

Homeward Bound

15 August 2025

One Planet Shipping

Case Study #3

Introduction

Shipping is on the rise! Over the past 40 years, maritime transport has grown by around 250%. By 2023, the global merchant fleet counted over 100,000 vessels, with a combined capacity of 2.2 billion deadweight tonnes (DWT) — and growth shows no sign of slowing.¹ Yet shipping also increasingly threatens climate stability and ocean ecosystems. It underpins unsustainable levels of international production and trade, which are key drivers of climate change and biodiversity loss on land and at sea.

A new approach to maritime transport is urgently needed. One Planet Shipping, a Seas At Risk initiative aiming to guide the sector toward sustainability, positions shipping firmly within planetary boundaries. It emphasizes that a holistic approach to sustainable shipping can promote fair consumption, secure ports, responsible trade, and a just transition. The vision is structured around four guiding themes — Wind First, Reimagining Trade, All Aboard, and Homeward Bound.

For each theme, this series of case studies offers two illustrative examples. The first highlights a recent event that disrupted global shipping, with major financial, ecological, or social repercussions, exposing the underlying challenges. The second showcases a concrete solution, rethinking conventional models and demonstrating how sustainable shipping can be realized in practice within the One Planet Shipping framework.

Summary

The Beirut Explosion focuses on the 2020 tragedy at the Port of Beirut, when the detonation of unsafely stored ammonium nitrate devastated the port and nearby neighbourhoods, killing over 200 people. The explosion sparked public outrage over poor port management, but also lead to broader criticisms on port planning that ignores its urban and environmental context.

A different kind of port planning is possible: *Merwe-Vierhavens Rotterdam* demonstrates how better integration between port and city can work. A mix of industrial activities and urban functions will transform this old port area into a vibrant new district, offering space for living alongside innovative, circular and waterbound businesses.

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The Beirut Explosion

The explosion

The government-owned Port of Beirut is the main entry point of goods to Lebanon, and has been an important gateway to the whole Middle East since the mid 70s. The port covers a surface of nearly 200 thousand square meters, adjacent to the city of Beirut, where it today processes almost three thousand ships, a million TEU and 6 million tonnes of goods per year.²

On 4 August 2020, a massive explosion struck the Port of Beirut after a fire in one of the port's warehouses ignited 2,750 tonnes of unsafely stored ammonium nitrate. The ammonium nitrate had been unloaded from MV Rhosus in 2014, six years earlier, after Lebanese authorities had impounded the ship when its owner failed to pay port fees and fines. Energy comparable to 1.1 kilotonnes of TNT was released by the blast, ranking it among the most powerful non-nuclear explosions ever recorded.³

The consequences

The explosion had severe effects. At least 200 people were killed by the supersonic blast wave that tore through the city, and around 5,000 others were injured. Hospitals quickly became overwhelmed, and about 300,000 people were left temporarily homeless. At least one third of the city's buildings were damaged, the total property damage was later estimated at \$15 million. The explosion triggered a seismic event measuring 3.3 in magnitude.⁴ In the port, the blast wiped out an entire area, destroying warehouses, ships, quays, a grain elevator and other key infrastructure. At the center of the site, a crater of 140m wide remained.

The explosion also had political consequences. Already existing public anger over government corruption grew in scale and led to mass protests

across the country, eventually forcing the Lebanese government to resign.⁵

Poor port planning

Protesters denounced the negligence of authorities and the political elite responsible for the poor management of the port, holding them directly accountable for the explosion. But the public anger also opened up discussions on port planning. Since the beginning of its growth, the Beirut port development completely lacked awareness of its urban environment. According to Beirut Urban Lab, a Lebanese research space for urbanism, the city acted as a "backyard without any investment or synergy that could benefit the local economy" or people.⁶ This is especially true for Karantina, the poor and neglected municipality adjacent to the blast site that was most heavily impacted.⁷

The example of Beirut is striking, but many modern ports face similar challenges. While historically ports and cities were once deeply interconnected, poor and profit-driven port planning has pushed them apart. By re-engaging with their natural and urban contexts, ports can begin to restore some of the synergy with cities they have lost over time.



Smoke rises from the seaport of Beirut, one day after the explosion in August 2020. (© AP Photo/Hussein Malla)

#1 The State of Shipping and Oceans (2023), Seas At Risk

#2 Home, Port of Beirut

#3 Beirut explosion: How ship's deadly cargo ended up at port (2020), BBC

#4 Beirut explosion: What we know so far (2020), BBC

#5 Lebanon's Government Resigns Amid Widespread Anger Over Blast (2020), The New York Times

#6 Recovering the Port-City: The Implications of the Port Proposals on Beirut's Future (2025), Beirut Urban Lab

#7 Sustainable Beirut City Planning Post August 2020 Port of Beirut Blast: Case Study of Karantina in Medawar District (2021), D. Aouad and N. Kaloustian

Merwe-Vierhavens Rotterdam

Ports and cities

Under its Homeward Bound theme, the One Planet Shipping report argues that ports are often left behind in city planning. It advocates for more integrated port planning, better connected to the city, and suggests that ports could become hotspots for circular, regenerative economies.⁸

Over the past few years, attention to better integrated port-city interfaces has grown. On the one hand, urban design practices have become increasingly engaged with port environments, using design research to search for untapped forms of symbiosis between port and city. On the other hand, port authorities have begun redeveloping old port sites, actively seeking stronger links to the city and a more diverse mix of functions.

Merwe-Vierhavens

In Rotterdam, home to Europe's largest port, the port authority and municipality are redeveloping the Merwe-Vierhavens (M4H), an area of 100 hectares adjacent to the city on the north bank of the Nieuwe Maas. Once one of the largest fruit ports in the world, today this site's historical cargo functions have largely disappeared, leaving behind a patchwork of underused sites and infrastructure.⁹

The long term vision for M4H shows how the area will transform into a mixed district that combines new port activities with well-connected urban functions. The spatial framework, published in 2019, provides the outlines of this plan and defines different zones with different programmatic clusters. While the Galileipark, for example, houses the larger manufacturing industry, with room for innovative, circular and waterbound businesses, the Marconikwartier provides a more urban mix of living, working, culture and provisions.¹⁰

The development of M4H proceeds in phases, with initial projects completed. In the coming years, 2,500 new housing units and 30,000 square meters of innovative manufacturing space will be delivered. Full completion is expected around 2040.¹¹

Unlocked synergies

The integration between port and city brings various synergies to the M4H site. While the housing developments will benefit from mixed-use neighbourhoods, climate-adaptive waterfronts and a heat network, businesses and manufacturers will gain from the proximity to both the city's talent pool and port infrastructure. The port-city integration also facilitates logistics and resource flows that support re-use and recycling, meaning M4H will act as a testing ground for circular economy practices that serve both urban and maritime economies.¹²

The full success of Merwe-Vierhavens is yet to be realised, but the project already offers major inspiration to ports seeking stronger connections with the city. The era of isolated ports is over, M4H suggests: new hybrid environments can foster innovation, advance circular economy and enhance quality of life for residents and workers alike.



The Smart Hydrogen Hub, being built on this site, is one of the many innovative businesses emerging in the M4H area.¹³ (© Guido Pijper)

#8 One Planet Shipping - Navigating the waves of climate change and overconsumption (2024), Seas At Risk

#9 Over M4H Rotterdam, M4H Rotterdam

#10 Variation in Business Environments, Spatial Framework Merwe-Vierhavens Rotterdam (2019), M4H Rotterdam

#11 Herontwikkeling Rotterdamse Merwe- en Vierhavens grote stap verder (2024), StadsGroen

#12 Making the Future Port City in Rotterdam's Maker District (2021), Portus Online

#13 'We are building the Smart Hydrogen Hub, for and with M4H' (2024), Rotterdam Innovation City