
WIND
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From mind to matter
#WINDMEETSGAS24

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WIND MEETS GAS.

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The Challenge of Developing Port Infrastructure for Europe's Offshore Wind ambition

Port Infrastructure to drive the Energy Transition

Presentation Wind meets Gas

Patrick Walison

4 October 2024

9:20 – 9:45

Introduction

Patrick Walison – Maritime Strategy & Investments

Introduction

International economist with 15 years of experience in the maritime industry and (offshore) energy transition

Expertise

- Maritime strategy & business plan development
- Energy transition business cases & investments
- Economic analysis & trade forecasting
- Financial modelling & CBA

Professional experience

- Consultant & Economist, RHDHV
- Strategy & Markets Advisor, Van Oord
- International Advisor Technology Industry, FME

Sectoral knowledge

Maritime, Ports, Offshore, Energy, Industry

Education

Erasmus University, School of Economics
International Economics, RSM Strategy

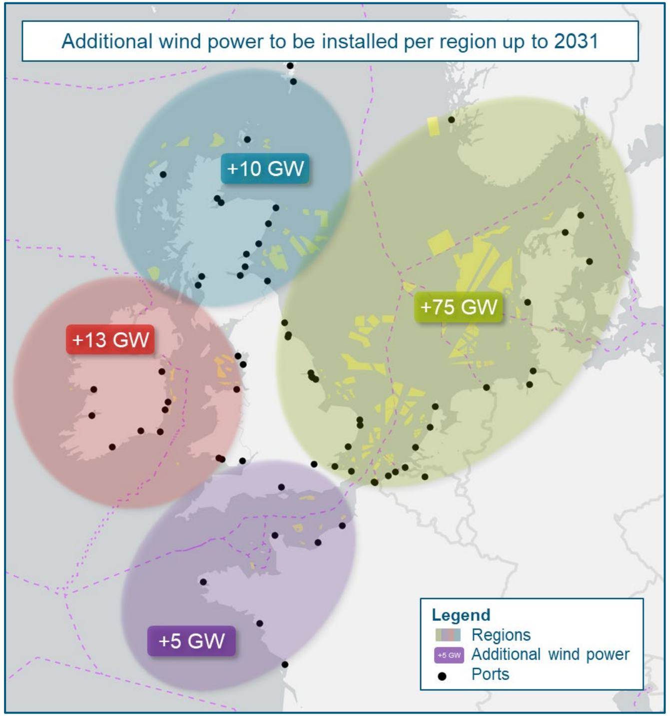
Recent project experience

- ✓ North Sea Basin Study Wind Ports
- ✓ RUK FLOW Industry Roadmap 2040
- ✓ NSEC Offshore Wind Port Capacity Study
- ✓ Impact of Hydrogen in Dutch Seaports
- ✓ Green Corridor Rotterdam - Singapore
- ✓ Shore Power Inventory Study NL
- ✓ LH2 Bunkering in Port of Den Helder
- ✓ Pre-feasibility of ZCBF in Morocco
- ✓ ESPO New Energy Landscape

Immediate action needed in port infrastructure development to meet offshore wind targets and decarbonisation ambitions

- Offshore Wind deployment rate times four by 2030
- Ports must invest heavily to keep up
- 5 key challenges are holding ports back
- All stakeholders need to take action

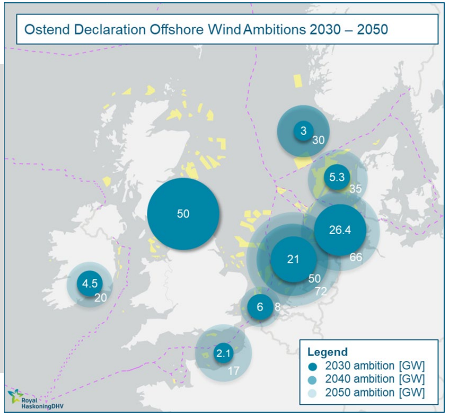
Content



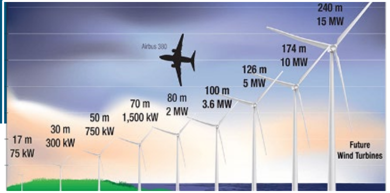
Additional wind power to be installed per region up to 2031
+10 GW
+13 GW
+75 GW
+5 GW
Legend
Regions
+5 GW
Additional wind power
Ports

Offshore wind is a booming market…

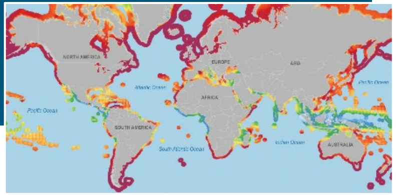
Global offshore wind is forecasted to grow from over 60 GW at the end of 2022 to 240 GW by 2030 and over 410 GW by 2035. Europe is aiming for 300 GW in 2050.



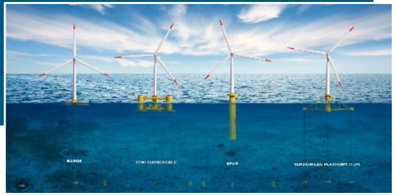
Scale of projects and turbines



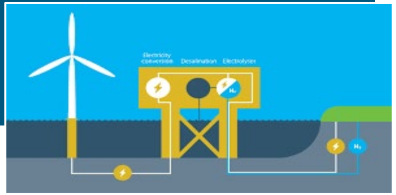
Becoming a global market



Floating offshore wind



System integration and Power to X

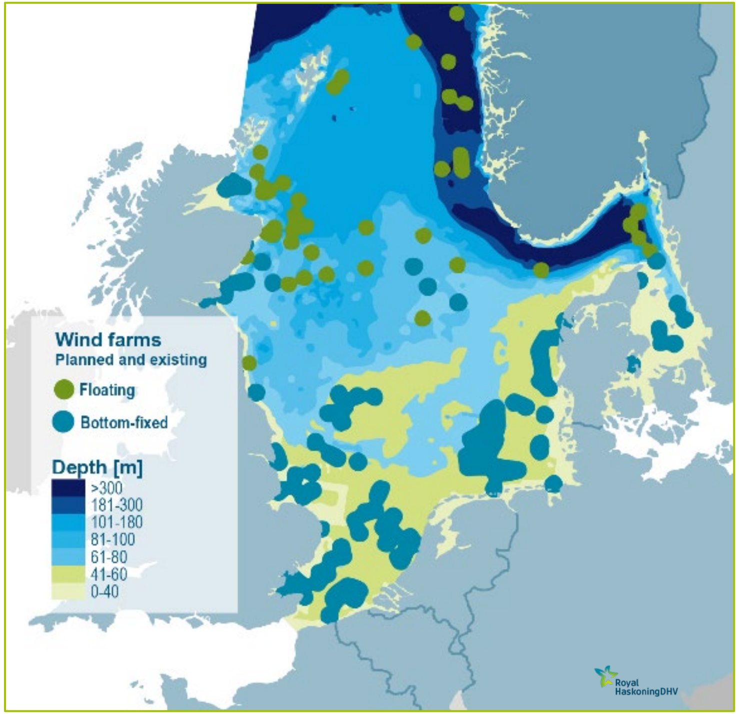


Source: GWEC, Economist, NSEC

Demand for offshore wind port capacity peaks in 2030 and remains structurally high until at least 2040

Offshore Wind Demand Scenario

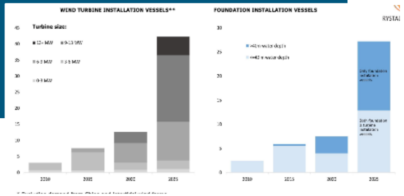
- Countries surrounding the North Sea Basin: Installation of ~15,000 new wind turbines before 2050
- Significant supply chain challenges to support this growth
- Suitable & sufficient port infrastructure in the North Sea identified as important bottleneck

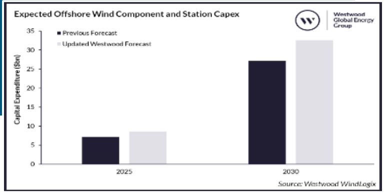


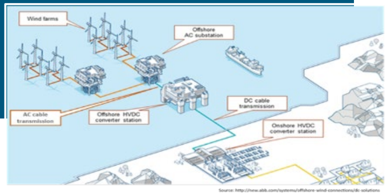
…with growing pains

The offshore wind market needs to deal with three core supply chain challenges:
1) Securing access to raw and rare materials against decent prices
2) Scaling manufacturing capacity
3) Built and optimise logistics and installation capacity

Supply chain industrialisation	Vessel & supply chain shortages	Cost & inflation	Grid & interconnection





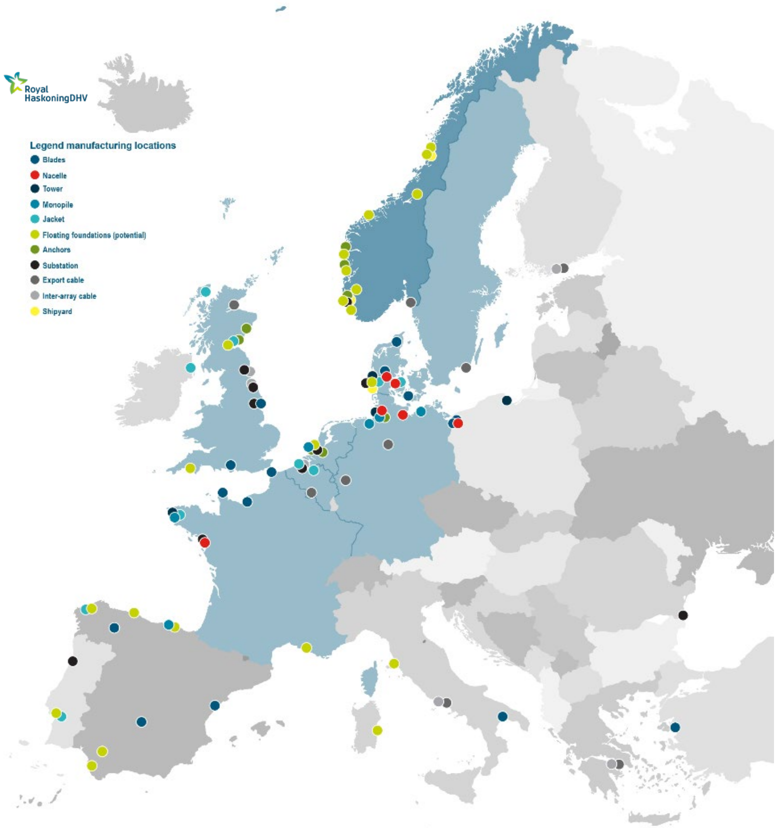


Source: Westwood, RUK, Wind Europe

1 European Supply Chain must grow fast to keep up with demand

Market Dynamics

- **Annual Installation Target:** The Net Zero Industry Act mandates a target of achieving 36 GW of wind energy (Onshore and offshore) manufacturing capacity by 2030 to ensure that European wind farms are built using turbines made in Europe
- **Current deployment**: As of 2023, the European wind energy supply chain is facing challenges, with offshore installations amounting to 3.8 GW.
- Manufacturing of components is done all over the world, with many factories in Europe as well
- If European projects are to be supplied by European OEM's, **the manufacturing capacity for offshore wind has to grow significantly from around 4 GW now to over 20 GW in 2030.**



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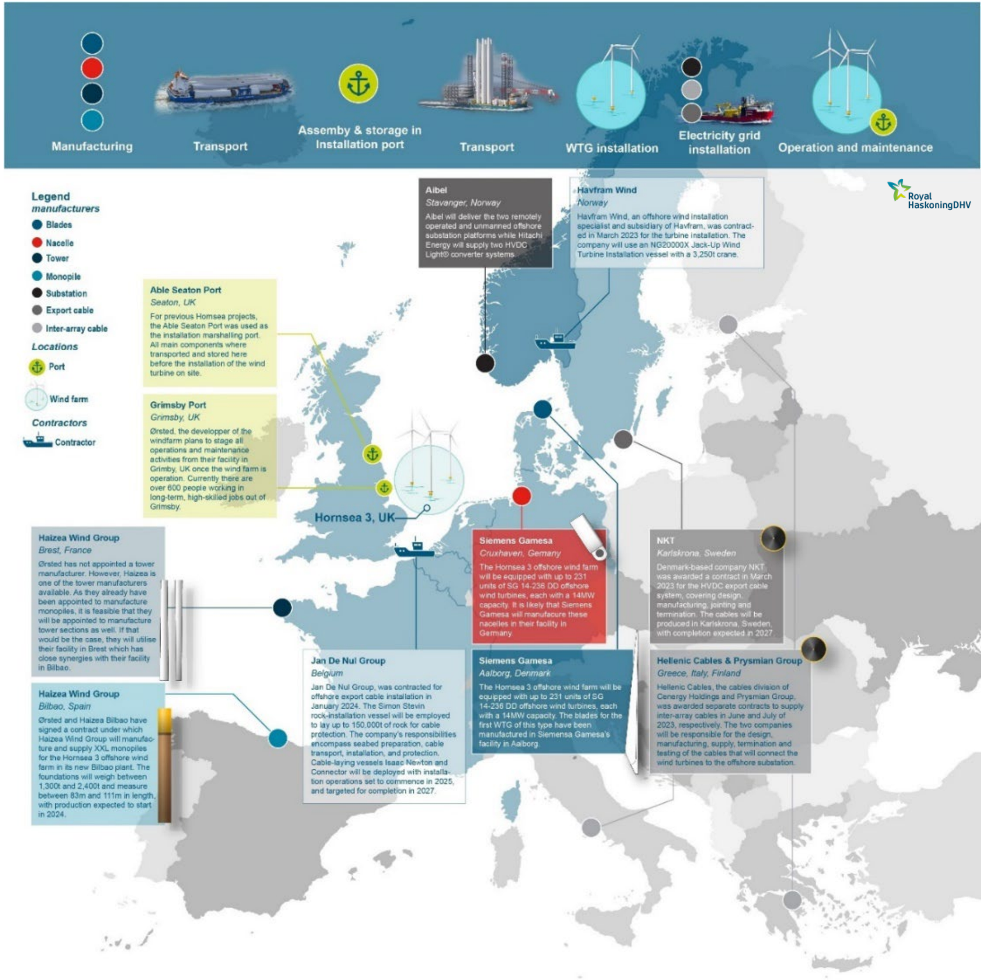
1

OWF supply chains are complex

Wide array of players in the supply chain

- Hornsea 3 wind farm UK is installed from the Able Seaton Port.
- The XXL monopiles for the project will be built by Haizea from their facility in Bilbao, Spain.
- Aibel, Stavanger will supply the two sub stations.
- Jan de Nul is contracted for installation of the NKT Export cable.
- The Siemens Gamesa Turbines are built in Cuxhaven and installation is contracted to Havfram Wind. Blades from Aalborg.

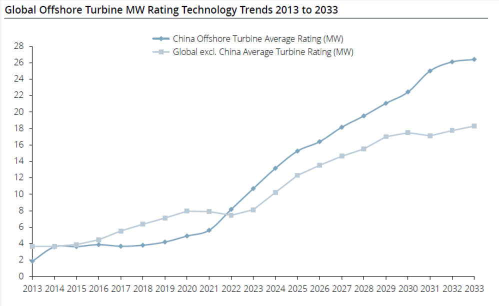


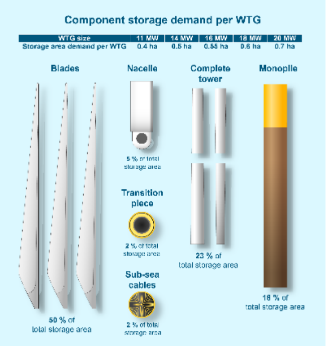
1

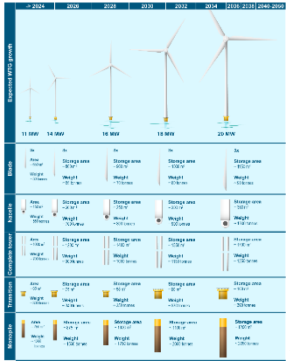
Technology is scaling fast: Turbine sizes grow to 20 MW in base scenario and to 30 MW in extreme scenario up to 2040

Trends & Developments

- Western turbine sizes could develop to 20-25 MW around 2035
- After 2035 we assume a consolidation
- High scenario: If Asian suppliers access European market, larger platforms could be used
- Supply chain and (port) logistics need to absorb and develop







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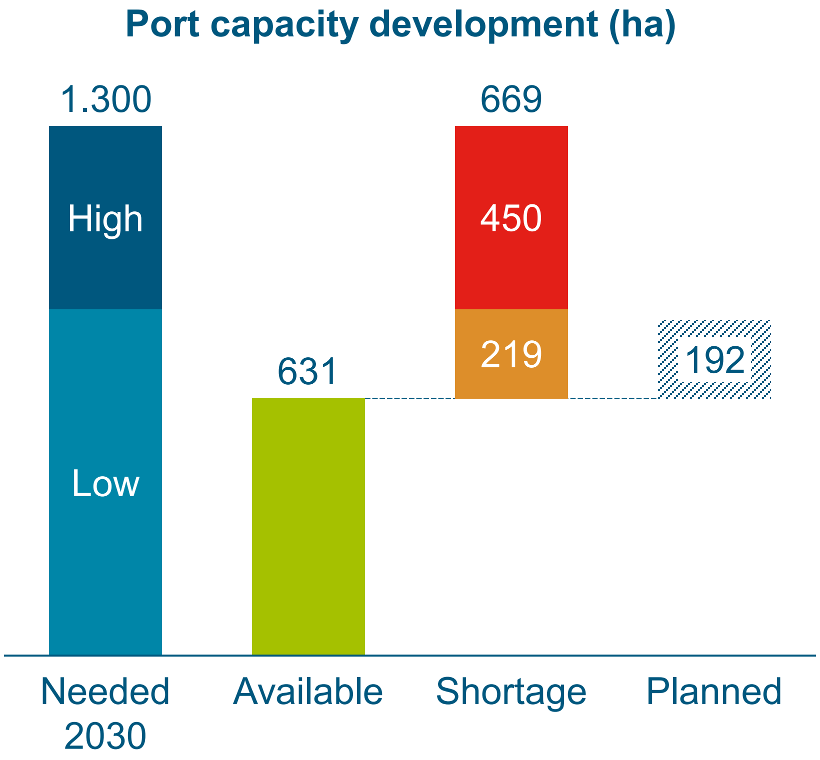
New port capacity needed in the North Sea before 2030

- Hundreds of hectares new port space needed before 2030
- Planned expansions are not enough
- Not all available terrain dedicated to offshore wind (competition for space)
- Many planned expansions are being held back



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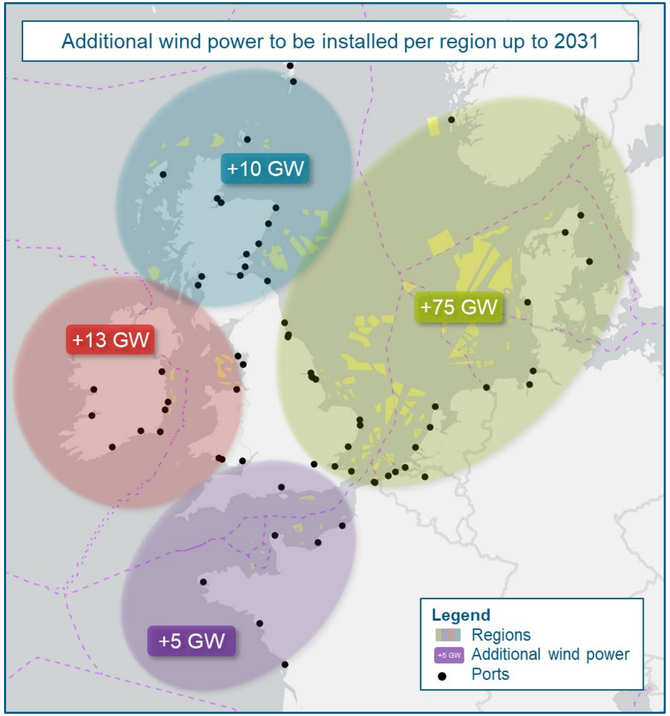

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Different port roles are required to service the market, with the feasibility being dependent on specific sector criteria

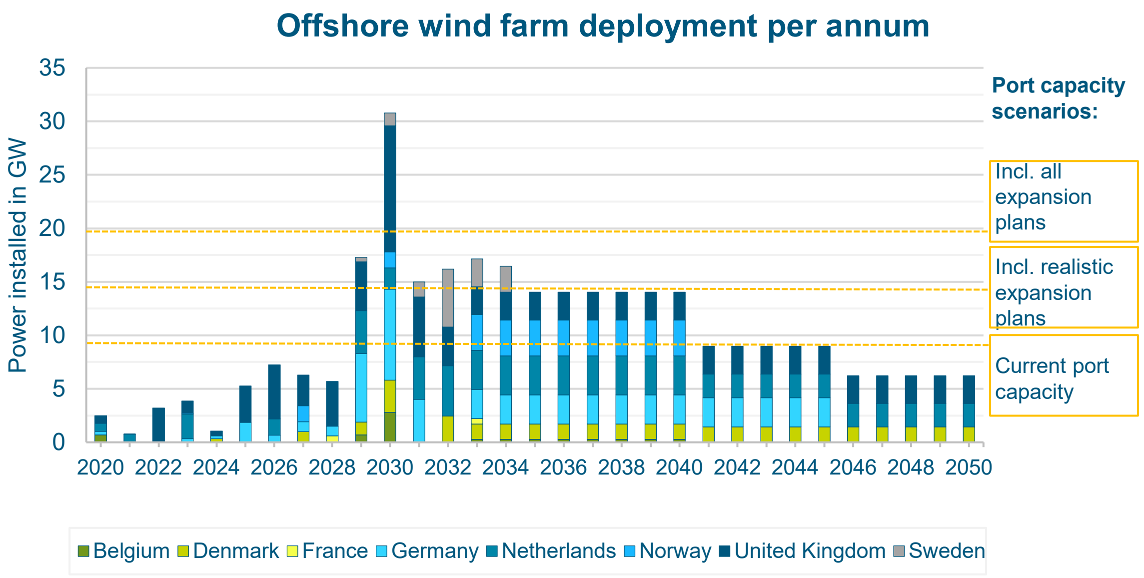
Source: RHDHV-NSEC

Demand for offshore wind installation port capacity peaks in 2030 and remains structurally high until at least 2040

2

Peak towards 2030

- Towards 2030 the offshore wind deployment will peak
- Driven by the UK, Germany and the Netherlands
- The share of floating wind in the annual deployment is expected increase sharply after 2030
- Floating commissioning dates are expected to be delayed
- **In short term, port capacity will limit deployment**



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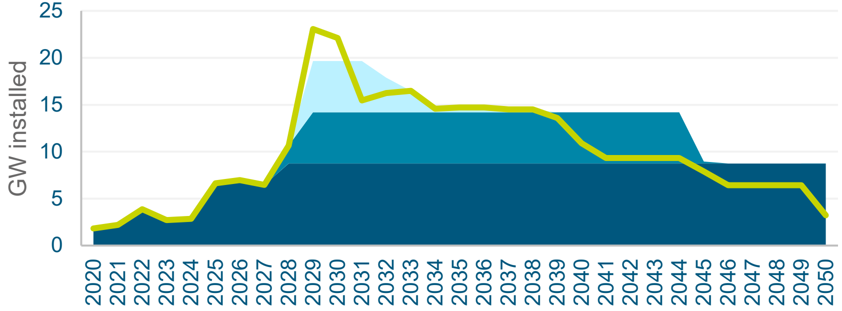
There is insufficient port capacity to service the North Sea offshore wind targets, delaying 2030 targets with 3-4 years while 2050 targets will not be met

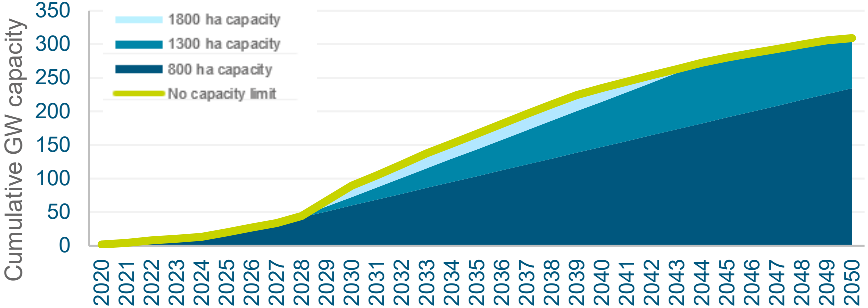
North Sea OW port supply-demand outlook

- There will be port undersupply from 2027 onwards due to the expected deployment peak
- **Currently available port capacity** (~800ha)
  The 2030 deployment target is delayed 3-4 years
  2040 target is delayed 10 years, 2050 targets will not be met
- **Expanded port capacity** (~1,300ha)
  The 2030 and 2040 deployment targets will be delayed with 1-2 years, the 2050 ambitions will be met
- **Peak port capacity** (~1,800ha)
  If additional identified port capacity will be developed the 2030 will have a maximum delay of 1 year, the 2040 and 2050 targets will be met

GW timeline if port storage area is limiting



Cumulative GW timeline if port storage area is limiting



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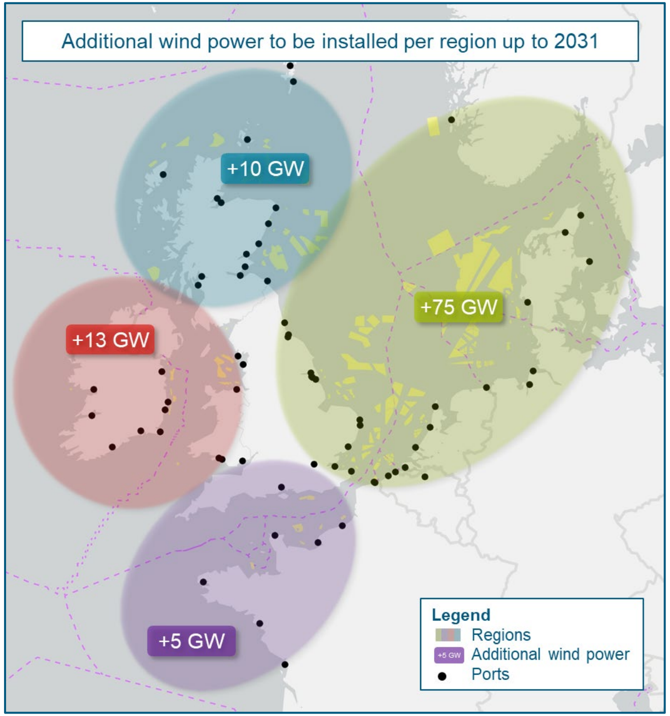

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Energy transition topics that will change the port

Ports	Wider port area	Economy & community
A **Decarbonising operations in / near ports**	B **Industrial clusters, port-city links and offshore**	C **Green supply chains and business models**
Energy saving	Waste to energy and chemicals	Zero-/low carbon fuel supply chains
Decarbonisation of port equipment	Offshore energy	Zero-/low carbon electron supply chains
Onshore power supply	Offshore industry	Circular economy
Clean fuel bunkering	Industry decarbonisation	Decarbonisation of transport
On-site renewable power	Sustainable urban energy	
	Energy conversion	
	Energy storage hubs	
	Carbon Capture Use/Storage	

3

Port changes to facilitate future shipping & energy flows

Space	Facilities	Infrastructure	Flows	Industry	Hubs
Land-use trade-off	Service new energy	Enable new energy	New energy flows & processes	New technology & clusters	Connectivity and alliances
▪ Land availability ▪ Transition of current lay-out ▪ Modal shift ▪ Spatial planning ▪ Safety zones	▪ Handling equipment ▪ Port transport ▪ New charging and fuel bunker facilities ▪ Onshore power ▪ Energy transport ▪ Floating facilities	▪ Dedicated terminals & quays ▪ New on-/off loading facilities ▪ Power connection and grid ▪ Energy conversion and storage	▪ Growing LNG ▪ Large renewable power inflow ▪ New fuel import and production ▪ Emission flows and storage	▪ Industry energy demand change ▪ Tech and process innovation ▪ Change in players ▪ Attract new industry and local production	▪ Production and storage hubs ▪ Urban area energy connection ▪ Value chain clusters ▪ Joint business/project development

Challenges within the port

- **Land-use** in ports will be different, requiring **long-term, integrated spatial planning**
- Renewable energy and new energy carriers require **more and safe storage**
- Dedicated **corridors for cables and pipelines and hinterland connections** needed
- **More space and different** use needed for energy, leading to challenges in spatial planning
- High investment levels, difficulty to secure funding and **complexity in investment decisions**
- Secure energy and project development skills to deal with energy transition developments
- **Operational implementation** complexity, risks and interference

European port infrastructure investments are emerging, while they are essential to unlock offshore wind potential

- Port investments are not emerging fast enough
- Port infrastructure is central to efficient and scalable offshore wind construction
- Port capacity can become a serious bottleneck for European offshore wind ambitions.
- Without swift action offshore wind energy targets are unlikely to be met.

NSEC Countries 'Unlikely' to Meet 2030 Offshore Wind Target Without Immediate Action on Port Development, Study Says

Lack of port infrastructure threatens Scotland's offshore wind boom

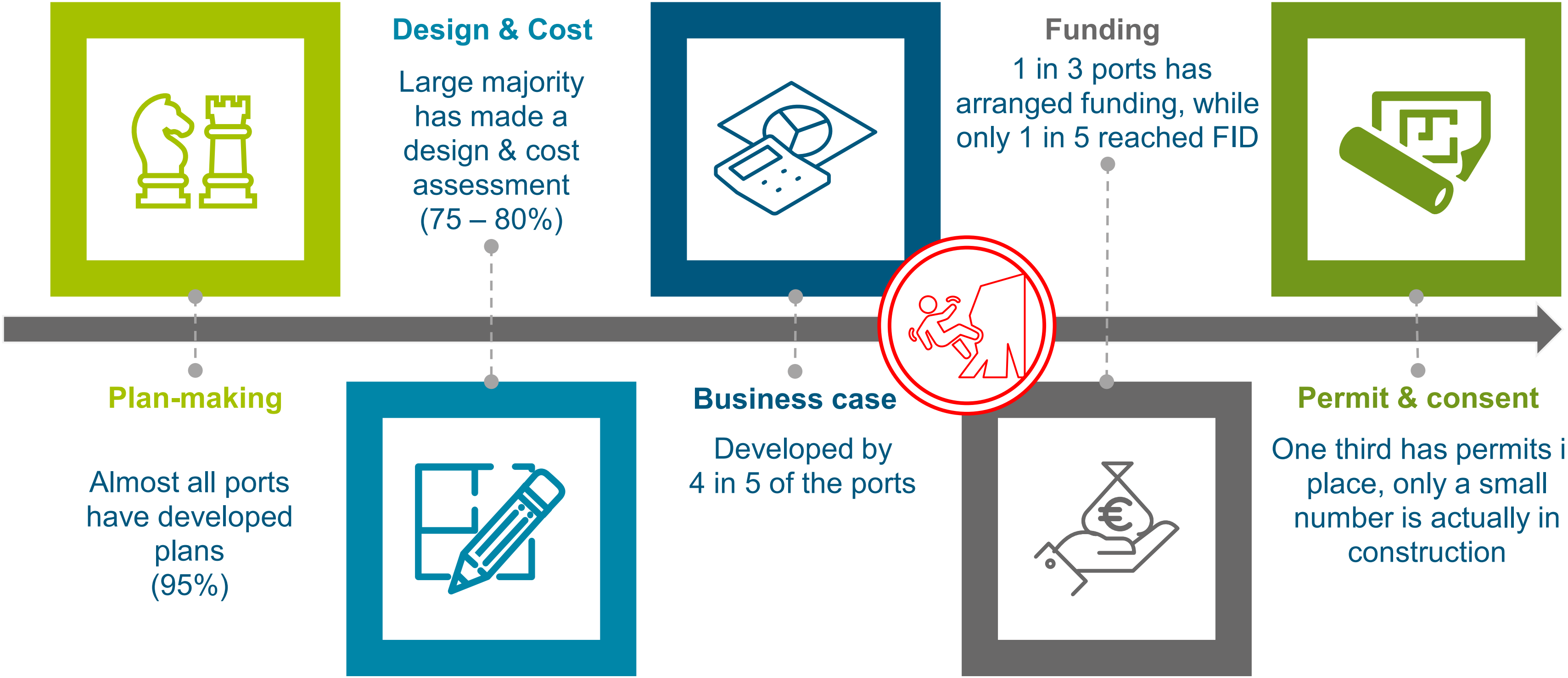
Upscaling Europe's port infrastructure critical for offshore wind development

Industry Roadmap 2040: Building UK Port Infrastructure to Unlock the Floating Wind Opportunity

Source: Offshore Wind Biz, FT, Wind Europe, RUK, NSEC

3

Two out of three ports have not progressed beyond the business case stage



3

Investments are held back by a high level of uncertainty and a non-viable business case, with alternative use being more attractive

Key challenges holding back offshore wind supply chain and port investments

Demand uncertainty

High level OW **targets are providing insufficient certainty throughout the value chain** for port investments and funding to materialise

Non-viable Business cases

Large long-term investments with limited returns, create **unattractive business cases for OW port** development projects

Technical development risks

Uncertain future technical requirements create **risk of either overinvesting or becoming unsuitable** for future wind farms

Competition for space

Ports have **limited space and a large demand** coming from other (future) uses with more certainty, returns and clear requirements

Incentive mismatch

Market actors all contribute to solve issues but have different perspectives and interests. **Ports do not directly suffer the consequences of inaction in offshore wind**

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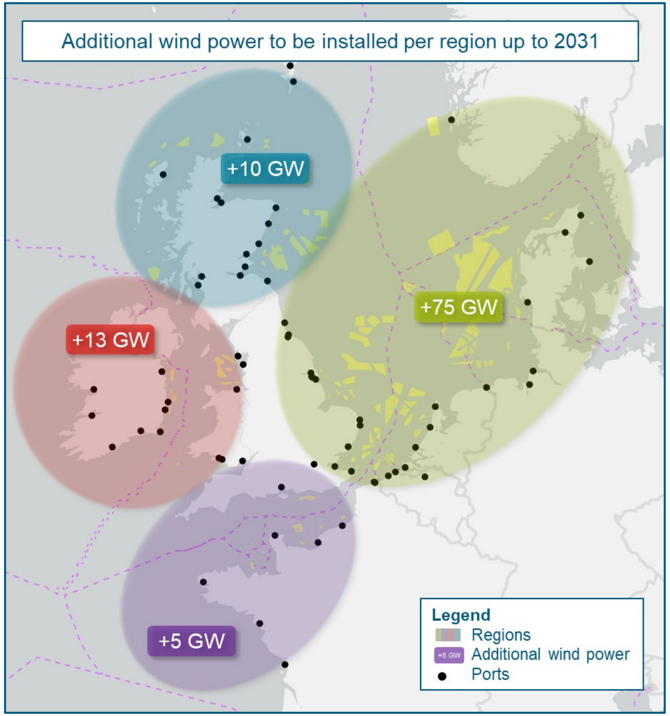

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4

Transforming an existing port into a wind port

Wind Ports
development life-cycle

Find the
market opportunity

Develop a capability

Specialise

Optimise
the operation

Keep adapting

Create an evolution rather than a revolution

4

Port Masterplanning

Port Masterplanning

- Functional layout
- Technical requirement expectation
- (Future) Operational & storage planning
- Supply chain characteristics
- Port use or expansion options
- EIA and planning requirements

Wind farm build strategies

- Foundation types, design and assembly requirements
- Developer strategy for the build
- T&I requirements (shuttler, feeder, in port integration)
- OEM’s and wider supply chain requirements
- Consider number, size and deployment schedule
- Weather and other seasonal delays

Achieving industrialised scale

- All types of facilities can play a role
- Look at strengths (location/area, infra, workforce, supply chains)
- Be realistic about the challenges
- Develop a holistic approach with stakeholders and developers
- Wider regional distribution

To successfully overcome the barriers to invest, ports need to identify their role, potential and strategic way forward

Barriers to invest		Port focus
Investment viability	Long-term capital investment with shorter term contracts	Multi-purpose, staged investment
Offtake certainty	Limited historic, current and future demand certainty	Identify obtainable market, commercial development
Delivery strategy	Commercial and operational expertise of the port in OW	Built track record and partnerships
Investment structure	Ownership structure, financial health and operating model	Determine (combined) port operating model
Development Planning and Certainty	Long and uncertain development timeline for port infrastructure	Staged development plan
Port market position	Uncertainty in the competitiveness and role of a port	Wind port role identification

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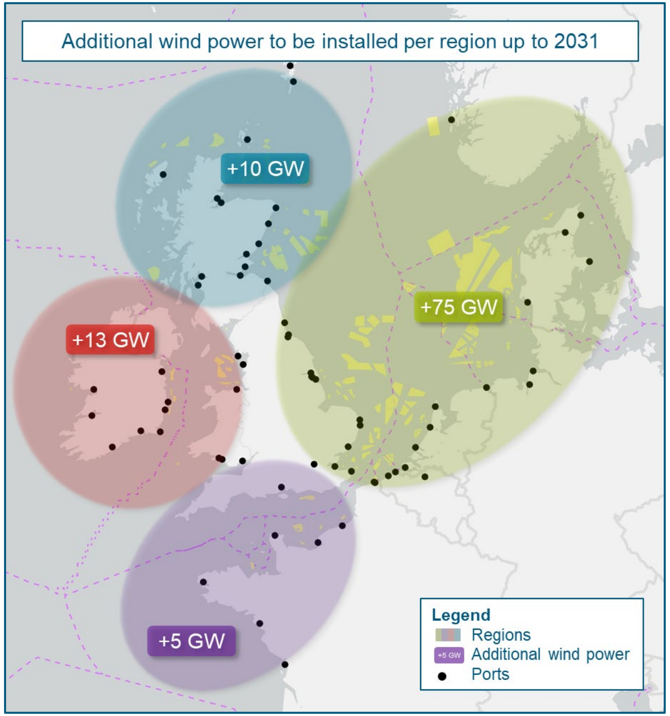

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5

Supply chain limitations will smoothen the peaks, a European build program would benefit efficiency, predictability and investments

- Large peak in and around 2030
- Booming market, growing pains
- Floating market is delaying
- Home markets are key
- More investment certainty required

Wind farm developments will be more spread over time due to supply chain shortages

- Turbine size moving towards industry optimum >20MW
- Floater commercialisation delay
- Risk-averse approach towards new installation methods
- Decentralised supply chain, consolidated players

Significant production capacity expansion needed. Manufacturing viewed from a global perspective

- Portfolio de-risking
- Preference for a clear project program
- Floating developers still back-up technology
- Build program towards 2050, not a race to 2030

Looking for the ability to build a solid portfolio, which makes it also easier to go to the supply chain.

5

Offshore wind market will become a more global with opportunities for ports and the offshore sector to diversify

- Combine with industrial development
- Consider raw material scarcity
- Securing a workforce will be challenging
- Large steel structures to be built outside Europe

Manufacturing will become a global market, European focus on specialised and essential production/assembly

- Port infrastructure becomes a limited resource
- Especially around 2030 and when fixed and floating compete
- Current port model not working
- Efficiency and corporation, not only invest in capacity

Ports need to collaborate, modify and expand to deal with growing demand to service >20MW turbines

- Vessels are built but shortage of purpose-build vessels expected
- More global spread and regionalisation of vessels
- Integration of production and installation activities (cables)
- Feedering will be more common but not in the North Sea. FLOW fleet uncertain

Offshore service portfolio on the North Sea will change, leading to demand for purpose build vessels for construction and O&M

Action is needed from all stakeholders to solve the key challenges for offshore wind port infrastructure in Europe

Governments & public bodies

- **Focus on creating the right conditions** for the industry to function and achieve the public goal
- Each region has its own challenges and approach
- Several building blocks for success

Ports & supply chain

- **Focus on expanding, optimizing, collaborating and standardising**
- Develop new port facilities
- Optimisation of port space usage through supply chain collaboration and knowledge exchange

Financial institutions

- **Focus on mobilising public and private funding** by providing assistance in funding
- Establish a finance work group to develop the business model and mobilise funding.

Important role for governments to stimulate infrastructure & supply chain development by putting offshore wind ambitions into action

Public action to support the sector

- ✓ Create demand certainty through increased tender pipeline visibility, coordination of tenders and timelines
- ✓ Organise a smooth permitting and consenting process for both offshore wind projects and ports
- ✓ Initiate a framework to take away bottlenecks in permitting, spatial and legal constraints and cross border inefficiencies.
- ✓ Increase access to finance with guarantees, grants, mobilising public funding streams to unlock private funding
- ✓ Early-stage port selection and regional/national port plans
- ✓ Stimulate industry collaboration and set up sector dialogues

Objective	Solutions
Reduce demand uncertainty through increased tender pipeline visibility, collaboration and coordination	✓ Translate ambitions into a shared project pipeline ✓ Collaborate and produce a multi-year strategy ✓ Setting up the dialogue ✓ Programmatic procurement ✓ Optimise sizing and timing of tenders ✓ Early-stage port selection ✓ Early-stage tendering and extension of time towards execution
Improve business case viability by mobilising investments and strengthening port revenues	✓ Broaden the definition and purpose of TEN-T ✓ Special offshore wind facility under Connecting Europe Facility (CEF) fund ✓ Channel EU Recovery funds and Net Zero Industry Act support to offshore wind supply chain development ✓ European Investment Bank (EIB) focus on offshore wind port development ✓ Use of Cost Benefit Analysis methodology ✓ Value chain collaboration on infrastructure investments ✓ Strengthen port revenues ✓ And Develop more attractive revenue models ✓ Build a business case based on multi-purpose revenue ✓ Stimulation of terminal operator models ✓ Revenue support
Reduce technical development risks	✓ Technology and requirements collaboration for port planning ✓ Locking technology or standardisation to confirm port requirements ✓ Support new logistics concepts to reduce port requirements ✓ Develop and stimulate a multi-port strategy
Improve spatial use and planning	✓ Futureproof spatial planning ✓ From competition of space to cooperation ✓ Accelerate permitting procedures ✓ Easing legal and administrative procedures ✓ Set Renewable Acceleration Areas for ports
Create urgency, incentives and collaboration	✓ Government recognition of the sense of urgency and value ✓ Incentivise ports to act ✓ Coordination on securing port capacity needs to be improved ✓ Involvement of European and national governments to drive offshore wind port capacity

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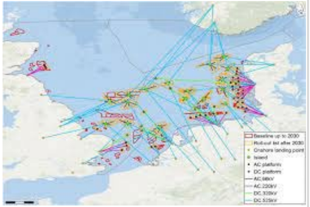
Referenties

The new energy landscape: impact on and implications for European ports
(ESPO – EFIP 2022)

Port Study for Floating Offshore Wind Farms,
(The Crown Estate, 2020)



Scenario Study Offshore Wind North Seas 2030-2050
(RWS, 2022-2024)

NSEC Offshore Wind Port Study
(2023)

Ireland market study on opportunities in offshore wind, hydrogen and ports
(RVO 2022)

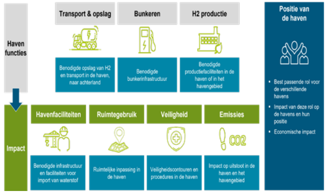
Floating Offshore Wind Industry Roadmap 2040
(RenewableUK 2023)

North Sea Basin Study Offshore Wind
(Innovation Norway, 2024)

Potential for LH2 bunkering study
(Port of Den Helder, 2023)

North Sea Wind Power Hub

North Sea Wind power Hub (NSWPH) - Caisson Island North Sea
(Tennet, 2021-2022)



Impact of H2 on Dutch seaports
(Ministry of Infrastructure, 2023)

Reach out for any questions!

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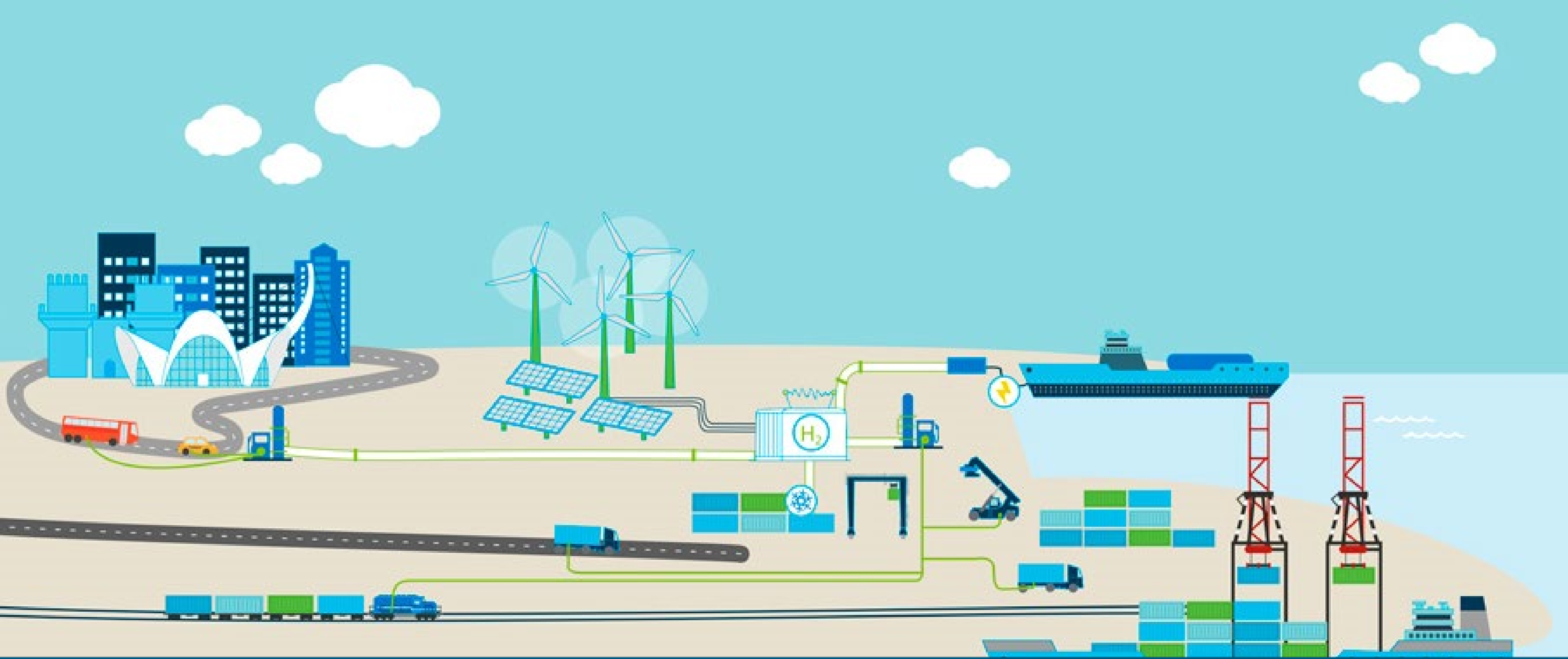

Thank you for your intention!

A reflection on regional benefits

Panel discussion

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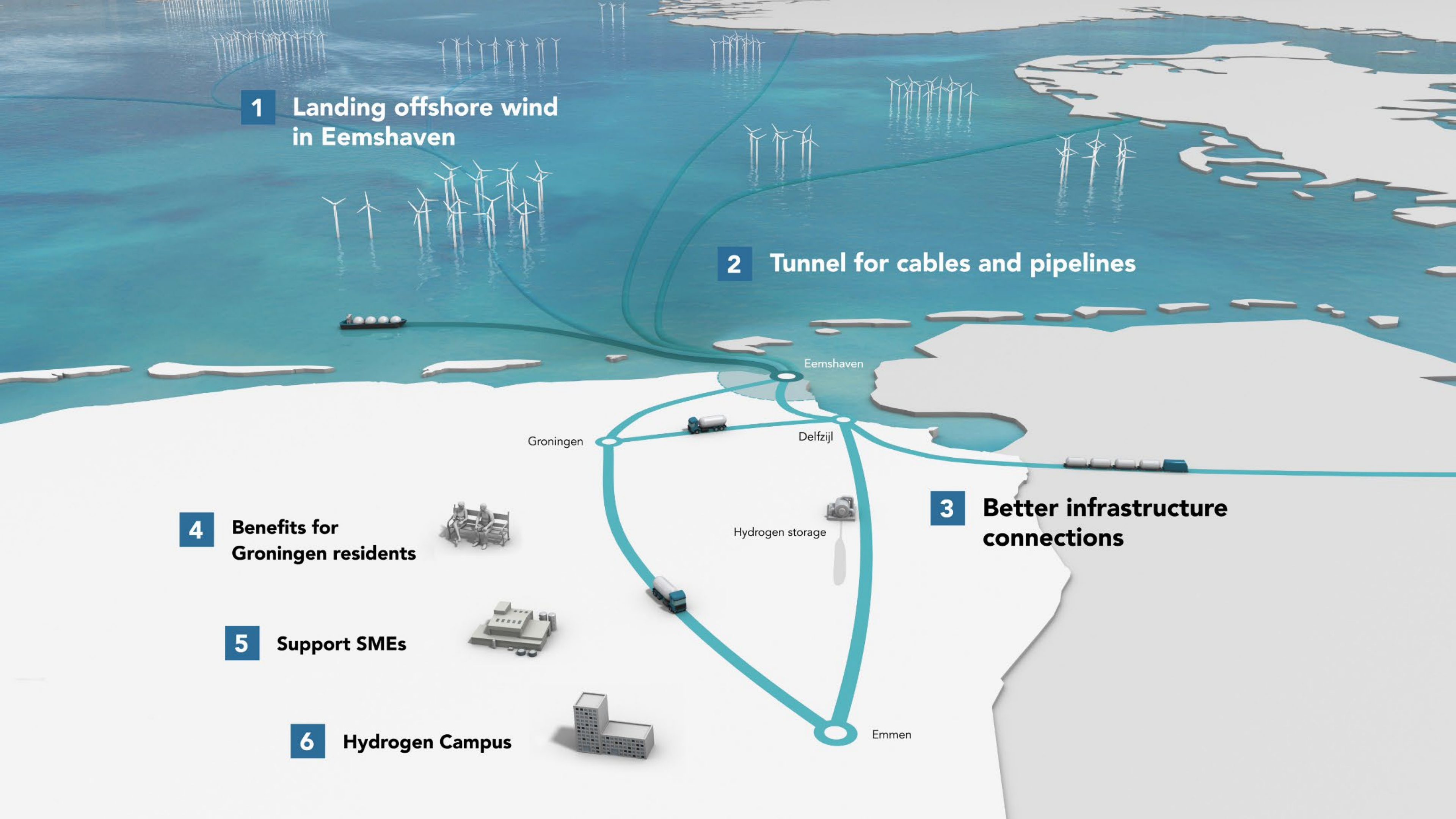
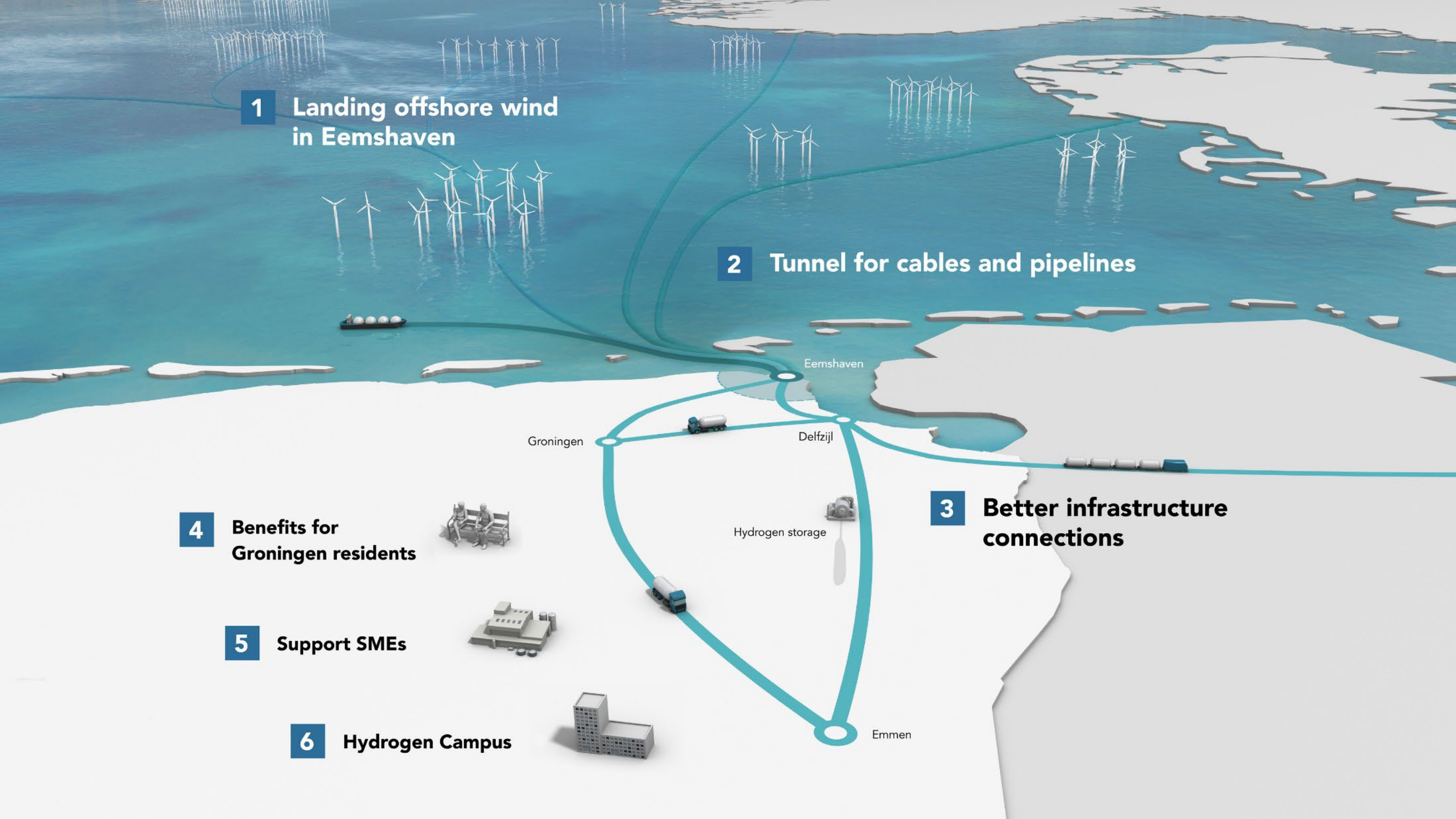


1 Landing offshore wind in Eemshaven
2 Tunnel for cables and pipelines
3 Better infrastructure connections
4 Benefits for Groningen residents
5 Support SMEs
6 Hydrogen Campus
Eemshaven
Groningen
Delfzijl
Hydrogen storage
Emmen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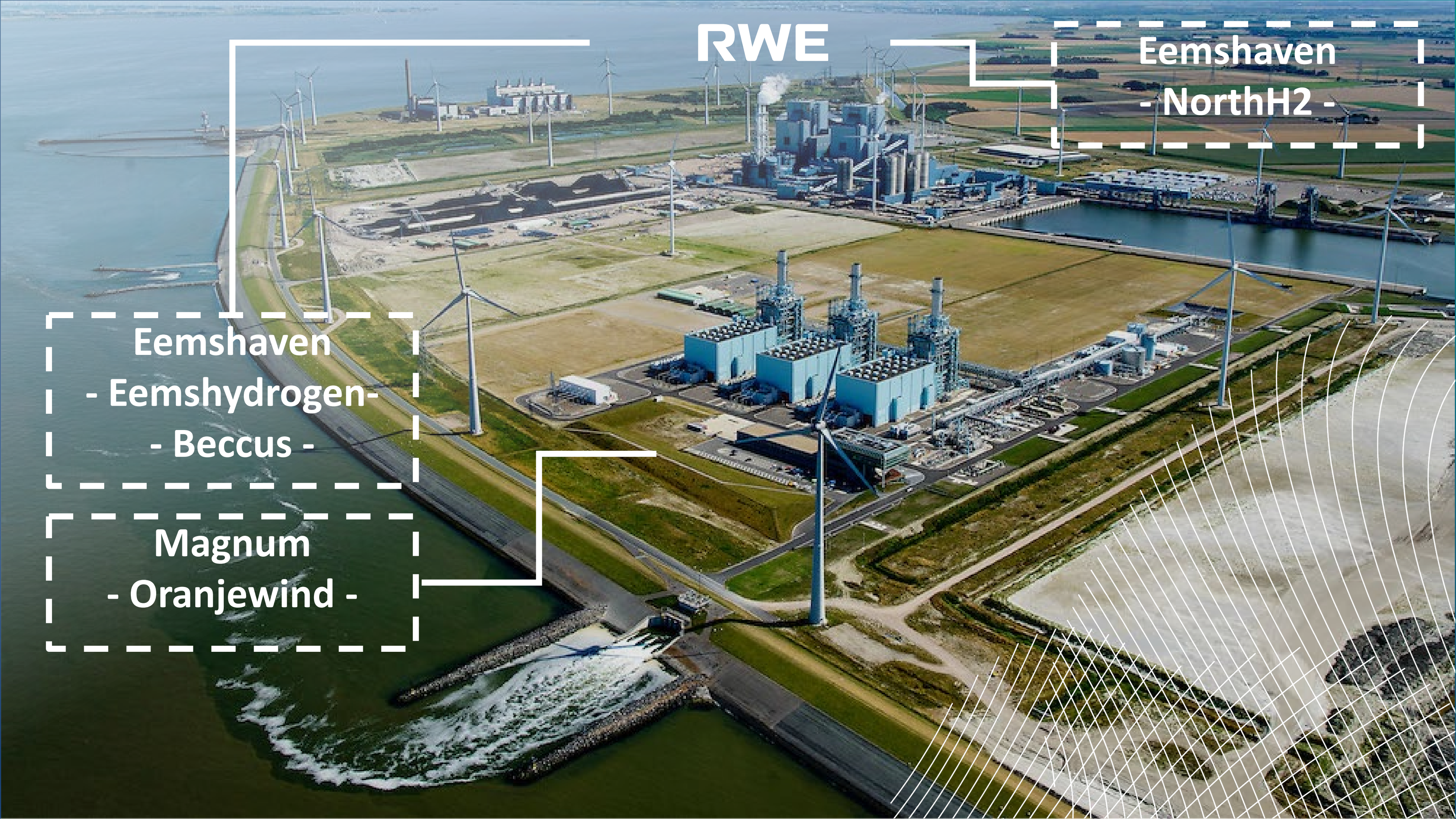
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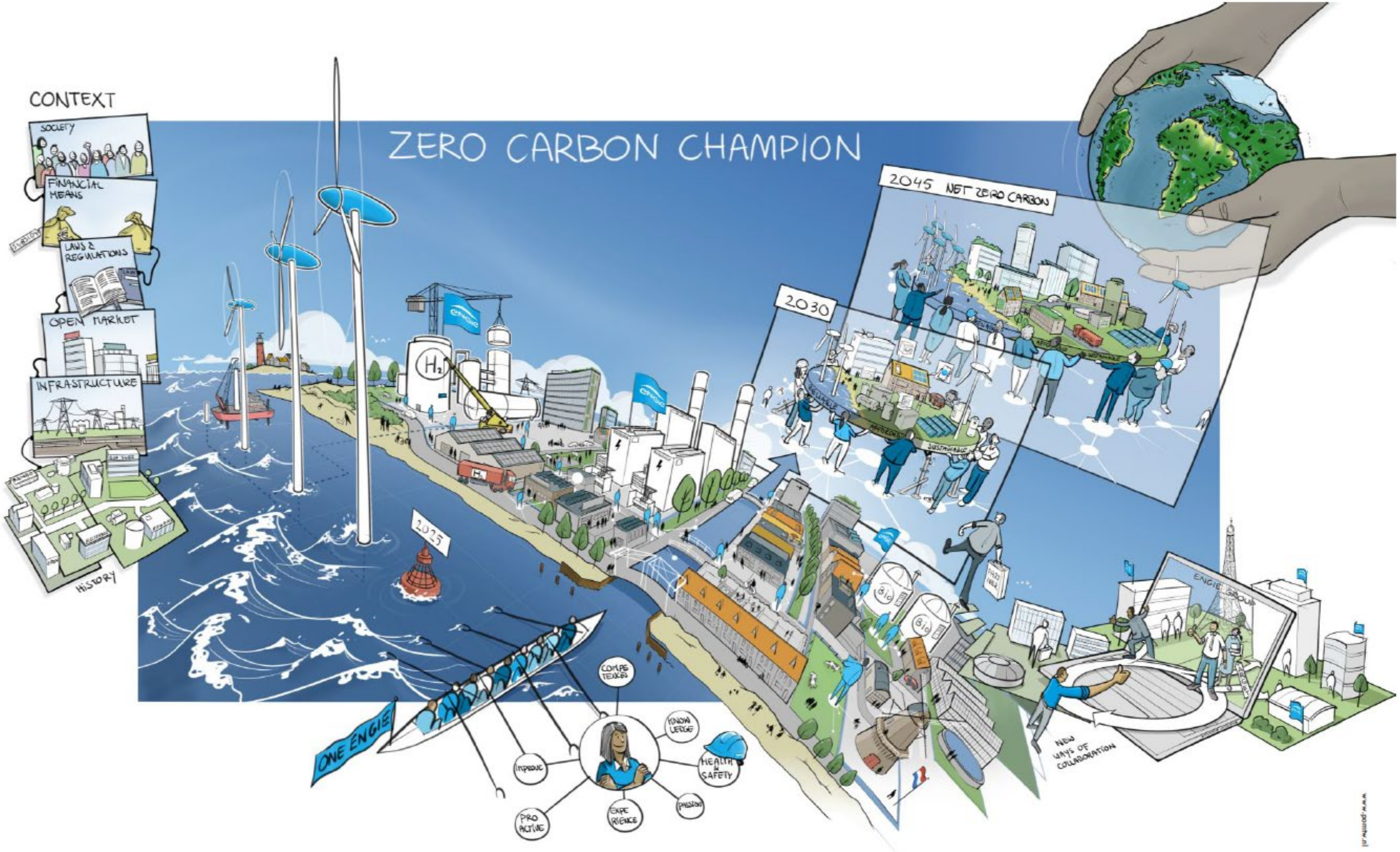
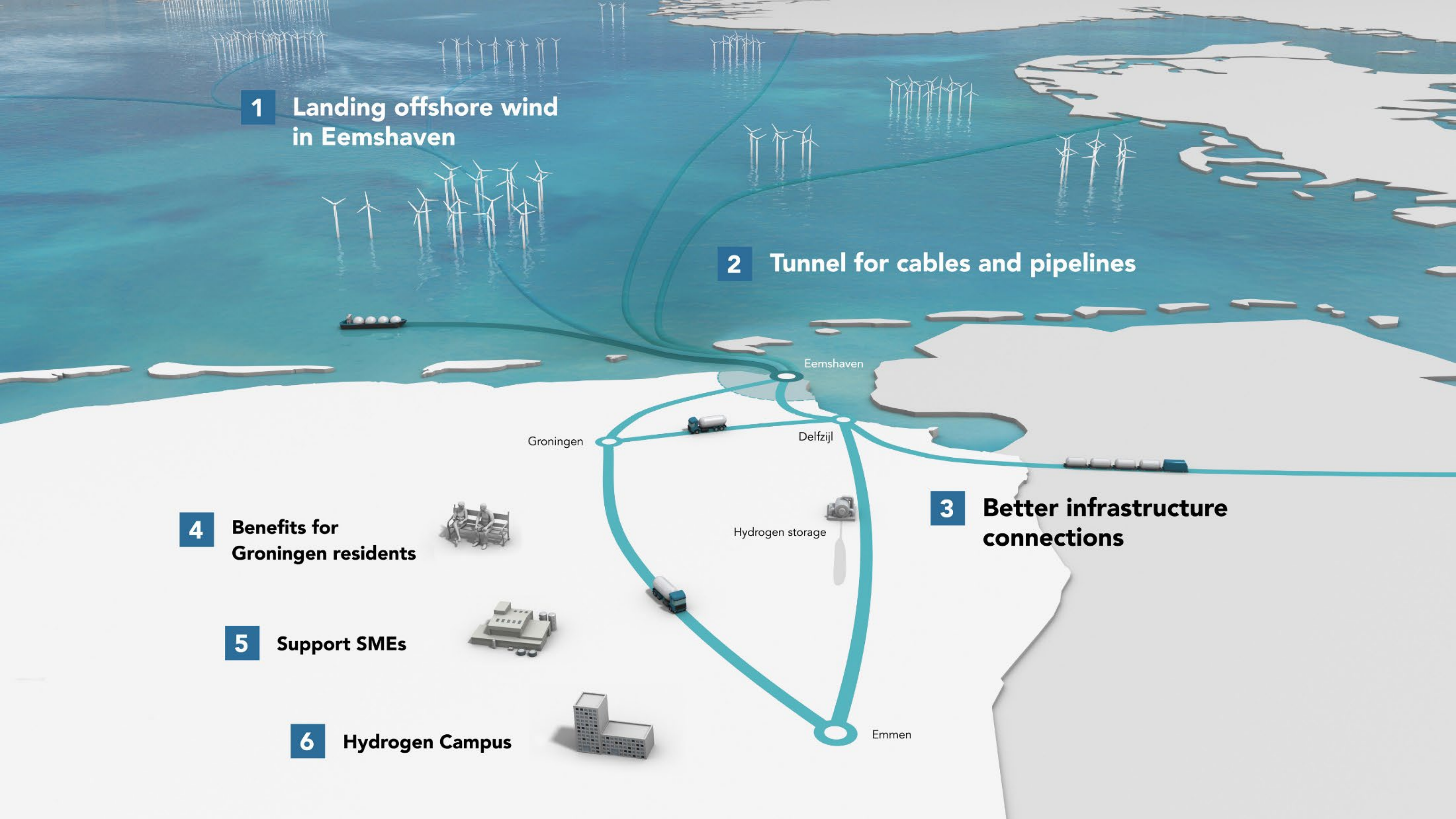
- Eemshydrogen-
- Beccus -
Magnum
- Oranjewind -



CONTEXT
SOCIETY
FINANCIAL MEANS
SUBSIDY
LAWS & REGULATIONS
OPEN MARKET
INFRASTRUCTURE
HISTORY
ZERO CARBON CHAMPION
2045 NET ZERO CARBON
2030
2025
H_2
Bio
ONE ENGIE
COMPETENCES
KNOWLEDGE
HEALTH & SAFETY
PASSION
EXPERIENCE
PRO ACTIVE
IMPROVE
NEW WAYS OF COLLABORATION
ENGIE GROUP


1 Landing offshore wind in Eemshaven
2 Tunnel for cables and pipelines
Eemshaven
Groningen
Delfzijl
Hydrogen storage
3 Better infrastructure connections
4 Benefits for Groningen residents
5 Support SMEs
6 Hydrogen Campus
Emmen

Coffee break

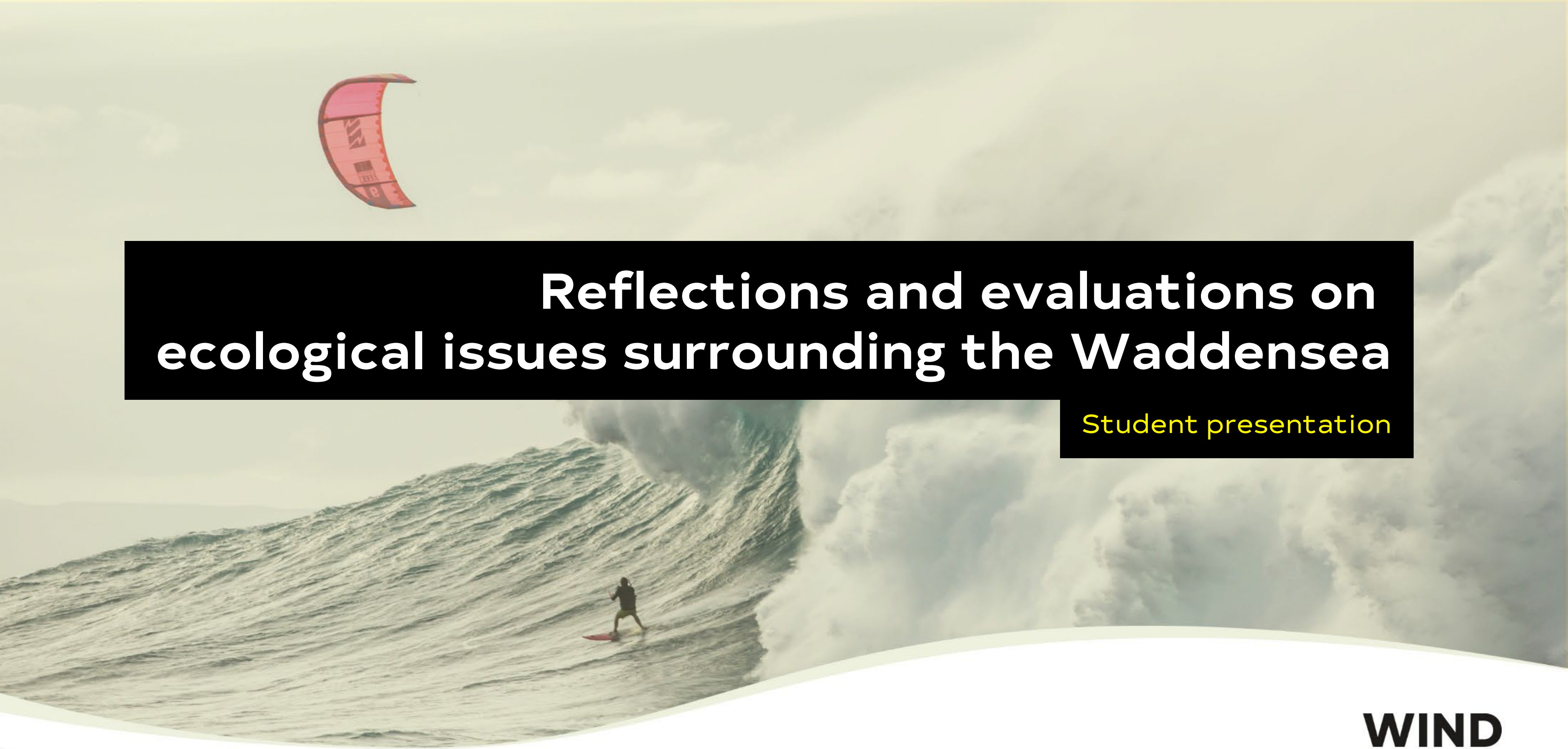
10:30 – 11:00

WIND
MEETS
GAS.

Stef Broenink

Olympic medalist rowing

WIND
MEETS
GAS.



Reflections and evaluations on ecological issues surrounding the Waddensea

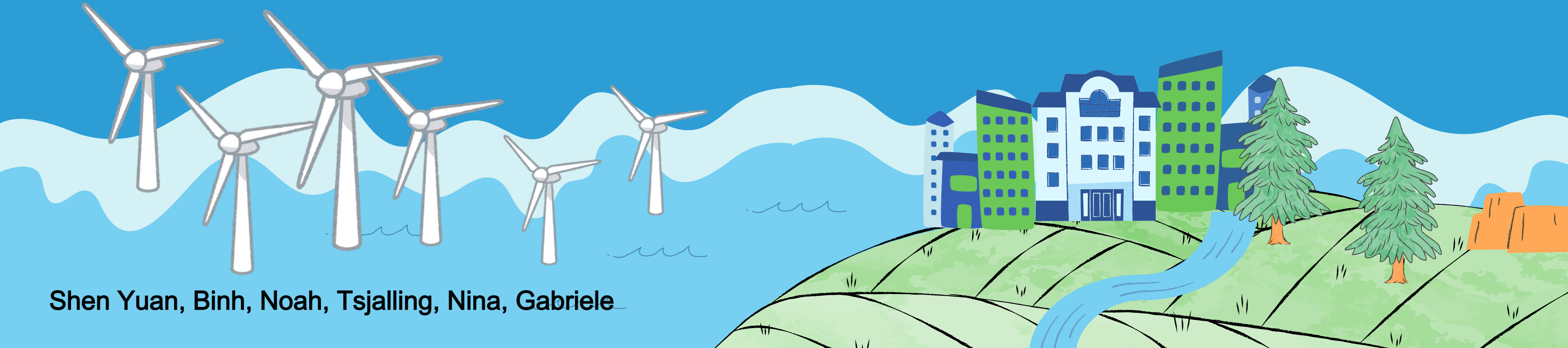
Student presentation

WIND MEETS GAS.

SEA H2

Sustainable Solution for the Ecosystem

GROUP 6



Shen Yuan, Binh, Noah, Tsjalling, Nina, Gabriele

Imagine we could give green power to 100+ million households at the cost of ‘only’ money?

Problem

SEA H2

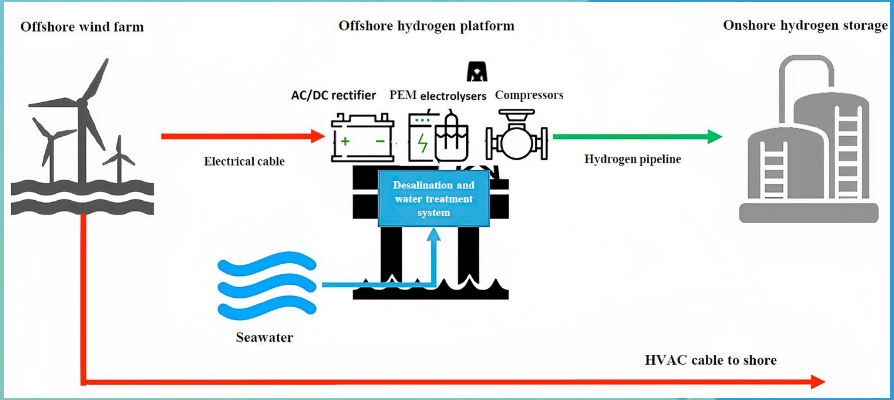
Solution

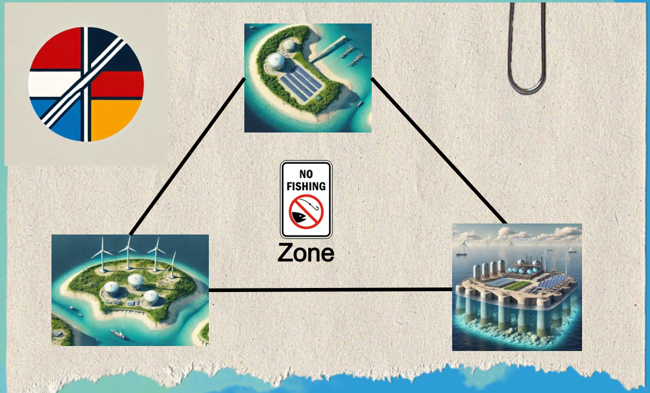
Concept

Characteristics

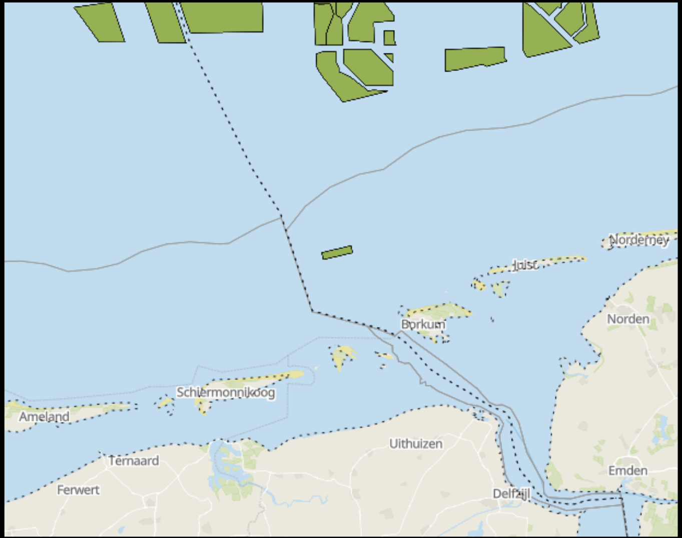
- around 1.5 GW*
- 3ha island size*
- 25km2 preservation zone
- 600 million Euros*
- nature-inclusive design

*data based on Princess Elisabeth Island project, Belgium



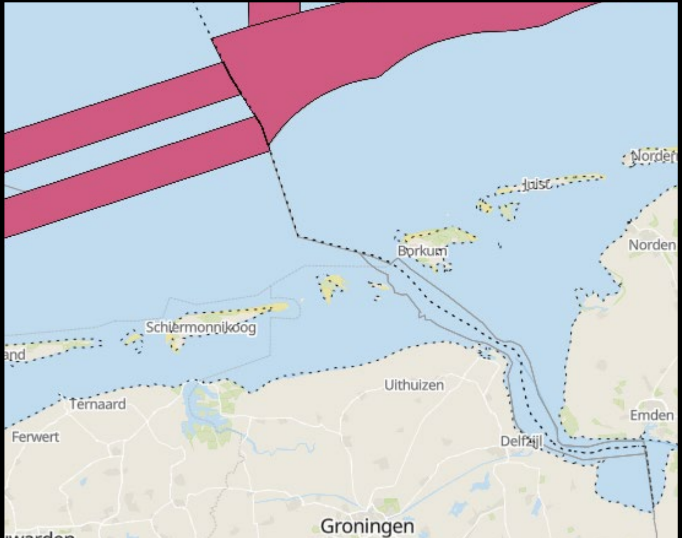


Pipelines

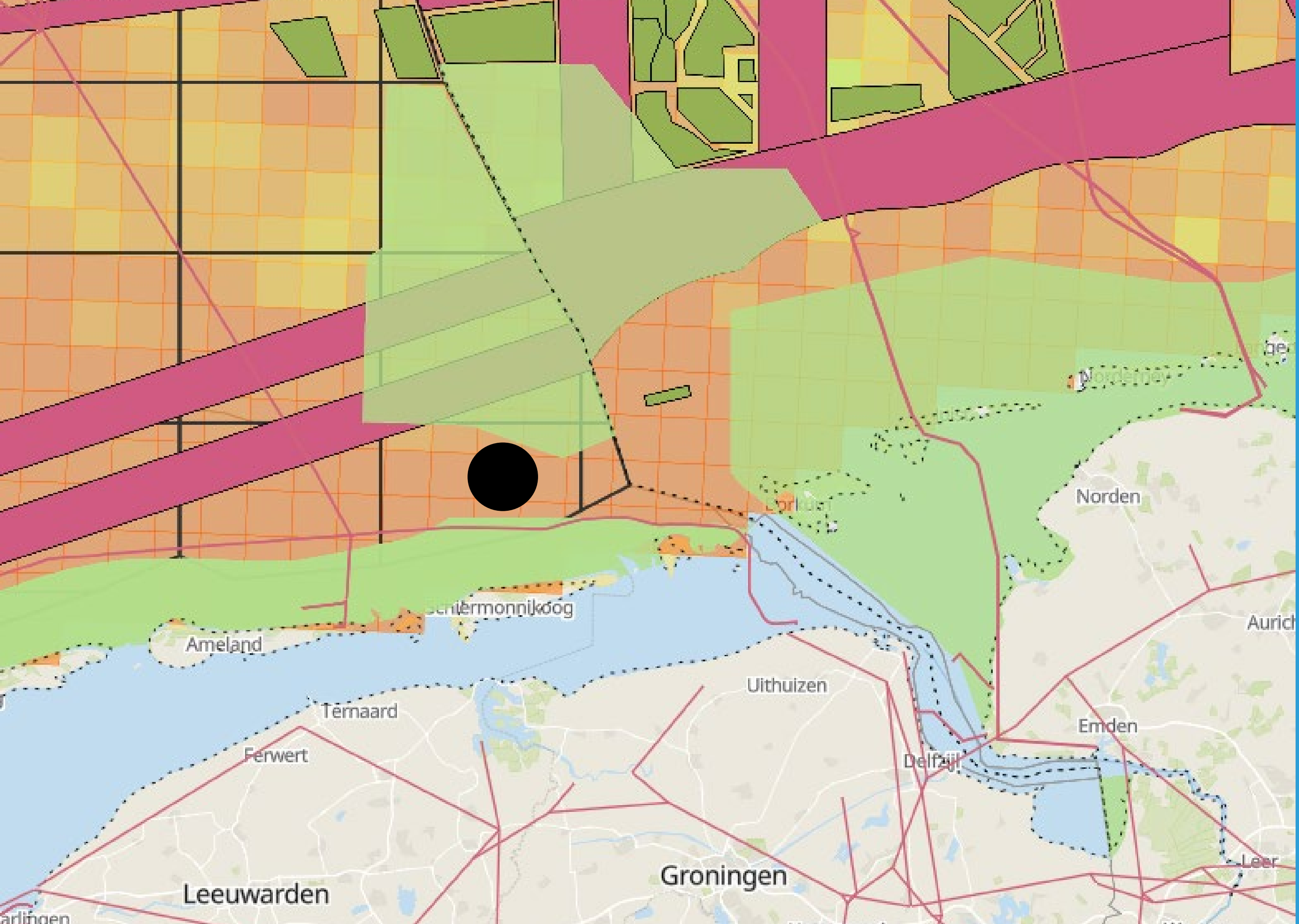


Windfarms

Natura2000



Shipping



Island location

Shipping routes

Nature protected areas

Seabird-windfarm sensitivity

Off-shore windfarms

License areas NL

Oil and gas pipelines

Interreg
Deutschland – Nederland

(Ko-)finanziert von der Europäischen Union
(Mede) gefinancierd door de Europese Unie

Conclusion

SEA H2

Benefits

- 25 km² preservation zone
- Distribute the port activities
- Improve habitats
- Increase biodiversity
- Green energy for Europe

Challenges

- High Cost
- Communication
- Permissions
- Environmental Assessments

Thank You !

Danke! Grazie! Dankewol! Cảm ơn! 謝謝！

Reflections and evaluations on the topic Logistics and Planning Development

Student presentation

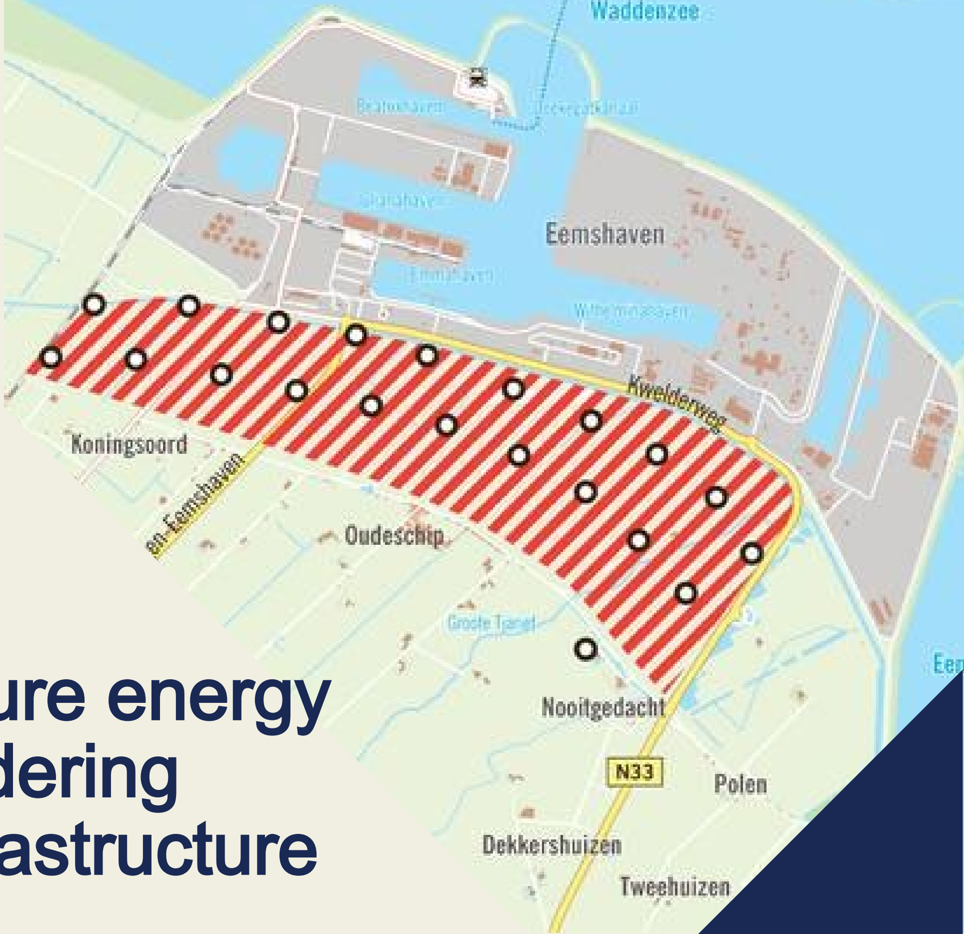
WIND MEETS GAS.

Hanze
University of Applied Sciences
Groningen

Eemshaven Energy Hub

Phuong Anh Nguyen
Eva Huang
Robin Heersema
Rayen Ramautar
Stan Claerhout

Hanze
University of Applied Sciences
Groningen



How can we effectively plan and realize the physical expansion of the Eemshaven to facilitate future energy imports and exports, considering spatial possibilities and infrastructure improvements?

SOLUTION

OFFSHORE
ENERGY HUB

Hanze
University of Applied Sciences
Groningen

SOLUTION

OFFSHORE
ENERGY HUB

- Strategic location
  - (Dutch) North Sea
  - Existing energy lines
  - Horizon pollution

Hanze
University of Applied Sciences
Groningen

SOLUTION

OFFSHORE ENERGY HUB

- Strategic location
    - (Dutch) North Sea
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STORAGE AND PRODUCTION

Hanze
University of Applied Sciences
Groningen

SOLUTION

OFFSHORE
ENERGY HUB

- Strategic location
  - (Dutch) North Sea
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STORAGE AND
PRODUCTION

MODERNISATION
OF EEMSHAVEN

Hanze
University of Applied Sciences
Groningen

SOLUTION

OFFSHORE ENERGY HUB

- Strategic location
  - (Dutch) North Sea
  - Existing energy lines
  - Horizon pollution

STORAGE AND PRODUCTION

- Utilize & develop off-shore wind mill
- Ocean Grazer
- Hydrogen fuel cells

MODERNISATION OF EEMSHAVEN

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SOLUTION

OFFSHORE ENERGY HUB

- Strategic location
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STORAGE AND PRODUCTION

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- Ocean Grazer
- Hydrogen fuel cells

MODERNISATION OF EEMSHAVEN

- H2 packaging & transportation
- Reuse facilities
- Less disturbance
- Hydrogen valley

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Groningen

Why EEH?

FUTUREPROOF

- Long term plan
- Blue to green hydrogen

ENVIRONMENTAL BENEFITS

- Wadden Sea
- Oostpolder
- Artificial reef

LOCAL COMMUNITY VALUE

- Energy Security
- Educational opportunities
- Reduced pollution

REVENUE STREAM

- Subsidies from GOV
- Export H2 to regions
- Attract OW Partners

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University of Applied Sciences
Groningen

Thank You for Your Attention!

Any question?

Stan Claerhout

EuropeanMaster
Renewable Energy
2024-2026

Eva Huang

Energy for Society
2024-2026

Rayen Ramautar

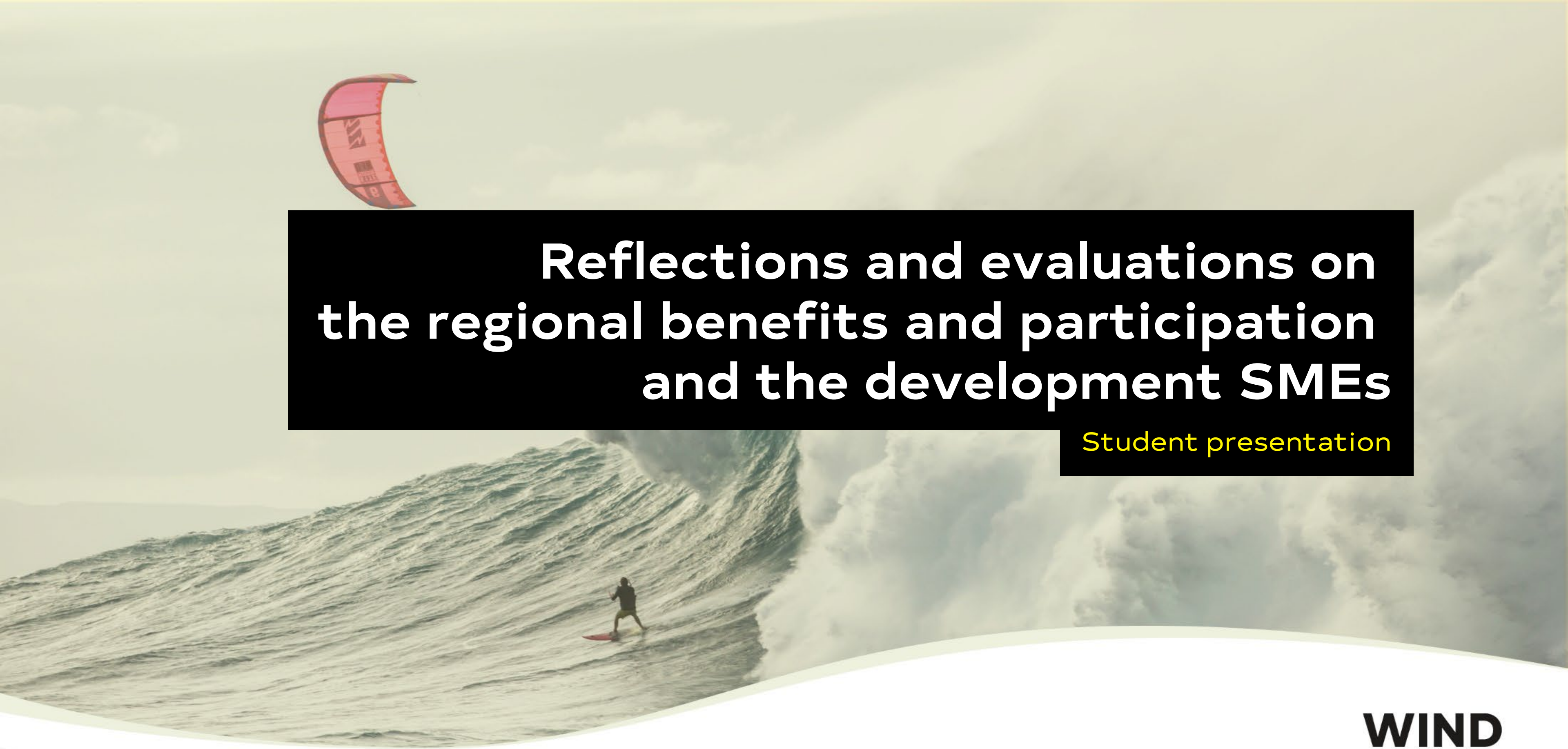
Energy for Society
2024-2026

Phuong Anh Nguyen

Sustainale Energy
System Management
2024-2026

Robin Heersema

Sustainale Energy
System Management
2024-2026



Reflections and evaluations on the regional benefits and participation and the development SMEs

Student presentation

WIND MEETS GAS.

Milan Meyberg

Founder Emissary of Gaia

WIND
MEETS
GAS.

Award ceremony

Student presentations

WIND MEETS GAS.

Match and lunch

13:15 – 14:00

WIND
MEETS
GAS.

WIND MEETS GAS.

See you next year!

#WINDMEETSGAS25

New Energy Coalition

Drivers of Change