



Climate change mitigation and adaptation. What works for ports?

Part 2

ClimaTech is the largest global database on technologies and strategies to...



Mitigate climate change

Identify the most effective solutions to decarbonise infrastructure.

3 scopes of emissions:

- 1 Scope 1** → direct emissions from the infrastructure
- 2 Scope 2** → emissions linked to energy consumption
- 3 Scope 3** → all other indirect emissions (transport, procurement, waste, etc.)



Adapt to its consequences

Understand the physical risks each type of infrastructure faces and assess the best resilience measures.

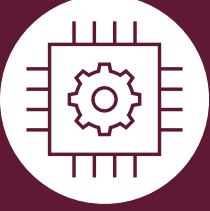
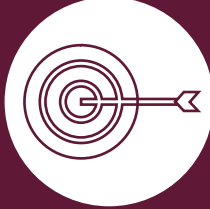
4 types of risk:

-  **Flood**
-  **Storm**
-  **Heat**
-  **Wildfire**

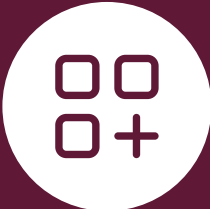
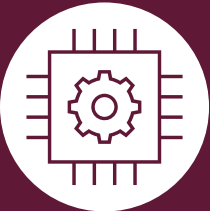
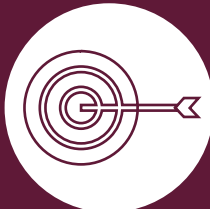
We can use ports to understand what ClimaTech can do.



Decarbonisation (1/3)

 Type of Infrastructure	 Container Port
 Category	1 Decarbonisation S1
 Strategy	Using low-carbon fuels for vehicles that cannot be currently converted to electric vehicles, such as heavy maintenance vehicles, cranes and other lifting equipment
 Key Technologies	• Biodiesel • Renewable diesel for lifting equipment • Renewable diesel for service fleets
 Effectiveness	Low 34 %

Decarbonisation (2/3)

 Type of Infrastructure	 Tool Port
 Category	2 Decarbonisation S2
 Strategy	Purchasing renewable energy from an external energy company to reduce reliance on the electrical grid, which is largely dependent on fossil fuels
 Key Technologies	• Power purchase agreements (PPAs) • Wind-generated electricity • Solar-generated electricity • Hydro-generated electricity • Blockchain-based energy tracking systems • Digital marketplaces for renewable energy credits (RECs)
 Effectiveness	Very High 100 %

Decarbonisation (3/3)



**Type of
Infrastructure**



Container Port



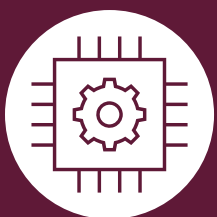
Category

3 Decarbonisation S3



Strategy

Upgrading port infrastructure
with facilities to power docked
ships with an electrified link from
the shore as opposed to burning
fossil fuels in ship engines



Key Technologies

- High-voltage shore power systems
- Smart grid integration
- Energy storage technologies

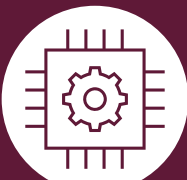


Effectiveness

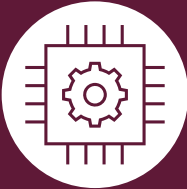
High



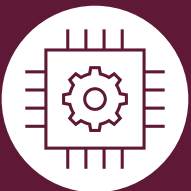
Physical risk (1/4)

 Type of Infrastructure	 Bulk Goods Port
 Physical Risk	 Flood
 Strategy	Upgrading existing drainage systems to enable them to cope with larger predicted floods
 Key Technologies	• Enlarging drainage pipes • Additional pumping stations • Integrating smart drainage • High-capacity stormwater drains • Backflow prevention valves
 Level of Typical Protection (Flood Return Period)	Medium
 Risk Reduction Effectiveness	Low 19 %

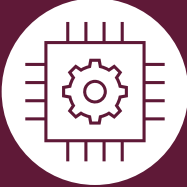
Physical risk (2/4)

 Type of Infrastructure	 Tool Port
 Physical Risk	 Storm
 Strategy	Large structures such as causeways, breakwaters and moles, either offshore or onshore, that protect assets from strong winds and associated wave action
 Key Technologies	• Reinforced concrete • Corrosion-resistant alloys • Energy-absorbing composites • AI-driven structural monitoring
 Level of Typical Protection (Storm Return Period)	High
 Risk Reduction Effectiveness	Medium 50 %

Physical risk (3/4)

 Type of Infrastructure	 Tool Port
 Physical Risk	 Heat
 Strategy	Specialised coatings applied to surfaces to reduce heat absorption and minimise temperature build-up. These coatings typically contain reflective pigments or additives that reflect sunlight and infrared radiation
 Key Technologies	• High-albedo coatings • Reflective pigment additives • Infrared-reflective coatings • Cool roof coatings
 Level of Typical Protection (Temperature Threshold)	High
 Risk Reduction Effectiveness	Medium 60 %

Physical risk (4/4)

 Type of Infrastructure	 Container Port
 Physical Risk	 Wildfire
 Strategy	Regularly remove dry brush, dead trees, and flammable debris near the asset. This reduces the fuel available for wildfires
 Key Technologies	• Automated land-clearing equipment • Remote-controlled mulchers • High-efficiency forestry masticators • Drone-assisted surveying • AI-driven terrain analysis • GPS-guided excavation
 Risk Reduction Effectiveness	High 70 %



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ClimaTech Database

Search: TICCS Category: Effectiveness:

TICCS Supersector	TICCS Class	TICCS Subclass	Category	Strategy	Description	Key Technologies	Effectiveness	Reference
Transport	Port Companies	Sea Port	Decarbonisation S1	Increasing energy efficiency of operations	Making port operations more efficient by using advanced technologies, automation and process control strategies to reduce fuel usage across the site.	Smart lighting systems, AI-driven climate control for HVAC and cooling systems, efficient cargo handling, equipment, management systems, waste heat recovery systems.	Medium	Alomarash, A.S., Rafique, F. & Ouan, A. (2023). Ports: Technical and operational measures towards greenhouse gas emissions and energy efficiency. A review. Marine Pollution Bulletin, 340, 113506.
Transport	Port Companies	Other Port	Decarbonisation S1	Increasing energy efficiency of operations	Making port operations more efficient by using advanced technologies, automation and process control strategies to reduce fuel usage across the site.	Smart lighting systems, AI-driven climate control for HVAC and cooling systems, efficient cargo handling, equipment, management systems, waste heat recovery systems.	Medium	Alomarash, A.S., Rafique, F. & Ouan, A. (2023). Ports: Technical and operational measures towards greenhouse gas emissions and energy efficiency. A review. Marine Pollution Bulletin, 340, 113506.
Transport	Port Companies	Container Port	Decarbonisation S1	Increasing energy efficiency of operations	Making port operations more efficient by using advanced technologies, automation and process control strategies to reduce fuel usage across the site.	Smart lighting systems, AI-driven climate control for HVAC and cooling systems, efficient cargo handling, equipment, management systems, waste heat recovery systems.	Medium	Alomarash, A.S., Rafique, F. & Ouan, A. (2023). Ports: Technical and operational measures towards greenhouse gas emissions and energy efficiency. A review. Marine Pollution Bulletin, 340, 113506.
Transport	Port Companies	Bulk Goods Port	Decarbonisation S1	Increasing energy efficiency of operations	Making port operations more efficient by using advanced technologies, automation and process control strategies to reduce fuel usage across the site.	Smart lighting systems, AI-driven climate control for HVAC and cooling systems, efficient cargo handling, equipment, management systems, waste heat recovery systems.	Medium	Alomarash, A.S., Rafique, F. & Ouan, A. (2023). Ports: Technical and operational measures towards greenhouse gas emissions and energy efficiency. A review. Marine Pollution Bulletin, 340, 113506.
Transport	Port Companies	Container Port	Decarbonisation S1	Low carbon fuels for power generation	Using low carbon fuels such as biofuels or hydrogen to power port operations.	Biodiesel, renewable energy, electrification of port operations, use of hydrogen.	N/A	Opagkouris, D., & Alomarash, A.S. (2023). Exhaust emissions and engine performance analysis of a marine diesel engine. Fuel, 330, 126000.
Transport	Port Companies	Sea Port	Decarbonisation S1	Low carbon fuels for power generation	Using low carbon fuels such as biofuels or hydrogen to power port operations.	Biodiesel, renewable energy, electrification of port operations, use of hydrogen.	N/A	Opagkouris, D., & Alomarash, A.S. (2023). Exhaust emissions and engine performance analysis of a marine diesel engine. Fuel, 330, 126000.

Opagkouris, D. &

