supply around 100 to 180 thousand tonnes of green hydrogen a year to industry and/or the transport sector.
	GoodShipping	The Port of Rotterdam partners with the GoodShipping programme that delivers CO_2-reduction certificate for Scope 3 Emissions at a special price. GoodShipping also helps shippers to gain exposure through branded container on the campaign visuals and to be promoted in campaign communications.
	Inland shipping on batteries	The port partners with ZES to introduce a new energy system for sustainable inland shipping, offering emission-free sailing through exchangeable battery containers, charging stations, technical support, and an innovative payment concept. It aims to make inland shipping cleaner, climate-neutral, and competitive with fossil fuels. ZES is backed by four companies, including Ebusco, ING, Wärtsilä, and the Port of Rotterdam Authority, with support from the Ministry of Infrastructure & Water Management and the Province of South Holland. Its mission is to enable more sustainable inland shipping, while its vision is for inland shipping to operate cleanly and climate-neutrally.
	Charging station for electric trucks	Truck charging stations have been established at the Waalhaven Truck Park, featuring 8 charging bays, including 2 fast chargers. Electric truck drivers can utilise these facilities during short and long breaks. The secure truck park offers necessary amenities for drivers and vehicles. They operate on a report-and-charge basis, with drivers reporting arrival via intercom and charging their trucks at no cost. Charging instructions are provided, and drivers can use all park facilities during their stay. The Port of Rotterdam aims to electrify all 6 secure truck parks in the area to accommodate the increasing fleet of electric trucks, with subsidy options available for sustainability initiatives. Carriers or supply chain parties seeking charging infrastructure can reach out for assistance.

	Green Corridors Rotterdam - Gotteborg	The Green Corridor initiative practically entails the establishment of a common framework for cooperation between ports to stimulate the adoption of new alternative fuels, such as methanol, necessary for achieving full maritime decarbonization in line with the Paris Agreement. This involves facilitating the bunkering of these fuels and integrating them into the operations of seagoing vessels. Additionally, the initiative aims to connect the ports of Gothenburg and Rotterdam to a larger network of deep-sea corridors, thereby promoting the use of sustainable fuels across broader maritime routes. Through these practical measures, the initiative seeks to drive tangible progress towards reducing greenhouse gas emissions within the shipping industry.
	Green Corridors Rotterdam - Singapore	The initiative involves optimizing maritime efficiency and safety through digitalisation. A digital trade lane will be established to facilitate the seamless movement of vessels and cargo, enabling just-in-time arrivals. The collaboration with the Global Centre for Maritime Decarbonisation and the Mærsk Mc-Kinney Møller Center for Zero-Carbon Shipping, along with industry partners, aims to operationalise meaningful pilots along the green corridor, accelerating the transition to sustainable shipping practices on an international scale.
	Green Corridors Europe	The initiative, led by the Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping, involves collaboration with several Port Authorities including Gdynia, Hamburg, Roenne, Rotterdam, and Tallinn. It aims to demonstrate the early commercialisation of alternative fuel supply chains and create a blueprint for rolling out green corridors in various locations. The project will follow a phased approach: Pre-feasibility: Identifying potential routes, vessel types, and fuels for establishing high-impact green corridors in the region. Feasibility: Assessing the technical, regulatory, and commercial feasibility of the selected routes. Implementation: Executing the vision and establishing green corridors in Northern Europe and the Baltic Sea. Throughout the process, additional public and private stakeholders will be engaged to activate the full value chain required to realize the vision. Green corridors are recognized as a vital facilitator for the shipping industry's transition, aligning with the Clydebank Declaration announced during COP-26 in Glasgow.

Port of Antwerp	Air Quality monitoring	In collaboration with the Flanders Environment Agency (VMM), we oversee air quality within the port area. Utilizing a network of monitoring stations equipped with smart sensors (iNoses), we bolster our understanding of air quality conditions. Accessing these sensors in real-time through our digital twin, we integrate diverse data sources to optimize our research efforts.
	Discount for green shipping	Introduction of a discount for 'ESI at berth' of € 500 per call if the data is shared within a maximum period of 72 hours.
	Soil and water quality monitoring	The port conduct regular monitoring of soil and groundwater quality within the port area, which includes overseeing our port assets. The goal is to complete the remediation of all historical soil contamination by 2036. Soil surveys play a crucial role in identifying contaminated areas and assessing the associated risks, guiding the need for remediation measures. As exemplified at the Fort Sint-Filips site, a heavily contaminated area can be transformed into a safe sheep pasture The port closely monitors water and waterbed quality alongside air and soil quality. It utilizes smart sensors to monitor water quality and is developing an action plan to address issues like salinisation and rising temperatures.
	Monitoring of substances of very high concern, such as PFAS	Possibility to deploy innovative treatment techniques.
	Water level management	In case of flooding, a Dock level management application helps to monitor water levels and allow its management through optimisation of the locks A pump system was also installed to be used in case of drought. The pump are supposed to transfer water from different sources to ensure adequate supply to docks and canals, as well as measures to prevent seawater intrusion.
	Circular use of water	Study on possibility to collect and reuse or infiltrate as much rain or rainwater as possible.
	Plastic Pollution	The Port applied the zero pellet loss charter, aiming to reduce the flow of plastic into the water. They initiated a competition focused on cleaning tiny pieces of plastic from the tidal area. The winning entry, the vacuum cleaning robot "Nul-O-Plastic," was designed by Envisan, the environmental company of the Jan De Nul Group. Envisan developed soft tracks for the robot, enabling it to navigate the fragile soil of a nature reserve.
	Biodiversity	The port actively protects biodiversity by creating fish spawning areas and implementing a species protection program in collaboration with Natuurpunt. This initiative safeguards 90 protected plant and animal species within the port area, allowing for both conservation and industrial development. Furthermore, the port has established ecological infrastructure, forming a green corridor that connects natural areas within the port and supports the habitat of port-specific flora and fauna.
	Renovation of building	The port's implementing various sustainability measures, including building insulation, transitioning to an electric vehicle fleet, and promoting sustainable commuting for employees.
	Greening of Port's own fleet	The Antwerp-Bruges Port Authority operates a fleet comprising tugs, dredgers, and enforcement vessels, actively investing in integrating alternative fuels and reducing energy consumption. Efforts include connecting ships to shore power, operating existing vessels at lower revs, and systematically replacing them with more fuel-efficient types. The introduction of Reversed Stern Drive (RSD) and electric-powered vessels, such as the upcoming e-RSD and fully electric enforcement vessels, alongside ongoing projects involving hydrogen- and methanol-fueled tugs, demonstrate a commitment to innovation and sustainability. Notably, the "Hydrotug" and "Methatug" represent world-first conversions to hydrogen and dual-fuel methanol propulsion respectively, contributing to carbon-neutral shipping goals. Furthermore, the enforcement vessels are equipped with battery packs, enabling electric operation at low speeds while minimising CO2 emissions and reducing harmful pollutants through integrated exhaust gas treatment systems.

	Reasoned travel policy	The Port joined the "Coalition for Sustainable Business Travel," Emphasis is placed on reducing travel through digital meetings whenever feasible. When travel is necessary, preference is given to public transportation, electric pool cars, or bikes. For longer distances, trains are prioritized when practical; otherwise, air travel is utilised with carbon offsetting to mitigate the CO2 footprint.
	Antwerp@C	The Port of Antwerp is collaborating with major players in the energy and chemical sectors to innovate CO2 reduction through Carbon Capture & Storage (CCS) and Carbon Capture & Utilisation (CCU). Partnering with Air Liquide, BASF, Borealis, ExxonMobil, INEOS, Fluxys, and Total Energies, the Antwerp@C project aims to halve CO2 emissions in Antwerp by 2030. The initiative involves capturing and locally transporting CO2, necessitating pipelines, liquefaction plants, and storage units. Due to Belgium's unsuitable subsoil for underground storage, international cooperation is crucial. Antwerp@C plans to transport CO2 to empty gas fields in the North Sea initially, with potential expansion to pipeline transport to the Netherlands in subsequent phases.
	Green Energy Hub	The Port of Antwerp aims to establish itself as Europe's primary import hub for green hydrogen. It plans to import green energy and hydrogen from regions with excess wind and solar power. Additionally, it aims to boost local production with green hydrogen plants. Infrastructure developments include constructing quays, terminals, and pipelines to accommodate this energy, as well as enhancing intermodal connections to distribute hydrogen to inland areas.
	Shore Power	The Port of Antwerp-Bruges promote shore power supply, enabling ships to disconnect their diesel generators and switch to local power in order to significantly mitigate emissions. Presently available for barges and the port's own fleet, the plan includes expanding shore power infrastructure to accommodate the largest container and cruise ships by 2028. Moreover, the cruise terminal in Zeebrugge, under the Port of Antwerp-Bruges' management, will be equipped with shore power capabilities starting in 2026. By 2030, there will be a European Union mandate for container and cruise ships to connect to shore power wherever such infrastructure is available, marking a crucial step towards sustainable maritime operations.
	Warmnetwerk : Waste generated heat	The Antwerp-North Heat Network aims to repurpose waste heat generated by industrial processes, particularly in the city's chemical cluster. Collaborating with Indaver, the network transports waste heat to Boortmalt, the world's largest malting plant, where it is reused in malt production. Subsequently, Fluvius plans to extend the network to residential areas like 'Rozemaai' and 'Luchtbal', benefiting 3,000 households, 7 schools, and various public buildings. Upon full implementation, the network is expected to annually save 80,000 tons of CO2 emissions, equivalent to those produced by 12,500 Antwerp families.

Port of Marseille	Shore Power	Marseille Fos, the first French port with electrical connections for ships since 2017, aims to reduce air and CO2 pollution. With a 50 million euro investment by 2025, it's expanding to international ferries, ship repair, and cruise ships. Cap Janet terminal in Marseille will offer full ship electrification. Studies are also underway for similar projects at Fos docks. In 2019, during the Blue Maritime Summit, Marseille Fos and prominent shipping companies committed to a Blue Charter, which mandates stricter rules than national and international regulations. These rules include using shore power by 2025, sulphurised fuel or other eco-friendly alternatives, hosting LNG-powered ships, and reducing speed upon entering the port area. Marseille Fos plans to provide electrical connections for two cruise ships simultaneously by 2025, supplemented by renewable energy from photovoltaic power units installed on warehouse roofs.
	Alternative fuels for HGVs H2Haul program	In the port of Marseille, the HyAMMED project, led by Air Liquide, implemented hydrogen motorization technology to transition heavy vehicle transport towards environmentally friendly mobility. It was part of the EU's H2Haul program aimed at zero-emission logistics. The project involved constructing Europe's first high-pressure hydrogen station for long-distance trucks, facilitating up to 20 daily refuelling's for low carbon hydrogen trucks with an 800 km range.
	VALHYDATE	The VALHYDATe project, located in the Provence-Alpes-Côte d'Azur region on the industrial-port territory of Marseille Fos (PIICTO platform), aims to demonstrate the valorisation of "decarbonized waste" hydrogen produced by platform industries and "green" hydrogen from renewable sources, notably within the framework of the JUPITER 1000 project led by GRT gas and its partners or through other projects. It focuses on three types of sectoral applications: Stationary application to secure local and regional electricity supply, Mobility application to power corporate fleets or logistic sites, for goods transport vehicle mobility, buses, coaches, and even onboard river and maritime applications, Power-To-Liquid application for low-carbon methanol production from hydrogen and industrial CO2. The purpose of the VALHYDATe project is to: Structure a viable and sustainable hydrogen valorisation industry, Ensure the replicability of the studied applications in other territories, Validate the economic model of this new energy sector, which generates employment.
	Refuelling ships LNG	Following refuelling tests by truck in 2017 and obtaining all regulatory authorizations in 2018, the Port will commence offering its customers an LNG refuelling barge in early 2022. In the summer of 2021, the Gas Vitality, a 135-meter micro LNG carrier, successfully completed its sea trials. Chartered by TotalEnergies Marine Fuels, the LNG tanker will be stationed in Marseille Fos in 2022 to cater to the Mediterranean region.
	REPONSES Project	The goal of the RÉPONSES project is to offer tangible responses and solutions to combat pollution. This involves fostering constructive dialogue among stakeholders, which includes local residents, initiating new actionable measures, and ensuring everyone has access to centralized, independent, accessible, and reliable information regarding health and environmental conditions, as well as the ongoing efforts to enhance them.
	Environmental Ship Index (ESI)	Since 2017, the Port of Marseille Fos has set up the Environmental Ship Index (ESI) awards, promoting the efforts of the World Port Climate Initiative (WPCI). This scheme rewards the ships of companies which achieve performances that go beyond the regulatory requirements. More specifically, shipping companies whose ships best contribute to air quality are honoured for their proactive efficiency and are rewarded with a reduction in port charges.
	Modal Shift	The port of Marseille Fos aims to strengthen and expand its hinterland by developing a vision focused on the southern facade of Europe. This strategy aims to address environmental challenges while promoting responsible economic growth. For example, the transfer of containers to rail significantly reduced road traffic, with 27,000 fewer trucks on the Vergèze-Fos-sur-Mer route in 2019. Over the past five years, the port has seen nearly a 100% increase in rail transport, demonstrating its commitment to alternative modes of transportation. It has invested €20 million since 2008 in its rail infrastructure, now offering 190 options for combined transport to 21 destinations, including 8 in Europe, served by 6 combined transport operators.

	Renewable Energy	The Port is aiming to actively engage in renewable energy production, spanning from wind turbines to photovoltaic panels. It seeks partnerships to generate its own green energy at competitive prices for all customers. Feasibility studies in 2020 explored setting up a 9 MW photovoltaic installation on six warehouse roofs in Marseille's Eastern Docks. Additionally, another photovoltaic project, developed by Solarcentury - Oxygn, with a capacity of 10 MW, is underway at the Port-Saint-Louis-du-Rhône dyke in the Fos ZIP (Industrial Port Zone).
	Habitat protection / Green Belt	Management Plan for Natural Spaces has been in place since 2007 for an area of nearly 3,000 hectares, a space that is currently excluded from any commercial development. Several initiatives are underway: the MédiCyn project, which involves the restoration of temporary ponds in areas of marsh and salt meadows whose use is shared with activities linked to hunting and pastoralism; restoration of an oak woodland as part of IKEA's compensatory measures; the closure of access to the Ventillon sector for motor vehicles; the enhancement of the built heritage with the restoration of the Bergerie de la Favouillane, a true showcase of pastoralism within the green belt; the construction of a permanent enclosure for the nesting of the little tern on the Gracieuse sand spit; a clearance plan to better manage the risk of fire on the marshes, to rejuvenate the environment and to encourage the return of certain species has just been put in place.
	Waste management	The Port's 2018 - 2021 waste plan has imposed a reduction in the thresholds limiting the storage of waste on board ships leaving Marseille Fos. The Port's reporting system now provides an alert for each port call to anticipate the ship's waste situation, a service appreciated by the Port's customers.
	Biodiversity offset	The Port of Marseille Fos is taking steps to become a biodiversity offset operator by leveraging its experience in managing natural spaces and supporting investors in finding and implementing solutions to preserve biodiversity during development projects. Instead of carrying out offsetting activities outside its territory, the Port assists investors in ensuring respect for existing biodiversity when setting up operations. Companies like IKEA, Maisons du Monde, and IDEC have received support from the Port's teams to limit biodiversity loss resulting from construction activities. Actions include acquiring natural spaces, rescuing impacted species, conducting scientific studies, and implementing conservation measures such as closing off areas like the Coussoul du Ventillon sector to vehicle traffic to protect rare arid steppe habitats and their protected species.

Port of Genoa	Road and rail accessibility	Investment in rail activities
	Smart electricity grids	The Ports of Genoa are leveraging technological innovation to optimise energy management and reduce environmental impact. Smart management systems are being deployed to monitor and control the ports' electricity grids, enabling real-time optimisation of electricity production, consumption, and storage.
	Solar panels installation	The Ports of Genoa are capitalising on the abundant solar radiation in the region through the installation of solar panels on warehouse roofs. This strategic move not only aligns with sustainability goals but also contributes to reducing carbon emissions and mitigating environmental impact.
	On shore power supply	In addition to solar energy initiatives, the Ports of Genoa are investing in shore power infrastructure to provide electricity to ships while they are docked. This enables vessels to switch off their onboard generators, resulting in a significant reduction in noise and air pollution.
	Research in new green fuels	Study on methanol, ammonia, hydrogren to bunker ships
	Production of renewable energy	Study to harness the sun, wind and sea waves
	Pollution management	Innovative tools and boats are deployed to collect plastic and debris floating along the channels of port basins. Special systems are put in place to intervene in the event of accidents where pollutants risk being spilled in the water
	Waste management	Waste discharged from ships or from land based activities are handled with the help of specialised company in order to spearate waste colelction and promote circular economy. This also prevents soil and pollution.
	Coastal protection	Biodiversity protection, and measures to defend the coastline from erosion or polutions.
	Anti flooding infrastructure	Installation of new breakwaters in Genoa and Vado Ligure, dredging and quaywall upgrade upgrades
	Less congestion	Port access gates to be upgraded in terms of infrastructure and technology to allow a smooth outflow.
	Port Environmental Energy Plan	Energy saving action plan
	Data collection on Energy consumption	Monitoring of consumption to create accurate database to be used to optimise energy efficiency.
	Alternative fuel infrastructure	progressive replacement of fossil fuels with alternative renewable sources (biomass fuels, LNG), in order to reduce CO2 emissions in port areas and improve air quality.
	Certification of energy consumption of the Port Authority's buildings	Initiative to undertake restructuring works targeting energy efficiency.
	Upgrade of public lighting	Replacing traditional lamps with low energy lights (LED)
	Electrification of the Port Authority's car fleet	Replacing the port's cars-fleet with electric vehicles and install fast-charging stations in strategic sites within the port area.