United Nations TD/B/C.I/MEM.7/32

United Nations Conference on Trade and Development

Distr.: General
14 August 2024

Original: English

Trade and Development Board
Trade and Development Commission
Multi-year Expert Meeting on Transport, Trade Logistics and Trade Facilitation
Eleventh session
Geneva, 23–25 October 2024
Item 3 of the provisional agenda

Maritime transport in times of polycrisis*, **

Note by the UNCTAD secretariat

Summary

Maritime transport and logistics are currently at a turning point amid a fast-evolving operations landscape. Lying at the heart of international freight transportation systems that link supply chains and deliver globalized trade, the sector continues to navigate the post coronavirus disease (COVID-19) pandemic world, while being increasingly shaken by disruption. More than ever, the sector needs to respond and adapt to disruption and volatility driven by a confluence of factors. In addition to heightened geopolitical tensions and climate-induced factors, the sector needs to address and navigate macroeconomic uncertainty, inward-looking policies and protectionist measures, shifts in supply chain design and globalization patterns and growing electronic commerce. Maritime transport and logistics also need to integrate risk assessment and vulnerability reduction criteria, as well as take up digitalization and data-driven business models. Furthermore, as the sector is under pressure to shift towards to a path of low and zero carbon, it needs to accelerate its energy transition and adopt green technologies and cleaner alternative fuels.

In this context and against a backdrop of more frequent disruptions culminating in interconnected crises, the expert meeting will focus on key thematic areas relevant to advancing sustainability, low-carbon and resilient maritime transport and trade in a time of polycrisis.

* Mention of any firm or licensed process does not imply the endorsement of the United Nations.

** This note draws primarily on UNCTAD research, particularly editions of the *Review of Maritime Transport*, and insights from UNCTAD projects on sustainable and resilient transport and logistics (see https://unctad.org/topic/transport-and-trade-logistics/infrastructure-and-services) and the Global Supply Chain Forum.

Discussions will centre around the following priorities, while taking into account the outcome of relevant global key policy processes, including the Global Supply Chain Forum convened on 21–24 May 2024 in Bridgetown by UNCTAD and the Government of Barbados:

- Decarbonization of the shipping sector as an imperative and the criticality of a just and equitable transition to a low- or zero-carbon shipping paradigm.
- Harnessing the potential of alternative energy to enhance port sustainability and support the decarbonization of shipping: the UNCTAD sustainable and smart ports concept.
- Future-proofing maritime transport and logistics by enhancing preparedness and the ability to respond, recover and adapt to disruption and change.

I. Introduction and setting the scene

1. In recent years, global supply chains and underlying transport networks and logistics have been deeply shaken by a succession of disruptive events. More frequent and intensified disruptions have rippled through global logistics and supply chains.

2. Disruptive factors include trade policy tensions between major economies that were exacerbated since 2018, the COVID-19 pandemic that sent shockwaves across world economies and a global logistics crunch in 2021–2022 that drove unprecedented system inefficiencies, such as port congestion and soaring freight rates and costs. Since early 2022, maritime transport and logistics have also been grappling with the ongoing war in Ukraine, which reshaped global trade flows and heightened energy and food security concerns. By the end of 2023, global logistics, with maritime transport at its core, were again unsettled by parallel disruptions unfolding in the Red Sea, the Suez Canal and the Panama Canal. These maritime passages are critical gateways for international maritime trade, with around 10 per cent and less than 3 per cent of globalized seaborne trade volume, respectively, crossing the Suez Canal and the Panama Canal. Nonetheless, enhanced sustainability and resilience are needed in maritime transport and logistics, as is accelerating the energy transition towards a low- or zero-carbon path through the adoption of alternative cleaner fuels and green technologies. While maritime transport carries over 80 per cent of world merchandise trade volume and has a relatively low carbon footprint per unit of transport work (grams of carbon dioxide (CO_2) per ton-mile), in shipping, greenhouse gas (GHG) emissions increased 20 per cent over the past decade.[1]

3. In this context of polycrisis and many imperatives, enabling more sustainable, low-carbon, agile and resilient maritime transport and logistics is key to addressing underlying challenges and leveraging opportunities. Rapid and multi-faceted action is required, as underscored at the inaugural Global Supply Chain Forum in May 2024, organized by the UNCTAD and the Government of Barbados. The forum brought together over 1,000 participants worldwide and reiterated the strategic importance of an integrated approach to supply chain sustainability and resilience building. It emphasized how disruptions are currently upending global shipping and trading networks, increasing shipping delays, freight rates and transport costs and affecting supply chain reliability, trade patterns, the geography of trade, shipping GHG emissions and regulatory compliance. These trends can undermine the ability of the sector to meet global GHG emission reduction targets set under the Paris Agreement and the 2023 IMO Strategy on Reduction of GHG Emissions from Ships of the International Maritime Organization (IMO).[2]

4. Discussions at the forum have also highlighted the need to make global production and distribution networks, which heavily depend on transport and logistics more inclusive, sustainable and resilient, specifically considering the special needs of small island developing States (SIDS). Some participating ministers from SIDS advocated for the transition to green and sustainable technologies in maritime transport to promote energy efficiency and combat marine pollution.[3] They also called for international financial institutions, development banks and donors to prioritize funding and investment in SIDS transport and logistics sector, focusing on projects that promote resilience, sustainability, connectivity and inclusivity.

5. The forum also underscored the need to address the compounded effects of disruptions from all sources, including climate change. Actions should be two-tracked and focus on reducing GHG emissions through mitigation action, as well as enabling climate adaptation of transport infrastructure and services.

[1] UNCTAD, 2023a, *Review of Maritime Transport 2023: Towards a Green and Just Transition* (United Nations publication, Sales No. E.23.II.D.23, Geneva).

[2] See IMO Marine Environment Protection Committee, Resolution MEPC.377(80), MEPC 80/17/Add.1, annex 15.

[3] See https://unctad.org/conference/global-supply-chain-forum-2024 (accessed 12 August 2024).

6. Decarbonizing maritime transport and logistics entails complexities but also opportunities, including for developing countries given their potential to emerge as key suppliers and users of renewable energy resources. Ports are central to accelerating the energy transition in maritime transport. Beyond cargo handling and logistical functions, ports can produce, store, consume and deliver alternative fuels (low and zero carbon) through alternative fuel bunkering facilities and services. Establishing adequate regulatory frameworks, including to ensure safe usage of new fuels and that ports are well prepared to take up this new role, has been recognized as critical to achieving sustainable, low-carbon and resilient maritime transportation and logistics.

7. Against this backdrop and bearing in mind other relevant developments in particular the fourth International Conference on Small Island Developing States, General Assembly resolution 78/148, on strengthening the links between all modes of transport to achieve the Sustainable Development Goals, and the outcome of the Second United Nations Global Sustainable Transport Conference, the eleventh session of the Multi-Year Expert Meeting on Transport, Trade Logistics and Trade Facilitation will focus on the following thematic areas:

- Decarbonization of the shipping sector as an imperative and the criticality of a just and equitable transition to a low- or zero-carbon shipping paradigm.
- Harnessing the potential of alternative energy to enhance port sustainability and support the decarbonization of shipping: the UNCTAD sustainable and smart ports concept.
- Future-proofing maritime transport and logistics by enhancing preparedness and the ability to respond, recover and adapt to disruption and change.

II. Building the resilience and sustainability of maritime transport and logistics

A. Maritime decarbonization[4]

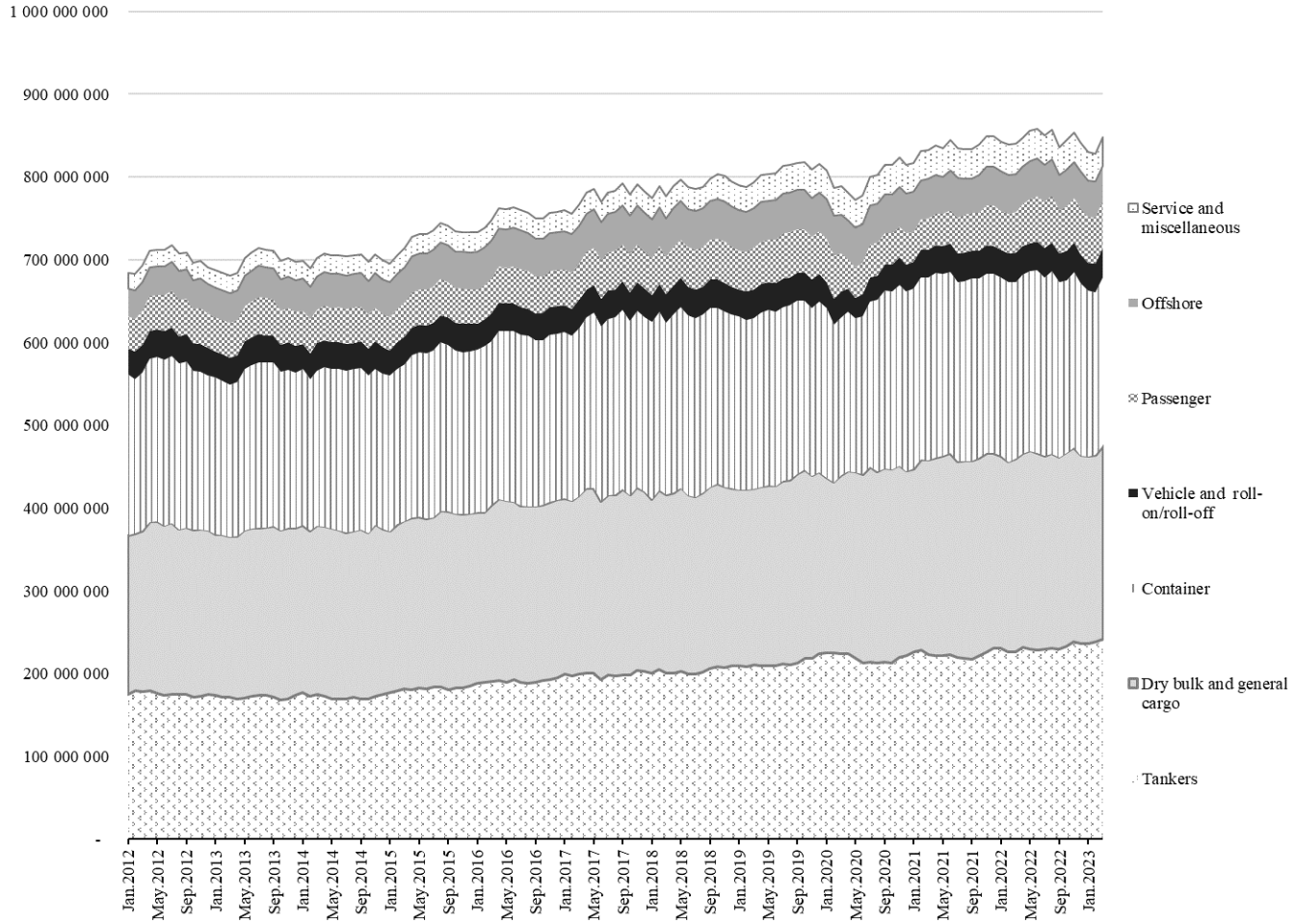
8. Shipping is under pressure to decarbonize as soon as possible due to a combination of regulatory mandates, commercial incentives, increasing demands for sustainability and heightened scrutiny from customers, partners and the public. Currently, international shipping is responsible for 2.8 per cent of global GHG emissions. Without further action, the IMO projects CO_2 emissions from the sector to increase from about 90 per cent of 2008 emissions in 2018, to 90–130 per cent of 2008 emissions by 2050.[5]

9. GHG emissions fluctuate based on shipping activity levels, trade flows, vessel type, size and age, and operational practices. Total CO_2 emissions of vessels have increased over the past decade, despite a reduction in emissions per ton-mile. The variation in carbon intensity among vessel types is evident in figure 1, where containerships emit more CO_2 per ton-mile compared to dry and liquid bulk ships.

[4] This section draws largely on UNCTAD, 2023a.

[5] IMO, 2020, *Fourth IMO Greenhouse Gas Study*, London.

Figure 1
Total carbon dioxide emissions by vessel types
(Tons)



Source: UNCTAD, 2023a.

10. In 2022, ships flying the flags of Liberia, the Marshall Islands and Panama the world leading flags of registration by tonnage and number of vessels, accounted for over one third of CO_2 emissions, similar but not identical to their share in tonnage registered under their respective flag.[6] Registries provide their flags to different ships, including both highly and less efficient vessels, which can impact the registry's overall emission profile.

11. As regards ownership, vessels controlled by owners in China, Greece and Japan account for the largest share of CO_2 emissions.[7] As owners invest in different vessel types, country ranking in terms of tonnage owned diverges from the ranking in terms of GHG emissions.

12. For shipping to succeed in decarbonizing, the sector must reach consensus regarding the regulatory framework and GHG mitigation measures of the future as soon as possible.

A global regulatory framework is required to reduce greenhouse gas emissions in the shipping sector

13. Though not covered in the Paris Agreement, IMO has been actively addressing international shipping. At its sixty-ninth session in April 2016, the Marine Environment

[6] UNCTAD, 2023a.
[7] Ibid.

Protection Committee acknowledged the need for further improvements in reducing shipping emissions and affirmed the role of IMO in this effort.[8]

14. Given the growing urgency of reducing global GHG emissions, the 2023 IMO Strategy, adopted in July 2023, establishes new and more ambitious targets. They include an enhanced, common ambition to reach net-zero GHG emissions from international shipping close to 2050, a commitment to ensure an uptake of alternative zero and near-zero GHG fuels by 2030, as well as indicative checkpoints for 2030 and 2040: (a) reduce the total annual GHG emissions from international shipping by at least 20 per cent, striving for 30 per cent, by 2030, compared to 2008; (b) reduce the total annual GHG emissions from international shipping by at least 70 per cent, striving for 80 per cent, by 2040, compared to 2008.

15. The 2023 IMO Strategy adopted at the eightieth session of the Marine Environment Protection Committee sets out the levels of ambition to reduce GHG emissions and includes candidate midterm and long-term further measures, with possible timelines and impacts on States. Before adoption of a measure(s), the impacts on States of the measure(s) should be assessed. Special attention should be paid to the needs of developing countries, particularly small island developing States (SIDS) and the least developed countries (LDCs).

16. While progress is ongoing, achieving the targets outlined in the IMO Strategy remains a challenge. The industry is uncertain about the most effective strategies for reducing carbon emissions and transitioning to low- or zero-carbon fuels. This uncertainty underscores the importance of mainstreaming shipping decarbonization objectives to ensure a coordinated and effective approach to meeting these ambitious goals.

17. The shipping industry needs a clear, consistent and predictable regulatory environment with minimal uncertainty. Postponing agreement and implementation of relevant IMO GHG regulatory measures could threaten decarbonization goals.

18. Flag States are responsible for enforcing IMO regulations on reducing GHG emissions, while owners are generally responsible for making commercial and investment decisions pertaining to ships, including when to order new capacity and the type of engines and fuels to be used by ships ordered.

19. In parallel with IMO work, efforts such as the European Union Emissions Trading System, which extended to maritime transport starting in 2024, are also under way.

20. Given the globalized nature of international shipping, fragmented solutions with exemptions and varied rules can result in suboptimal outcomes. A universal regulatory framework for decarbonizing the sector, applicable to all ships regardless of flag, ownership country or operating region, is essential to ensure a level playing field and prevent a two-speed decarbonization landscape.

Measures and strategies to pave the way to decarbonization

21. Decarbonizing shipping necessitates coordinated efforts across the entire ecosystem from within and outside the maritime transport sector. Collaboration should involve carriers, port and terminal operators, manufacturers, shippers, investors, energy producers and distributors to catalyse the required transformation.

22. Key obstacles to rapid shipping energy transition and decarbonization include fuel availability and costs, fuel technology, fuel and technical maturation levels, technical feasibility, safety, bunkering infrastructure requirements and onboard storage, as well as engine design and crew skills.

23. Meeting GHG emission reduction targets entails a portfolio of measures that affect operations (for example, route optimization, vessel speed and maintenance), fleet design, propulsion systems, engines and fuels.

[8] In accordance with Assembly resolution A.963(23), the IMO secretariat continues reporting to Subsidiary Body for Scientific and Technological Advice to the United Nations Framework Convention on Climate Change, under the agenda item on emissions from fuel used for international aviation and maritime transport.

24. There is currently no one-size-fits-all alternative fuel solution. The path to decarbonization indicates that zero-emission fuels will need to constitute 5 per cent of the international shipping fuel mix by 2030. However, the shift to alternative fuels is still at an early stage. In 2022, 98.8 per cent of the global fleet relied on conventional fuels, with only 1.2 per cent using alternative fuels, primarily liquefied natural gas and, to a lesser degree, battery, liquid petroleum gas and methanol. Nevertheless, progress is evident; of vessels currently on order, 21 per cent are designed to operate on alternative fuels, notably liquefied natural gas, battery, liquid petroleum gas and methanol.[9]

25. Investments in future fleets, fuels and onboard green technologies are crucial for transforming the shipping industry and meeting IMO GHG emission targets. Some estimates suggest an additional $8 billion to $28 billion annually would be needed to enable ships to decarbonize by 2050. Expanding fuel production, distribution and bunkering infrastructure to support 100 per cent carbon-neutral fuels by 2050 will necessitate annual investments ranging from $28 billion to $90 billion. These estimates also indicate that achieving full decarbonization could increase annual fuel costs by 70 per cent to 100 per cent compared to current levels.[10]

26. Furthermore, enforcement of universally applicable IMO regulations by both flag States and port States is essential for ensuring compliance and achieving effective decarbonization. Nevertheless, well-articulated national and regional initiatives can further support IMO work and accelerate the reduction of GHG emissions in shipping.

Towards a just transition

27. Shipping decarbonization measures entail costs that are likely to drive up maritime logistics costs. Increases in maritime logistics costs can potentially negatively impact trade and economic output, particularly in developing countries such as SIDS and LDCs. These economies already pay relatively higher transport costs for imports and exports and have limited capacity to mitigate increases in maritime logistics costs.

28. In 2021, UNCTAD conducted a comprehensive impact assessment of the proposed IMO short-term GHG reduction measures, which require ships to reduce GHG emissions.[11] UNCTAD estimated an increase in maritime logistics costs of 2.7 per cent under a median scenario, with an increase in time at sea of 2.8 per cent and an increase in average maritime shipping costs of 1.5 per cent in 2030. SIDS and LDCs will likely experience a greater decline in gross domestic product and in import and export flows compared to developed coastal countries.[12]

29. UNCTAD currently contributes to conducting the comprehensive impact assessment of the basket of candidate midterm GHG reduction measures.[13] IMO member States are considering midterm GHG mitigation measures that cover technical aspects, such as a fuel standard for energy efficiency, and an economic element, such as levies on GHG emissions. Such measures can help incentivize action and bolster alternative fuel competitiveness. While decisions about the allocation of funds that could potentially be generated will be determined by IMO member States, a portion of the funds could, for example, be directed to scaling up decarbonization efforts and assisting developing countries facing relatively higher impacts on maritime logistics costs, economic growth and trade. Some funds could also support investments in ports, climate adaptation, trade reforms and enhancing transport connectivity for SIDS and LDCs. These measures can help to ease their transition to low-carbon shipping and tap new business opportunities prevailing in the alternative energy sector.

[9] UNCTAD, 2023a.

[10] Ibid.

[11] Measured against the energy efficiency design index, energy efficiency existing ship index and carbon intensity indicator.

[12] UNCTAD, 2021, *UNCTAD Assessment of the Impact of the IMO Short-Term GHG Reduction Measure on States* (United Nations publication, Geneva).

[13] See https://www.imo.org/en/OurWork/Environment/Pages/Assessment-of-impacts-on-States.aspx.

30. Meanwhile, seafarers and maritime workers play a pivotal role in the transition towards decarbonizing the shipping industry and will be significantly impacted by the shift to greener practices. Ensuring a just transition for them involves not only enhancing their skills to handle new technologies and alternative fuels but also improving working conditions and wages. Training programmes and capacity-building initiatives are essential to equip maritime workers with the knowledge and skills required for operating new, energy-efficient vessels and systems. A supportive and inclusive approach will ensure that the transition is equitable and that maritime workers are not left behind in the move towards sustainable shipping practice.[14]

B. Energy transition and ports

Drivers of port energy transition

31. Ports play a key role in enabling the maritime transport sector energy transition. They are key nodes in the maritime transport network, facilitating international trade flows and energy distribution; they are also large energy consumers. Several factors are driving port strategies in support of the energy transition, including the more stringent environmental requirements being streamed into shipping and port services, while impacting the competitive landscape for shipping and ports.

32. Ports are increasingly shifting to clean energy sources for their facilities and to power operations. By adopting solutions, such as solar panels, wind turbines and green hydrogen, ports can significantly reduce reliance on fossil fuels. These clean energy initiatives not only help promote the sustainability of ports in cutting down GHG emissions but also enhance the resilience of port operations against energy price volatility and supply disruptions.

33. In addition, with increasing GHG emission regulations in future, declining revenue streams for ports, linked to the storage and distribution of fossil fuels, are anticipated. This trend is already visible in the decreasing share of oil in global maritime trade and the shrinking tanker merchant fleet. The downward trend in fossil fuel-related activities, prompting a shift towards alternative energy sources, underscores the need for ports to adapt to the evolving landscape.

34. Initiatives aimed at expanding the demand for alternative shipping fuels and mobilizing investments in relevant infrastructure and technologies have surged recently. Notably, shipping companies and ports focused on pilot projects (such as green shipping corridors) and research and development to deploy “green ships” (powered by new technologies and green fuels) have formed innovative partnerships.

35. One such initiative is the Rotterdam–Singapore Green and Digital Shipping Corridor, established in 2022. The initiative encompasses stakeholders ranging from shipping lines, port authorities and operators, fuel suppliers, fuel coalitions and associations, banks and learning institutes. Bringing together 26 partners to date, the initiative aims at implementing several first-mover pilot projects and testing commercial structures to accelerate the uptake of zero and near-zero emission fuels, such as synthetic and biovariants of methanol, ammonia, methane and hydrogen.[15] Under the Green Shipping Challenge launched in 2022, countries and private and partners collaborate on issues such as the development of green corridor routes, conduct of feasibility studies for renewable energy uptake for ships and energy-related technologies, regulatory developments and vessel retrofitting.[16] Ports in these regions are working closely with shipping companies to

[14] See, for example, https://www.ics-shipping.org/representing-shipping/maritime-just-transition-task-force/.

[15] Singapore, Maritime and Port Authority of Singapore, 2024, Singapore–Rotterdam Green and Digital Shipping Corridor accelerates digitalization and decarbonization with new global value-chain partners, 15 April; Kingdom of the Netherlands, Port of Rotterdam, 2023, Partners support emission reductions on Rotterdam-Singapore Green and Digital Shipping Corridor, 19 September.

[16] High-Level Panel for a Sustainable Ocean Economy, 2023, New Green Shipping Challenge announcements made at COP28, 5 December.

develop the necessary infrastructure for green fuels, such as hydrogen, ammonia and biofuels. These efforts are crucial in creating a sustainable maritime industry capable of meeting future environmental standards and reducing its carbon footprint.

36. Policymakers and other maritime stakeholders would need to ensure the involvement in these corridors of developing countries to enable a just and equitable energy transition. For example, the Global South Green Corridors project, launched in 2024, aims at assisting countries in the global South in using resources sustainably and making a vital contribution to the achievement of climate-neutral shipping. The project supports green growth and job creation by identifying and developing green corridor projects. Pre-feasibility studies are planned for Fiji, Namibia, Panama and other countries to be announced.[17]

37. The current global context of high and volatile fossil fuel prices has heightened the strategic importance of energy security, prompting many countries to reconsider energy strategies, including for ports, and focus on promoting the production and use of alternative energy sources.

Sustainable smart ports: Harnessing the potential of alternative energies and green technologies

38. UNCTAD defines a "sustainable and smart port" as a port that leverages the energy transition and technology-based solutions to (a) improve port operational efficiency by promoting energy efficiency and (b) harness the ability to use, produce and distribute renewable energy to support sustainable development.

39. Key principles of sustainable and smart ports include:

(a) Energy efficiency: implementing measures to reduce energy consumption in port operations, such as optimization of logistics and energy management systems.

(b) Renewable energy: utilizing renewable energy sources, such as solar, wind and biofuels, to power port operations: this includes installation of solar panels and use of wind turbines to generate electricity.

(c) Green technologies and digitalization: adopting green and digital technologies to enhance operational efficiency and sustainability, including electrification of equipment, use of onshore power supply for vessels, use of data analytics, "Internet of things" devices and automated systems to monitor and manage energy use and emissions.

(d) Collaborative approaches: engaging stakeholders, including port authorities, shipping companies and local communities, in collaborative efforts to develop and implement sustainable port initiatives.

40. The transition to sustainable and smart ports presents numerous opportunities and poses significant challenges, namely financial constraints, technological readiness and regulatory frameworks. Financially, the high initial investment required for renewable energy infrastructure and green and digital technologies can be a barrier, particularly for developing country ports. Innovative financing mechanisms, such as public–private partnerships and blended financing, are essential to overcome these challenges. On readiness, adoption of advanced technologies requires substantial capacity-building and training for port personnel. Ensuring the maritime workforce is equipped with the skills to operate new technologies is crucial for a successful transition. Lastly, developing and implementing effective regulatory frameworks that support the energy transition and promote sustainable practices is vital. This includes clear targets for emissions reduction and incentives for renewable energy adoption.

41. Box 1 provides an overview of some challenges and opportunities for sustainable and smart port development in Mauritius.

[17] Prevljak NH, 2024, It's time for the rise of Global South in maritime decarbonization, 20 March, Offshore Energy.

Box 1
Mauritius: Challenges and opportunities in advancing the sustainable and smart ports status of Port Louis

Mauritius has for several years been actively promoting the ocean economy, aiming to develop Port Louis as a potential container transhipment hub. The need to promote the port's sustainability and secure significant investment in new equipment and bunkering infrastructure (currently mainly related to the bunkering of hydrocarbon fuel) has been acknowledged.

The Mauritius Ports Authority formulated the Green Port Initiative and established the high-level Green Port Committee to spearhead it. Port stakeholders signed a port environment charter to show commitment for enhancing collaboration towards the Green Port Initiative.

Mauritius is making good progress towards its green port development targets, as detailed in a 2019 voluntary national review, through increased use of alternative energy sources and the established institutional framework.

Gaps persist, however, such as land planning at the port level, risk management associated with hazardous installations at port (acknowledged in the port master plan), limited access to technology and data for research and (climate change-related) policy formulation and access to finance.

An ongoing UNCTAD project is supporting Mauritius in developing a matrix of recommendations to promote sustainable and smart ports, based on UNCTAD sustainable and smart port assessment methodology. The initiative aims at supporting energy transition in ports in collaboration with local stakeholders and promoting capacity-building. A structured approach provides a framework for policy analysis and prioritization of actions.

C. Building resilient maritime transport and logistics

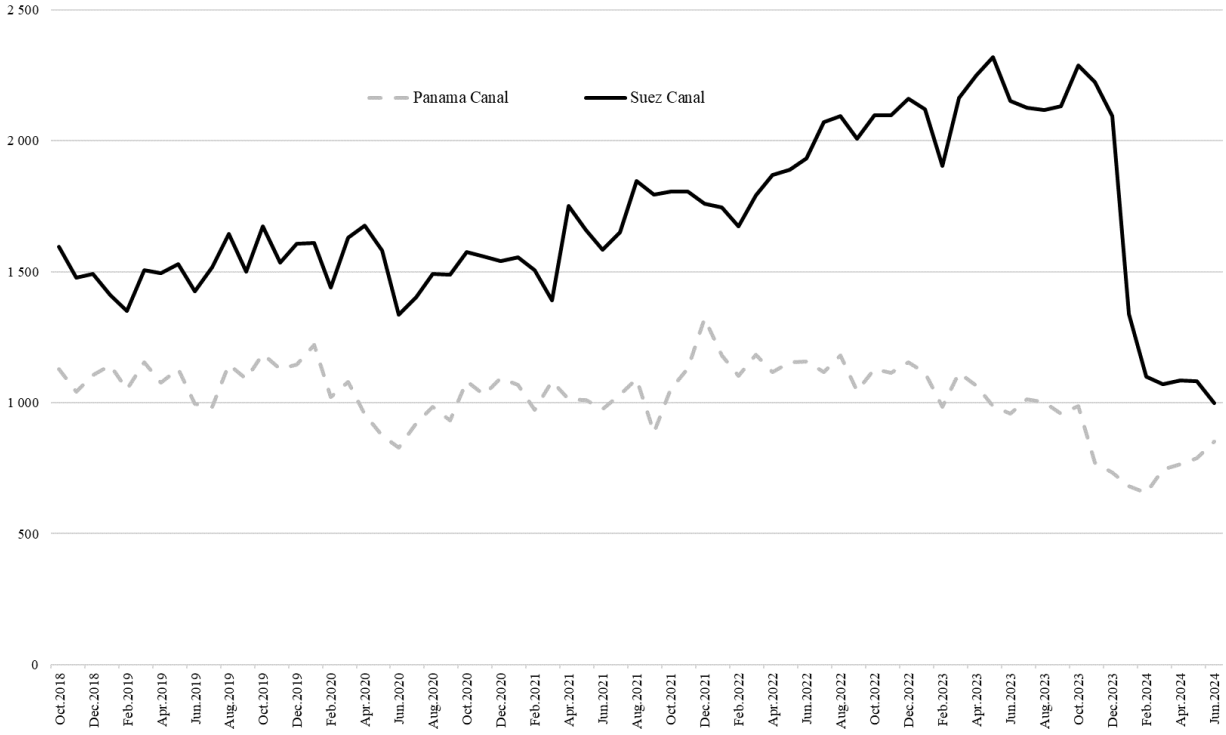
Maritime transport and logistics at the front line of recurring disruptions

42. Maritime transport and logistics that underpin global supply chains and deliver international trade are evolving amid multiple crises and overlapping risks. In 2020 and against the backdrop of an already challenging global geopolitical and trade policy landscape, the COVID-19 pandemic laid bare the vulnerability of global supply chains and underlying maritime transport networks and logistics. These have been further underscored by the war in Ukraine that started in 2022 and caused upheaval in Black Sea-dependent shipping and trading networks. The war in Ukraine redefined trading patterns, particularly for energy and grain, and heightened food and energy security concerns. It led to changes in exporter and importer markets for oil and grain commodities and increases in distances travelled, fleet deployment, port call configuration and vessel routing.

43. In late 2023 and into the first half of 2024, attacks on ships have disrupted shipping operations in the Red Sea and the Suez Canal. The average number of Suez Canal ship transits in June 2024, compared to December 2023, fell by 70 per cent. The largest drops were recorded by liquified natural gas carriers (-95 per cent), car carriers (-91 per cent) and containerships (-88 per cent). The number of transits by all other ship segments also declined, with crude carriers recording the smallest reduction (-31 per cent). At the same time, reduced water levels in the Panama Canal have led to restrictions on ship transits, a two-year trend that was exacerbated in 2023. By June 2024, the number of vessel transits through the Panama Canal and the Suez Canal were down by over half compared to their respective peaks (figure 2). Most of the decline in the Suez Canal occurred since December 2023, with the onset of the Red Sea crisis, while the number of transits through the Panama Canal have been decreasing over the last two years. These simultaneous disruptions have amplified unpredictability, risks and costs for maritime transport, logistics and trade.

44. The crisis in the Red Sea has caused most shipping operators to deviate course and shift vessels onto a longer route, around the Cape of Good Hope. This has caused an average increase of one third in the time and distance travelled by ships operating on the Asia–Europe trade lane. Rerouting away from the Red Sea has caused operational shifts and increased costs, including operational expenses such as crew wages and fuel costs, as well as higher insurance premiums and heightened exposure to piracy risks, particularly in the Horn of Africa region. For some ships, rerouting through the Cape of Good Hope has boosted steaming speeds to ensure schedule integrity. For example, 17,000 20-foot equivalent unit containerships and above experienced an average increase of about 6 per cent. By sailing longer distances and upping speed levels, ships are also increasing fuel consumption and GHG emissions. Vessel rerouting has also caused logistical inefficiencies, including port congestion, as off-schedule arrivals raise logistical complexities. For example, since May 2024, there have been reports of bottlenecks in the Port of Singapore owing to diverting ships through the Cape and reflecting Red Sea ripple effects on downstream ports.[18]

Figure 2
Panama Canal and Suez Canal: Number of monthly transits



Source: UNCTAD secretariat calculations, based on data from Clarksons Research.

Some implications for global maritime transport and logistics

45. Disruptions may trigger shifts in globalization patterns, supply chain configuration and production models, with implications for maritime transport and logistics, as growing trade policy tensions, the COVID-19 pandemic, the global logjam in logistics in 2021–2022, the war in Ukraine and, more recently, challenges faced in the Red Sea, Suez Canal and Panama Canal have exposed the limitations of extended supply chains and the just-in-time business model.[19] Upheaval arising from more frequent disruptions has uncovered the risks and vulnerability generated by extended supply chains and overreliance on a few suppliers and markets. This holds true for food and energy and for parts and components

[18] UNCTAD, forthcoming, *Review of Maritime Transport 2024*.

[19] For a detailed discussion on the growing disruption affecting maritime transport and trade, see the 2020–2024 editions of *Review of Maritime Transport*.

that are key to strategic manufacturing activity. The 2021–2022 semiconductors shortage is illustrative of the challenges facing supply chains amid a highly disrupted maritime transport and trading environment.

46. Recurrent disruptions are also igniting the debate over the future of globalization and the continued relevance of lean supply chains that have been driven for decades by efficiency and low-costs considerations. Instead, concepts such as just-in-case business models, risk management, supply chain visibility and resilience-building are gaining traction, while the question of whether to bring production home or closer to home is currently high on the policy agenda for many countries and global manufacturing executives.

47. Outright deglobalization is unlikely, though more frequent disruptions and heightened geopolitical concerns are likely to accelerate some ongoing trends that aim at enhancing resilience and promoting security and predictability. Rather than a massive exit, gradual shifts in sourcing are more probable. More companies are pursuing "the best cost", instead of the "lowest cost" objective, by weighing manufacturing and transportation costs against factors such as supply chain resiliency and environmental sustainability.

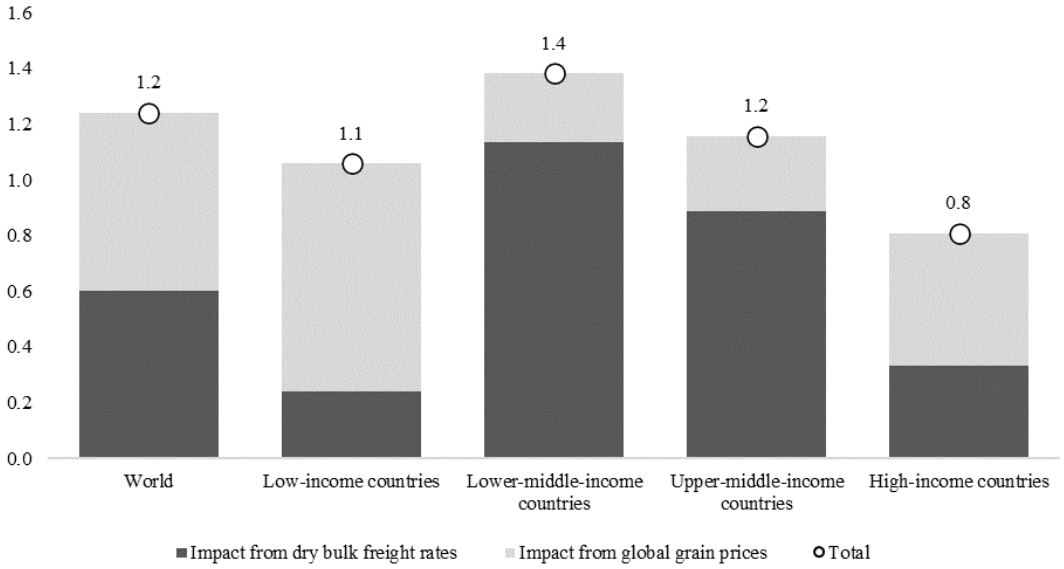
48. Disruptions have also implications for energy and food security. The war in Ukraine affected energy and food prices and raised concerns about energy and food security. The shift in Europe away from Russian energy commodity imports resulted in energy flows travelling longer distances and being sourced from more distant locations. Redirecting Russian energy shipments towards new markets in East and South Asia has also boosted distances travelled and altered shipping and trading patterns. The war in Ukraine has also shaken global markets for metals (for example, nickel), with knock-on effects on the price of renewables and production of clean-energy products.[20]

49. Disruptions are also increasing maritime transport and logistics costs. Soaring and volatile freight rates, higher surcharges aimed at covering additional fuel costs, security, congestion, equipment management and repositioning have been driving an inflated cost environment. Cost increases are ultimately reflected in increased consumer prices and production costs. UNCTAD finds that the pandemic, the war in Ukraine and the 2021–2022 crunch in global logistics have caused shipping rates to surge and consumer prices to jump, thereby fuelling inflation.[21] The disruption-induced surge in container shipping costs, which peaked in early 2022, sharply increased consumer prices for many goods, with vulnerable economies such as SIDS the most affected. Likewise, the war in Ukraine caused dry bulk freight rates and grain prices to increase. Simulations by UNCTAD showed that the impact of these increases led to 1.2 per cent hike in consumer food prices, with higher increases being observed in middle- and low-income countries (figure 3).

[20] UNCTAD, 2023b, Technical note on critical minerals: Supply chains, trade flows and value addition, Geneva.

[21] UNCTAD, 2022a, *Review of Maritime Transport 2022* (United Nations publication, Sales No. E.22.II.D.42, Geneva).

Figure 3
Impact of higher freight rates and grain prices on consumer food prices
(Percentage increase)



Source: UNCTAD, 2022a.

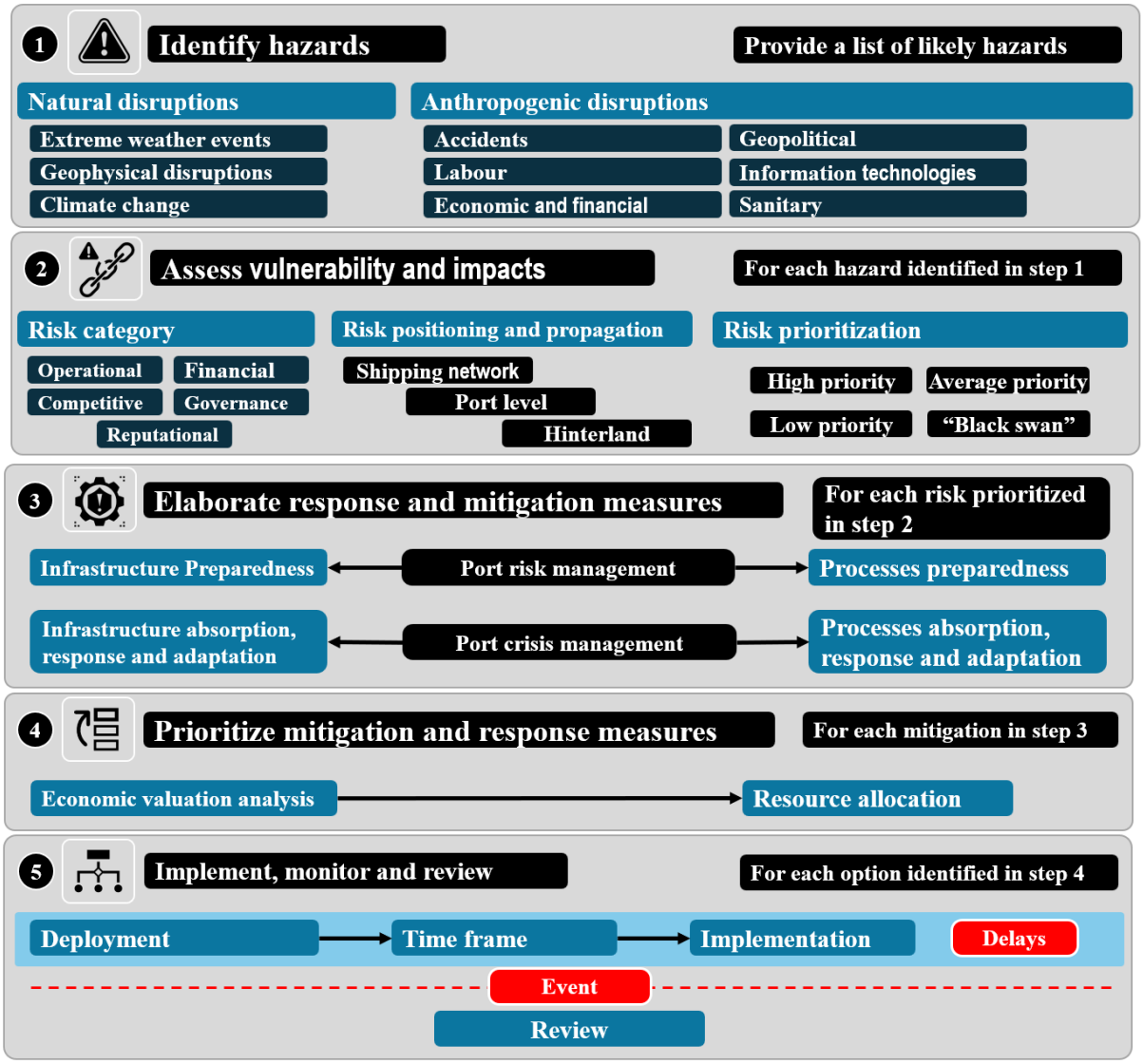
Mainstreaming resilience criteria in maritime transport and logistics decision-making processes

50. Ensuring that global maritime transport and logistics are resilient in the face of disruption requires shifting the mindset from crisis management to strategic resilience building.

51. In *Building Capacity to Manage Risks and Enhance Resilience: A Guidebook for Ports*, UNCTAD sets out a step-by-step approach to resilience-building in ports and across the maritime supply chain (figure 4).[22] The Guidebook promotes resilience "by design" is promoted and tools and capacity-building instruments spanning risk identification, assessment and management tools and techniques are provided, as well as lessons learned and good practices generated from past disruptions and experiences. Measures to prepare, respond, cope and recover from disruptions also feature.[23]

[22] UNCTAD, 2022b, UNCTAD/TCS/DTL/INF/2022/3, Geneva.
[23] See also https://resilientmaritimelogistics.unctad.org/.

Figure 4
UNCTAD approach to resilience-building in maritime transport and logistics



Source: UNCTAD, 2022b.

52. As the debate over the future shape of globalization is intricately linked to the resilience imperative, reconciling the two issues requires ensuring a gradual and flexible approach.

53. A set of resilience building measures that are being pursued or considered include the following:

(a) Build redundancy by having backup systems and production sites in place.

(b) Diversify suppliers by reducing dependency on one single input provider through, for example, the China Plus One Strategy. Dual-sourcing or multi-sourcing also support supplier diversification, with some industries in India, Japan, the United States of America and Europe changing their business models.[24]

(c) Build inventories and safety stocks as a buffer.

(d) Build longer-term relationships with suppliers, partners and technology manufacturers, as well as data providers.

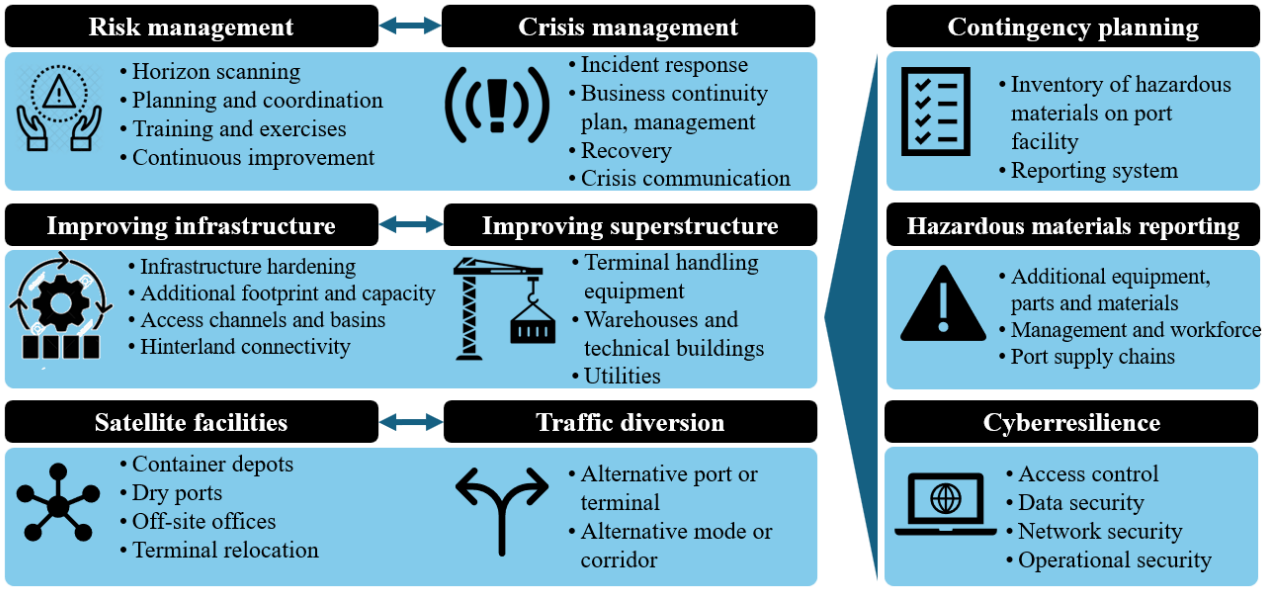
[24] UNCTAD, 2022a.

(e) Mainstream risk management techniques, business continuity planning, demand forecasting and supply chain visibility and end-to-end transparency (for example, equipment tracking devices and data analytics).

54. With self-reliance and national security concerns growing in importance, some countries are also looking at reshoring and nearshoring as resilience-building measures. UNCTAD finds that, since 2022, the geographical proximity of international trade has remained relatively constant, showing minimal nearshoring or "farshoring" trends. However, there has been a rise in the political proximity of trade, indicating that bilateral trade patterns have been favouring trade between countries with similar geopolitical stances (a pattern generally referred to as "friend-shoring").[25] Some East Asian and Latin America economies may find opportunities to integrate more into supply chains affected by geopolitical concerns.

55. All in all, resilient supply chains will need to be flexible and agile and aim to achieve balanced trade-offs, including, for example, leveraging and combining both just-in-time and just-in-case supply chain models. Any such measures and related decisions will have implications for maritime transport and logistics stakeholders who will need to implement their respective mitigation measures to build resilience. Figure 5 highlights some key resilience-building measures for seaports.

Figure 5
Key mitigation and response measures to port disruptions



Source: UNCTAD, 2022b.

56. Digitalization is key to enabling resilience. For example, it can help optimize capacity and improve logistics, including through advanced analytics and collaboration platforms.[26] The COVID-19 pandemic has shown how technology has helped to navigate disruption and ensure business continuity. Enhanced communications, collaboration and partnerships, data and information sharing to ensure visibility and transparency have also proven their worth.

D. Sustainable freight transport: An integrated supply chain approach

57. As maritime transport and logistics link global supply chains through integrated multimodal, door-to-door transport networks, a cohesive approach to sustainability and

[25] UNCTAD, 2024, *Global Trade Update*, March.
[26] McKinsey and Company, 2021, How COVID-19 is reshaping supply chains, 23 November.

resilience that considers the entire transport and logistic chain from origin to destination and integrates the three dimensions of sustainable development (economic, social and environmental) is required. Ensuring optimum operations, connectivity, resilience in the face of shocks and disruptions, competitiveness, high productivity levels of infrastructure, equipment and labour can all support economic sustainability across the freight transport chain. Access, gender equality, safety and security underpin social sustainability. Furthermore, green and low-carbon solutions promote the environmental sustainability of freight transportation systems, including maritime and inland transport and logistics (freight transport logistics). Thus, while maritime transport is the backbone of international trade, door-to-door global transport and trade would not be possible without multimodal transportation and hinterland connections. These connections include inland transport infrastructure (for example, road and rail networks, dry port facilities), services (such as trucking and railway services) and institutional arrangements (for example, transport and transit corridors). Hinterland transport and logistics connectivity is thus a pre-condition to sustainable freight transportation.

58. On the economic side, key criteria include achieving good port hinterland connectivity levels where frequency, reliability and cost of service are crucial. Hinterland connectivity and seamless movement of goods from ports to destination are important for global supply chains. The pandemic highlighted the critical importance of good hinterland connections for supply chain resilience, particularly in times of crises, with disruptions having exposed the negative impact of vulnerable and underperforming hinterland transport connections and logistics.

59. Economically sustainable hinterland connectivity ensures that goods can be moved quickly and efficiently, while minimizing congestion and delays and reducing costs. Among other factors, it relies on adequate infrastructure, services, equipment, pricing mechanisms and sound competition levels.

60. Sustainable corridors and dry ports are critical for hinterland access and integration into global supply chains. Trade and transport corridors serve as major networks for the movement of people and goods between countries and regions by providing more efficient transport and logistics infrastructure and services and promoting interoperability and harmonization of procedures between different countries. Transport and trade corridors can evolve and become logistic and economic corridors, by acting as engines of economic development and linking ports to key sectors. This will require an institutional and coordinated framework that brings together all stakeholders to develop, implement and oversee comprehensive strategies and investments.

61. Dry ports have also proven to have a positive impact on the efficiency and reliability of freight transport connectivity and supply chains. They provide a range of value added logistics services, including customs clearance, warehousing and cargo consolidation. In addition, dry ports can be developed into logistics hubs or special economic zones, further enhancing their benefits. However, the development of dry ports faces several challenges, including the need for substantial initial investment, efficient connectivity (roads, railways and inland waterways), support facilities and extensive coordination among various stakeholders. [27]

62. Social and environmental sustainability are equally important for hinterland connections, dry ports and corridors. While environmental sustainability, particularly as regards decarbonization, and IMO work are in the spotlight and sustainable smart ports draw headlines, building the sustainability of hinterland connections and across modes is also crucial for a cohesive sustainable freight transport. Box 2 sets out the UNCTAD sustainable freight transport concept and framework, including the key metrics used to capture the three dimensions of sustainable freight transport.

63. The UNCTAD sustainable freight transport framework applies to all modes of transport and across corridors.[28] Guidance and practical tools are presented to stakeholders

[27] See https://unctad.org/meeting/capacity-building-webinars-ppps-logistics-hubsplatforms-angola-webinar-de-capacitacao-em (accessed 12 August 2024).

[28] For more information, see https://sft-framework.unctad.org/.

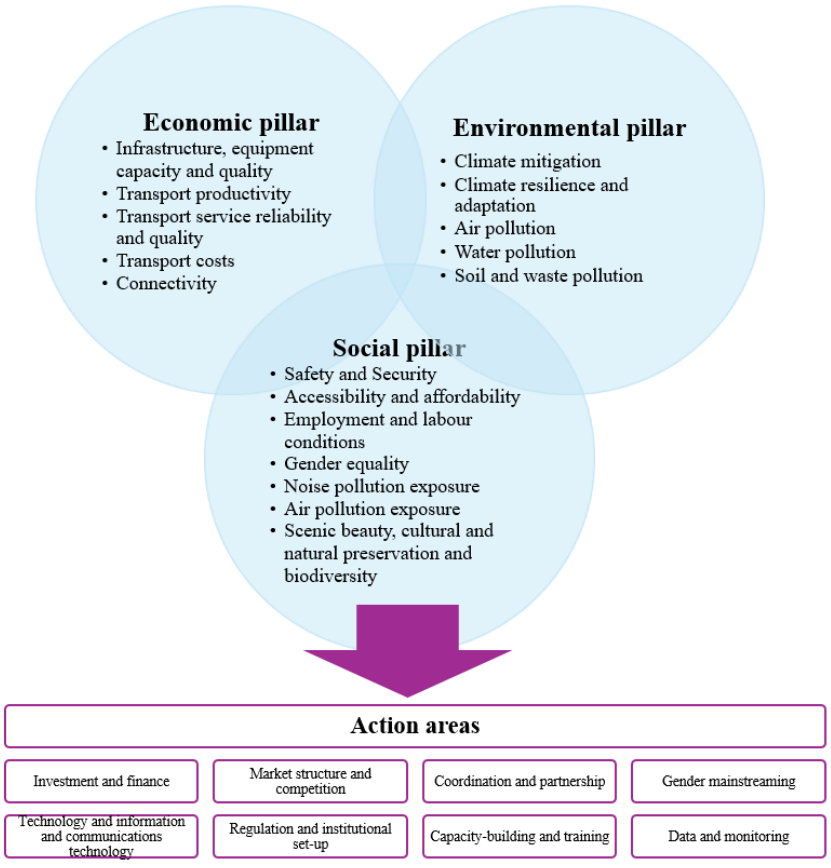
to evaluate the status quo, promote sustainable freight transport systems and track progress. The framework was applied in the two main transit transport corridors of East Africa (the Northern and Central Corridors) and in SIDS in the Caribbean, Angola and Fiji. A key outcome of the sustainable freight transport framework is a comprehensive evaluation of the sustainability performance of the multimodal freight transport in countries and across corridors and matrix of policy recommendations supporting sustainable freight transport strategy development.

Box 2

What is sustainable freight transport?

Sustainable freight transport balances the economic, social and environmental sustainability in an integrated manner to foster synergies, complementarities and coherence. These three pillars of sustainable freight transport are interlinked and emphasize the triple bottom line of the sector:

- **Economic sustainability**. Relates to trade competitiveness, freight transport costs, quality and reliability, freight transport productivity, resilience and operational continuity, connectivity and market access, infrastructure investment and fiscal burden, energy efficiency and sustainable production and consumption.
- **Social sustainability**. Relates to safety, security, employment, social inclusion (for example, gender), labour conditions, affordability, aesthetic impacts, cultural preservation, health and noise and vibration.
- **Environmental sustainability**. Relates to externalities, such as GHG emissions, pollution (air, water and soil), resource depletion, land use and habitat fragmentation, waste, biodiversity loss and ecosystems degradation, and climate disruptions and impact.



Source: UNCTAD sustainable freight transport framework, available at https://sft-framework.unctad.org/.

E. Role of innovative finance in supporting sector transformation: Public–private partnerships, climate finance, green and blue bonds

64. Shifting to a sustainable and resilient freight transportation path that is efficient, reliable, low-carbon, smart and information technology-enabled, resilient and inclusive, requires a deep transformation and significant investments. With the climate agenda currently in sharp focus, diversifying sources and scaling up of investment levels in alternative fuels, retrofitting ships with greener technologies, new green ships, upgraded port facilities and infrastructure are critical. As noted above, however, these will require significant investments.[29]

65. There are currently various innovative financing schemes, some of which could be tapped to facilitate the transition to low-carbon emitting freight transport. These include sustainable finance products, such as green bonds, blue bonds and sustainability-linked loans, as well as public–private partnerships and collaboration.

Sustainable finance and climate finance

66. Sustainable finance has become crucial and now serves as both an investment criterion and a component of financial risk management given the integration of environmental, social, and governance criteria into investment strategies. Climate finance, a subset of sustainable finance, specifically targets investments that contribute to mitigating or adapting to climate change. Sustainable finance instruments have become key to raising capital for projects that promote environmental sustainability and combat climate change.

67. Green bonds and blue bonds are specialized financial instruments designed to raise capital for projects with environmental benefits. Green bonds typically finance initiatives such as renewable energy, energy efficiency and pollution prevention projects. Blue bonds, on the other hand, focus on marine and ocean-based projects, such as sustainable fisheries and marine conservation. In maritime transport, these bonds have been used to support various sustainability initiatives. For instance, Maersk issued its inaugural green bond in November 2021, raising €500 million ($537 million) through a 10-year note under the Maersk green finance framework to fund green methanol vessels.[30] Subsequently, in September 2023, Maersk issued a $750 million green bond to fund clean transportation projects.[31] Similarly, in January 2024, a major Japanese shipping company issued blue bonds worth ¥10 billion (approximately $70.45 million), with a five-year maturity through a public offering in Japan.[32] To qualify for green bond finance, vessels need to meet specific criteria outlined by organizations or standards, such as the Climate Bonds Initiative (an international organization), the European Union taxonomy for sustainable activities and the Green Shipping Programme (a public–private partnership of Norway).[33]

68. Sustainability-linked bonds and sustainability-linked loans are financial instruments designed to promote and reward sustainability performance in various sectors, including maritime shipping and ports. The funds raised are not tied to specific projects, but rather to broader corporate or national sustainability goals, supporting activities such as training, procurement and equipment purchases to achieve these goals.

69. These instruments offer favourable terms and interest rates linked to the achievement of pre-defined sustainability performance targets, which include key performance indicators. Regular reporting on verified performance is required. If the targets are missed, the instruments often include a “step-up” clause that can increase the interest

[29] UNCTAD, 2023a.

[30] Maersk, 2021, Maersk issues first green bond to fund first green methanol vessels, 19 November.

[31] Maersk, 2024, *2023 Green Finance Report*, Hellerup, Denmark.

[32] Hakirevic Prevljak N, 2023, MOL [Mitsui OSK Lines] to issue world’s first blue bonds in shipping, 15 December, Offshore Energy.

[33] Det Norske Veritas, n/d, Green finance: Raising money for decarbonization with green, sustainability-linked and transition loans and bonds, available at https://www.dnv.com/maritime/hub/decarbonize-shipping/key-drivers/investors-and-finance/green-finance/ (accessed 13 August 2024).

rate. Similarly, if the targets are exceeded, a "step-down" clause can reduce the interest rate.[34]

70. The concepts of sustainability-linked loans and sustainability-linked bonds have been used by other industries but is also gaining momentum in the maritime sector as the industry works to meet international goals to reduce its environmental impact. For instance, as part of its commitment to sustainable energy, in Singapore, PSA Marine received a three-year sustainability-linked loan of €30 million equivalent in November 2020.[35] The interest rate of the loan is linked to the achievement of environmental, social and governance targets, specifically the deployment of crew transfer vessels to support offshore wind energy activities, such as the transportation and accommodation of personnel, cargo and equipment for offshore wind farms.[36] In 2021, the Port of Newcastle in Australia secured $A515 million (US$398 million) in sustainability-linked loans, incentivized by targets for reducing emissions and enhancing biodiversity.[37] Meanwhile, the Norwegian tanker operator Odfjell completed a sustainability-linked bond offering in January 2021, raising US$100 million linked to its efforts to reduce GHG emissions.[38]

Public–private partnerships and collaboration

71. Public–private partnerships play a crucial role freight transport, combining the strengths of the public and private sectors to improve infrastructure and operations. For example, in ports, they often involve collaborative agreements between government entities and private sector companies to develop, manage and operate port facilities. These partnerships leverage the strengths of both sectors, combining public oversight and regulation with private sector efficiency, expertise and investment. For example, the Port of Tema in Ghana, developed through a public–private partnership between the Ghana Ports and Harbours Authority and Meridian Port Services, showcases the effectiveness of this model.[39]

72. Beyond traditional concession-based public–private partnerships, other forms of public–private collaboration stimulate investment, drive innovation and support the sustainable transition of the maritime sector. The Clean Maritime Demonstration Competition of the United Kingdom of Great Britain and Northern Ireland exemplifies this in having awarded £33 million to 33 projects focused on developing clean maritime technologies, including electric vessels, charging ports and hydrogen fuel systems, aiming to decarbonize maritime transport, support coastal economies and create high-skilled jobs.[40]

73. Efforts of the Port of Rotterdam to become a hydrogen hub illustrate successful public–private collaboration in the port energy transition. The port collaborates with various private firms to develop a large-scale hydrogen network, aiming to import and produce green hydrogen. By 2030, Rotterdam plans to supply Europe with 4.6 million tonnes of hydrogen annually, significantly reducing carbon emissions and maintaining its position as a key energy port.[41]

74. In Angola, the development of dry ports and logistics hubs through public–private partnerships is a key strategy for economic diversification and improving trade efficiency,

[34] Mills S and Wardle M, 2024, *Developments in Maritime Finance and Maritime Financial Centres Developments*, Z/Yen, Long Finance, London.

[35] DBS Bank, 2020, PSA Marine forges ahead with offshore wind in Europe, 11 November.

[36] Ibid.

[37] Duran P, 2021, Australian coal port's loan terms linked to social, emissions goals, 4 May, Maritime Logistics Professional.

[38] The Maritime Executive, 2021, Hapag-Lloyd joins shipping industry move to green financing, 8 February.

[39] AP Moller-Maersk Terminals, 2023, Second phase of Tema Port expansion dubbed "New era in Ghana's maritime industry, 17 November.

[40] United Kingdom (2024). £33 million boost to turn green ports and ships into a reality. 26 January, available at https://www.gov.uk/government/news/33-million-boost-to-turn-green-ports-and-ships-into-a-reality.

[41] See https://en.rotterdampartners.nl/articles/hc-rotterdam-large-scale-hydrogen-network/ (accessed 13 August 2024).

while promoting green transition. The Lobito Corridor project, supported by international partners and highlighted at the Group of 20 Summit, aims at enhancing the transportation of critical minerals for green energy. [42] Under the European Union–UNCTAD Joint Programme for Angola: Train for Trade II, UNCTAD has been supporting these efforts by providing capacity-building and training activities to promote effective public–private partnership models and sustainable freight transport solutions.[43]

75. Promoting innovative financing tools, such as green bonds, blue bonds, sustainability-linked loans and public–private partnerships, requires strong regulatory frameworks, developing local capital markets for bonds and bankable projects to attract private investment. Coordinated efforts among Governments, international organizations, financial institutions and national stakeholders are key. Awareness raising, capacity-building and institutional strengthening are also critical.

76. Integrating official development assistance into the landscape of innovative financing mechanisms can also enhance the ability to support the transport sector towards sustainability and resilience in this time of polycrisis. Leveraging official development assistance can help de-risk investments, improve project bankability and viability, support policy and regulatory development, build capacities and promote international cooperation.

III. Summary and issues for discussion

77. Maritime transport and logistics are currently crossing a complex landscape characterized by frequent disruptions and the need for a robust sustainability and resilience framework. Such a framework needs to mainstream resilient and risk management principles, decarbonization targets, greener and alternative fuels, sustainable and smart port infrastructure and services, efficient and sustainable hinterland connections, greater digitalization uptake and upskilling and reskilling of transport workers. Underpinning the overall framework are the innovative sustainability financing mechanisms, including climate finance together with public–private partnerships and enhanced collaboration across the entire ecosystem of stakeholders from within and outside the sector, as well as increased official development assistance to ensure the resilience and sustainability of the sector, particularly in developing countries.

78. Capacity-building, best practice exchange, information sharing and enhanced cooperation are equally important. Financiers, development partners, and international organizations also play a crucial role in providing the necessary resources, expertise and support to facilitate the transition, particularly for developing countries, SIDS, LLDCs and LDCs. In this context and bearing in mind, ongoing UNCTAD work supporting the sustainability and resilience-building agenda in freight transport and logistics, experts will discuss key issues at stake and aim to identify priority actions to support the sector navigate through disruptions while building resilience and advancing the sustainability agenda, especially in developing countries, SIDS, LDCs and LLDCs.

79. To provide focus and guide discussions, experts may wish to consider the following:

(a) How can maritime transport and logistics be made more resilient in the face of disruption? What is the role of key stakeholders, including Government, industry actors, financiers, international organizations and others?

(b) How can the maritime transport sector accelerate decarbonization efforts? What are the implications for developing countries' transport and trade? How can developing countries be supported, particularly SIDS, LDCs and LLDCs, in their transition?

[42] The project involves many actors, among others, from Government, development banks, financing institutions and the private sector. These include Angola, the Democratic Republic of the Congo, the United States of America, Zambia, the European Union, African Development Bank and Africa Finance Corporation, as well as a consortium comprising Trafigura, Mota-Engil and Vecturis.

[43] See https://unctad.org/project/eu-unctad-joint-programme-angola-train-trade-ii (accessed 13 August 2024).

(c) How can ports both enable and accelerate the shift to a sustainable and low-carbon path, in particular through the potential arising from alternative fuels? How can ports support shipping decarbonization?

(d) How can financial resources and investment be scaled up and diversified? What are the options available to maritime transport and hinterland transport networks and logistics?

(e) How can mainstreaming sustainability (economic, social and environmental) and resilience criteria and principles be ensured across the transport and logistics chain, all modes of transport and stakeholders involved in the delivery of door-to-door transportation? What are the challenges, lesson learned and good practices for replication at wider scope?