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Munster Technological University



Port Operations Management

Offshore Renewable Energy and Ports

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Decarbonisation and Regulation



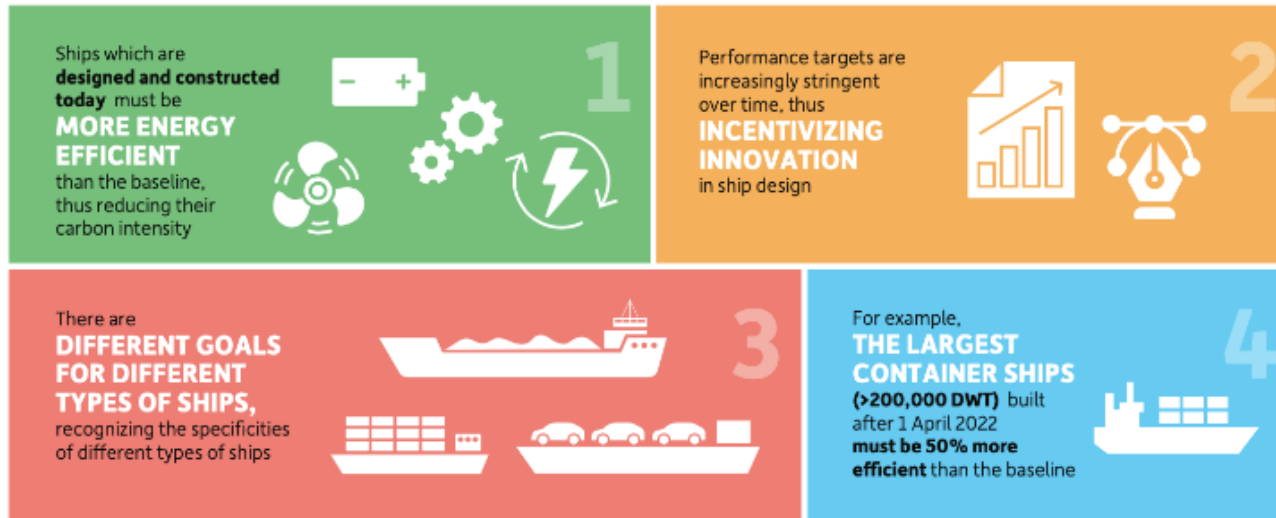
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EEDI ENERGY EFFICIENCY DESIGN INDEX IMPROVING THE TECHNICAL PERFORMANCE OF NEW BUILD SHIPS



The **Energy Efficiency Design Index** (newbuilds) looks at improving the technical performance of new build ships

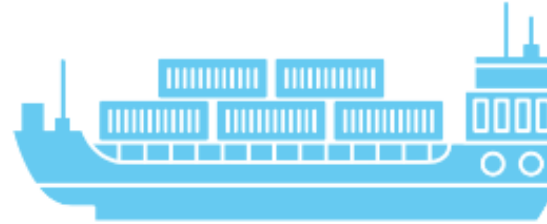


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EEXI

ENERGY EFFICIENCY EXISTING SHIPS INDEX IMPROVING
THE TECHNICAL PERFORMANCE OF EXISTING SHIPS



A technical indicator that measures the theoretical energy efficiency of an existing ship against a reference baseline established by the IMO

An example of a Ports Operations Reaction:

Main Engine Power Limitation systems

In order to comply with Energy Efficiency Existing Ship Index (EEXI) requirements, many vessels have been outfitted with Shaft Power Limitation (SHaPoLi), Engine Power Limitation (EPL) or similar systems.

Where such limiters are fitted, it is important that the Pilot Card properly reflects the ME settings and the engine power available.

Additionally, Pilots must be made aware of any constraints and/or limitations on the available engine power as part of the Master / Pilot Exchange.

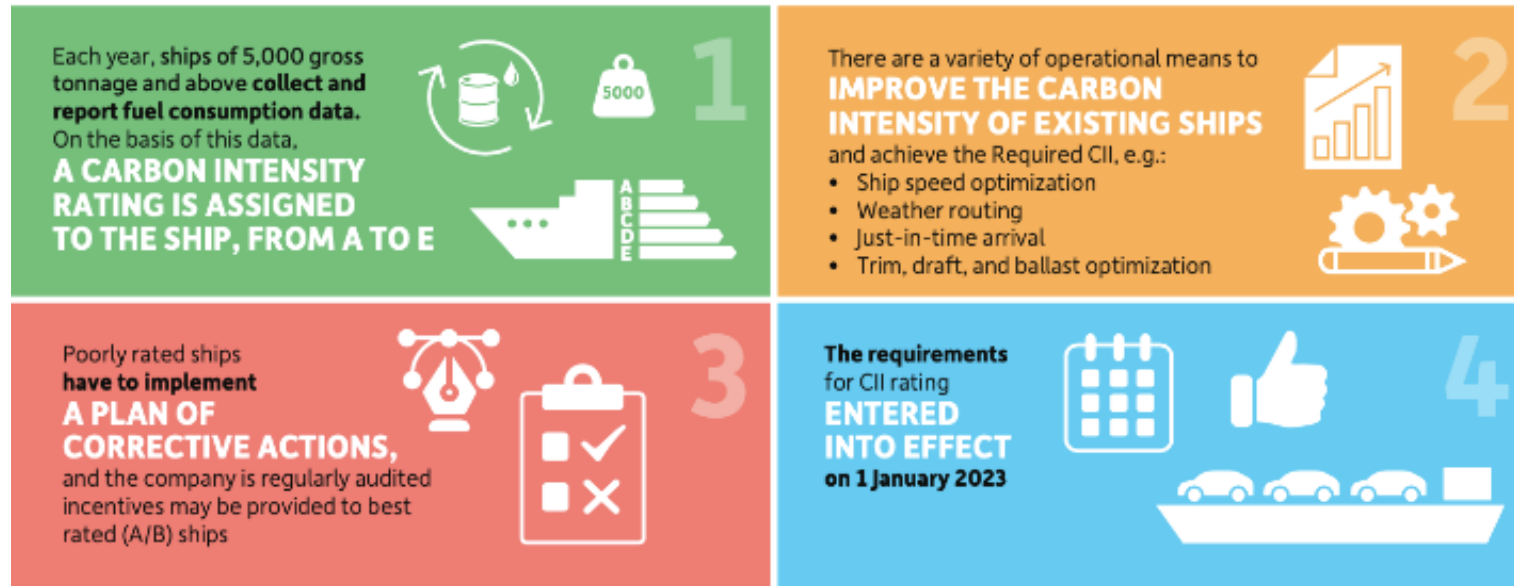
The Safety of Navigation is the over-riding concern and in circumstances where the manoeuvrability of a vessel is compromised, limited or restricted due to the fitting of any Main Engine Limiters, the Master must be able to override such settings on request. In circumstances where this is not possible additional control measures such as tug assistance will be required.

The Carbon Intensity Indicator (every ship over 5000GT measure of operational performance) looks at improving the operational performance of existing ships. The CII evaluates a vessels annual operational carbon performance and results in a rating from A to E

CARBON INTENSITY INDICATOR (CII RATING)



IMPROVING THE OPERATIONAL PERFORMANCE OF EXISTING SHIPS



Decarbonisation- New Green Fuels

Liquid fuels

Methanol- cheaper to introduce than other alternative fuels produced from feedstocks like biomass requires about 2.5 times more storage volume for the same energy content as fuel oil, already in service, is corrosive and toxic and renders some engine components liable to damage

Biofuel- a renewable fuel source which may be considered carbon neutral since the organic matter used to produce biofuels absorbs as much CO₂ during its lifetime as it releases when burned.

- Agricultural and social political issues as the land ,mass needed to produce biofuels increases. Limited shelf life and they oxidise, some have high acidity and degrade overtime

The Nautical Institute, 2024. *Training Standard for Handling Alternative Fuels in the Maritime Sector*. [online]. Available: <https://www.nautinst.org/resources-page/new-training-standard-for-alternative-fuels.html> [accessed 22 Dec 2024]

Decarbonisation

Liquified and compressed gas fuels:

Ammonia- Bad rep because of its toxicity has been produced in vast quantities for use in fertilisers and pharma, it's a gas but above 10 bar becomes a liquid making it easier to transport and store. Requires 2.5 times more storage volume for the same energy content as fuel oil. Ammonia combustion produces nitrogen oxides, its toxic and corrosive.

LNG-still fossil but cleaner, reduce shipping's carbon footprint more of a bridging fuel, limited bunkering facilities, storage, low flash point and can cause asphyxiation

Hydrogen- major issues with containment systems storage and application. No major hydrogen engine builders to date can be stored as a gas and needs four times more storage volume for the same energy content as fuel oil. It has a large flammable range and is explosive

[Why is LNG winning the future –Lloyd's List: The Shipping Podcast – Apple Podcasts](#)

Decarbonisation

Power conversions systems:

Nuclear power- unloading at offshore hubs platforms or artificial island like Dubai, so these ships wouldn't have to enter port and wouldn't pose as much as a risk for ports and their vicinity, fuel cells, solar and wind

Energy Storage Systems:

Lithium-ion batteries and metal hydrides-

All of these come with different risks and precautions and will shape how ports are developed. The industry is also looking at alternative hull forms, friction reduction and anti-fouling

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- Need research- economic/ technical/ policy to better understand
- EU's "Fit for 55" package for transition to carbon neutrality
- Pax and Lo Lo plug into shore power when moored at the quayside -2030
- Zero Carbon emissions by 2050- Paris Agreement/ IMO
- Innovations for ship size, design and ports shoreside power infrastructure
- Smart Ports- sustainable, resilient, efficient and digital
- Irish Ports as hubs for logistics, distribution, training & education
- Growth in regional port capacity for ORE/ Blue economy
- Ports continue to develop to serve their changed local markets



The Master Plan for your nearest Port
Interesting ORE fact



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Photo Courtesy of Killybegs Fishery Harbour Centre- Photo taken 18/09/2024, blades 58m in length

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Port Operations Management Lesson 2 by Deirdre Lane FNI MSc Master Mariner

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DMAP's

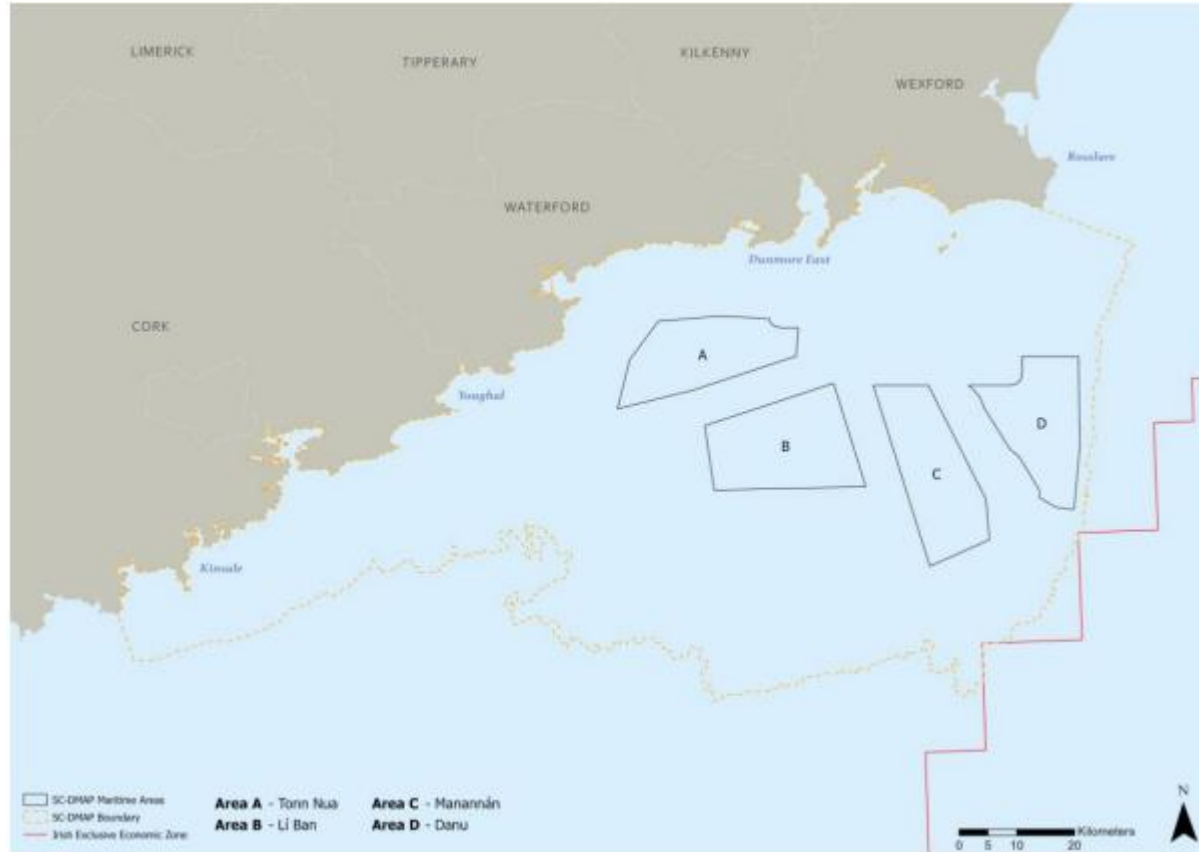
gov.ie - The South Coast Designated Maritime Area Plan for Offshore Renewable Energy (SC-DMAP)

<https://www.gov.ie/en/department-of-climate-energy-and-the-environment/publications/national-designated-maritime-area-plan-dmap-for-offshore-renewable-energy/>



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	2030 Target	2040 Target	2050 Target
Generation capacity	5 GW	20 GW	37 GW

[final-national-ports-study.pdf \(windenergyireland.com\)](#)

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Requirements and timelines set by unique circumstances of individual projects



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Stakeholder consultation throughout

- Scoping Exercises
- Marine licences
- Site Surveys
- Licence award
- Site surveys, energy measurement, engineering design, environmental studies (3 years)
- Consent submission
- Consent award
- Construction (3-4 years)
- Commence commercial operation-35 years

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Port Requirements

More space please!!!! And now.

- Upgrading current port handling infrastructure, quay reinforcement, and connectivity to road and rail networks
- Multi modal e.g. Cruise ships and for marshalling ORE
- New logistics and assembly zones to facilitate wind turbine marshalling and pre-assembly
- Heavy duty quay space to support wind turbine pre-assembly & installation vessel mobilisation
- Lay down areas for storage of heavy components
- Manufacturing facilities
- Dredging and ongoing improvements
- Marshalling ports with a designated port area for assembling storing and preparing wind turbine component parts

Port Requirements

- Deep water quay
- SOVs typically require 100 m of quayside per vessel and minimum draft of 7 to 8 m
- High-capacity crane with enough height to handle large floaters and reach the elevation of the turbines
- Ports with readily available facilities to avoid delays and logistical challenges
- Proximity to windfarm to minimize towing time
- Decommissioning- recycling components

Offshore & Maintenance

O&M for 35 to 40 years

- A port that serves the long term servicing of ORE
- Proximity to the wind farm to minimise time and costs
- Min transfer times and reduce delays in adverse weather
- Buildings for marine control, offices, changing rooms, meeting rooms, office space, marine co-ordinator, welfare facilities- the hub of operations!
- Outdoor storage yards, assembling loads/ stores for the vessels
- Heavy duty pontoons for accommodating Crew Transfer Vessels (CTV's)
- CTVs typically require 35 m of space per vessel and a minimum draft of 3m
- Quayside davit cranes
- Staff parking

Marshalling Ports- Assembly

Fixed and Floating

- Proximity to the wind farm allowing for more flexibility, maximising programme and reducing vessel cost
- Unrestricted tidal access highly desirable alongside minimum restrictions on air draft
- Large landside areas are desirable to facilitate a degree of flexibility in operations

Port Ops and ORE challenges

https://assets.gov.ie/static/documents/Offshore_Wind_Technical_Resource_Assessment.pdf

- Added pressure: Survey vessels/ areas/ co-operation
- Component sizes continue to grow
- Blades for projects are now 135m long
- Blades are now being stacked athwartships
- Blades extending 35-40m into the channel with passenger ferries and other traffic swinging beside them
- Channel management
- Real time and dynamic information
- Berth management

<https://windenergyireland.com/images/files/final-national-ports-study.pdf>