Green Ports in Action: Accelerating Climate Solutions Through Collaboration

Insights and case studies from the Green Ports Forum
Barcelona | 2024

C40 CITIES

About the Green Ports Forum

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The Green Ports Forum is an initiative of C40 Cities' Ports & Shipping programme, which brings together an ambitious community of action through public-private partnerships with cities, ports, and industry. By building this bridge between cities and ports, the two together can support each other and enable the change needed to make a decarbonised future reality.

Mission Statement

The Green Ports Forum is a platform for leading cities and ports to accelerate urgent and collaborative climate action aligned with the 1.5°C pathway.

We achieve this by working with cities and ports and across the entire maritime logistics chain to:

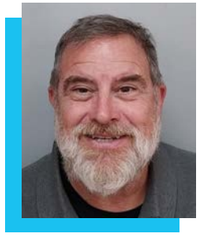
- mobilise knowledge
- build coalitions
- catalyse policy
- inform infrastructure investment decisions
- enhance city and port capabilities
- accelerate zero-emission technology and fuel adoption
- attract capital
- support project implementation
- operationalise Green and Digital Shipping Corridors

Participating C40 Cities

2024 C40 GREEN PORTS FORUM!

BARCELONA, NOVEMBER 6-8 2024

CITY OF BARCELONA



On behalf of the City of Barcelona, it is a pleasure to address all of you within the framework of the Green Ports Forum. Hosting this event in our city has been a great opportunity to reaffirm our commitment to the decarbonisation of ports and the sustainable transformation of global logistics chains.

Barcelona is driving, together with the Port, active collaboration in key areas such as the electrification of docks, the promotion of alternative fuels, and the reduction of emissions from port and land traffic.

Through this strategic alliance, we are working to ensure an energy transition that generates environmental, social, and economic benefits for all citizens, with special attention to the neighborhoods closest to the port infrastructure.

Thank you for your participation, and we look forward to continuing to work together to achieve a greener and more sustainable world.

Mr. Jordi Campillo
Director of Strategic Projects at the Barcelona City Council

Photo: Pexels

About Barcelona City Council

The Barcelona City Council is the institution responsible for the management and administration of the city of Barcelona. Its mission is to promote the well-being and quality of life of its citizens by providing high-quality public services and fostering the sustainable and equitable development of the city.

The City Council works in a wide range of areas, including urban planning, environment, mobility, education, culture, and social welfare, always aiming to create a more inclusive, innovative, and resilient Barcelona. Under the leadership of its mayor, the City Council is committed to implementing policies based on citizen participation and transparency, ensuring that all decisions are made for the benefit of the community and in alignment with current global challenges such as social inequality and the climate crisis.

www.barcelona.cat

PORT OF BARCELONA

The Port of Barcelona was delighted to co-host the 2nd edition of the Green Ports Forum in Barcelona, together with our partners from C40 Cities. The workshop brought together a community of industry leaders, policy makers, researchers, and NGOs from major cities and maritime administrations to share best practices, forge partnerships, and drive collective action to advance maritime decarbonisation.

We look forward to building on the action plan for the Green Ports Forum and will continue to pave the way for more projects in greener shipping and ports. The Port of Barcelona is committed to environmental sustainability and has implemented several initiatives to reduce its carbon footprint and improve air quality. Our strategic plan includes the development of a new energy model, the decarbonisation of port and maritime activities, and the promotion of intermodality. These efforts align with our goal to become an emissions-neutral port by 2050.

Your participation and insights were invaluable to us. I look forward to continuing our work together, building on the momentum we have created, and making significant strides towards a sustainable future for our oceans.

Javier Garrido
Manager Innovation, Port of Barcelona

Photo: Pexels

About Port of Barcelona

The Port of Barcelona is a transport infrastructure and key services for the territory. Its leadership has contributed to positioning the Port as a leading logistics centre in the Mediterranean and the first peninsular port for international traffic. Its mission is to generate prosperity in the community, increasing the competitiveness of its clients through the efficient and sustainable provision of logistics and transportation services. To develop its mission, the Port of Barcelona has set itself the goal of being the SMARTest logistics hub in the Mediterranean: “The SMARTest logistic hub in the MED”.
The SMART initials are equivalent to the five attributes that it wants to consolidate to achieve its vision, that is, what the Port plans to be in the near future as a port: (S)ustainable, (M)ultimodal, (A)gile, (R)esilient and (T)ransparent.

www.portdebarcelona.cat

Four years of the Green Ports Forum

C40's Ports & Shipping Program launched in 2021 at a time when collaboration between ports and cities on climate action was limited, and Green Shipping Corridors had yet to emerge. Knowledge on enabling cross-value chain collaboration was scarce.

Today, more than 44 Green Shipping Corridors are in place globally, with dozens of leading ports and cities working together to drive lasting climate action.

Through shared goals, knowledge exchange, and strategic partnerships, these stakeholders are harnessing the power of collaboration to accelerate progress.

This transformation is the result of systematic and coordinated efforts led by ports and cities, and supported by a global network of research institutions, industry partners, and non-profit organisations.

Within this setting, the **C40's Green Ports Forum** offers a platform for dozens of ports and cities to convene in a peer-to-peer network, offering support via webinars, workshops and working groups. The knowledge sharing, peer-to-peer support, and research activities are underpinned by a data-driven approach and benchmarking of member's performance, which can be used to develop tailored technical assistance for Forum members, and communicate priority projects to development financiers and other important partners.

Green Ports Forum achievements 2021-2024

1. **A collaborative foundation:** Members mobilised to define the Forum's core themes, mission, and goals.
2. **Active engagement:** Over 50 participants attend the annual in-person workshops, as well as thematic webinars, workshops and working groups.
3. **A Green Shipping Corridors community:** 17 members engage in a dedicated working group, and many attend an annual Leaders Summit.
4. **Shared knowledge and thought leadership:** Knowledge exchange is facilitated via the Ports & Shipping **Vimeo channel**, and **C40's Knowledge Hub**.
5. **Data and insights:** Benchmarked member's performance with the Pulse Check Survey, identifying best practices, trends, and priorities.

20+
of the world's top cities and ports align on a shared vision for climate action

Forum member's climate leadership

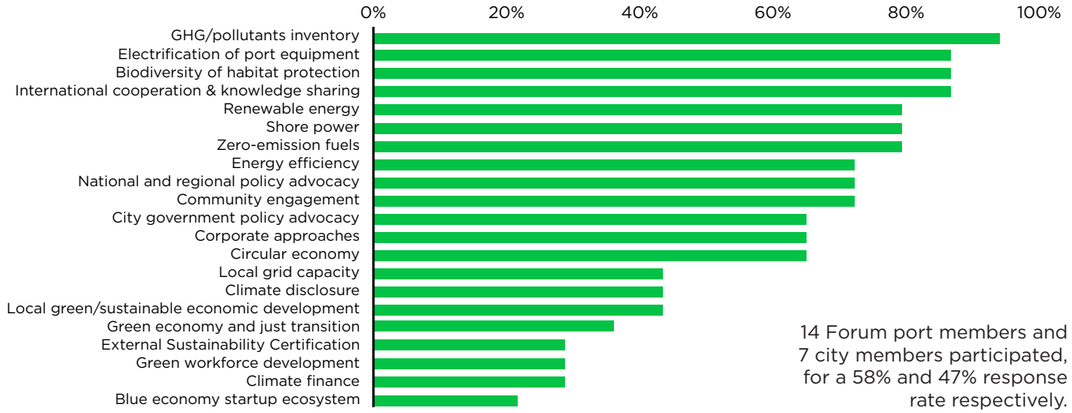
In 2024, C40 initiated its Green Ports Forum Pulse Check survey. The survey identifies the focus of port climate actions and how cities and ports are collaborating on climate goals.

A wide range of climate data was collected via interviews and a survey of Forum members, identifying leading practices and priorities, allowing C40 to better tailor support offered through the Forum.

Green Ports Forum members that...

Pulse Check survey results

What are ports focused on?



14 Forum port members and 7 city members participated, for a 58% and 47% response rate respectively.

Forum members are engaged in many leading climate initiatives detailed in the *Navigating Change: How ports and cities can collaborate on climate action* report.

Read the report.

2024 workshop overview

Each year, Green Ports Forum workshops aim to pave the way for collaborative action and meaningful progress on port-city climate action.

50 individuals gather annually from global ports and cities to harness their collective strengths to tackle pressing climate issues from a maritime perspective.

Workshops are designed to foster an environment where participants effectively contribute and champion initiatives and to define a collective path forward. Recognising every participant as a crucial champion, each year the workshop emphasises the importance of building partnerships and working collaboratively to create actionable plans.

Workshop objectives

1. **Effectively bring together stakeholders** to accelerate the adoption of zero emission equipment, zero emission fuels, and renewable energy at ports.
2. **Maximise the community benefits** of ports' climate action and maritime decarbonisation, including green jobs and investment.
3. **Build pathways for effective city-port collaboration** on ambitious green ports climate projects including Green Shipping Corridors.
4. **Articulate the business case for sustainability**, to support increased investment and resourcing for urban and maritime climate action.

"COMING FROM AN INDUSTRY WITH HIGH COMPETITION, IT IS SO NICE TO BE IN A SPACE FOR COLLABORATION! WHEN IT COMES TO CLIMATE, EVERYBODY WINS OR LOSES."

Workshop participant

In 2024, given political headwinds, the urgency of climate change was underscored, including a discussion of making the business case through climate disclosure and leveraging innovative financing solutions for climate action.

Across the board, participants emphasised the importance of near-term 2030 targets, in addition to long-term goals extending to 2050. Delegates shared that they are being bombarded with information and a lot of articles, and they value the Forum's assistance in curating knowledge and aggregating these to be more digestible.

Delegates participated in eight case studies, followed by breakout sessions where they prototyped new solutions to advance port-city decarbonisation efforts. These collaborative sessions provided an opportunity to develop practical strategies and share expertise.

The case studies highlighted how ports and cities are working together to address shared challenges in maritime decarbonisation, focusing on balancing energy demand, expanding infrastructure, and ensuring equitable workforce transitions.

Workshop participants

CHINA

Guangzhou Port Authority
Guangzhou Port Group
Shanghai Municipal Transportation Commission

INDIA

India's Ministry of Ports, Shipping, and Waterways
Jawaharlal Nehru Port Authority
Mumbai Port Authority

JAPAN

City of Yokohama Port and Harbour Bureau

NORWAY

City of Oslo
Port of Oslo

SINGAPORE

Maritime and Port Authority of Singapore

SOUTH AFRICA

eThekwini Municipality

SPAIN

City of Barcelona
Port of Barcelona

TANZANIA

City of Dar es Salaam
Tanzania Port Authority

UNITED STATES

City of Los Angeles
City of Seattle
Northwest Seaport Alliance
Port of Long Beach
Port of Los Angeles
Port of New York and New Jersey

GLOBAL KNOWLEDGE PARTNERS

- **CDP**
- **CENIT**
- **Connected Places Catapult**
- **Global Maritime Forum**
- **High Ambition Climate Collective**
- **Oceans 5**
- **Zero Emission Port Alliance**

"WE NEED TO MAINTAIN MOMENTUM TO KEEP THE TRANSITION MOVING FORWARD."

Workshop participant

THEME 1

Clean energy hubs for port-city synergy

Ports and cities are uniquely positioned to collaborate on developing clean energy hubs that serve both urban and maritime needs. By integrating renewable energy generation, storage, and distribution, these hubs can power port operations while also supporting citywide decarbonisation efforts.

A structured approach—grounded in governance, financial alignment, data-driven decision-making, and community engagement—is essential to ensuring these hubs are effective, equitable, and scalable.

Discussions highlighted the need for joint planning, investment, and policy coordination to maximise impact and resilience.

Strengthening this port-city synergy is key to accelerating the transition to a zero-emissions future.

Key takeaways

- **Formalized collaboration:** Ports and cities should align on a Memorandum of Understanding (MOU) to set shared targets for electrification, alternative fuels, and energy efficiency.
- **Joint financing mechanisms:** Establishing a common fund through public-private partnerships will ensure sustainable financing for climate initiatives.
- **Incentives and compliance:** Implementing taxes for non-compliance while providing opportunities for companies to actively engage in decarbonisation efforts.
- **Coordinated funding strategies:** Ports and cities can apply for external funding together, amplifying their combined influence for stronger financial backing.
- **Data sharing & prioritisation:** Sharing energy usage data between ports and cities ensures informed decision-making. Prioritizing projects that offer co-benefits to local communities fosters public support and social equity.

CASE STUDY: PORT OF SEATTLE

View Case Study ↗

Port-city collaboration to electrify Seattle Waterfront

Project objective
To develop a holistic clean energy strategy for the Seattle waterfront.

Ryann Child
Senior Environmental Program Manager, Port of Seattle

Project overview

The Port of Seattle, Northwest Seaport Alliance (NWSA), and Seattle City Light (SCL) aim to eliminate emissions from Seattle's working waterfront. The Seattle Waterfront Clean Energy Strategy focuses on improving infrastructures, technologies, and implementation strategies for clean, cost-effective, and reliable energy for the Port and NWSA's facilities, tenants, and maritime industries. A baseline of energy use, mainly from liquid fuels, was established. The Strategy assessed future electric loads, predicting peak power loads from maritime properties to grow 2.5-3 times by 2050 compared to 2019, and identified electrical equipment that will exceed capacity.

Project impact / next steps

The completion of the Seattle Waterfront Clean Energy Strategy is key in addressing infrastructure constraints to enable the electrification and zero-emission transition of the maritime industry in Seattle. The findings will inform SCL's and the Port's capital improvement plans, site-specific energy and decarbonisation master planning efforts, and the scoping of projects for grant-funding opportunities. It also identifies where more work is needed to address energy resilience.

THEME 2

Accelerating zero-emission equipment through port-city collaboration

Ports and cities play a crucial role in accelerating the adoption of zero-emission equipment by aligning policies, investments, and infrastructure planning.

These discussions emphasised the need for coordinated action, financial innovation, and strategic partnerships to overcome barriers to deployment. By leveraging joint procurement, shared infrastructure, and incentive programs, cities and ports can drive down costs and scale adoption more rapidly.

A collaborative approach ensures that zero-emission solutions are integrated into both port operations and urban freight networks, reinforcing the broader transition to a clean and resilient economy.

Key takeaways

- **Integrating with wider stakeholders:** Successful adoption of zero-emission equipment requires coordination with equipment suppliers, terminal operators, utilities, and government agencies.
- **Estimating power demand & infrastructure needs:** Accurate power demand estimates are essential for planning the necessary infrastructure, with ports and cities ensuring sufficient capacity for charging and energy distribution.
- **Port & city roles in infrastructure & policy:** Ports should handle charging infrastructure and ensure access to clean energy, while cities focus on increasing grid capacity and implementing regulatory mandates for zero-emission technologies.
- **Amending landlord/tenant agreements:** Ports can leverage lease agreements with tenants to support the adoption of zero-emission equipment, offering incentives and flexibility
- **Building consensus on technology choices:** Collaboration between ports, cities, and stakeholders is needed to reach a consensus on standardised technologies for large-scale deployment.
- **Financing & business model considerations:** Ports and cities can leverage green bonds and evaluate stakeholders' willingness to pay to create financial incentives.
- **Stakeholder engagement:** Engaging terminal operators, utilities, government agencies, and private-sector stakeholders is essential for successful equipment adoption.

CASE STUDY: ZERO EMISSION PORT ALLIANCE

View Case Study ↗

Accelerating electrification of container terminal equipment

Project objective
Decarbonise 100,000-120,000 units of container handling equipment worldwide.

Wouter Vink
Low-Carbon Energy System Designer, ZEPA

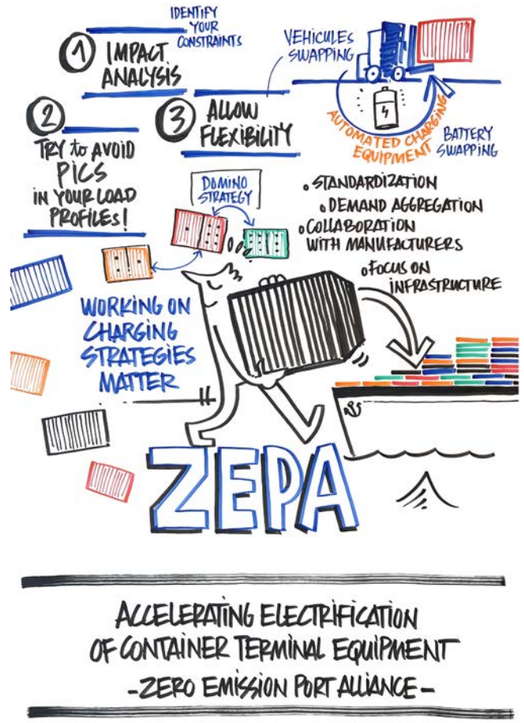
Project overview
Zero Emission Port Alliance (ZEPA) is an industry-wide strategic alliance working to remove barriers to electrification of port equipment, by aggregating demand and harmonising standards to gain economies of scale and make clean solutions more affordable.

DP World and APM Terminals are decarbonising equipment at the ports of Rotterdam and Aarhus through battery electric solutions.

Project impact / next steps
ZEPA's aggregate demand survey indicates that adoption rates for electric equipment would increase by 15% in a cost-parity scenario.

There are ongoing efforts to work with ports and other stakeholders to strengthen port power infrastructure to meet anticipated increases in electrical load requirements.

Project updates can be found on their website: **zepalliance.com**.



KEY PARTNERS

ZERO EMISSION PORT ALLIANCE
DP WORLD
APM TERMINALS
PORT OF ROTTERDAM
PORT OF AARHUS

THEME 3

Collaborative strategies for advancing zero-emission fuels

Ports and cities have a vital role in aligning the needs of fuel producers and offtakers to establish their regions as leading zero-emission fuel hubs. Discussions underscored the importance of collaboration in infrastructure development, financing strategies, and regulatory support to ensure the scalability of zero-emission fuels.

By coordinating investment in production and distribution networks, fostering public-private partnerships, and streamlining policy frameworks, ports and cities can accelerate market readiness. This integrated approach strengthens the supply chain for sustainable fuels, driving the transition to a cleaner and more resilient energy future.

Key takeaways

- **City & port priorities:** Cities focus on economic development, public health, and congestion management, while ports prioritise cargo volumes and tenant success.
- **Key stakeholders:** Fuel providers, shipping lines, fuel associations, environmental agencies, and labour unions need to collaborate on shared decarbonisation goals.
- **Targets & actions:** Achieving 2030 emission reduction goals involves developing offtake agreements, establishing bunkering infrastructure, and addressing land availability and cost gaps.
- **Workforce & job transition:** Facilitating skills transfer and workforce mobility from fossil-fuel industries to clean energy sectors is crucial for a smooth transition.
- **Financing & data deeds:** Diverse financing options, such as municipal bonds and subsidies, can bridge funding gaps for zero-emission fuels. Additionally, data on fuel demand, land use, and workforce projections is essential.
- **Aligning fuel producers & offtakers:** Ports and cities need to act as connectors to develop infrastructure, address regulatory standards, and promote fuel mandates.
- **Scaling zero-emission fuels:** Developing key infrastructure and working with fuel providers and shipping lines will ensure scalability, while financing mechanisms need to secure long-term investments.

CASE STUDY: MPA SINGAPORE

View Case Study ↗

Scaling green ammonia: Singapore's approach to collaborative purchasing

Project objective
Developing ammonia power generation and bunkering.

Zer Hien Ng
Sustainability Manager,
Maritime Port Authority
of Singapore

Project overview

The Maritime and Port Authority (MPA) of Singapore together with the Energy Market Authority of Singapore has launched a project to explore the uses of low emission ammonia for power generation and bunkering.

As part of this national project, low emission ammonia will be used for the purposes of power generation (55-65MW) as well as for bunkering (100 ktpa). This cross-cutting project helps to reduce wider commercial risk while still exploring the viability of ammonia for power generation and bunkering on a relatively small scale.

Singapore is also supporting existing efforts by developing standards conducting bunkering trials, developing safety procedures, and seafarer training programmes to help further enhance safety and manage the risks associated with handling ammonia.

Project impact / next steps

The project aims to have the first ammonia-fuelled ships operational by 2027-2028.

KEY PARTNERS

MP SINGAPORE
ENERGY MARKET AUTHORITY

Key takeaways

LEGEND

LONG-TERM PLANNING AND INFRASTRUCTURE DEVELOPMENT

POLICY, REGULATION, AND GOVERNANCE

INNOVATION, FINANCE, AND WORKFORCE TRANSITION

POLICY AND REGULATORY ALIGNMENT IS CRITICAL

Effective policy frameworks, incentives, and globally harmonised regulations are essential for accelerating the transition to sustainable port operations and ensuring a coordinated effort in decarbonisation.

CLEAN FUELS AND LONG-TERM PLANNING

Deploying zero-emission fuels at scale requires early investment in infrastructure, community engagement, and the adoption of emerging technologies. Ports like Singapore and Seattle are leading this transition, focusing on ammonia and methanol bunkering and grid expansion to support future fuel demand.

ELECTRIFICATION AND GRID RESILIENCE

Ports are advancing electrification efforts but face challenges in securing sufficient grid capacity. Smart grid solutions and coordinated infrastructure planning are vital for meeting energy demands across both urban and port areas.

INNOVATION MUST BE PURPOSE-DRIVEN

Purpose-driven innovation, supported by incubation hubs and aligned regulations, is crucial for accelerating the adoption of transformative technologies that drive sustainability in ports and cities.

CONSISTENT PROGRESS TRACKING ENHANCES ACCOUNTABILITY

Initiatives like C40's recent "Pulse Check" benchmarking survey allow for monitoring and tracking progress, ensuring accountability while keeping ports and cities aligned with their ambitious climate goals.

COLLABORATIVE BUSINESS MODELS AND STANDARDISATION

The Zero Emission Port Alliance and other collaborative initiatives address infrastructure and cost challenges through collective procurement and standardisation, setting an example for coordinated investment.

FINANCING NEEDS TO BRIDGE STRATEGY AND IMPLEMENTATION

Stronger collaboration between ports and cities, supported by de-risking mechanisms like public-private partnerships, is critical for bridging the gap between strategy development and the practical implementation of green initiatives.

EMISSIONS REPORTING MUST BE STANDARDISED

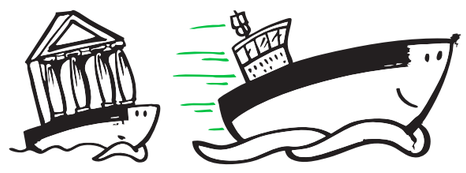
Standardising emissions reporting across ports improves transparency, enables clearer data tracking, and supports the global evaluation of emissions reduction efforts.

THE ROLE OF GREEN SHIPPING CORRIDORS IS SHIFTING

Green Shipping Corridors are evolving from pilot projects to mechanisms that generate market certainty and attract investment, playing a vital role in decarbonising maritime operations.

WORKFORCE TRANSITION FOR A GREEN ECONOMY

The shift to zero-emission fuels offers significant job creation and workforce development opportunities. Targeted training programs, alongside initiatives like Seattle's electric truck rebate program and Guangzhou's recruitment efforts for port electrification, ensure a just and effective green transition.



THEME 4

Port-city partnerships for offshore wind cluster development

Ports and cities can drive the growth of offshore wind clusters by working together to foster job creation, innovation, and energy independence. Discussions highlighted the need for a coordinated strategy that integrates strategic planning, workforce development, and investment to scale offshore wind infrastructure.

By aligning policies, streamlining permitting processes, and investing in specialised port facilities, cities and ports can position themselves as key hubs for the offshore wind industry. This collaborative approach not only accelerates clean energy generation but also strengthens local economies and supply chains, ensuring long-term sustainability and resilience.

Key takeaways

- **Strategy development & planning:** Defining the scope, goals, and timeline for offshore wind clusters, including feasibility studies and identifying key stakeholders like governments and developers.
- **Catalysing the offshore wind cluster:** Ports should serve as hubs for offshore wind turbine assembly, storage, and maintenance, while engaging local manufacturers to support turbine production.
- **Workforce development & transition:** Ensuring that workers from fossil fuel industries transition smoothly to offshore wind roles through apprenticeships and training programs.
- **Financing & investment:** Developing joint financing mechanisms such as green bonds and public-private partnerships to fund offshore wind infrastructure.

CASE STUDY: CITY OF YOKOHAMA

View Case Study ↗

Innovative grid solutions for Yokohama: Leveraging battery tankers and floating offshore wind

Project objective

The Port of Yokohama and private companies will collaborate to deliver electricity from floating offshore wind power carried by battery tankers.

Hisako Miura
Manager for Policy Coordination Division, Port and Harbour Bureau, City of Yokohama

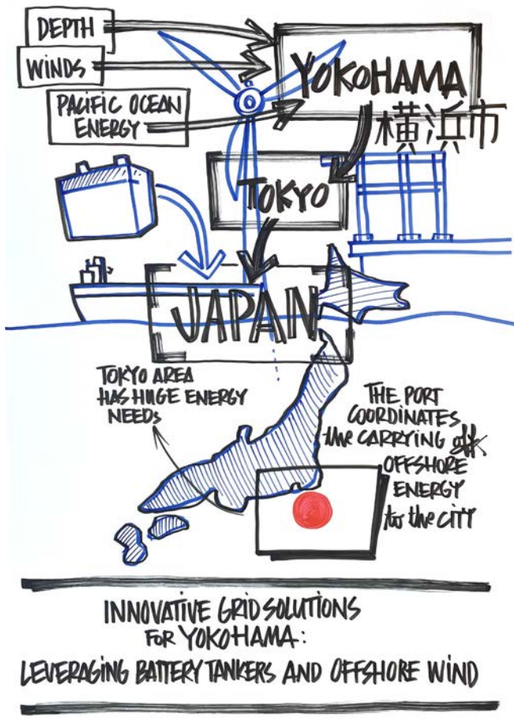
Project overview

The depth of Japan's coastal waters presents challenges in laying submarine cables, complicating the transmission of energy from offshore wind farms to in-demand areas.

The Port of Yokohama seeks to deliver electricity to the metropolitan area carried by battery tankers from floating offshore wind farms. Yokohama will also coordinate the flow of electricity to Tokyo, as a major power-consuming city. This project aligns with the Port of Yokohama's goal of achieving carbon neutrality by 2050.

Project impact / next steps

In January 2025, the City of Yokohama signed a memorandum of understanding (MoU) with four partners including an offshore wind power developer and a bank. All parties will collaborate to supply electricity stemming from floating offshore wind power to wider areas while supporting the industrialisation of the Yokohama waterfront area. The study under this MoU will consider the use of battery tankers to transport electricity.



KEY PARTNERS

CITY OF YOKOHAMA
OCEAN POWER GRID INC.
TEPCO POWER GRID INC.
TODA CORP.
MUFG BANK, LTD.

THEME 5

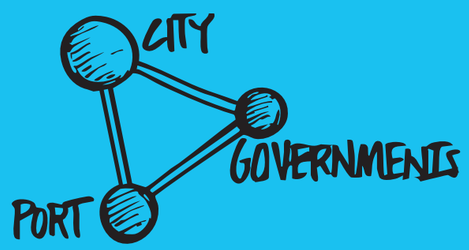
Scaling blue economy solutions through port-city partnerships

Ports and cities can catalyse the growth of the blue economy by fostering innovation ecosystems that attract cleantech startups and investment. Discussions highlighted the importance of standardised regulations, strategic collaboration, and supportive infrastructure to create an enabling environment for scaling blue economy solutions.

By streamlining permitting processes, facilitating public-private partnerships, and investing in research and development, ports and cities can drive sustainable economic growth while protecting marine ecosystems. Strengthening these partnerships ensures that emerging technologies and business models contribute to a resilient and thriving blue economy.

Key takeaways

- **Roles & key stakeholders:** Ports and cities should connect innovation hubs, research institutions, and investors to facilitate business-to-business (B2B), business-to-government (B2G), and government-to-government (G2G) collaboration.
- **Targets & actions:** Ports and cities can establish testing zones, regulatory sandboxes, and expertise-sharing platforms to support cleantech growth. Cities can streamline regulations to encourage innovation and develop clear commercialisation pathways.
- **Financing & incentives:** Utilise tax incentives, investment funds, and public-private partnerships to support cleantech ventures.



CASE STUDY: DAS ES SALAAM AND TANZANIA

Collaboration for a greener future

Project objective
To cut down greenhouse gas emissions.

Theresia Dennis
Senior Environmentalist,
City of Dar es Salaam

Thobias Sonda Mathew
Principal Environmental Officer,
Tanzania Port Authority

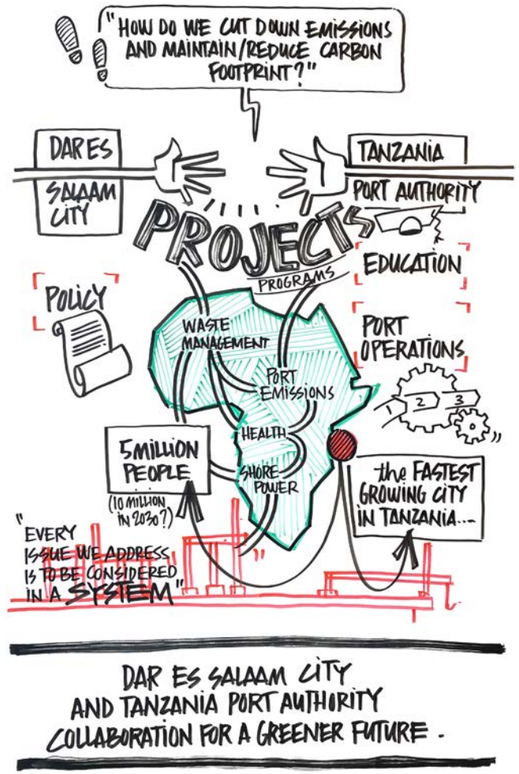
Project overview

Dar es Salaam City and Tanzania Ports Authority seek to promote sustainable transport through electric public transit, biking, and walking paths, while implementing the green port policy which includes replacing diesel-powered terminal equipment with electric-powered ship-to-shore cranes.

Other priorities include energy efficiency and waste management, particularly by integrating renewable energy sources and implementing waste minimisation practices respectively. Port-city collaboration extends to urban greening programmes – such as enhancing biodiversity through support for native plants and wildlife, and community engagement through tree-planting, air quality monitoring, and preservation of green spaces.

Project impact / next steps

Next steps include scaling the work on sustainable transport, energy efficiency, waste management, environmental and social impact assessment (ESIA) for city and port projects, engaging key stakeholders in pursuit of greener solutions and urban greening.



THEME 6

Port-city collaboration for sustainable transportation and logistics

Transforming freight, intermodal transport, and logistics to support a zero-emission future requires strong port-city collaboration. This group focused on the need for coordinated planning, policy alignment, and investment in clean freight infrastructure to drive long-term transformation in logistics systems.

By aligning efforts across stakeholders—ranging from port authorities to city planners and private sector partners—ports and cities can create integrated transport networks that reduce emissions, improve efficiency, and support sustainable economic growth. This collaborative approach ensures the transition to cleaner, smarter, and more resilient logistics systems.

Key takeaways

- **Roles & key stakeholders:** Ports serve as logistics hubs, while cities lead freight planning and involve key stakeholders such as terminal operators and residents.
- **Targets & actions:** Develop memoranda of understanding (MoUs) and pilot projects, introduce clean freight policies, and expand charging infrastructure for zero-emission logistics.
- **Financing & implementation:** Leverage public and private funding to support infrastructure expansion and encourage commercialisation of clean transport solutions.

CASE STUDY: CITY OF SEATTLE

View Case Study ↗

Driving a just transition: Electrifying drayage trucks operating in Seattle

Project objective
Address air quality and the impact on childhood asthma by electrifying drayage trucks.

Tracey Whitten
Transportation Electrification Program Manager,
City of Seattle

Project overview

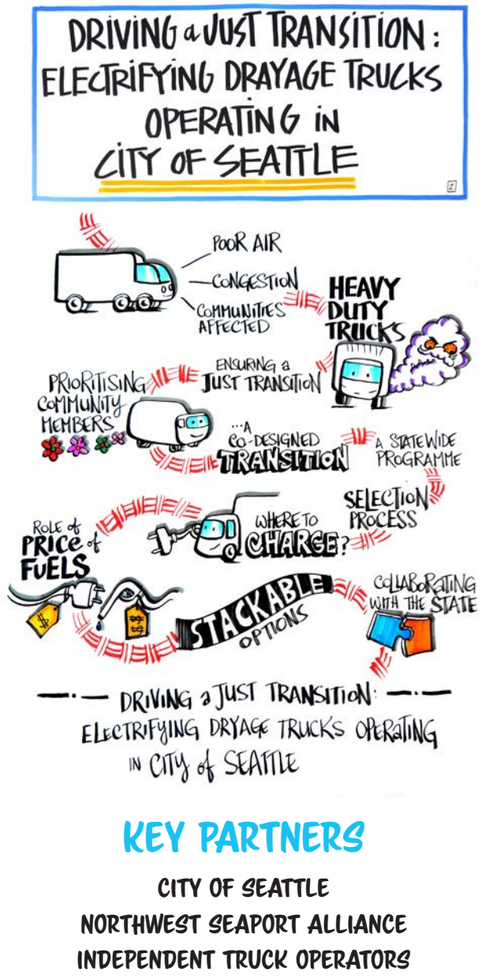
The City of Seattle is empowering independent truck operators to foster equitable, zero-emission freight solutions while ensuring cleaner air and a just transition for all.

Co-designed with frontline community members, the City is offering rebates for small, independent operators (<20 trucks), and small fleet owners to purchase electric drayage trucks.

As part of this initiative, the City of Seattle is providing one-on-one support for filling in applications, including language support.

Project impact / next steps

Next steps include collaboration with the State of Washington for wider implementation and impact.



THEME 7

Shore power integration for decarbonisation

Shore power is a critical solution for decarbonising the shipping sector by enabling vessels to plug into shore-based electrical power, reducing reliance on fossil fuels while docked. This group emphasised the need for a holistic approach to shore power infrastructure, considering factors such as equipment, end-users, grid capacity, and coverage.

Collaboration between ports, cities, and ship owners is essential to ensure the widespread adoption of shore power and to facilitate the integration of this technology into the broader decarbonisation efforts of the shipping industry. A unified strategy will accelerate progress toward a cleaner and more sustainable maritime sector.

Key takeaways

- **Challenges & considerations:** High adaptation costs require cooperation between ports and ship owners to standardise solutions and lower costs.
- **Actions & goals:** Make shore power mandatory for shipping companies with penalties for non-compliance, ensuring compliance is cheaper than non-compliance.
- **Policy alignment & regulatory support:** Promote global shore power standards and influence the International Maritime Organisation (IMO) to harmonise regulations.
- **Financing & support:** Leverage grants, national funding, and local port fees to cover the cost gap and support ports progressing towards decarbonisation goals.

CASE STUDY: PORT OF BARCELONA

View Case Study ↗

A blueprint for maritime decarbonisation through dock electrification driven by collaboration

Project objective
Implementing onshore power to enable ships at berth to connect to 100% renewable electricity.

Ana Arévalo
Head of Shorepower,
Port of Barcelona

Project overview

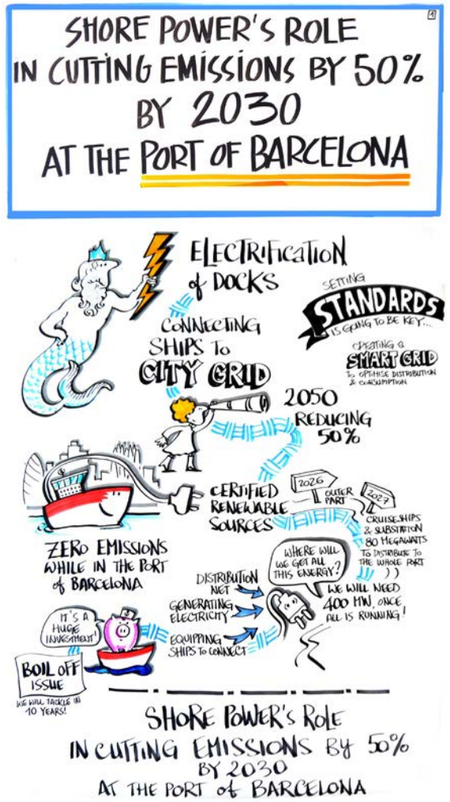
The Port of Barcelona is leading maritime decarbonisation with NEXIGEN, a plan to electrify berths and integrate onshore power supply (OPS) technology, reducing CO_2 emissions by nearly 50%.

The phased implementation (2020-2050) includes OPS pilots, infrastructure optimisation, a new Port Substation (SE Port), and a smart grid for efficient power distribution. OPS will be deployed across container, ferry, and cruise terminals, ensuring compliance with the Alternative Fuels Infrastructure Regulation (AFIR).

Project impact / next steps

By 2030, 90% of passenger ships and container ships above 5,000GT calling at the Port of Barcelona will be required to connect to OPS, aligning with AFIR.

Once fully implemented, NEXIGEN will achieve 90% reduction in emissions from ships during berthing, 50% reduction in GHG emissions, a significant decrease in NO_x, SO_x, and particulate matter, improving air quality. The next steps include expanding OPS infrastructure across additional terminals and refining operational best practices through continuous pilot testing.



KEY PARTNERS

PORT OF BARCELONA
TERMINAL OPERATORS
SHIPPING COMPANIES

CASE STUDY: GUANGZHOU PORT AUTHORITY

View Case Study ↗

Implementing clean energy equipment at Guangzhou Port

Project objective

By using shore power, Guangzhou Port seeks to implement clean energy equipment, build photovoltaic facilities, clean fuel ships and provide clean fuel bunkering for a green port collection and distribution system.

Project overview

Guangzhou Port Authority is constructing shore power facilities for various ships, encouraging leading port companies to share their experience in green and low-carbon technology adoption and clean port operation. Additionally, the port is supporting port companies to build photovoltaic facilities on warehouses, garages, and office building roofs. The port is also publicising shipping decarbonisation goals and advocating for the construction of clean fuel ships and bunkering facilities.

Project impact / next steps

Guangzhou Port's non-oil and gas chemical terminals have 95% shore power berth coverage—consumption exceeded 12.35 million kWh in 2024. Large-scale equipment use electricity, with 70% new energy container tractors in Nansha Port. A 4,000-horsepower pure battery-powered tugboat is under construction, with three pure battery-powered container ships planned. 10 electric cruise ships have been built for the Pearl River cruise and annual power generation of photovoltaic facilities exceeds 10 million kWh.

The next step is to enable methanol bunkering. From 2021 to 2023, Guangzhou ranked second in the International Urban Cruise Vitality Index.

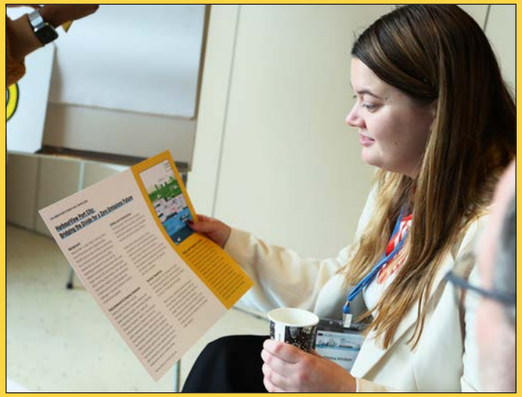
KEY PARTNERS

GUANGZHOU PORT GROUP
CITY PORT
CNOOC + OTHER PORTS, SHIPPING, AND MARINE FUEL COMPANIES

Photo, Left: Luyanda Mafumbu from the eThekwini Metropolitan Municipality

Photo, above: Zer Hien Ng from MPA Singapore presenting to a small breakout group

Photo, right: Juvarya Veltkamp from the C40 Ports & Shipping Team addresses all workshop participants



Photo, Left: Emma Minken from the Port of Oslo reviews workshop materials

C40
KNOWLEDGE

Port-city collaboration on climate action

The Green Ports Forum provides a range of resources to support cities and ports in accelerating the transition to zero-emission, sustainable operations. The C40 Knowledge Hub offers research, analysis, case studies, and implementation guides, capturing the most impactful steps to take, and practical strategies for implementation.

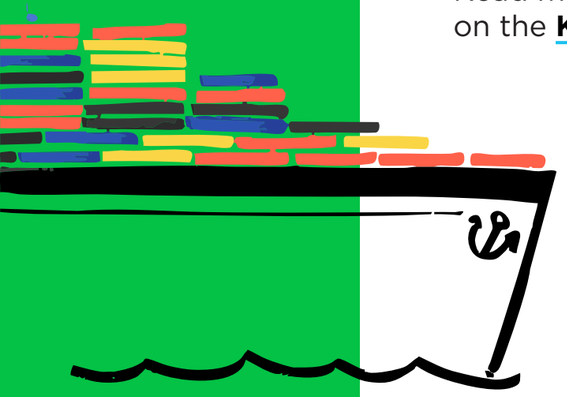
Additionally, our **Vimeo channel** hosts recordings of past webinars, featuring expert insights and case studies from leading ports worldwide.

Many materials are available in Chinese, French, Japanese, and Spanish, and these resources empower stakeholders with the knowledge and tools needed to drive a green and just economy where everyone, everywhere, can thrive.

Collaboration between cities and ports is essential to unlock the significant economic and environmental opportunities presented by the energy transition.

By working together, cities and ports can align climate strategies to address shared challenges and harness mutual benefits. While cities bring expertise in renewable energy, resilient infrastructure, and sustainable transport, ports offer the infrastructure and scale to advance clean energy adoption and innovation. Partnerships between city governments, port authorities, local communities, and businesses can create comprehensive climate action plans that reduce emissions, enhance resilience, and ensure equitable outcomes.

Read more about the following case studies on the **Knowledge Hub**.



→ Read the case study

Battery tankers and offshore wind in Yokohama

Japan's coastal ocean depth poses challenges for undersea cable installation, complicating energy transmission from offshore wind farms to areas of demand. In May 2023, the City of Yokohama partnered with Ocean Power Grid, a start-up, and TEPCO Power Grid, a utility company, to **create a green energy supply hub**.

This initiative uses **battery tankers to store and transport electricity generated by offshore wind farms** to coastal centres. The project aligns with the Port of Yokohama's goal of achieving carbon neutrality by 2050, supporting this aim through the development of electric power facilities and the provision of onshore power supply for cruise.

→ Read the case study

Energy transition in Barcelona

The Port of Barcelona is transitioning to a smart energy hub model based on **renewable energy generation, energy storage, low carbon fuels, and a smart electricity grid**. The port will move away from traditional logistics based on fossil fuel consumption, which do not meet Paris Agreement targets, to new models that decarbonise landside and sea-side activities and offer low-carbon alternatives. The Port's energy transition is driven by the Port and City of Barcelona's shared goal of reducing emissions by 50% by 2030 and achieving net zero by 2050.

Decarbonising economic activities and adopting sustainable energy technologies strengthens Europe's resilience through greater access to sustainable energy.

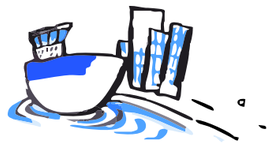
→ Read the case study

Green fuels and electrification in Seattle

The Port of Seattle is committed to becoming a zero-emission port by 2050, with a target to reduce greenhouse gas emissions (GHGs) 50% by 2030. Cruise ships are the largest source of maritime-related GHGs at the Port of Seattle. To address emissions from cruises, the Port formed a collaborative partnership with the major cruise lines, homeports, ports of call and nongovernmental organisations focused on exploring low and zero-GHG emission cruising between Washington, British Columbia and Alaska.

The Port of Seattle, Northwest Seaport Alliance, and Seattle City Light partnered to develop green methanol bunkering for the cruise corridor, aligning with the Seattle Waterfront Clean Energy Strategy. Similarly, collaborations between the port, city officials and other regional ports are expanding shore power, further advancing shared sustainability goals.

Photos: Pexels and Unsplash



Los Angeles—Long Beach—Shanghai
Green Shipping Corridor

The Los Angeles - Long Beach - Shanghai Green Shipping Corridor (GSC) is a first-of-its kind voluntary partnership of leading maritime stakeholders. Announced in January 2022, the Partnership agreed to establish the GSC to decarbonise goods movement between the largest ports in the United States and China, on one of the world's busiest container shipping routes.

The GSC aims to showcase cutting-edge goods movement technologies, decarbonisation applications, and best management practices to enhance efficiency, and catalyse technological, economic, and policy efforts to progressively decarbonise shipping and port-related activities.
The Partnership is jointly led by the Port of Los Angeles, Port of Long Beach and Shanghai Municipal Transportation Commission (SMTC), supported by C40 Cities, and includes the City of Los Angeles as one of the partners.

The Corridor Partnership has made significant progress towards the goals it set in its Implementation Plan Outline, aiming namely to:

1. Begin deploying reduced- or zero-lifecycle-carbon-emission-capable ships by 2025
2. Demonstrate the feasibility of deploying the world's first zero-lifecycle-carbon-emission container ship(s) by 2030
3. Support investment in and development of clean marine fueling infrastructure and supply

→ Learn more about GSCs

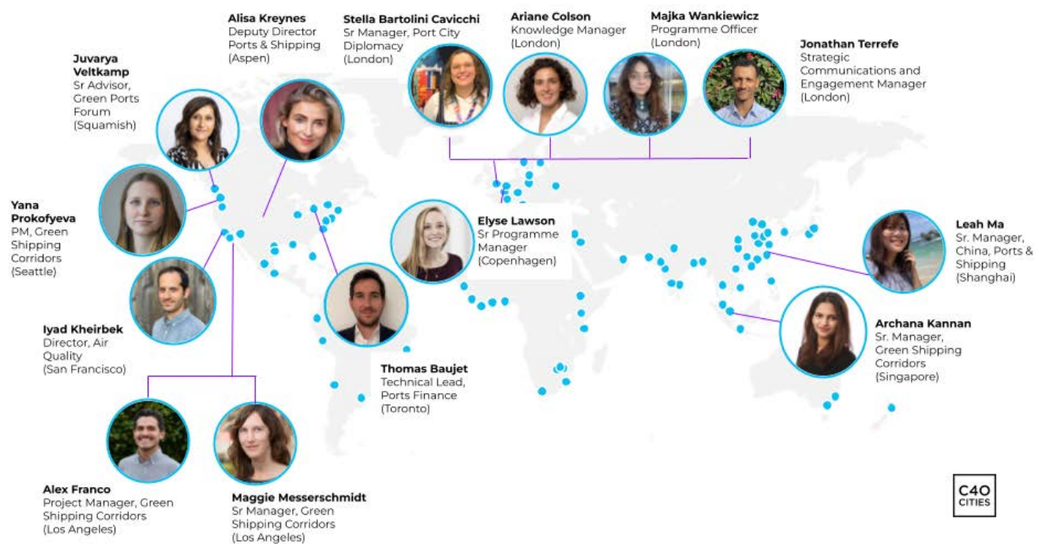
About C40

C40 is a network of nearly 100 mayors of the world's leading cities working to deliver the urgent action needed right now to confront the climate crisis and create a future where everyone, everywhere, can thrive. Mayors of C40 cities are committed to using a science-based and people-focused approach to help the world limit global heating to 1.5°C and build healthy, equitable, and resilient communities. We work alongside a broad coalition of representatives from labour, business, the youth climate movement, and civil society to support mayors to halve emissions by 2030 and help phase out fossil use while increasing urban climate resilience and equity.

The current co-chairs of C40 are Mayor Sadiq Khan of London, United Kingdom, and Mayor Yvonne Aki-Sawyerr of Freetown, Sierra Leone; three-term Mayor of New York City Michael R. Bloomberg serves as President of the Board. C40's work is made possible by our three strategic funders: Bloomberg Philanthropies, Children's Investment Fund Foundation, and Realdania.

To learn more about the work of C40 and our cities, please visit **our website**, or follow us on **X/Twitter**, **Instagram**, **Facebook**, and **LinkedIn**.

C40 Ports & Shipping Team



C40 CITIES

Green ports in action: Accelerating climate solutions through collaboration

Insights and case studies from the Green Ports Forum
Barcelona | 2024

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