



**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.





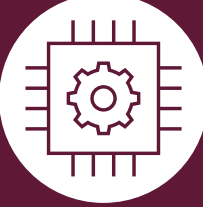
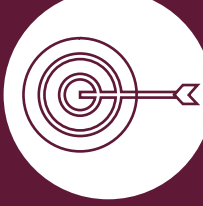
4 types of risk:

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





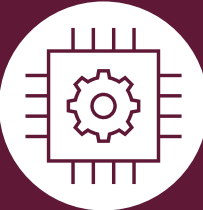
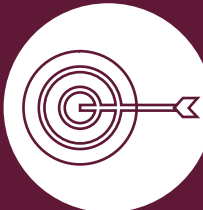
We can use ports to understand what ClimaTech can do.



Decarbonisation (1/3)

| | |
|--|---|
|  <p>Type of Infrastructure</p> |  <p>Container Port</p> |
|  <p>Category</p> | <p>1 Decarbonisation S1</p> |
|  <p>Strategy</p> | <p>Using low-carbon fuels for vehicles that cannot be currently converted to electric vehicles, such as heavy maintenance vehicles, cranes and other lifting equipment</p> |
|  <p>Key Technologies</p> | <ul style="list-style-type: none"> • Biodiesel • Renewable diesel for lifting equipment • Renewable diesel for service fleets |
|  <p>Effectiveness</p> | <p>Low</p> <p>34 %</p> |

Decarbonisation (2/3)

| | |
|--|--|
|  <p>Type of Infrastructure</p> |  <p>Tool Port</p> |
|  <p>Category</p> | <p>2 Decarbonisation S2</p> |
|  <p>Strategy</p> | <p>Purchasing renewable energy from an external energy company to reduce reliance on the electrical grid, which is largely dependent on fossil fuels</p> |
|  <p>Key Technologies</p> | <ul style="list-style-type: none"> • 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) |
|  <p>Effectiveness</p> | <p>Very High</p> <p>100 %</p> |

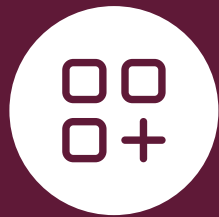
Decarbonisation (3/3)



Type of Infrastructure



Container Port



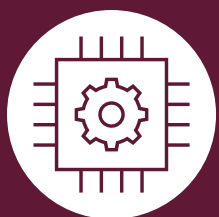
Category

3 Decarbonisation S3



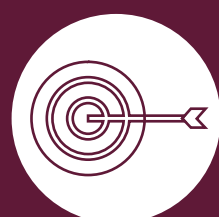
Strategy

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






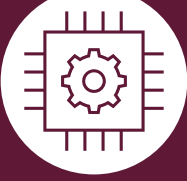




Effectiveness






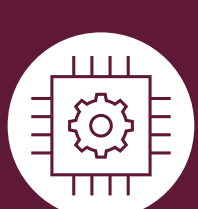


High








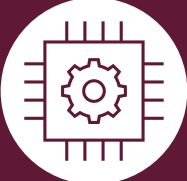



Physical risk (1/4)

| | |
|---|--|
|  <p>Type of Infrastructure</p> |  <p>Bulk Goods Port</p> |
|  <p>Physical Risk</p> |  <p>Flood</p> |
|  <p>Strategy</p> | <p>Upgrading existing drainage systems to enable them to cope with larger predicted floods</p> |
|  <p>Key Technologies</p> | <ul style="list-style-type: none"> • Enlarging drainage pipes • Additional pumping stations • Integrating smart drainage • High-capacity stormwater drains • Backflow prevention valves |
|  <p>Level of Typical Protection (Flood Return Period)</p> | <p>Medium</p> |
|  <p>Risk Reduction Effectiveness</p> | <p>Low</p> <div style="display: flex; align-items: center;"> <div style="width: 19%; height: 15px; background-color: #f08080; margin-right: 5px;"></div> 19 % </div> |






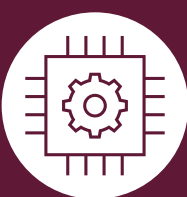

Physical risk (2/4)

| | |
|---|--|
|  <p>Type of Infrastructure</p> |  <p>Tool Port</p> |
|  <p>Physical Risk</p> |  <p>Storm</p> |
|  <p>Strategy</p> | <p>Large structures such as causeways, breakwaters and moles, either offshore or onshore, that protect assets from strong winds and associated wave action</p> |
|  <p>Key Technologies</p> | <ul style="list-style-type: none"> • Reinforced concrete • Corrosion-resistant alloys • Energy-absorbing composites • AI-driven structural monitoring |
|  <p>Level of Typical Protection (Storm Return Period)</p> | <p>High</p> |
|  <p>Risk Reduction Effectiveness</p> | <p>Medium</p> <div style="display: flex; align-items: center;"> <div style="width: 50%; height: 20px; background-color: #f08080; margin-right: 10px;"></div> 50 % </div> |

Physical risk (3/4)

| | |
|---|--|
|  <p>Type of Infrastructure</p> |  <p>Tool Port</p> |
|  <p>Physical Risk</p> |  <p>Heat</p> |
|  <p>Strategy</p> | <p>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</p> |
|  <p>Key Technologies</p> | <ul style="list-style-type: none"> • High-albedo coatings • Reflective pigment additives • Infrared-reflective coatings • Cool roof coatings |
|  <p>Level of Typical Protection (Temperature Threshold)</p> | <p>High</p> |
|  <p>Risk Reduction Effectiveness</p> | <p>Medium</p> <div style="text-align: right;">  <p>60 %</p> </div> |

Physical risk (4/4)

| | |
|---|--|
|  <p>Type of Infrastructure</p> |  <p>Container Port</p> |
|  <p>Physical Risk</p> |  <p>Wildfire</p> |
|  <p>Strategy</p> | <p>Regularly remove dry brush, dead trees, and flammable debris near the asset. This reduces the fuel available for wildfires</p> |
|  <p>Key Technologies</p> | <ul style="list-style-type: none"> • Automated land-clearing equipment • Remote-controlled mulchers • High-efficiency forestry masticators • Drone-assisted surveying • AI-driven terrain analysis • GPS-guided excavation |
|  <p>Risk Reduction Effectiveness</p> | <p>High</p> <p>70 %</p> |



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ClimaTech Database

Search: TICES: Category: Effectiveness:

| TICES Subsector | TICES Class | TICES Subclass | Category | Strategy | Description | Key Technologies | Effectiveness | Reference |
|-----------------|-----------------|-----------------|------------------|--|---|--|---------------|---|
| Transport | Port Components | Sea Port | Decarbonation II | 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 systems, offshore wind turbines, solar panels, energy storage systems, waste heat recovery systems. | Medium | Alomari, A. S., Bahri, J., & Chan, A. (2023). Port technical and operational measures to reduce greenhouse gas emissions and improve energy efficiency. A review. Marine Pollution Bulletin, 180, 113006. |
| Transport | Port Components | Other Port | Decarbonation II | 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 systems, offshore wind turbines, solar panels, energy storage systems, waste heat recovery systems. | Medium | Alomari, A. S., Bahri, J., & Chan, A. (2023). Port technical and operational measures to reduce greenhouse gas emissions and improve energy efficiency. A review. Marine Pollution Bulletin, 180, 113006. |
| Transport | Port Components | Container Port | Decarbonation II | 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 systems, offshore wind turbines, solar panels, energy storage systems, waste heat recovery systems. | Medium | Alomari, A. S., Bahri, J., & Chan, A. (2023). Port technical and operational measures to reduce greenhouse gas emissions and improve energy efficiency. A review. Marine Pollution Bulletin, 180, 113006. |
| Transport | Port Components | Bulk Goods Port | Decarbonation II | 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 systems, offshore wind turbines, solar panels, energy storage systems, waste heat recovery systems. | Medium | Alomari, A. S., Bahri, J., & Chan, A. (2023). Port technical and operational measures to reduce greenhouse gas emissions and improve energy efficiency. A review. Marine Pollution Bulletin, 180, 113006. |
| Transport | Port Components | Container Port | Decarbonation II | Low carbon fuels for power generation | Using low carbon fuels to power port operations. | Batteries, renewable energy, hydrogen, solar panels, wind turbines, energy storage systems, waste heat recovery systems. | N/A | Opferkuhl, D., & Alomari, A. S. (2023). Environmental and climate performance analysis of a port: a case study. Sustainable Production and Consumption Reports, 6, 2019-2027. |
| Transport | Port Components | Sea Port | Decarbonation II | Low carbon fuels for power generation | Using low carbon fuels to power port operations. | Batteries, renewable energy, hydrogen, solar panels, wind turbines, energy storage systems, waste heat recovery systems. | N/A | Opferkuhl, D., & Alomari, A. S. (2023). Environmental and climate performance analysis of a port: a case study. Sustainable Production and Consumption Reports, 6, 2019-2027. |

