LOOP·Ports

Circular Economy Network of Ports

FINAL CONFERENCE

Online

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Circular Economy Network of Ports (LOOP-Ports)

BUSINESS MODELS IN EU PORTS

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FUNDACIÓN VALENCIAPORT

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Business models

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BUSINESS MODELS

7

Business models

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Business models

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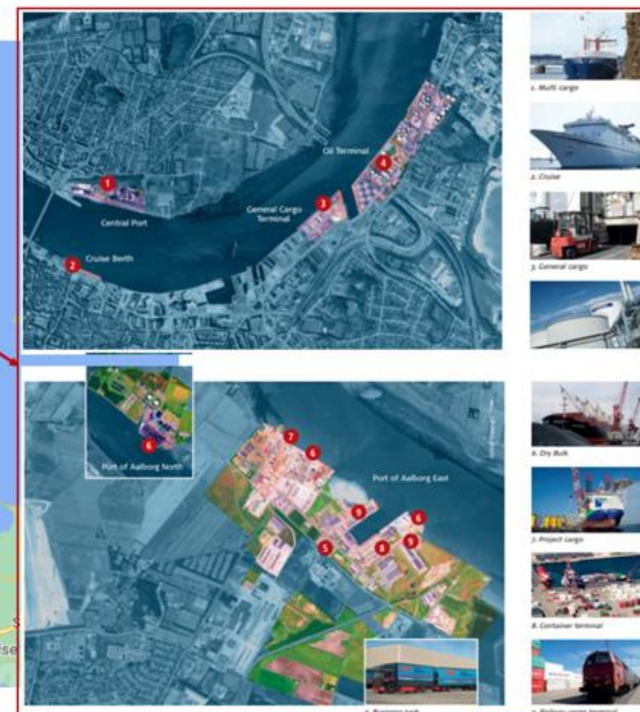
INDUSTRIAL SYMBIOSIS – BUSINESS PARK

The BM is based on the example of Port of Aalborg and industrial symbiosis practices and case studies. The objective is to create an efficient platform/model for sharing materials and by-products among tenants with the aim to enhance environmental, economic and social performance through collaboration.



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INDUSTRIAL SYMBIOSIS – BUSINESS PARK

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KEY PARTNERS

- Port tenants
- Local municipality
- Knowledge institutions

KEY RESOURCES

- Resource flow assessment system
- Synergies identification platform
- Logistical facilities

VALUE PROPOSITION

- Shared value and Improved environmental performance
- Competitive advantage through innovation and sustainable business growth

REPLICABILITY IN PORTS

- The BM is build based on different practices and lessons learned from facilitation of industrial symbiosis. Thus, the replicability of the BM is quite high.
- Potential barriers to replicability: local/regional regulations, (business) culture

COSTS STRUCTURE

- Planned

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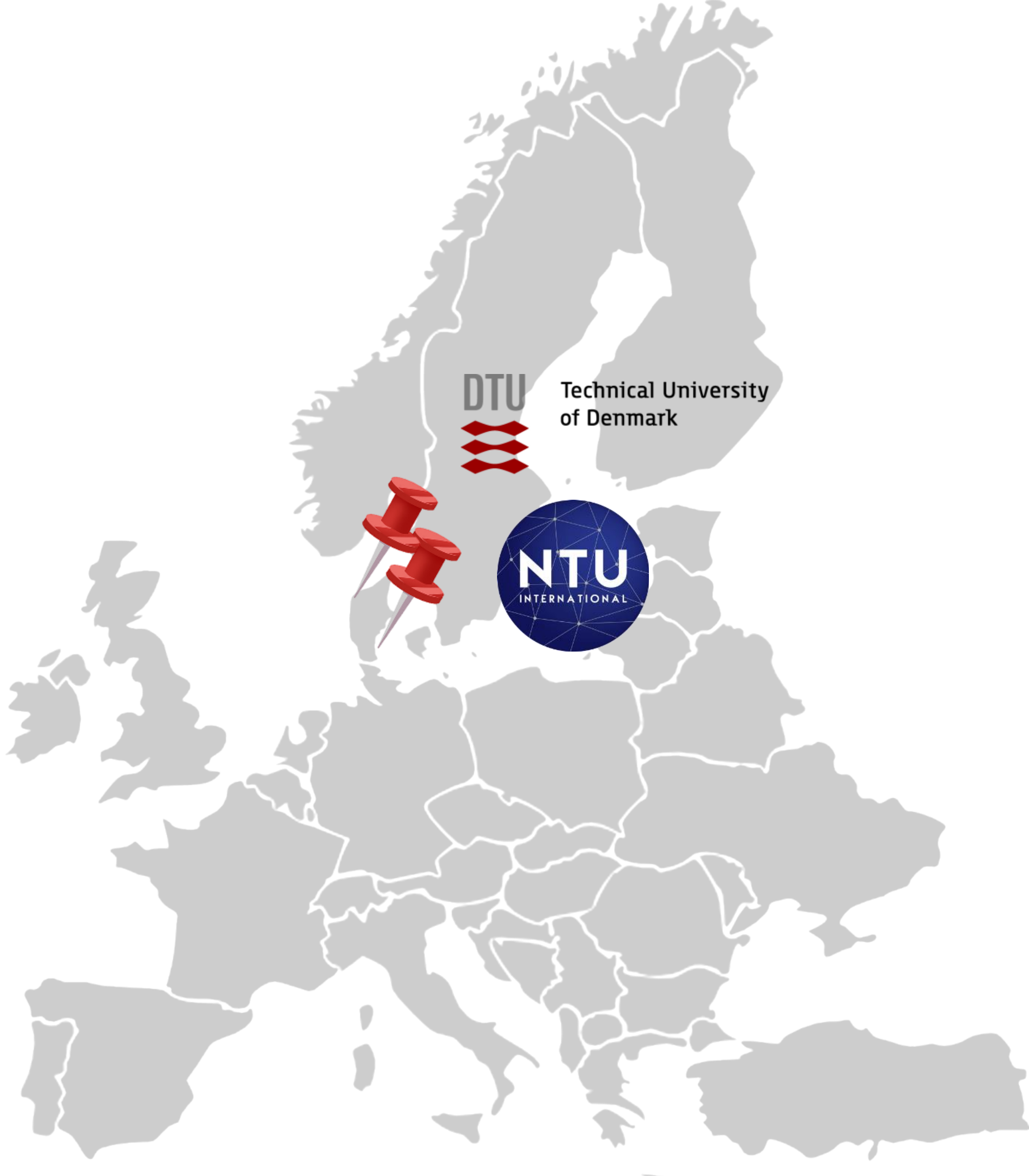

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ONSHORE POWER FOR CRUISE SHIPS – PORT OF KRISTIANSAND (NO)

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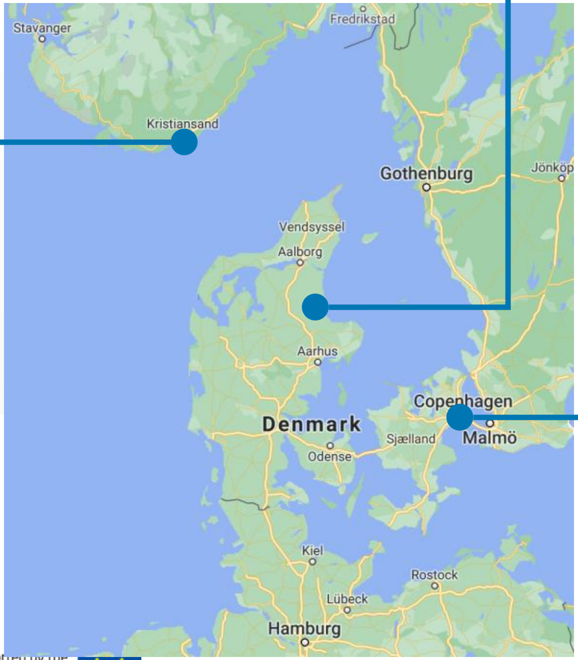
Providing cleaner energy to berthed vessels

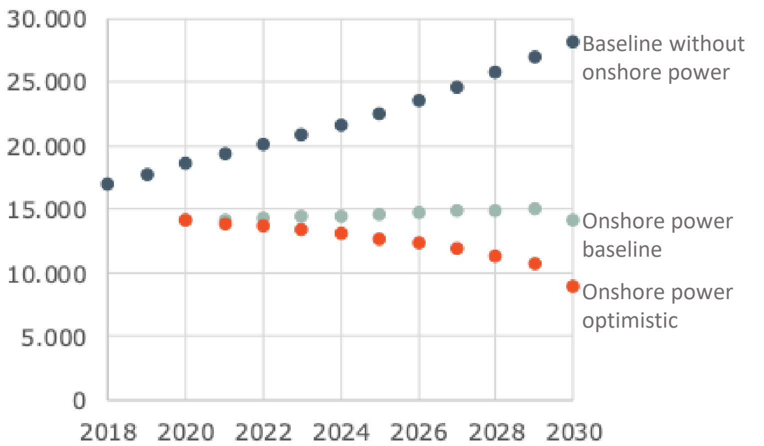
The BM is based on the onshore power for cruises calling at the Port of Kristiansand in order to provide cleaner energy to berthed vessels.

Report based on

- Implemented case in Port of Kristiansand
- Pre-analysis for Copenhagen Malmö Port
- Equipment provider PowerCon



Predicted CO2 emissions in Copenhagen Malmö Port



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ONSHORE POWER FOR CRUISE SHIPS – PORT OF KRISTIANSAND (NO)

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KEY PARTNERS

- Equipment provider
- Local energy provider
- Public investment fund

KEY RESOURCES

- Resource flow assessment system
- Synergies identification platform
- Logistical facilities

VALUE PROPOSITION

- Less particle emissions
- access to greener energy
- Extended lifetime of vessels' engines and generators.

REPLICABILITY IN PORTS

- In ports with relative many cruise calls
- access to innovation or sustainability funding
- smaller scale onshore power available for ferries and other vessels

COSTS STRUCTURE

- Approximately €5M to support 1 cruise ship
- Ports charge cruise companies €0.25-0.30/kWh
- Often only viable business case if >100 cruise ships annually. Therefore, requires public investment to set up.

Environmental impacts: up to 48% CO2 reduction, 75% NOx reduction, 50% SOx reduction.
Circular Economy: increased lifetime of vessels' engines as they run 15% less when not providing energy in port and improved access to (proactive) maintenance.

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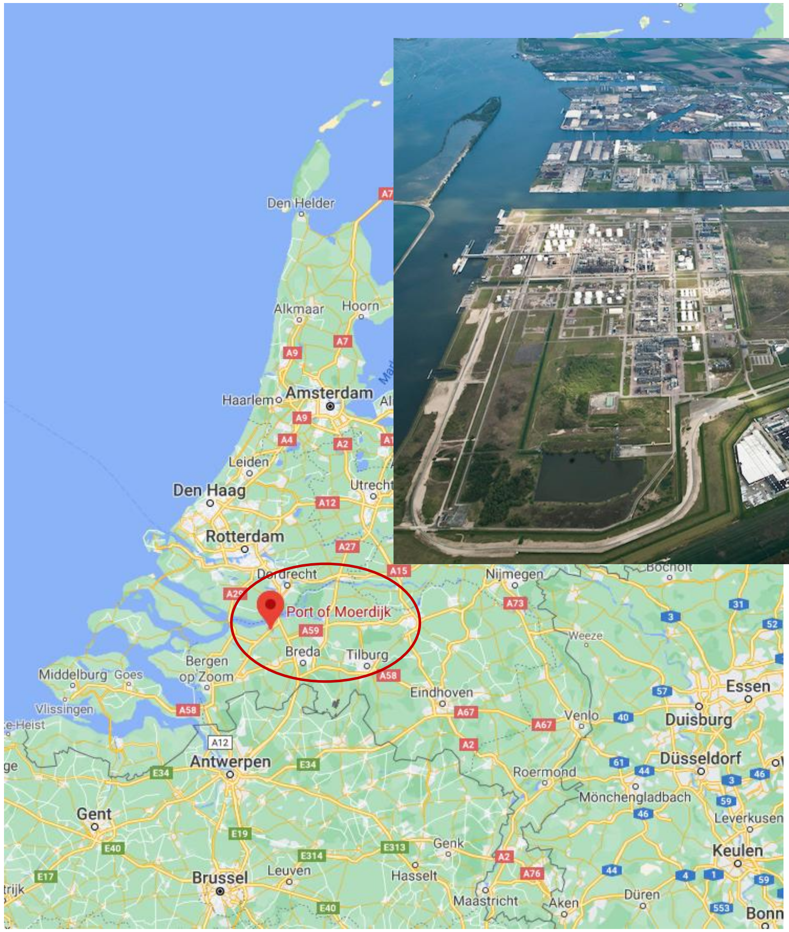
PYROLYSEPROEFTUIN – PORT OF MOERDIJK (NL)

An experimental garden to demonstrate pyrolysis

The BM is based on testing several streams for the production of pyrolysis oil



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PYROLYSEPROEFTUIN – PORT OF MOERDIJK (NL)

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KEY PARTNERS

- Port Authority
- Local Authority
- Licencing authority
- Waste treatment companies
- Chemical industry

KEY RESOURCES

- 6 demo installations built (4 operative, 1 approved, 1 under approval).
- 30+ pyrolysis value chains investigated

VALUE PROPOSITION

- "How can we get most value from the materials that we are treating?"
- "What sustainable alternative to fossil fuels can we use as feedstock?"

REPLICABILITY IN PORTS

- Port with strong industrial presence
- Respond to the innovation needs of the local industry
- Close relationship with licensing authority is key to success (planning and operation permissions)
- Port authority is pivotal to reinforce relationships within the port and with organizations (other industry, research, government) outside the port

COSTS STRUCTURE

- Total 6M€ subsidy to set up the Pyrolyseproeftuin
- Financing of demonstration runs (cost 100,000€ – 200,000€)
- 50% subsidized - 50% company investment

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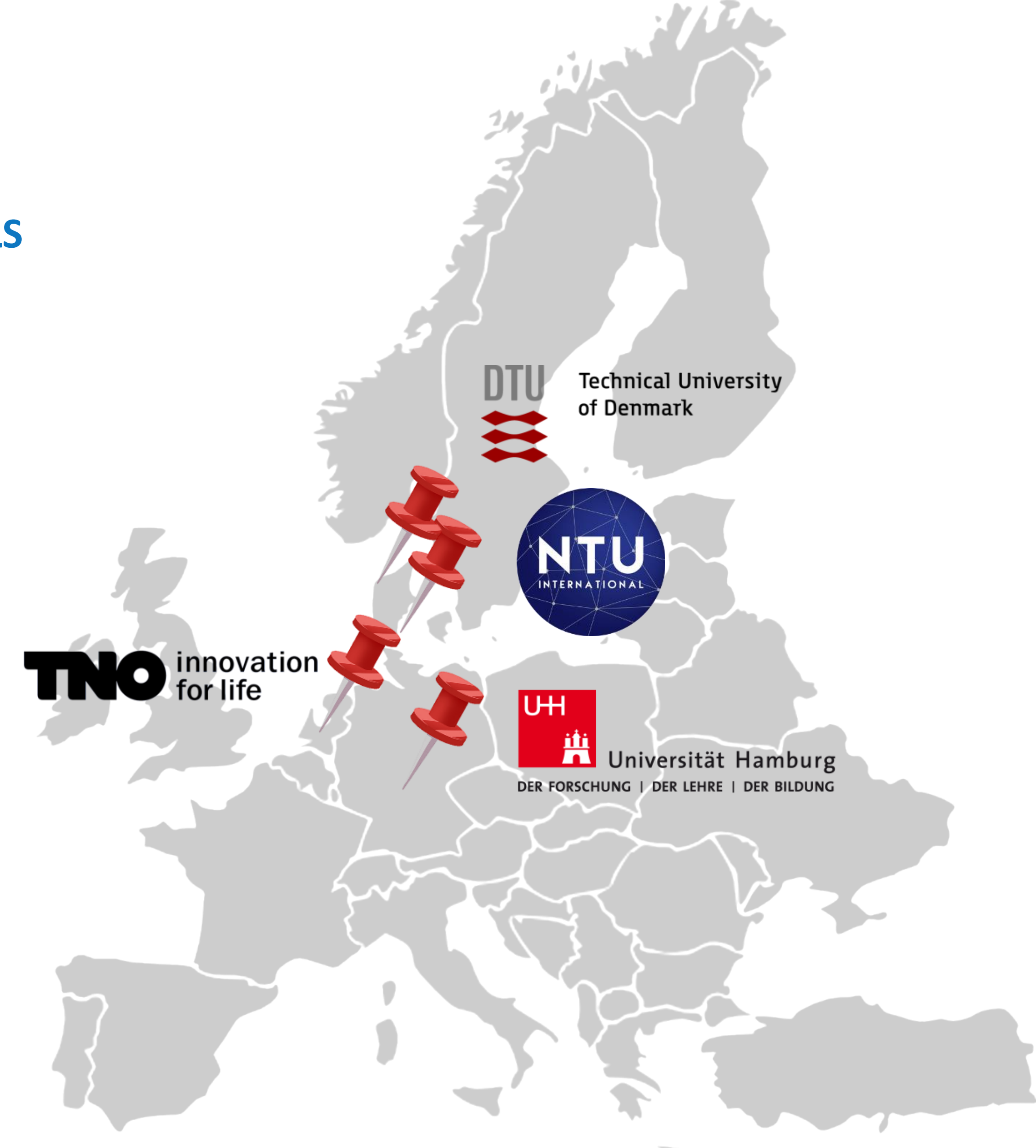

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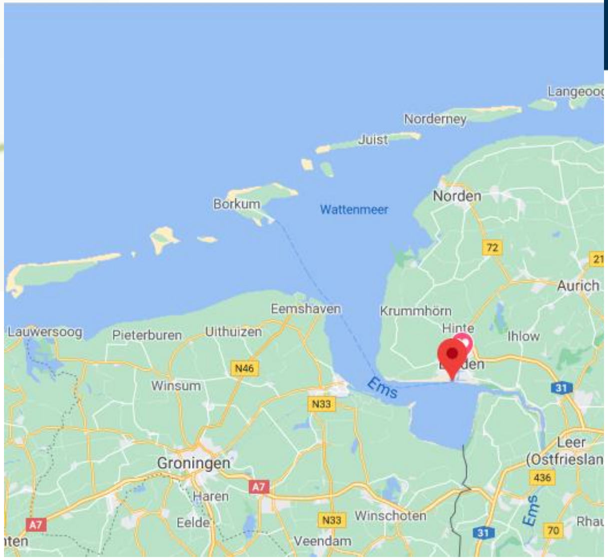
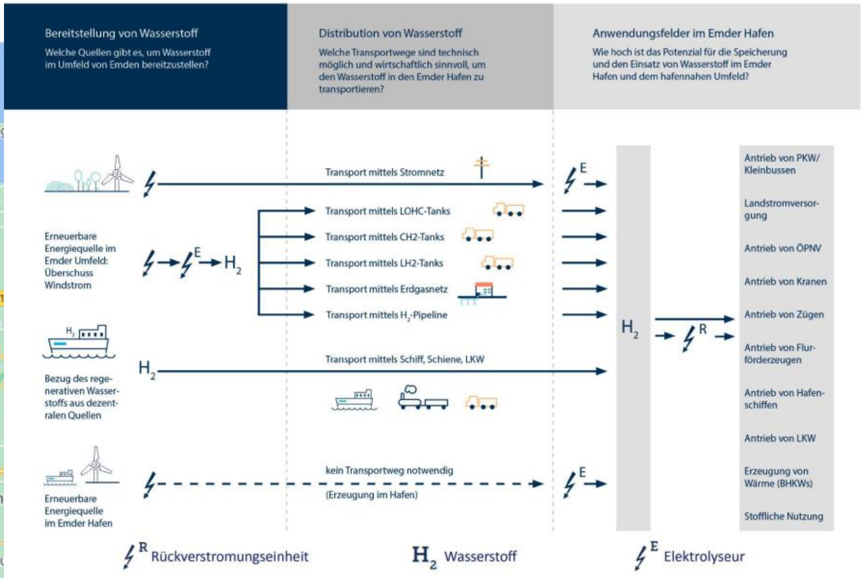
WASH2EMDEN - PROJECT FOR HYDROGEN APPLICATIONS IN THE SEAPORT OF EMDEN

The main objectives are the emission reduction in shore-side port operations and in logistics and with the ships in port by using excess wind power. Moreover, showing the technically most sensible and economical ones Hydrogen supply chain in the port of Emden is another goal

- The proximity to wind turbines, some of which generate more electricity than in the region consumed, lead to the project of Emden as a hydrogen site. The available excess wind power is converted through electrolysis to hydrogen (H2). H2 is storable, transportable and suitable for different applications in the port surroundings.
- The versatile cargo handling structure Seaport of Emden allows different fields of application test for hydrogen (e.g. applications for systems that use hydrogen directly or those that convert H2 back into electricity and use this electricity).





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WASH2EMDEN‘ - PROJECT FOR HYDROGEN APPLICATIONS IN THE SEAPORT OF EMDEN

KEY PARTNERS

- Port Authority
- Local Authority
- Regional Authority
- Port Cluster

IMPACT

Min: conversion of 30% of fossil-fueled cars and trucks – H2 demand for the port of 0,05 kt/a and for the Emden city of 1,7 kt/a.
Max: conversion of all fossil operated assets- hydrogen requirement at port of 1,6 kt/a and for the Emden city of 9,4 kt/a

VALUE PROPOSITION

Actual import prices - Green hydrogen from Marocco: 4-6 € / kg. Blue hydrogen from Arabian Peninsula or Russia: 2-4 € / kg
Estimated savings - The direct comparison shows that with a direct use of wind power (including all statutory allowances) up to 50% of the costs can be saved.

REPLICABILITY IN PORTS

Depends on costs and regulatory framework for the construction of a wind turbine, electrolyzer, storage of Hydrogen, establisment of a H2 filling station, the ports regulation and technology maturity, etc.
=> Within German regulatory framework the production of green hydrogen using conventional power or grid-connected wind power only makes sense when you look through exemptions. The tax burden is quite high, for the initiation of a hydrogen economy the framework conditions in favor of lower carbon emissions energy sources still to be adjusted (statutory allowances).
=> Green hydrogen from green electricity can be produced cost-effectively today, if wind power or photovoltaic systems without network connection and therefore without promotion of the Renewable Energy Sources Act (EEG) are in operation and the electricity is used directly for electrolysis.

COSTS STRUCTURE

- Elektrolyser of about 15.812 kg/a: est. 0,5 Million. € (Hydrogen is calculated at a price of 12.5 €/kg.)
- H2-storage over 12,7 kg H2 at 350 bar: est. 0.2 Million €
- Trucks for H2-Transport (8 bundles of bottles with a total of 100 kg hydrogen per truck): 50.000 € / truck
- H2-filling station: est. 1,0-1,5 Mio € (H2 production costs: 8-9 € / kg)
- H2 applications in trucks, cars, busses etc.: from 65.000 € / car upwards

CO2-Savings. CO2-Emissionen in the Port of Emden: 140.571 t CO2/a.

- Emission reduction vs. hydrogen demand - 1- 30% switch: 675 t CO2/a vs. 56 kt H2/a. 2 - 100% switch: 10.534 t CO2/a vs. 1.875 kt H2/a
- Depending on market readiness of H2 technologies: Short term: 2.100 t CO2/a , Mid term: 58.000 t CO2/a ,Long term: 79.000 t CO2/a

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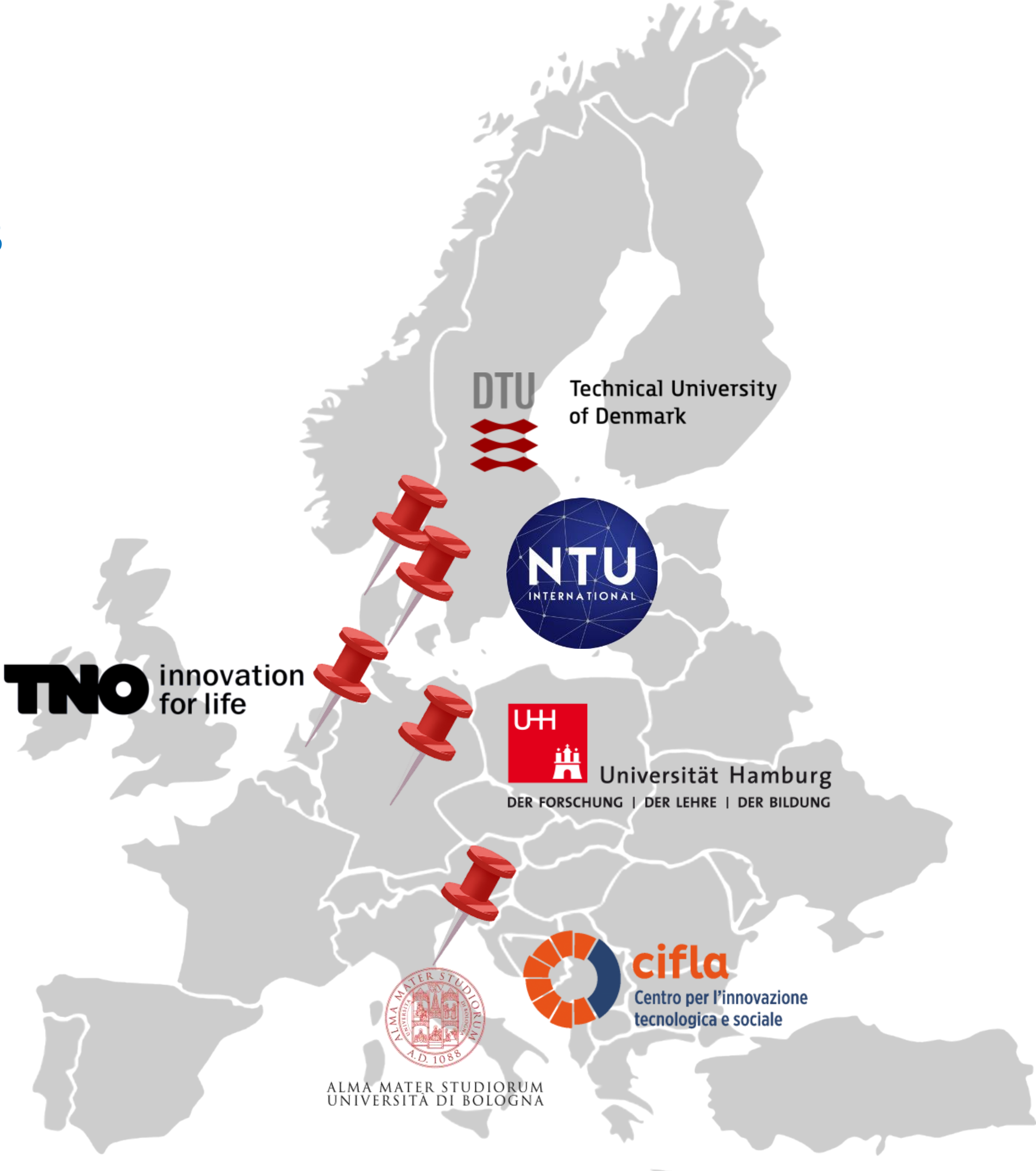

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CONTAINER SERVICE RAVENNA – CSR, PORT OF RAVENNA

CSR CONTAINER SERVICE RAVENNA srl

Customised total loss container

The main objective is to extend container durability with maintenance and repairing and reinvent a second life for total loss container

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CONTAINER SERVICE RAVENNA – CSR, PORT OF RAVENNA

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CSR CONTAINER SERVICE RAVENNA srl

KEY PARTNERS

- Port Authority
- Shipping companies
- Terminal container manager

IMPACT

- 5000 Containers repaired every year and about 100/120 customized and sold outside of the port ecosystem.
- 15 permanent job positions with an increasing need of young technical experts

VALUE PROPOSITION

- Is it possible extend container life once they are Total Loss Container (TLC) ?
- Can we customize TLC for reinvent their role outside the port ecosystem?

REPLICABILITY IN PORTS

- **Location inside the Port cluster, better if associated to Container Platform Manager**
- **Repairing and maintenance services should be included in the business**
- **Inland ecosystem with strong industrial and agricultural presence**
- **Urban regeneration vision for the City-port system**

COSTS STRUCTURE

- Investments – Total 1M€ equipment including tools for container maintenance and customisation
- Revenue – 1.5M€ entire turnover, 200k€ from customised. Container with 40% of profit

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RECYCLING FIBERGLASS FROM RECREATIONAL BOATS

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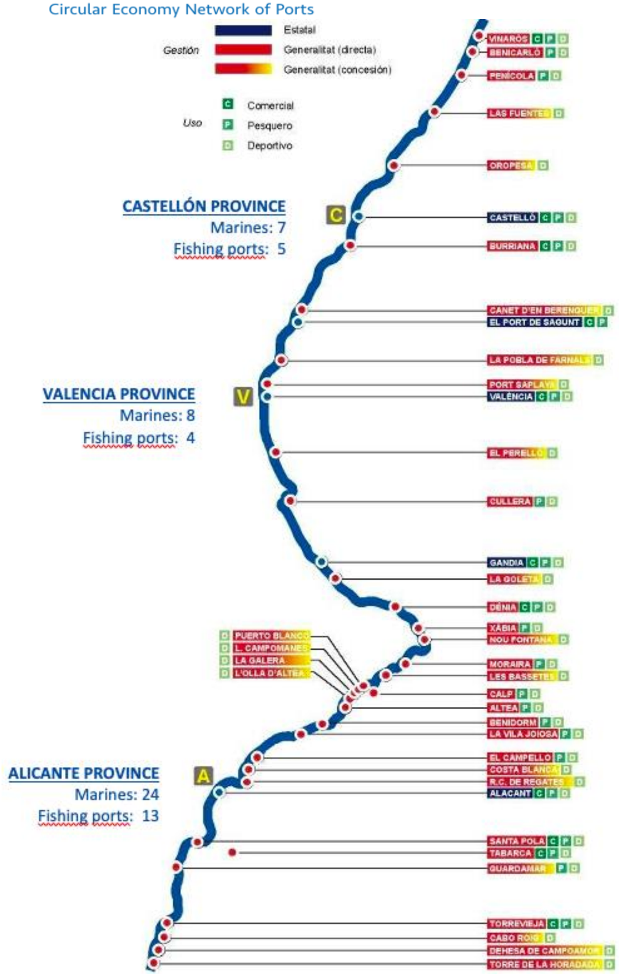

The main objective is to take fiberglass residues from recreational boats as an opportunity to repurpose the high flow of this residues by using an innovative fiberglass recycling solution (UA). The potential could impact in marinas, shipbreakers, authorised waste managers, as well as many other sectors, have difficulties to find CE alternatives for fiberglass residues.

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CM PLASTIK RECYCLING

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RECYCLING FIBERGLASS FROM RECREATIONAL BOATS

KEY PARTNERS

- Boat owners
- Marinas and Fishing ports
- Shipbreakers
- Landfills,
- Authorised waste managers
- Recycled fiberglass buyers

KEY RESOURCES

Intellectual: Fiberglass recycling method patent Uni. Alicante + Authorization revalue the fiberglass residue
Human: Chemist/ laboratory technician.
Physical: Infrastructures + Required materials/ resources

VALUE PROPOSITION

To grant the possibility of revaluing the fiberglass residue, solving mainly two problems:

- Lack of fiberglass waste management sustainable alternatives
- Lack of affordable, sustainable and circular alternatives for the management of boats at the end of their useful life.

REPLICABILITY IN PORTS

- Fiberglass residue volume.
- The dispersion between the generating parts of fiberglass residues → Transport as a critical factor.
- The existing legislation regarding the management of boats at the end of their useful life and regarding the management of fiberglass residues.
- The shipbreaking cost.

COSTS STRUCTURE

- Investments – linked to a emerging market
- Revenue – pilot

FG WASTE FROM SHIPS → PATENT REACTOR → FG AS RAW MATERIAL

FG WASTE FROM SHIPS → TECHNOLOGY MACHINERY → MATERIAL TO BE USED IN WIDE APPLICATIONS IN GENERAL INDUSTRY

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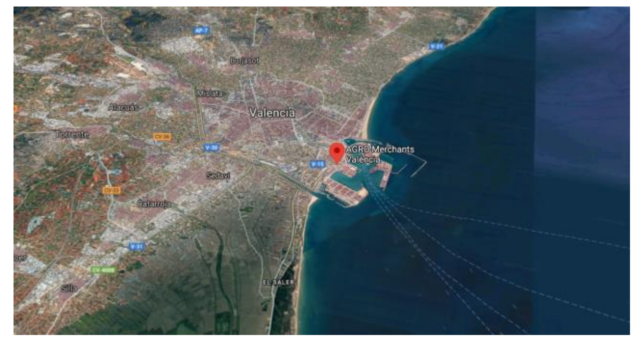
WASTE HEAT RECOVERY – PORT OF VALENCIA (SPAIN)

A solution from refrigerated warehouses at ports

The BM is based on solutions to take advantage of wasted heat recovery associated with the energy comsumption of the refrigerated warehouses located in the port for use in its urban environment (lighting, heating of buildings, heating of swimming pools, etc.)



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WASTE HEAT RECOVERY – PORT OF VALENCIA (SPAIN)

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KEY PARTNERS

- Agromerchants
- Port Authority
- Port cluster companies
- Local public authorities

KEY RESOURCES

The investor is adapting and implementing the system that collect the heat coming from the refrigerator and provides through pipes heat for the facilities. Investor selects the engineering company and balance the costs according to the revenues renting the energy to the rest of the beneficiaries

VALUE PROPOSITION

- Use of waste heat to warm the building
- Use of waste heat to dry the loading and unloading area of goods to remove humidity
- Use of waste heat to warm nearby buildings (BIP or Harbour Master Tower)
- Use of waste heat to eliminate humidity in Temagra's terminal (clean solid bulk)

REPLICABILITY IN PORTS

- Any refrigerator warehouse in a port (perishable cargo)
- Solution affected and impacted by the Industrial regulation.
- Tailored solution because the distances to the energy demand are different.
- Need of heat in the port activities to be supplied by the system
- Revenues should cover maintenance of the system and the demand must be stable and providing a good price

COSTS STRUCTURE

- Investments – 25,000 € + 25% indirect costs
- Revenue – 25% annually

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