



A new chapter

by Ewa Kočańska

The [Port Reform Toolkit](#), from the World Bank Group, has been the maritime sector's reference point since 2001, helping governments, port authorities, and operators modernise and navigate change. Now in its third edition, the Toolkit offers a structured approach to port reform, with practical guidance on governance, regulation, financing, and institutional design. It gives decision-makers a clear road map for reform, ensuring ports remain resilient, competitive, and able to continue driving economic growth. The current issue includes new material on digital transformation, cyber security, environmental & social governance, labour transitions, and the critical role of ports within their communities.

The 2025 Toolkit's key value lies in providing a consistent framework at a time when ports are under unprecedented ecological, societal, and geopolitical pressures. Global disruptions such as the coronavirus pandemic and armed conflicts have revealed how fragile supply chains can be, while environmental regulation, decarbonisation, and rapid technological change are forcing ports to adapt.

Slowbalisation & friendshoring

Globalisation has long been a driving force behind the growth of maritime trade. After WWII, and especially during the hyperglobalisation era of the 1990s and early 2000s, growing trade and value chains increased demand for sea transport, with ports acting as gateways. However, recently this trend slowed down, opening a period called slowbalisation with weaker global GDP growth, a decoupling between trade and output, and a gradual shift away from the deep international specialisation in supply chains.

While early globalisation bolstered the power and control of developed nations,

today developing countries import as much, if not more, than they export. This is mostly fuelled by Asia's demand for commodities such as iron ore and grain, as well as goods needed for production.

Geopolitics is also reshaping trade flows. While the talk of nearshoring has so far produced little change, friendshoring (favouring politically aligned and trusted partners) is gaining traction as companies and governments try to build resilience against sanctions, instability, and supply chain shocks.

Energy trade is also transforming; fossil fuels still make up 40% of maritime volumes, but investment in clean energy now far outpaces fossil fuel spending. Ports will increasingly be expected to handle renewable energy components and to act as transportation, storage, and bunkering hubs for low- or zero-carbon fuels, reshaping their cargo and infrastructure needs.

Meanwhile, shipping routes are lengthening as operators prioritise reliability over speed in the face of droughts and security risks. The effect of these circumstances is a port sector at the centre of changing trade dynamics, where resilience,

adaptability, and planning are becoming especially significant.

Race for scale

The global container shipping industry has also been reshaped over the past three decades by sweeping consolidation, strategic alliances, and the pursuit of economies of scale. For port authorities, this has complicated the task of managing competition and maintaining a balance between the public interest and private power.

Horizontal integration through mergers and acquisitions meant that the top 20 carriers' share of the market went up from under 50% in the mid-1990s to more than 90% today. The sector is now dominated by a few giants, who control more than half of global container carrying capacity. At the same time, vertical integration erased the boundary between shipping lines and terminal operators as several of the largest carriers are now among the world's leading terminal operators, competing directly with long-established independent players.

Alliances continue to play a major role in the shipping industry, with vessel-sharing

agreements allowing carriers to share the huge costs of running liner services across broader networks. While these partnerships improve (carrier) efficiency, they also raise concerns among regulators and shippers about decreasing competition, rising costs, and the growing leverage carriers hold over ports.

Furthermore, the vessels themselves have undergone a transformation. Container ships that in the past carried 1,500 TEUs now reach over 24,000, forcing ports and other parties (like maritime offices in charge of fairways) to upgrade infrastructure almost continually. This race for scale overextends port capacity, requires deeper channels, longer crane arms, and more flexible labour, while also exposing supply chains to new risks. Incidents like the *Ever Given's* grounding in the Suez Canal highlighted the fragility of ever-larger ships. There is a growing debate about whether vessel growth has reached its practical and economic limits, even as jumbo ships continue to enter regional trades.

Fleet composition has shifted as well, with dry bulkers and container ships gaining share at the expense of oil tankers. In the coming years, decarbonisation will continue transforming the tonnage due to ports and shipping lines having to handle new clean energy molecules. This will require new vessels and significant investment in liquid bulk infrastructure, reshaping maritime sector strategies for decades to come.

Reinvention towards resilience

The role of port authorities is also undergoing a key shift. Once seen primarily as landlords, regulators, or operators, their job now is to act as community builders, entrepreneurs, and organisers in response to extra pressures such as climate change, digitalisation, and growing stakeholder scrutiny. They no longer just manage port estates; they also have to balance financial competitiveness with environmental and social responsibilities. Consolidation in the shipping sector, public scepticism about port expansion, and the need for climate resilience have forced port authorities to be more proactive and transparent. They coordinate various stakeholders, from shipping lines and energy providers to local communities, likewise cultivate innovation to attract investment and talent.

Since ports are becoming a bedrock for new trades and energy systems, they have also become the key actors in the transition from fossil fuels to clean energy. Authorities must manage trust and the



Photo: World Bank Group

validity of their actions, as societal acceptance of port activities is no longer automatic. Regional cooperation among ports, often supported by governments, is also on the rise, reflecting a recognition that ports function as interconnected nodes in global and regional logistics networks.

Over the past three decades, ports worldwide have also changed through privatisation and financialisation. The shift began in the 1990s, when reforms transferred responsibilities from public authorities to private operators, with the landlord model (separating public ownership of land and infrastructure from private management of quay & yard services) becoming dominant. While this boosted efficiency and investment, it also raised concerns about loss of public control, especially when foreign state-backed companies or financial investors gain influence over critical infrastructure/services.

Next, the expansion of global trade and shipping capacity attracted new financial actors, including pension funds, investment banks, and sovereign wealth funds. Their capital increased port growth but also introduced risks, including inflated asset prices and conflicts between short-term investor goals and long-term national interests. Governments are increasingly scrutinising these investments to balance efficiency gains with sovereignty, resilience, and strategic security.

The last few years have shown just how fragile global supply chains really are and how a single local event can send shock waves across the world. Natural disasters like earthquakes, floods, droughts, and pandemics have become more frequent, while human-made disruptions, such as wars, cyber attacks, labour strikes, and

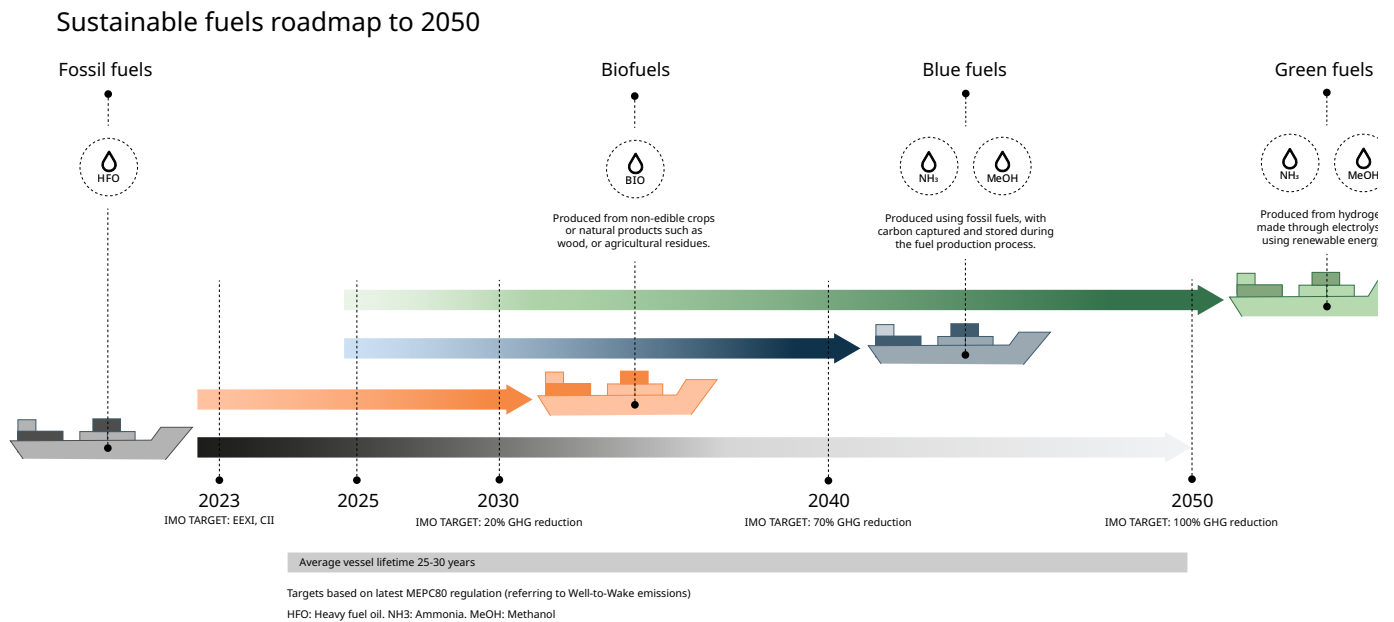
industrial accidents, have pushed ports to their limits. The epitomic Suez Canal blockage, the COVID-19 pandemic, and most recently the Red Sea vessel attacks have highlighted how quickly crises ripple across trade networks. Resilience has therefore become a strategic necessity. A resilient port must absorb disruptions, restore operations quickly, and adapt to new realities. In practice, resilience is about reducing potential vulnerability while ensuring that ports remain reliable in an increasingly unpredictable world.

Climate outlook

Ports have a serious challenge in meeting global climate change objectives while also maintaining operational efficiency and competitiveness. To meet their obligations, ports have been implementing various decarbonisation strategies based on emissions assessments, low-carbon technologies, and specific policy frameworks. For example, electrification of cargo-handling equipment, providing vessels with shore power, and on-the-spot renewable energy generation through solar and wind installations are becoming standard measures; operational efficiency, supported by digital traffic management and automation, helps minimise idle times and unnecessary fuel use.

Additionally, regulations and policies concerning issues such as carbon pricing, renewable power procurement, or separate port fees for low-emission vessels help with reinforcement. Since the global shipping industry is guided by the International Maritime Organization's climate strategy (to cut greenhouse gas emissions to net zero by 2050), the ports have to become central to the transition to cleaner fuels. This shift creates new market opportunities for ports in countries

Fig. 1. Port elements and the potential climate impacts on them



Source: IDB Invest

with renewable energy resources, allowing them to develop export-oriented clean fuel supply chains (or to become increasingly independent from overseas imports).

Ports also have to adapt as they are especially vulnerable to sea-level rise, storm surges, extreme heat, and changing precipitation patterns. Integrating climate resilience into port design through higher construction standards, coastal defences, and improved drainage helps protect assets. Further, additional soft measures, like risk mapping or flexible land-use policies, also help. For example, tools like the IMF-Oxford PortWatch platform now enable authorities to model climate hazards and estimate downtime and infrastructure damage. Ports are now evaluated using ESG frameworks that promote transparency, fair labour practices, and community engagement. By integrating mitigation, adaptation, and accountability, ports can play a pivotal role in the development of a low-carbon economy.

Smart = safe

Digitalisation plays an important role in transforming global supply chains and, more specifically, port operations by reshaping everything from vessel scheduling to cargo handling. Technologies such as the Internet of Things, artificial intelligence, blockchain, and advanced terminal operating systems are included in the shift toward smarter, data-driven port logistics.

Automation has become a defining feature of this change. Since mid-2024, around

71 container terminals (about 8% of the world's major facilities) have been either fully or partially automated. These systems rely on interconnected sensors, real-time data analytics, and cloud-based management tools to improve efficiency, safety, and environmental performance.

However, this growing interconnectivity of ports has introduced new vulnerabilities, bringing cyber security to the top of the most important safeguards in the maritime industry. Ports now depend on wide digital networks to control many operational aspects such as automated cranes, gate access/visual data-gathering systems, and electronic customs documentation. A single breach in these networks can bring the entire supply chain to a standstill. To minimise these risks, ports have to adopt a top-down, integrated approach to cyber security. According to the World Bank, cyber security should be looked at as a core component of a port's operational and governance strategy, not simply as an IT function.

The Toolkit highlighted that port leadership must be able to define security priorities, ensure compliance across terminal operators and logistics providers, and allocate resources for constant monitoring, threat detection, and incident response. This can be done by using standardised frameworks across different systems, encryption, access control, and intentional data redundancy. Equally important is developing a culture of cyber

awareness. Regular training, simulation exercises, and clear reporting procedures improve preparedness and resilience. Last but not least, collaborating with governments and global/regional/national organisations also boosts intelligence-sharing and defence coordination.

As ports continue adjusting to their role as trade and green energy hubs, integrating technologies such as digital twins, just-in-time arrival systems, and smart city connectivity will benefit the entire supply chain. At the same time, sustaining cyber security, which is necessary for operational reliability and global trade resilience, depends on maintaining trust, continuity, and data integrity.

Cargo is (still) king – but there's a (growing) court too

The global port sector has entered a new chapter, written by changing economic conditions, rapid technological progress, and growing environmental & social pressures.

Clearly, ports are no longer just for cargo handling; they have evolved into strategic hubs that must strike a balance between efficiency and resilience, economic growth and sustainability, and traditional operations and digital transformation. To meet these challenges, port authorities need a long-term vision, cooperation, and flexibility as well as a versatile toolkit for monitoring, forecasting and scenario planning to create smarter, more resilient operations for the future. ■