Vilnius TECH – Maritime Academy
International conference
Maritime, offshore energy and port logistics
10.04.2025 Klaipeda

Welcome to DIOL

Interreg
North Sea

Co-funded by
the European Union

DIOL

Agenda

1. Why DIOL ?

2. Project and partnership

3. Pilots in the Work packages
* WP 1 Logistic hubs tools and services
* WP 2 Logistic hubs infrastructure
- WP 3 Policy and market support

4. Conclusion

Develop Innovative Offshore Logistics – DIOL :

facilitating the challenge, defined by the Esbjerg Declaration, in order to build the North Sea as a Green Power Plant

THE VISION

CREATE INNOVATIVE GREEN SOLUTIONS FOR LOGISTIC HUBS, SERVING OFFSHORE WIND FARMS AND ENERGY ISLANDS

Involve innovative technology to implement efficient, standardized and green competitive solutions to support the Esbjerg Declaration, and utilize the synergies from the collaboration between the North Sea countries to create wealth and economic growth.

For the realization of The Esbjerg Declaration, seaports and airports play a crucial role as logistic hubs providing green, efficient and smart logistic and service solutions.

In order to realise The Esbjerg Declaration, **a green transition** of airports and seaport takes place and two main question concerning logistic hubs can be formulated:

- How can logistic hubs in the North Sea region secure the ambitions of The Esbjerg Declaration?

- How can logistic hubs secure Energy Security, Sustainable Energy and Energy Resilience?

In May 2022 the Esbjerg Declaration was announced by Denmark, Germany, Netherlands , and Belgium.

In April 2023 the Oostende Declaration was announced and France, Ireland, Luxembourg, Norway and United Kingdom joined – so now we are 9 countries!

The North Sea Summit

Ostend, 24th of April 2023

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DIOL??

Our way of thinking DIOL!!

DIOL are adding seaports, airports, technology providers, scientific partners, legal and policy framework around new innovative technology and

developing offshore logistic solutions

providing the development of sustainable Renewable Energy infrastructures.

Interreg North Sea program 2021-2027

The Esbjerg Declaration

DIOL -Develop Innovative Offshore Logistic – accommodating the needs from The Esbjerg Declaration

- Lead beneficiary: Airport of Esbjerg/Municipality of Esbjerg
- Number of partners: 13
- Estimated total budget 7.300.000 €
- 60% ERDF-finance and 40% own finance

Partners in DIOL:

Logistic hub:	Airport of Esbjerg - Lead beneficiary
Logistic hub:	Port of Esbjerg
Logistic hub:	Port of Cuxhaven (Nports), DE
Logistic hub:	Airport of Den Helder, NL
Logistic hub:	Port of Oostende, BE
Logistic hub:	Port of Brest, FR
Scientific provider:	VIVES, BE
Scientific provider:	Fraunhofer, DE
Technology provider:	H2X Ecosystems, FR
Technology provider:	Brittany Aviation, FR
Technology provider:	Skeydrones, BE
Technology provider:	SeaTopic, FR
Technology provider:	AquaSmart Engineering BV, NL


seamade


Partners in DIOL

DEVELOPING OFFSHORE LOGISTIC SOLUTIONS!!

WP 1: Logistic hubs support Equipment/tools & manned/unmanned offshore transfer services
Work packages Leader: Fraunhofer

WP 2: Logistic hubs infra structure Facilities
Work packages Leader: VIVES

	Test/ Demo	Invest	Report s	Events/ Work-shops	Partners involved	Pilot leader
1) Long distance/Heavy load cargo drones (transfer material to/from hubs/islands)	X	X	X	X	Esbjerg A/P, Ostende P, Cuxhaven, Fraunhofer, VIVES	Fraunhofer
2) Green building equipment/cranes in construction/operation of installations	X		X		Esbjerg P, Brest, Cuxhaven	Brest
3) Smart operations data management and flexibility	X		X	X	Esbjerg A, Den Helder A Ostende P, Cuxhaven, Brittany Aviation, Vives	Esbjerg A
4) Smart environment data management for operations quality & safety	X		X		Brest P, Den Helder A, Brittany Aviation, VIVES, SeaTopic, AquaSmart Engineering BV	SeaTopic
5) Logistic hubs spatial planning and facilities adaptation		X	X	X	Esbjerg A, Ostende P, VIVES, Den Helder,	VIVES
6) Energy infrastructure security/surveillance/safety/facility	X	X	X	X	Esbjerg P + A, Den Helder A, Vives H2X, Brittany Aviation, Fraunhofer, Skeydrones, AquaSmart Engineering BV	Esbjerg A
7) Green fuel storage/supply in logistic hubs	X		X		Esbjerg A, Brest P, VIVES, Cuxhaven, H2X Ecosystems	H2X
8) Maritime storage facilities	X	X	X		Brest P, Esbjerg P	Brest

WP 3: Policy & Market supporting N5 GPPoE and Energy Islands realization Solutions upscaling and capitalization
Work packages leader: Esbjerg A

All partners

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PILOT 1: LONG DISTANCE DRONES FOR OFFSHORE OPERATIONS FROM LOGISTIC HUBS

FRAUNHOFER - Offshore Drone Campus Cuxhaven

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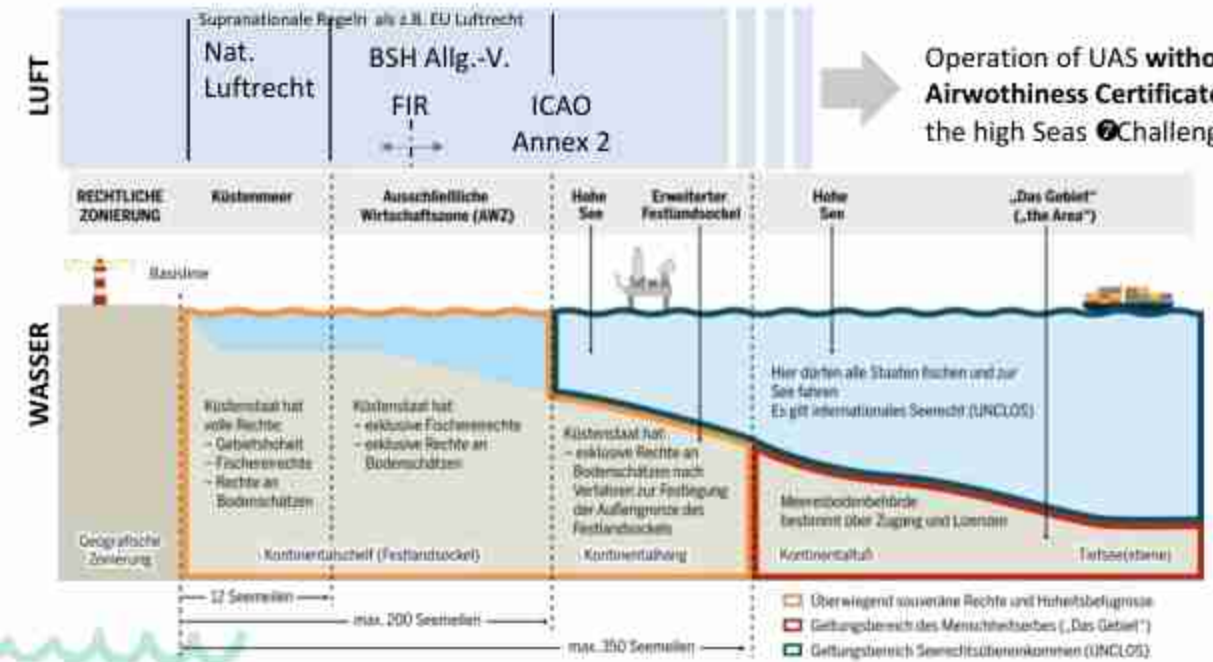
Fraunhofer IFAM

Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM

FROM CTV Vessels to Drones

Long haul flights – Leaving the 12 Nm Zone (EEZ)



Operation of UAS **without a Airwothiness Certificate** over the high Seas ❷Challenge

Details zu finde im ICAO Circular 328

Bildquelle:
https://de.wikipedia.org/wiki/Ausschließliche_Wirtschaftszone

Long haul flights – Leaving the 12 Nm Zone (EEZ)

Discussions with LBA ongoing

Long haul flights – Export control when leaving the 12 Nm Zone (EEZ)

- Coordination with Fraunhofer Central Entity
- Dual Use List (EU) 2021/821
- Export control numbers 9A012 and 9A112 refers to UAV
- A flight into the EEZ is an “export”
- General license for this purpose is available (Link1, Link2)
- Obligation:
  Mandatory documentation for entering and leaving the EEZ incl. landing destination
  Within 30 days this must be registered
- Concerning the “export control”, thereby all legislative requirements are fulfilled


REGULATION (EU) 2021/821 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 20 May 2021

(OJ L 206 11.6.2021, p. 1)

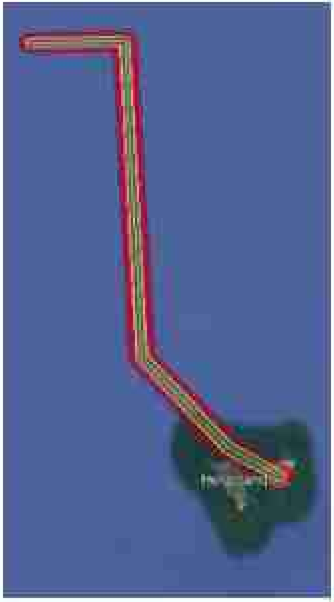

CHAPTER II

SCOPE

Long haul drone flights (Flight 1&2)

Flight 1:
Heligoland – SOV
In Cooperation with RWE
53km one way
Planned for End of 2025
Must be a VTOL-Drone

Source:
[illegible]



Flight 2:
Heligoland – Esbjerg
172km one way
Cross Border
Export Control
Find a way "into Esbjerg harbour"
EKEB is Fallback/Alternate
Planned for 2026

Status update

Pilot 2 - Port of Esbjerg

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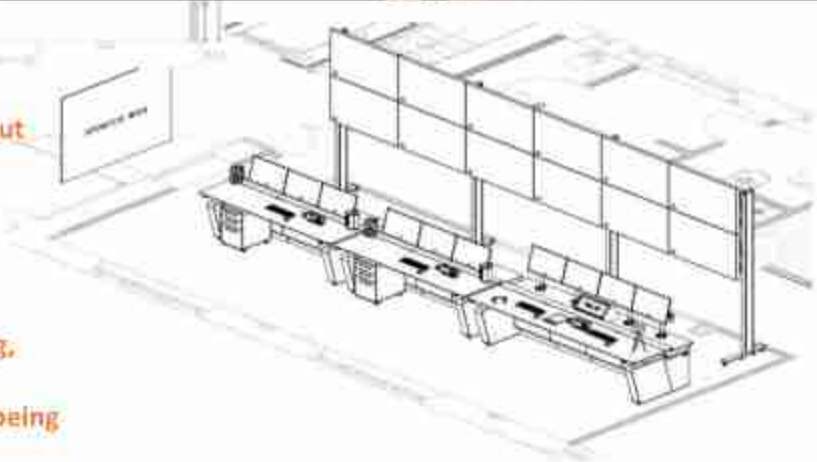
Blue Water Terminal Port of Esbjerg

Combination of:

- Portcontrol
  - Handling information from/about ships / drones
- Dronepilots
  - Piloting ships into the port



Coorporation with the airport of Esbjerg, controling the airspace

- a system to close communication is being set up

layout of area

Inside ISPS-area and nearby stakeholders technical warehouses at the port.

Extended area for the testfligt if the solution will be a fixed-wing-drone.

Area around for storage of drones and materials to be transported.

Next step is defining a more specific layout of the area.

Pilot 3 - Port of Brest

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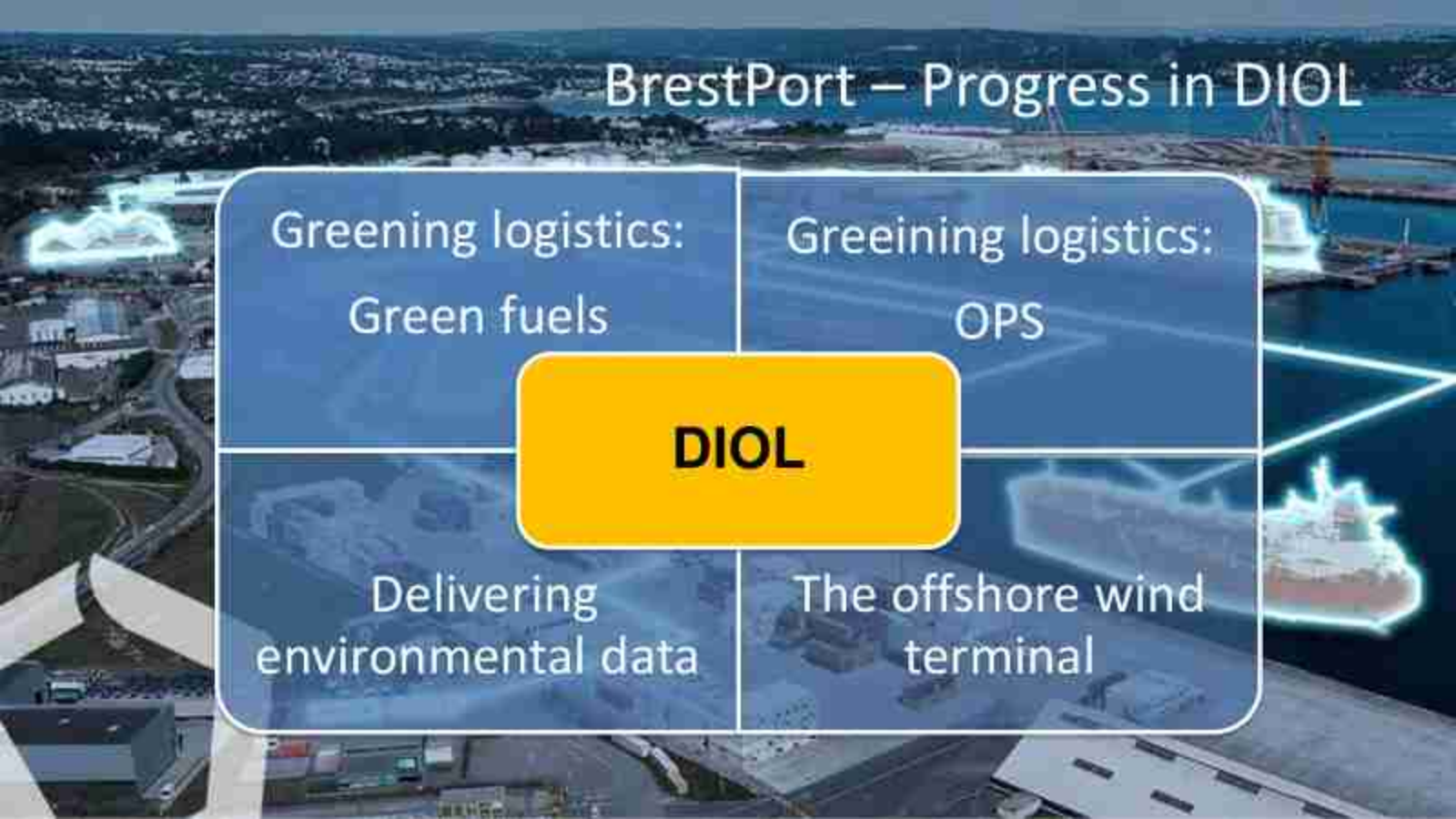
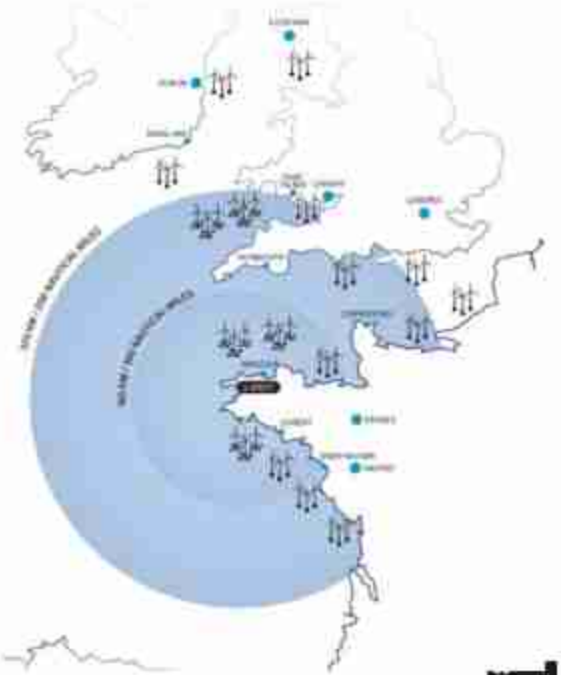
BrestPort – Progress in DIOL




A gas stock area already secured to welcome H2 / e-fuel plant
OPS and EMS
Refuelling berth for new fuels LNG, H2, e-fuels
Large dry docks for complex LNG/H2 vessels
Biodiversity protection zone
Heat production plant (waste recycling)
Gas (10% bio) liquefaction and storage plant
The green energies area: with land capacity

BrestPort at the heart of the Atlantic offshore wind market
5 to 10 GW/year for 20 years starting from 2030



Offshore wind: DIOL follow up

- Priority: manufacturing and integration of floaters, for Atlantic wind farms, keeping the integration of turbines and fixed-bottom wind logistic
- An initial financial support of the French 2030 program: €190 million planned for all ports in a call for tender (January 2025).
- Future steps to be developed within a European framework, reflecting the role of ports in the development of Europe's energy sovereignty.

Access to *all environmental data from one central server (data hub) and visusalised on standard equipment*

- Safety of ports operation:
  - Forecast environmental conditions (wind, waves, currents, tides) to secure loading/unloading operations :
  - **Especially important for offshore wind logistics**
- Safety of navigation :
  - the VTS station of the port becomes the information exchange tool with ships navigating in the area: ships get trafic and environmental conditions in real time
- Offshore wind farms surveillance and maintenance

Technical solution: the S-100 standard of IMO/IHO

Additional work: the S-100 standard of IMO/IHO Integrate drones and helicopters in the lancdscape

- Meeting with IHO director Mathias Jonas to get support of IHO as a whole
- Meetings stakeholders at the EMD2024
- Just add a new additional layer in the S100 standard
- Next: presentation to Hydro 2024

Pilot 4 - Port of CUXHAVEN (NPORTS)

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island supply, passenger transport, offshore cargo
Norderney
Baltrum
Langeoog
Spiekeroog
Wangerooge
Norden /Norddeich
Bensersiel
Hooksiel
Fedderwardersiel
Wilhelms-haven
Emden
bulk and general cargo, chemical products
motor vehicles, paper, wood and forest products, liquid cargo, building materials, project cargo, island supply, offshore/onshore cargo
Oldenburg
Brake
Großensiel
Bremerhaven
Cuxhaven
RoRo traffic, motor vehicles, building materials, project cargo, offshore cargo
Stade
bauxite, liquid and solid chemicals, building materials
Hamburg
cereals, animal feed, paper, wood and forest products, sulfur, iron, steel, project cargo
Bremen


Cuxhaven

Offshore Base Cuxhaven / Berth 8

Energy berth (160 m) with sole strengthening/ Jack Up potential

Lateral port (216 m) with gantry crane (500 to)

Foto: W. Scheer

Offshore Base Cuxhaven / Berths 9

Photo: W. Scheer

Offshore Base Cuxhaven / Berth 9.3

Ramp ap. 50 m wide, designed for heavy load operations

Berth 4

Start of construction: July 2016

Start of construction : end of 2017

Invest: ca. 36 Mio €

Operated by CuxPort GmbH

Jack Up possibility

Current Projects

Berth 5 - 7

Start permission process: 2016
Receipt of permission: 2019

Actually: preparing tender for operation and building
Starting building process at 4. Q. 2024

- Costs: ca. 300 Mio €
- 3 berths with a total length about 1.300 m
- ap. 28 ha new terminal area
- Ready for heavy load
- Deep enough for all installation vessels next generation

Offshore Base Cuxhaven / Berths 9

Shore Connection for ships

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Pilot 5 - AQUASMARTXL

Drones for the construction and the inspection of wet port infrastructure

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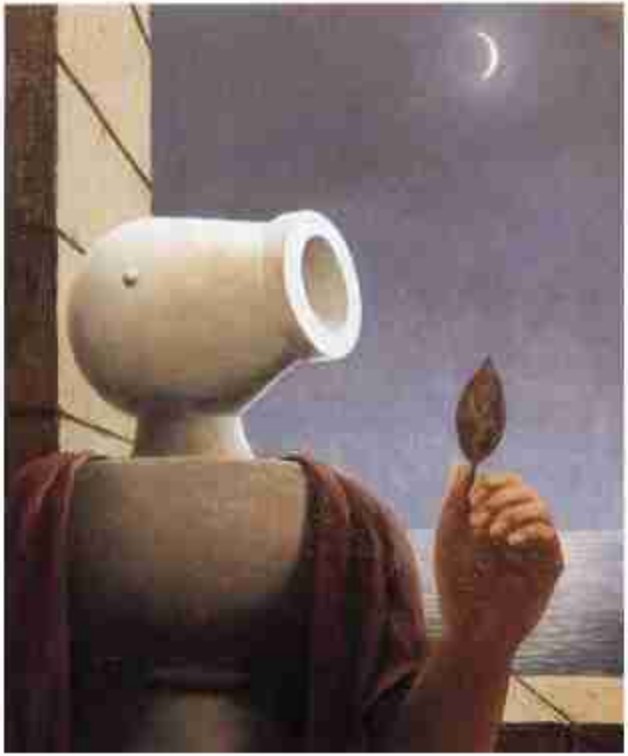
Upgrading aquatic drones & robots (hardware)



1. Upgrading aquatic drones & robots (hardware)

1.1 USV "Camera drone 2.0"

- **Characteristics**
  - Floating unmanned drone reaching narrow places between seal level and underside of the top deck of waterborne infrastructure (quays, bridges, piers).

    Equipped with camera for visual inspections and lighting for locations with no or limited daylight. Tethered and un-tethered versions.

- **Activities**
  - Design, drawing, printing and/ or ordering parts, assembling components, functional test, stress test, integral test.

    (thrusters, frame, electronics, lighting, controlling, painting)

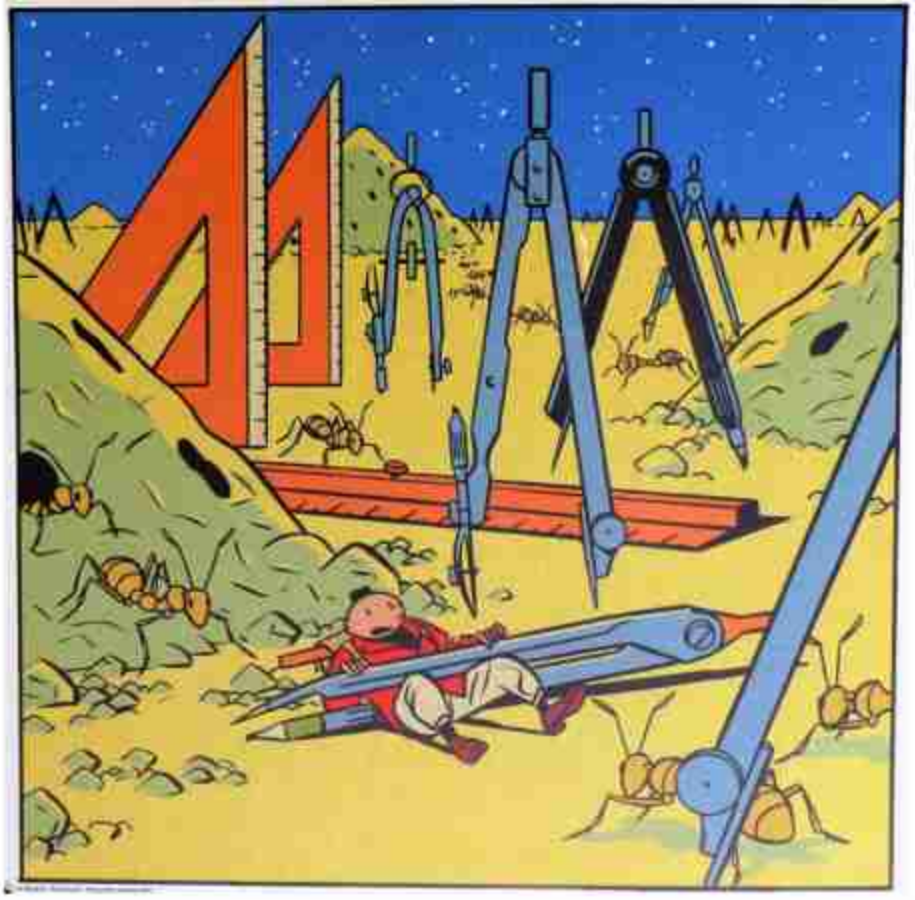
1. Upgrading aquatic drones & robots (hardware)

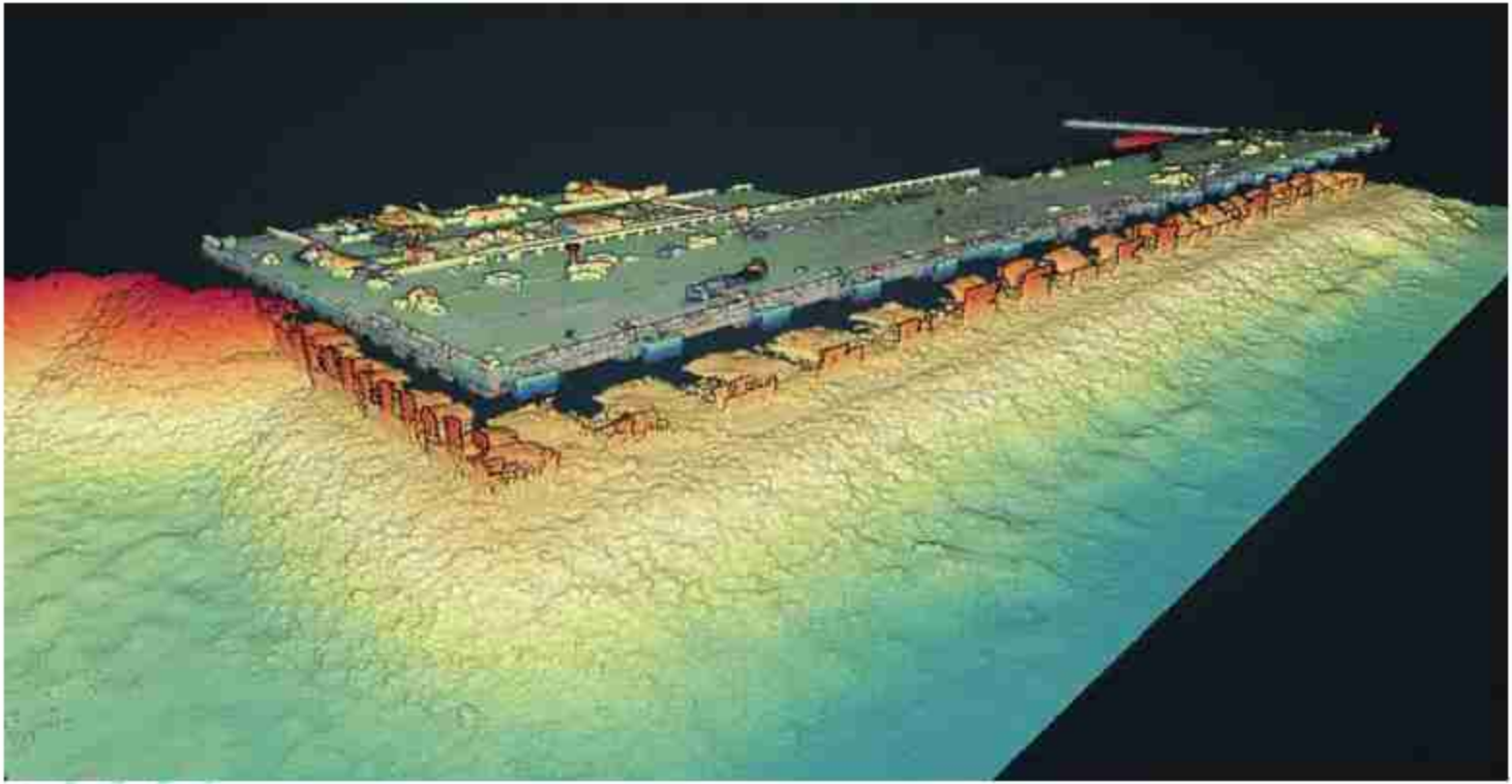
1.1 USV "Camera drone 2.0"

A floating unmanned drone, for inspecting quays built on caissons, with limited access between sea level and underside of top deck. Can operate in dark areas with limited or no daylight. The tethered version is used for deeper entries underneath the quay (potential loss of GPS signal) and un-tethered version for the front and the side of the quay.

1. Upgrading aquatic drones & robots (hardware)

Enhancement
AI data platform
(software)





Pilots

Pilot in Port Esbjerg (DIOL)

Pilot 6 - VIVES - University college

Drone development for fence inspection

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Hardware composition

- Polaris Electric
  - 70km range – 35km/h
  - Heavy duty -> Resistant to sabotage
- Sensor stack selection
  - GNSS RTK
    - 2 cm accuracy with FLEPOS (Flemish position system)
    - Optional own base station possible
  - LiDAR
    - Environment perception for global planner
    - Obstacle avoidance, long range
  - Depth cam
    - Obstacle avoidance, short range
    - Low light conditions -> no problem
  - 360° camera
    - Capture one, look many

Software development

- ROS2 based setup
  - Defacto the standard toolbox for robotics
- Own microservice architecture
  - Scalable, flexible, fault-tolerant
- On-device Intelligence
  - No cloud dependency for decision
- Hardware-agnostic
  - Can run on every type of robot
    - Wheeled, robot dogs, humanoids, …
- Strong focus on simulation
  - Risk reduction, cost efficiency, rapid iteration
- Cloud
  - Fleet Manager with OTA update support and Realtime data connection
  - Data lake
    - 360° image viewer
    - Ready for AI integration
  - Task manager

3D map from Google Maps.
Focus on exact GeoReference, less on high-end textures

Pilot 7 - H2X ECOSYSTEMS

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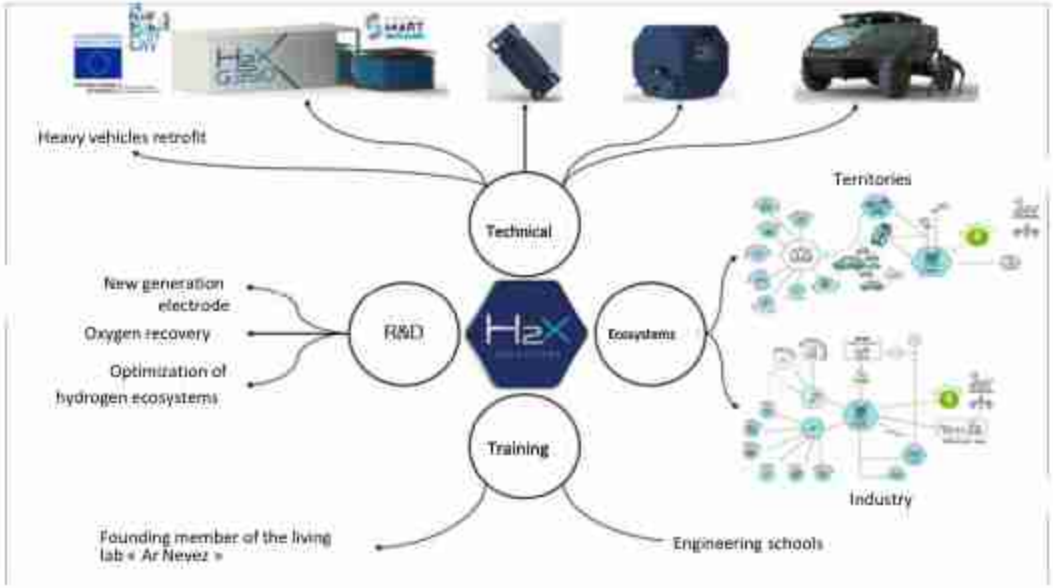

Heavy vehicles retrofit
Technical
Territories
New generation electrode
Oxygen recovery
Optimization of hydrogen ecosystems
R&D
H2X
Ecosystems
Training
Industry
Founding member of the living lab « Ar Nevez »
Engineering schools

HUB 350

H2X-Ecosystems develops an electro-hydrogen genset of high power supplied by renewable hydrogen.

Uses :

- Power grid support (in collaboration with Enedis)
- Shore power supply for ships
- Event
- Humanitarian or disaster zone
- Electrical erasure

Completely carbon-free, without noise pollution and emitting only water.

Labeled « Le Havre Smart Port City », « Smart Marina » and supported by Région Bretagne and by FEDER.

Low powers : Non Road Mobile Machinery

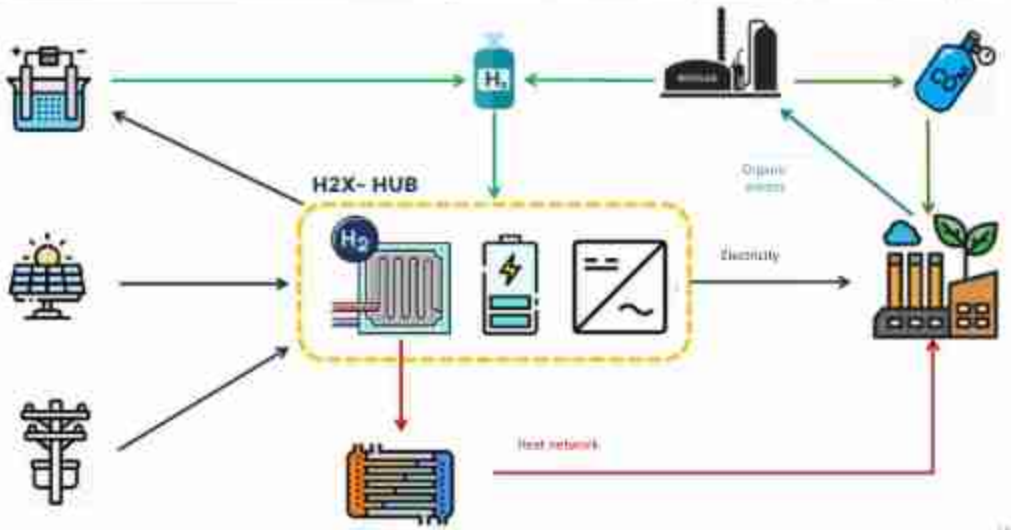
Hermione

2023 – under optimization – DIOL Pilot 6

Piranh2a

2026 – under development – DIOL Pilot 1&6

Industrial ecosystems with biogas



Industrial plants ecosystems

Functions :

- Hydrogen production on site,
- Low and High pressure storage,
- Solar panels
- Generator powered by hydrogen (Fuel Cell),
- DC/AC Conversion at battery storage

Applications :

- Elimination of peak consumption of the plant,
- Optimization of the site's carbon footprint,
- Traceability of energy flow....
- Electricity price smart management

Features :

- 100-900 kg H_2 300 bar
- 100 kWc at 1MWc solar farm
- 8-32 kg/j production H_2
- 100-700 kWh batteries
- 100-600 kW Hydrogen genset

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Thank you for your attention

More information:

Wim Stubbe - Aartlink

wistu1964@gmail.com