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The new energy landscape: impact on and implications for European ports

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ESPO conference Valencia

3 June 2022



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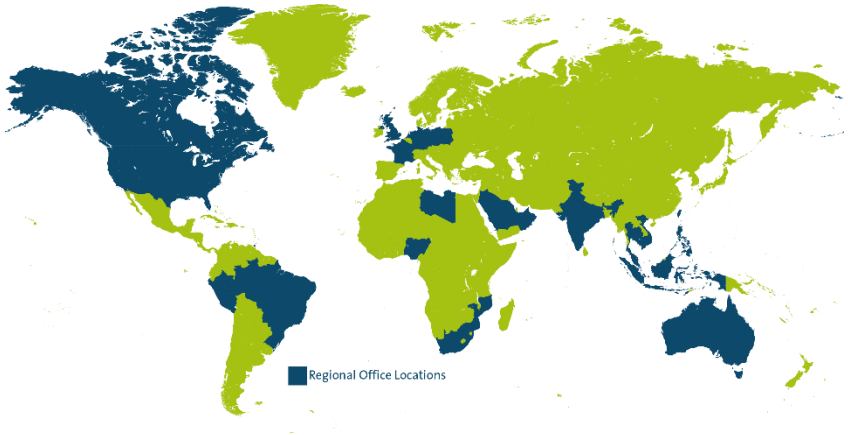

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Goal and methodology

This report identifies the impact of specific energy transition developments on European ports, and what role port authorities can play

The goal of this report is to increase understanding and awareness on the **impact of the energy transition on European ports**, and the implications for the role of port authorities.

The study is based on recent **literature,** providing a qualitative assessment of developments in the energy transition to **make existing information more accessible** to a wider audience.

We focused on identifying **common denominators** rather than accentuating regional and country differences and specifics. The report does address how **different port characteristics** shape the impact.

The new energy landscape: impact on and implications for European ports

Context

Policy frameworks are a driving force of the energy transition

- **EU Green Deal** - Emission-free economy by 2050 based on a path of 50% reduction by 2030.
- **Fit for 55 package** - Additional package to deliver European Green Deal, reduction of 55% by 2030.
  - The Alternative Fuel Infrastructure Regulation (AFIR)
  - Fuel EU Maritime (FEUM)
  - The European Emission Trading System (ETS)
  - Carbon Border Adjustment Mechanism (CBAM)
  - The EU's Energy Taxation directive

- Green investment policies
  - **EU Taxonomy** and the overall greening of finance, investments and financial support
  - **Next Generation EU** (NGEU) - A recovery plan for Europe to emerge stronger from the pandemic
  - **EU Transport Strategy** - Sustainable and Smart Mobility Strategy and Action plan

- **REPowerEU** – Recent initiative to increase the overall resilience of the European energy system and make Europe independent from Russian fossil fuels well before 2030.

Systematic shocks influence energy transition for better or worse…

- Energy transition is a **long-term process** towards a carbon neutral society. It will not be a straight linear line towards the end, but rather a **path of acceleration and delay** with uncertainty on when and how we actually reach our destination.
- Over the past decade we have seen a **series of crisis and shocks** (financial debt crisis, oil and gas crisis, trade war US-China, COVID-19 pandemic, Ukraine).
- **These are shocks with a major impact** on economic, societal, and political climate with direct and indirect consequences for the progress of energy transition.
- The **war in Ukraine** clearly illustrates the vulnerability of the European energy system and can both have a detrimental and stimulating impact on energy transition.
- **Systematic shocks are here to stay:** Geopolitical climate, economic power shift from West to East, hazardous climate change events will continue to affect progress of energy transition.

The new energy landscape: impact on and implications for European ports

Factsheets

The report addresses seventeen topics in energy transition impacting ports

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
A1. Energy saving	B1. Waste to energy and chemicals	C1. Zero-/low carbon fuel supply chains
A2. Decarbonisation of port equipment	B2. Offshore energy	C2. Zero-/low carbon electron supply chains
A3. Onshore power supply	B3. Offshore industry	C3. Circular economy
A4. Clean fuel bunkering	B4. Industry decarbonisation	C4. Decarbonisation of transport
A5. On-site renewable power	B5. Sustainable urban energy	
	B6. Energy conversion	
	B7. Energy storage hubs	
	B8. Carbon Capture Use/Storage	

The report offers 17 factsheets on selected developments in the energy transition and their implications for ports

- These factsheets are the core of the report and provide easy access to topics of interest.

Factsheet structure

- Topic introduction and drivers
- Role of the port and the port authority
- Impact on infrastructure
- Enablers and challenges
- Port profiles
- Sources used

Level	A. Sustainable transport in/ near port
Development	A5. On site or local renewable power generation
Illustration	Port of Helsinki (2020) / Eemshaven, Groningen Seaports (2021)
Introduction	Localised energy generation from renewable sources such as solar or wind are increasingly implemented within port areas to reduce carbon emissions in support of decarbonisation efforts and achieve independence from the grid by decentralised energy generation. Adoption of solar and onshore wind energy is relatively widespread and gained acceptance as viable and principle renewable energy sources using relatively mature technologies. Wave and tidal power generation offers future potential as renewable energy sources for ports. However, these sources are not widely available and technology is still emerging. Local renewable power generation can typically be used to power port office buildings, sheds, workshops and surrounding buildings, charge electric port equipment and vehicles, and in some cases shows potential of generating enough power to provide onshore power in the future. If linked with Energy Storage Systems (ESS), on site renewables can mitigate peak rate tariffs and provide ports with significant cost savings. Port authorities, and all players within the port, can individually and jointly develop and use renewable generated power by optimally utilising available space in the port.
Driver / benefits	For many years climate change mitigation has been a primary reason to support renewable energy development. With fast development and improvements in solar and wind energy technologies, these renewables are in many cases now cost-competitive and lead to energy cost savings over time. Key drivers for ports to invest and install local renewable energy generation are listed below: **Business opportunity and growth** • Commercial business case with earning potential via cost savings on energy costs and Green taxes, and/or sale of surplus energy to 3rd parties or tenants • Guarantees of Origin of locally produced renewable energy can attract new industries • Employment opportunities via positioning the port as innovative renewable energy hub **Policy and regulation** • Compliance with (international) climate change mitigation agreements. • EU-regulations and regional legislation (e.g. RES Directive, Renewable Energy Sources) on promoting use of energy from renewable sources to meet greenhouse gas (GHG) emission reduction targets and future carbon neutral goals. **Sustainability image for competitiveness**
	Site preparation • Levelling, laying of foundations and civil aspects are required to prepare locations for installation.
	• Easily scalable and implementable; having suitable roof structures on buildings can allow smaller scale implementation of solar power despite port land constraints.

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Key findings

Energy transition has many implications for port infrastructure, connectivity and supply chains

	MARITIME TRANSPORT	WATERWAY & IWT	QUAYS	TERMINALS	STORAGE	PORT AREA NETWORKS	HINTERLAND CONNECTIONS
A1. Energy saving			✓	✓			
A2. Decarbonisation port equipment			✓	✓		✓	
A3. Onshore power supply	✓	✓	✓			✓	
A4. Clean fuel bunkering	✓	✓	✓		✓	✓	
A5. On-site renewable power				✓		✓	
B1. Waste to energy and chemicals	✓	✓	✓	✓	✓		✓
B2. Offshore energy						✓	
B3. Offshore industry	✓	✓	✓	✓	✓	✓	✓
B4. Industry decarbonisation	✓	✓			✓	✓	✓
B5. Sustainable urban energy						✓	
B6. Energy conversion			✓	✓		✓	✓
B7. Energy storage hubs		✓	✓	✓	✓	✓	✓
B8. CCUS				✓	✓	✓	✓
C1. Zero-/low emission fuel supply chains	✓	✓	✓	✓	✓	✓	✓
C2. Zero-/low emission electron supply chains					✓	✓	✓
C3. Circular economy	✓	✓	✓	✓	✓	✓	✓
C4. Decarbonisation of transport					✓	✓	✓

The future energy landscape will impact land-use and require more energy focused infrastructure and spatial planning

Land-use in ports will be different, requiring **long-term, integrated spatial planning**

Dedicated **corridors for cables and pipelines and hinterland connections** needed to serve changing energy and resource flows to / from industrial clusters

Renewable energy and new energy carriers require **more and safe storage** to deal with supply-demand variations

Factsheet references

On-site renewables **(A5)**
Offshore industry **(B3)**
Zero/low carbon energy **(C1-C2)**

Industry decarbonisation **(B4)**
CCUS **(B9)**
Circular and biobased **(C3)**

Clean fuel bunkering **(A4)**
Waste to energy/chemicals **(B1)**
Energy storage hubs **(B8)**

Proactively planning, collaboration and developing expertise, infrastructure, and funding helps dealing with energy transition challenges

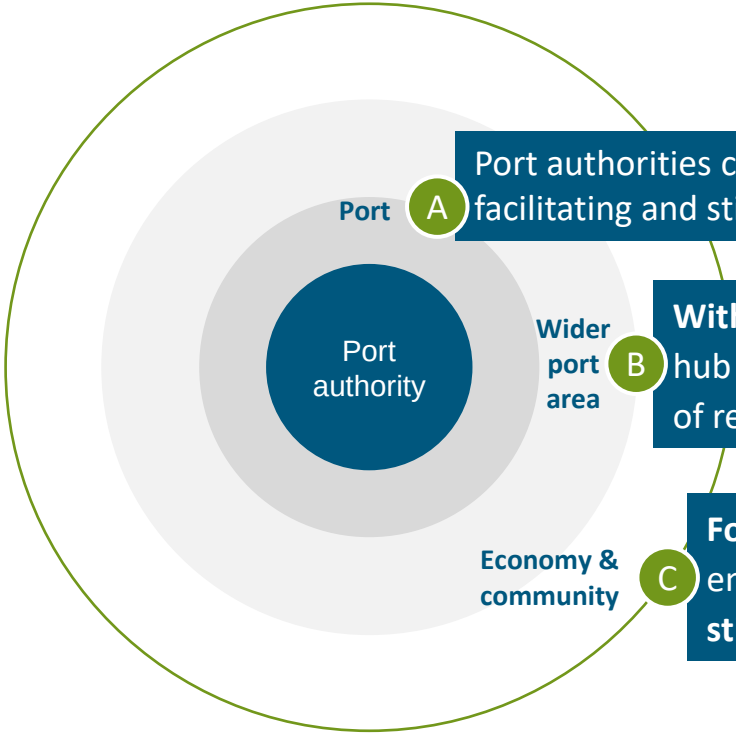
Challenges

- **Investments:** High investment levels, difficulty to secure funding and complexity in investment decisions
  (e.g. alternative fuel bunkering)
- **Space:** More space and different use needed for energy, leading to challenges in spatial planning
  (e.g. H_2 production and storage)
- **Skills:** Secure energy and project development skills to deal with energy transition developments
- **Operations:** Implementation without interference
  (e.g. electrification of equipment and transport)

Enablers

- ✓ **Funding:** support for full implementation of energy transition, risk mitigation, and joint funding
- ✓ **Spatial planning:** Securing sufficient and dedicated space for new energy developments
- ✓ **Energy infrastructure:** Upgraded and new enabling energy infrastructure in the port (e.g. power grid)
- ✓ **Engagement/ co-operation**: Good working relations with other ports and key stakeholders
- ✓ **Governance:** supporting future-oriented port development

Port authorities can directly act on their own decarbonisation responsibility and play a facilitating and guiding role in and outside the port



A Port authorities can **accelerate their own decarbonisation efforts** while facilitating and stimulating others **in the port**

B **Within the wider port area** port authorities can empower their hub function by acting as **facilitator, developer and integrator** of renewable energy streams and supply chains

C **For the wider economy and community** port authorities can empower the position of the port by **enabling and guiding others, stimulating collaboration**, and **co-creating** supply chains

Port authorities increasingly take on a broader role to make the energy transition happen and to future-proof the port

Landlord

- ✓ Land-lease focus
- ✓ Responsibility for own activities and emission scope
- ✓ Developments done by operators, business and industry in the port
- ✓ Reactive, act on legislation

Facilitator

- ✓ Landlord model with additional services
- ✓ Upgraded facilities and offering extra services based on client demand
- ✓ Actively engaged with clients

Enabler

- ✓ Future focused landlord
- ✓ Developing plans, services and infrastructure that enable energy transition progress
- ✓ Beyond the port area
- ✓ Proactively with clients and business partners

Investor

- ✓ Investor in needed energy infrastructure and projects initiated in the port
- ✓ Early-on funding of initiatives
- ✓ Public-private initiatives
- ✓ Participations and own developments, result driven

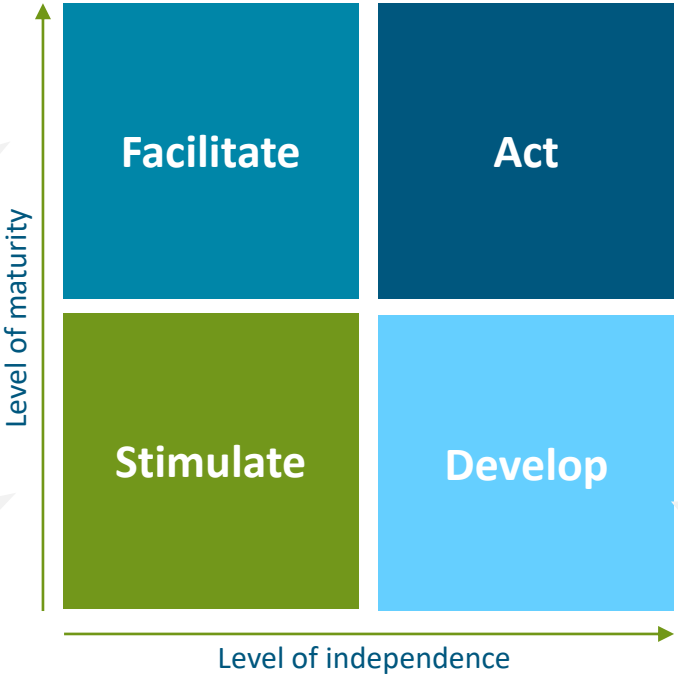
Developer

- ✓ Developer and investor of (joint) energy transition projects
- ✓ Inside and outside the port area
- ✓ Focus on collaboration and alliances
- ✓ Pilot new technologies and ventures
- ✓ Proactive and mission driven

The role of the port authority also depends on how mature the technology or market is and on the degree of independence for a certain development

Ports can **facilitate** changing client needs by servicing new energy demand with relevant facilities, infrastructure, and attract new businesses

Ports can **stimulate** industry clusters, business development, supply chain development, and innovation on new energy technology



Ports can **act** on decarbonisation activities with mature technologies and solutions, energy management and efficiency measures

Ports can **develop** long- term plans, new business models, and pilot new immature energy and process technologies, solutions, and facilities

The energy transition offers opportunities to become more efficient, expand port activities and services, and secure future growth

Selection of identified opportunities

Long-term **cost savings and returns** from energy efficiency and decarbonisation investments

Attract future industry and business by proactively developing the port area and secure or grow long-term land-use returns

Development of a crucial role in supply chains by creating dedicated terminals and corridors

Utility type role by managing energy flows in the port

Secure **new energy trade flows** and future proof market share

CO2

Offer decarbonised services that will contribute to emission reduction of clients and improve the competitive position of the port

Creation of dedicated services for new revenue streams by servicing industries, terminal operators and shipping liners with specific transport and energy flow services

Our main findings from the study of literature

The goal of this report is to increase understanding and awareness on the impact of the energy transition on European ports, and the implications for the role of port authorities.

- The energy transition is highly **complex, diverse and uncertain.** It will have **significant impact on port infrastructure such as quays, networks and storage space.**
- Many port authorities are mission driven and want to enable the transition by playing an essential role in **connecting future flows of energy and resources.**
- Taking on such a **role is demanding:** challenges pertain to **investment decisions, allocation of space, skills and operations**.
- Getting involved early **creates opportunities: cost savings, new revenue sources and future proofing the port.**
- We see **port authorities increasingly taking on a broader and more proactive role** towards energy transition topics, in line with their profile and working with key stakeholders.

Report

Link: http://bitly.ws/rWhh

Or: espo.be/publications

Thank you for your attention

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