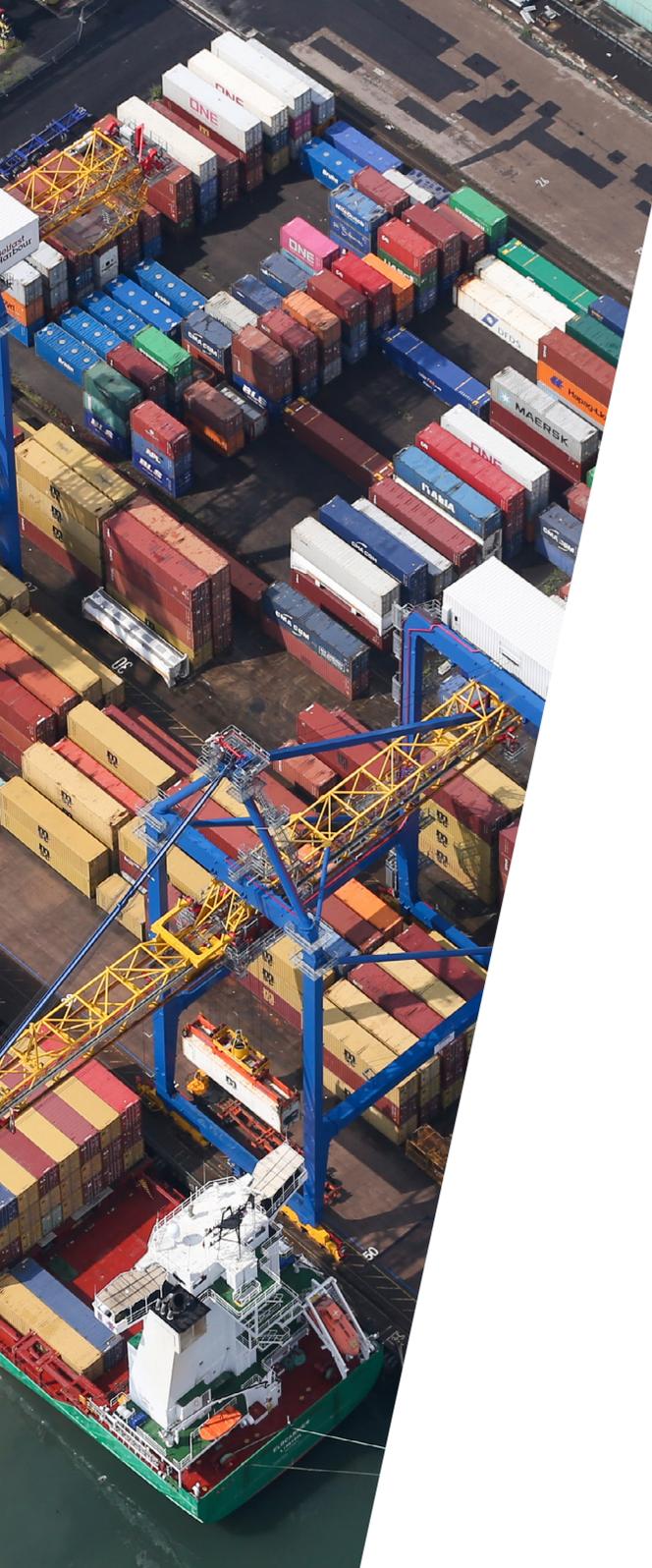




# CACHE Net Zero

Applications of space  
data and services in  
Ports of the Future





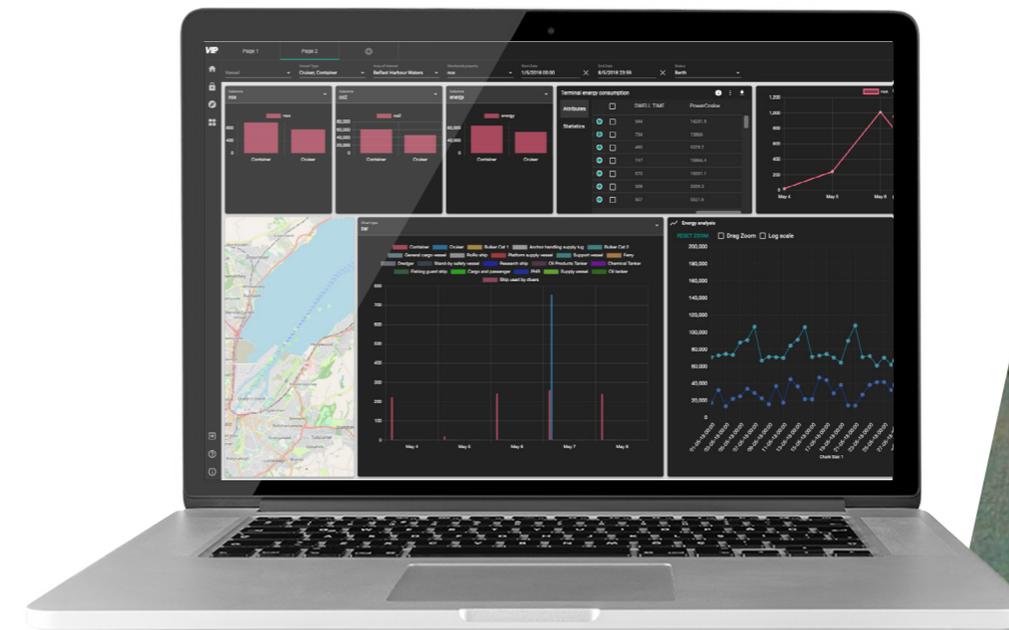
## Port Strategies for Clean Air and Clean Energy

The climate emergency is the most pressing global challenge today, leading to a growing number of industries taking action to decarbonise their activities and strive towards net zero operations.

For example, the UN's International Maritime Organisation (IMO) is promoting several initiatives to achieve the global decarbonisation of shipping and port operations. Key components of this challenge are reducing greenhouse gas emissions (GHG), improving air quality and moving to low-carbon energy sources, including renewables.

Over 90% of European ports are in urban locations and therefore contribute to their neighbouring cities' carbon footprints and air quality. However, emissions resulting from harbour operations and their impact on neighbouring environments are not yet widely monitored or validated, even though there is a clear link between reducing greenhouse gas emissions and improving air quality.

CACHE Net Zero (Clean Air and Clean Harbour Energy) is a subscription-based service that helps Port Authorities, Port Operators, and Shipping Operators develop, implement and monitor the progress of strategies to reduce emissions and energy consumption. Key ports are now recognising the role CACHE Net Zero can play in guiding them towards environmental sustainability, energy efficiency, and net zero decarbonisation.



## CACHE Net Zero as a Service

CACHE Net Zero is a suite of complementary services that are delivered through an innovative, interactive, cloud-based platform and are supported by robust data-driven analytics. These thematically linked services are designed to support Port Sustainability, Port Decarbonisation and Port Transitioning to Net Zero.

### Air Quality Inventories

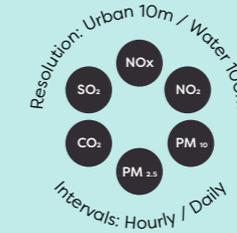
A Port Air Quality Strategy requires an up-to-date inventory that identifies how, when and where air pollution arises in the port environment and how it changes over time. CACHE Net Zero provides the means to map and locate the main sources of air pollution while differentiating between emissions from land-side and maritime-side activities, notably port quayside road traffic and shipping in port waters.

### Greenhouse Gas Emission Inventories

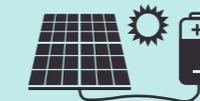
Maintaining an inventory of a port's greenhouse gas emissions is becoming increasingly important as obligatory carbon reporting becomes more stringent and port operators need to consider assessing carbon sustainability beyond minimal Scope 1 and Scope 2 reporting. CACHE Net Zero services are adaptable for evaluating Scope 3 emissions in the port's carbon supply chain.

By utilising CACHE Net Zero services, port operators and users can conduct baseline surveys of greenhouse gas emissions to develop and update their strategies for port environmental sustainability. Affordable, periodic updates enable pathways to net zero carbon and high air quality to be tracked over time.

## CACHE Net Zero delivers a suite of complementary services

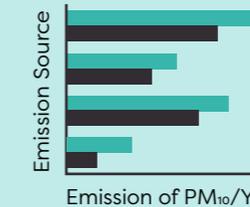


Emission Monitoring & Carbon Reduction Planning

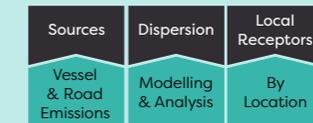


Renewable Energy Scenario Planning

Clean Energy Audit



Air emissions modelling and scenario planning



Air Quality Inventories

Greenhouse Gas Emission Inventories



“CACHE NET ZERO IS DESIGNED TO SUPPORT PORT SUSTAINABILITY, PORT DECARBONISATION AND PORT TRANSITIONING TO NET ZERO”

### Clean Energy Audit

Initial baseline assessments and ongoing audits of clean energy generation enable ports to evaluate the suitability of port infrastructure for installing renewable power sources and reduce dependence on fossil energy. The CACHE Net Zero service provides independent technical and economic analysis of, for example, the solar energy potential of rooftops and design of battery storage systems that ensure 24/7 renewable energy supplies.

### Emission Monitoring and Carbon Reduction

CACHE Net Zero offers data-driven analytics to enable Port Operators and Stakeholders to monitor and access centralised solutions for environmental sustainability, energy efficiency and renewable energy alternatives. Advanced modelling of all major emissions associated with port operations is at the heart of the service.

Annual average and hourly emission rates for NO<sub>x</sub>, NO<sub>2</sub>, PM<sub>2.5</sub>, PM<sub>10</sub> and CO<sub>2</sub> from dominant emitters can be monitored over the entire harbour or over specific key sites or infrastructure locations within the harbour.

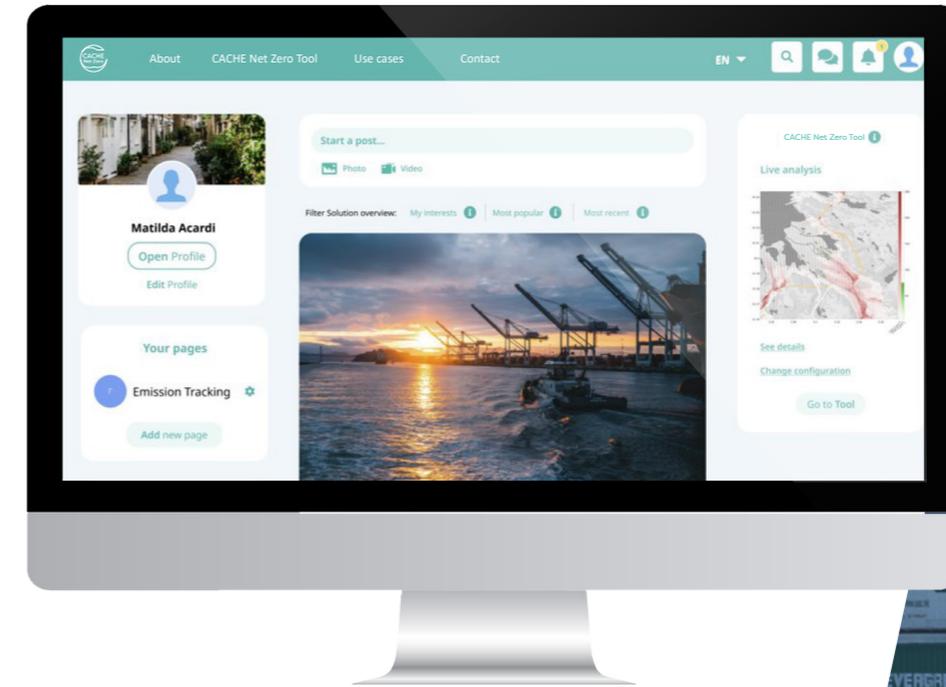
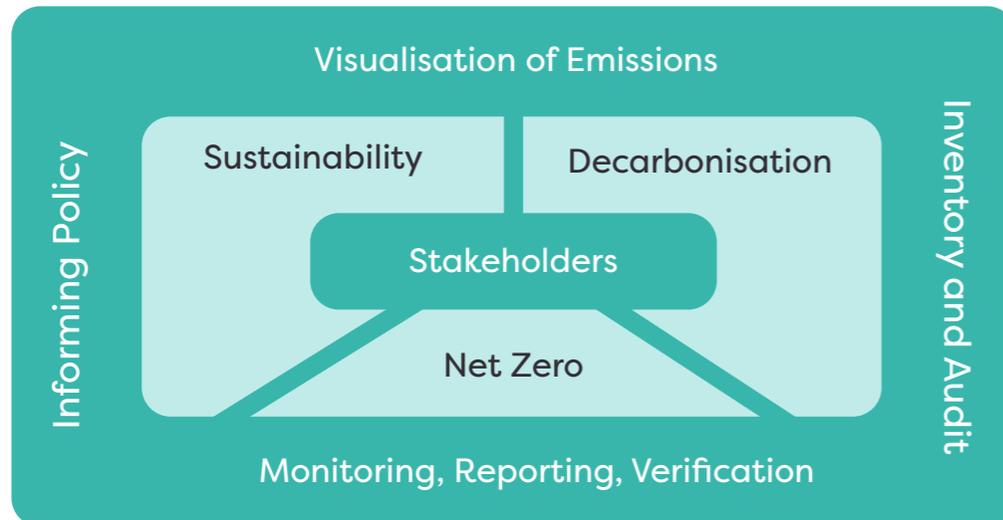
Dispersion of emissions is driven primarily by local weather and modelling provides data intelligence on emission concentrations and distributions both locally in and around the port (at 10m resolution) and in neighbouring regions, enabling the potential impacts of emissions from ports on their surroundings to be visualised and better understood.

## Benefiting Stakeholders and Communities

Through its diverse range of services and adaptability, CACHE Net Zero supports the sustainability, decarbonisation and net zero commitments held by key stakeholders including:

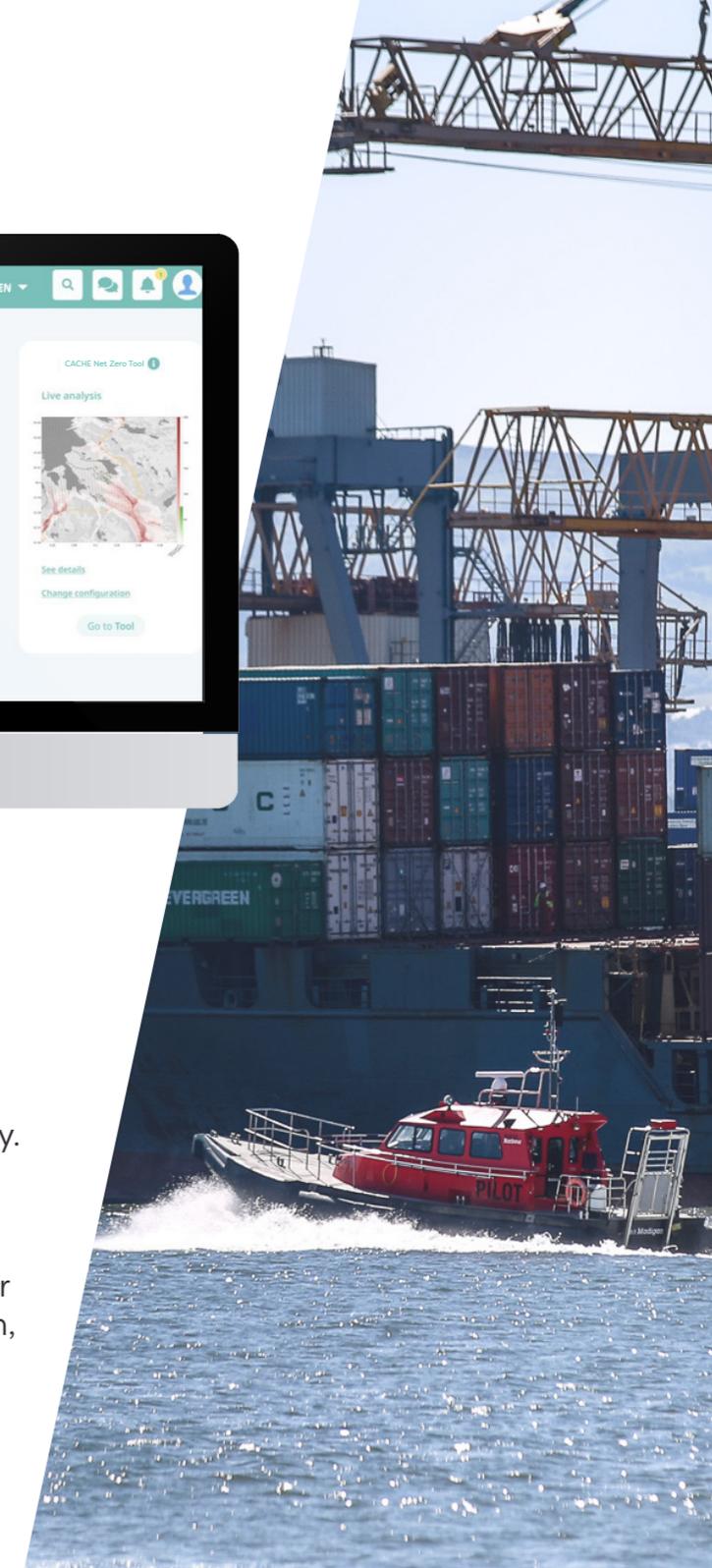
- ✓ Port Authorities
- ✓ Shipping Operators
- ✓ Port Business Tenants
- ✓ Consulting Agencies
- ✓ Local / Municipality Authorities

CACHE Net Zero offers a full solution that incorporates innovative data, regular inventories and audits, data driven analytics and high-quality visualisations. These support services for monitoring, reporting and verification of current situations and modelling of future scenarios inform policy making and establish potential environmental and financial benefits.



### CACHE Net Zero Port Community Platform

The Port Community Platform is a complementary component of CACHE Net Zero aimed to drive the transition towards sustainable practices in the maritime industry. While serving as a hub for progress reporting and findings dissemination from CACHE Net Zero to the wider ports and harbour communities, the platform also aims to foster a culture of knowledge sharing, collaboration, and innovation among key stakeholders. Ultimately benefiting the efforts towards decarbonisation.



Clean Air and Clean Harbour Energy (CACHE Net Zero) Demonstrator, brings together UK and EU leading players in downstream space data intelligence (Geospatial Insight Ltd), air and carbon emissions modelling (Redshift Associates Ltd), and smart cities (BABLE GmbH) to demonstrate a suite of space data-driven services that exploit space technologies and advanced data analytics for Port Sustainability, Port Decarbonisation and Port Transitioning to Net Zero.

This initiative is being co-funded by the European Space Agency under ARTES 4.0 Business Applications – Space Solutions.”

Belfast Harbour kindly provided a majority of the imagery used in this brochure.

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