SMART DEC

Smart Clusters for Maritime Decarbonisation

POLICY RECOMMENDATIONS

Towards Europe's Maritime Renaissance

SMARTDEC project's policy recommendations to EU institutions to foster maritime decarbonization in Europe

Interreg Atlantic Area

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ABSTRACT	The SMARTDEC policy recommendations provide the European Institutions with a series of recommendations to ensure the renaissance of Europe's leadership on maritime industries and especially green shipping. It focuses on converting lessons learnt and knowledge gathered during the project implementation phase into useful recommendations for the development of the upcoming EU Maritime Industry Strategy and EU Ports Strategy. In particular, the Policy recommendations explore the concept of "Maritime Industry Valleys" as a key tool for the efficient and effective implementation of the strategies.
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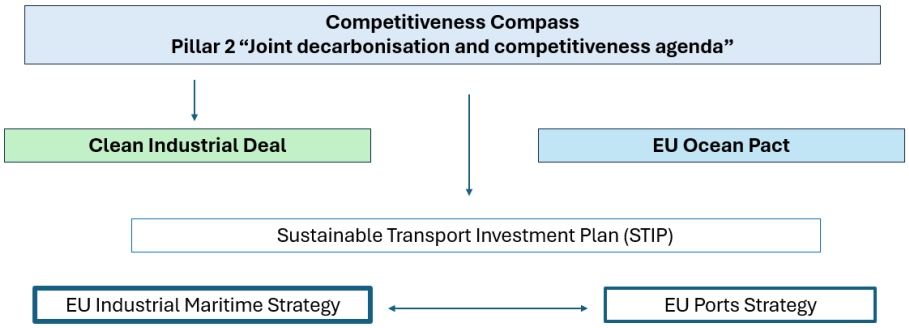
Introduction

The EU is not competing on a level playing field in shipbuilding compared to other countries. According to the Draghi report, the distortive impact in the sector has been particularly severe. Asian competitors can offer prices up to 40% lower than those in Europe. They also offer more favourable business environments such as attractive leasing options for shipowners. This had made the EU very dependant on Asian commercial shipbuilding. While the EU can have a comparative advantage on specialised ships such as research vessels, ice-breaker, energy vessels and offshore renewable energy maintenance vessels, these remain nich markets.

The decarbonisation of maritime transport has been seen at EU level as an opportunity to regain Europe's leadership on high value shipbuilding, while also advancing the EU's 2050 decarbonisation objectives. Under the previous European Commission mandate, key legislative initiatives such as *FuelEU Maritime* and the *Alternative Fuels Infrastructure Regulation (AFIR)* were launched. These initiatives aim, on one hand to set limits to the yearly average greenhouse gas (GHG) intensity of the energy used by ships above 5,000 gross tonnages calling at European ports, and on the other hand, to mandate ports to develop Onshore Power Supply capacity.

In 2025, some of the EU decarbonisation ambitions gained international momentum. The IMO Marine Environment Protection Committee approved on 7-11 April 2025, the creation of the "IMO Net-Zero framework" in its 83rd session (MEPC 83), a worldwide mandatory emissions limits and GHG pricing system for maritime transport, mandatory for ships over 5,000 gross tonnages, which correspond to vessels responsible for 85% of the total CO2 emissions from international shipping.

In its current mandate, the European Commission aims to complement these regulatory frameworks with actions to strengthen the industrial capacity of Europe to support the maritime sector's green transition. The mission letter of Commissioner Tzitzicostas, includes the development of a new industrial maritime strategy to "*enhance the competitiveness, sustainability, and resilience of Europe's maritime manufacturing sector*". It also outlines the creation of an EU ports strategy that should propose areas of targeted EU intervention and providing recommendations and guidance to stakeholders. Both strategies should be published by the end of 2025.



These two initiatives are positive as they aim to restore competitiveness of the EU maritime industry. However, several questions arise regarding how effectively they can address the competitiveness and decarbonisation challenges facing the EU shipping sector:

- How to lead the climate transition while competing in a global market where many players act with cheaper energy, less regulation and more speed of execution?
- How will these policy frameworks ensure that the EU does not lose strategic industrial capacity ending up importing 'dirtier' goods while Europe become 'clean' on paper?
- How these policy frameworks will tackle areas like high and volatile energy costs; slow processing and permitting (renewables, networks, storage, OPS); fragmentation of legislations ; insufficient funding for the leap from TRL 7–9, a difficult stage; too many pilots and lack of scaling while industrialization is needed; external dependencies in critical chains (raw materials, batteries, electrolyzers, fuels) ?

The SMARTDEC project has demonstrated a valuable experience when it comes to fostering technology adoption to support the decarbonisation of shipping. Tackling primarly the EU Atlantic Area, the project aims at developing a mentorship programme and a networking platform that connnects "Made in Atlantic" technologies with shipbuilders, shipping companies and ports, promoting ultimately the transfer of innnovation. Insights from SMARTDEC activities should be considered in the formulation of future EU maritime and port strategies. The recommendations presented in this document are addressed to EU institutions (European Commission, European Parliament, Council), EU Atlantic Member States, and the INTERREG Atlantic area programme. The recommendations are the result of multiple brainstorming sessions involving SMARTDEC partners, Associated partners, Atlantic Regional Authorities, Sector's representatives.

1. Recommendations to the European Commission, European Parliament and Council

General remarks

Insights from the SMARTDEC project

The decarbonisation of the maritime and port sector cannot be approached as a single technological solution or as a rigid sequence of isolated measures. It is a systemic process, with a comprehensive and pragmatic approach in which it is essential to act at all stages of the emissions cycle, combining measures from all stages (avoiding, reducing, offsetting, storing and revaluing emissions) in a complementary way.

- **Avoiding emissions: act before they occur**

The most effective way to decarbonize is to not emit. In the maritime field, this implies acting on the design of the system and the operation that may include: slow steaming, which has an immediate and proven impact on reducing fuel consumption; use of e-fuels and zero or low-carbon fuels (hydrogen, ammonia, green methanol) when available and technically feasible; optimization of routes, stopovers and waiting times using digital tools and advanced planning; logistics redesign to reduce unnecessary trips and improve the efficiency of intermodal transport. Avoiding emissions should always be the first priority, as it reduces systemic costs and reliance on more complex downstream solutions.

- **Reduce emissions: minimise the impact of the inevitable**

When completely avoiding emissions is not possible, the next step is to reduce them as much as possible through: electrification of port operations and use of OPS (Onshore Power Supply) for docked ships; energy efficiency technologies such as rigid sails, wind assistance systems, hydrodynamic improvements or heat recovery; use of transition fuels with a lower carbon footprint; digitalization and Automation to reduce energy consumption in terminals and machinery. These measures allow significant reductions to be obtained in the short and medium term, especially relevant for existing ports and fleets.

- **Offsetting emissions: covering what cannot be reduced in the short term**

Even with avoidance and reduction measures in place, residual emissions will continue to exist for years. In these cases, offsetting can play a transitional role with: high-quality certified carbon credits; ecosystem restoration projects (reforestation, wetlands, seagrasses); offsetting programs linked to local communities or port territories. It is key to understand that compensation does not replace reduction, but must be used in a limited, transparent and temporary way, avoiding greenwashing.

- **Storing emissions: capturing and sequestering CO_2**

In certain industrial and port contexts, especially where there are large concentrated emitters, it may be necessary to capture and store CO_2, which can occur in different ways: carbon capture and storage (CCS) in industrial-port infrastructures; geological storage or in safe marine formations; hybrid solutions combined with energy production or industrial processes. This stage is particularly relevant for sectors that are difficult to decarbonise and for ports with a strong industrial base.

- **Transform, reuse and revalue emissions**

Beyond storage, carbon can become a resource for a variety of purposes: use of captured CO_2 to produce carbonated beverages, building materials (cements, bricks), synthetic fuels or chemicals; integration of carbon capture and utilisation (CCU) solutions in port industrial ecosystems; creation of new circular value chains linked to the port. This stage connects decarbonisation with the circular economy, industrial innovation and job creation.

- **Measure, govern and decide: an essential cross-cutting stage**

To all the above stages must be added a cross-cutting dimension, which is the rigorous measurement of empirical emissions in real time: an enabling condition for decarbonization.

A critical, often underestimated, aspect is that a significant part of current emissions estimates in the maritime and port sector are still based on emission factors, assumptions and models built on data from 15-20 years ago. These models were useful at the time, but they no longer accurately reflect the current operational reality of contemporary ships, ports and energy systems.

This reliance on historical data introduces relevant distortions, as it underestimates or overestimates real impacts according to ship type, operation and local conditions, makes it difficult to clearly assign responsibilities between actors (ships, terminals, port authorities, energy operators) and delays corrective decision-making, when environmental damage has already occurred.

Therefore, it is essential to move towards empirical, continuous and near-real-time measurements, based on sensors, digital systems and real operational data. This approach makes it possible to: know what is emitted, when, where and by whom, with a sufficient level of granularity; assess the real impact on the environment, biodiversity, port workers and neighbouring communities; activate immediate corrective measures (operational, energy or regulatory) before the impacts accumulate; and improve the credibility of sustainability reports and avoid the risk of greenwashing.

Real-time measurement should not be understood only as a reporting tool, but as an operational and preventive instrument, essential to protect people's health, ecosystems and the competitiveness of the port system itself. Without current, empirical and actionable data, decarbonisation risks becoming a

theoretical exercise disconnected from reality. Only by acting in a coordinated manner throughout the carbon cycle will it be possible to move forward with the speed, scale and robustness that the climate transition demands, without compromising the competitiveness and resilience of the port and maritime system.

On Innovation in green shipping

Insights from the SMARTDEC project

The project has highlighted that the majority patents related to green shipping originate **outside the EU**, **primarily in Asia**, showing clear technological lead. The EU Atlantic region, in particular, shows limited involvement in **engineering and deep-tech** projects focused on the decarbonisation of maritime transport. Many alternative fuels and other technologies are still in the **very early stages of development.** Atlantic stakeholders interregotaed has expressed their preferences for electric technologies such as **solar energy, lithium-ion batteries, electric generators** as well as alternative fuels such as **Biodiesel, methanol, and green hydrogen.** The participation of Atlantic stakeholders in EU-funded research remains limited: only 16% of registered Horizon Europe projects related to green shipping (34 projects in total) included stakeholders from the Atlantic region.

Based on these findings, the SMARTDEC project partners recommend:

- **Ensure predictable funding for local innovation on green shipping**

The *Competitiveness Fund* and its Horizon Europe component should provide greater funding certainty for promising EU-made and locally driven innovations, like those identified through SMARTDEC, so they can better compete with heavily subsidised international players. In parallel, the European Commission should continue its work to simplify EU funding programmes (e.g., consortium requirements) and provide more accessible tools for SMEs.

- **Create a supportive business environment for maritime green-tech SMEs**

The EU should foster a more enabling environment for start-ups and SMEs working on maritime transport decarbonisation. This includes setting preferences for EU products or innovations in Public Procurements, improving access to finance through both banking and capital markets, and encouraging banks to adapt to new prudential frameworks (such as Basel regulations) that better support SMEs in the sector.

The EU should encourage public procurement that does not kill innovation, so that in addition to mechanisms such as PPIs (public procurement of innovation), more bridge contracts are made (from pilot to operation), framework agreements for repeatable purchases, joint purchases between ports (aggregate demand), and achieve "first-loss/guarantees" to reduce risk to the public buyer. First-loss

mechanisms[1] and public guarantees can significantly reduce the perceived risk for public buyers, enabling ports/shipping companies to move from pilot projects to real procurement of innovative decarbonisation solutions. The relevance of this type of mechanism/initiative is that it facilitates the paradigm shift in traditionally conservative sectors. The risk of obsolescence does not exist due to lack of technology, but due to the risk aversion of the public buyer, the fear of audits and responsibilities, and the difficulty in scaling up in the commercial phase of the development of innovation.

- **Channel ETS revenues into maritime decarbonisation**

A portion of the revenues from the EU Emissions Trading System (ETS) should be reinvested in supporting the energy transition of the maritime sector. These investments should be tailored to the specific technological and regional needs of EU maritime stakeholders.

- **Global Scouting benchmarking and knowledge exchange**

The acceleration of maritime decarbonisation is no longer confined to Europe. Significant progress is being achieved in other regions worldwide (particularly in Asia, the Middle East, North America and parts of the Global South) through large-scale deployment, integrated energy–port strategies and faster execution models. In this context, Europe would benefit from adopting a more systematic and structured approach to global scouting. Platforms such as SMARTDEC could play a role in aggregating and curating global intelligence, acting as a bridge between European stakeholders and relevant international initiatives. This outward-looking approach would strengthen Europe's strategic autonomy while ensuring that maritime decarbonisation efforts remain competitive, informed and connected to global developments. Ultimately, Europe's leadership in maritime decarbonisation will depend not only on setting ambitious targets, but also on its ability to observe, learn from and collaborate with frontrunners worldwide, translating global best practices into solutions adapted to the European context.

[1] *First-loss is a risk-sharing mechanism in which a party (usually public) takes the first losses if something goes wrong, so that the main buyer (e.g. a Port Authority) feels safe when buying an innovation. First-loss does not pay for innovation, it makes it possible for someone to buy it. Guarantees are similar to first-loss: a third party (EIB, state, public fund) guarantees part of the contract; if the supplier defaults or the technology fails to perform, the guarantee covers the buyer (first-loss and guarantees are often used in combination).*

On Ports energy transition

Insights from the SMARTDEC project

The project has demonstrated that effective logistical management is crucial for reducing emissions in ports. It also underlined the pressing need for investment and research **into charging stations for ports**. The most common means are **onshore power supply** (OPS), **recharging and transhipment points** for batteries and **bunkering of sustainable alternative fuels**.

Based on these findings, the SMARTDEC project partners recommend:

- **Accelerate the transformation of all ports into integrated energy hubs**

Ports, regardless of their size or specialisation, play a critical role in the maritime industry and should become key players in the energy transition. This includes enabling local energy production and storage, developing OPS infrastructure, powering shore-side operations, and supporting the decarbonisation of both maritime and hinterland transport. Ports are uniquely positioned to coordinate energy usage within their ecosystems. They would benefit from clear guidelines and decisions on the energy sources to focus on and on the preferred technologies to mobilise.

Beyond OPS, ports must be transformed into integrated and resilient energy centres, also capable of producing, managing, storing and optimising energy locally for the entire port ecosystem. This includes terminals, port machinery, logistics operators and companies in the port community, moving towards greater sovereignty and energy security.

In addition to OPS for ships, the port energy transition must contemplate additional use cases such as local renewable generation (solar, onshore and nearby offshore wind, marine energy when feasible), directly integrated into port operations; electrification of port machinery and fleets (cranes, RTGs, internal vehicles, short sea), reducing operational emissions and dependence on fossil fuels; energy storage systems (batteries, hydrogen, hybrid solutions) to manage peaks in demand and ensure operational continuity; Clean energy supply for the port community, not limited to ships, reinforcing the port's role as an industrial and logistics energy hub.

It is also key to deploy advanced models of intelligent energy management, supported by digital tools and innovation: energy demand and supply prediction platforms, based on operational, meteorological and maritime traffic data; energy management systems (EMS) that allow automatic or semi-automatic decisions on when to produce, store, consume or exchange energy with the grid; dynamic energy management systems. Origin of energy (local renewables, grid, storage) based on price, availability, carbon footprint and resilience; integration with port digital twins and operational planning systems to align energy, operations and decarbonisation.

In a context of increasing electrification of the maritime and port sector, energy is consolidating itself as a strategic resource. The volatility of energy prices has a direct economic impact on the competitiveness of ports and their business community, which makes it essential that critical infrastructures such as ports can actively participate in the electricity market. This approach would allow progress towards greater price stability in the long term, strengthening the resilience of the port system and ensuring that the transition to sustainability does not become a competitive disadvantage.

- **Recognise the challenges faced by small and medium-sized ports**

For many smaller ports, engaging in the energy transition presents significant financial risks and often depends on local conditions. Tailored support mechanisms are needed to reflect these differences. The need for specific support to small and medium-sized ports, which have less investment capacity but have a high potential for replicable impact, is underlined.

- **Boost investment through the Connecting Europe Facility (CEF)**

CEF should prioritise funding towards the above objectives and reinforce support for modal shift initiatives that benefit short sea shipping (including inland waterways). Completing "last mile" connections to ports is essential for enabling efficient, multimodal logistics chains.

It is also recommended to prioritise, through the Connecting Europe Facility (CEF) and other European instruments, the financing of port electricity infrastructures (OPS, grid reinforcement, microgrids); renewable generation and storage projects in port environments; digital energy management solutions and operational decarbonisation.

This approach will make it possible to move from ports as mere energy consumers to ports as active actors in the energy transition, accelerating the decarbonisation of maritime transport while strengthening the competitiveness and resilience of the European port system.

- **Support modal shift through regulatory and data harmonisation**

The EU should facilitate the modal shift to short sea shipping by harmonising reporting standards, removing internal trade barriers, and promoting the reuse of vessel inspection data across Member States. These actions would significantly enhance the efficiency of intra-EU trade flows.

- **Acknowledge the efficiency of maritime freight**

Long-distance maritime freight transport is significantly more efficient in terms of emissions per ton-mile compared to aviation, an increasingly used option by sectors like fast fashion. This advantage should be considered when designing future transport and sustainability policies.

- **Address the competitiveness challenges of remote ports**

Ports located in remote and outermost regions often face higher energy costs, which can undermine their competitiveness. The European Commission should initiate a structured dialogue, potentially through a dedicated working group, to identify solutions to this issue and ensure no region is left behind in the green transition.

- **Secure industrial resilience and fair global competition**

To revitalise the EU's industrial capacity in green shipbuilding, it is essential to ensure secure access to critical materials, such as steel, technical components, and onboard electronics. At the same time, the EU must uphold fair competition with global actors. The European Commission should consider incentivising the creation of *green shipping corridors* between the EU and non-EU regions through international trade and cooperation agreements. It is to be noted that green shipping corridors only work if there are offtake agreements, planned bunkering infrastructure and a price signal that makes the transition competitive.

- **Promoting the Energy Transition of Ports through Green Labeling and Incentives**

The EU should promote environmental labels recognising and promoting ports and shipowners engaged in the ecological transition. Such recognition can strengthen the visibility and reputation of frontrunners while encouraging broader sectoral participation. It could complement these initiatives with incentive mechanisms such as ecobonus schemes, rewarding efforts to reduce emissions.

On mobilising the EU Maritime Industry Value Chain

Insights from the SMARTDEC project

The **high upfront costs** of deploying new sustainable technologies at the full value chain scale remain a significant barrier.

Europe and the EU Atlantic Area already hosts a wide range of laboratories, testbeds, living labs, innovation hubs and pilot infrastructures capable of supporting the development, validation and upscaling of low-carbon maritime solutions. However, these assets remain highly fragmented, unevenly visible and often difficult to access for innovators and end users alike, particularly beyond regional or national boundaries.

To overcome this, **Partnerships and agreements** between stakeholders from different categories were identified as essential.

Building on its findings, the SMARTDEC project partners recommend the following:

- **Develop a first diagnosis of the EU Atlantic maritime industrial value chain**

The European Commission should build on SMARTDEC's studies to mobilise Member States and regional stakeholders around shared objectives and measurable indicators for monitoring progress.

- **Establishing a continuous monitoring and benchmarking mechanism at European level**

Establishing a continuous monitoring and benchmarking mechanism at European level (covering ports, shipping, fuels, energy integration and digital solutions) would allow policymakers, ports and industry stakeholders to identify mature and proven solutions with high replication potential in Europe, anticipate emerging trends and technologies before they reach the European market, and avoid duplication of efforts by building on knowledge already generated elsewhere.

- **Support the creation of "Maritime Industry Valleys" (MIVs)**

These interconnected ecosystems, bringing together shipyards, shipbuilders, ports, clusters, incubators, equipment suppliers, universities, research centres, public authorities, investors, and financial institutions, would be a key instrument for implementing the European Maritime Industry Strategy. They would help identify locally-driven strategic projects and attract EU funding (CEF, Competitiveness Fund, Horizon Europe, and National/Regional Partnership Plans). Such partnerships are vital to advancing green shipping and guiding investors and users towards the most effective decarbonisation strategies, while ensuring full consideration of local environmental specificities and citizens' needs. For an industrial policy that protects critical capabilities, and to foster EU's autonomy and resilience, it is essential to have a local chain of key technologies (electrification, batteries, H_2, industrial software); mass training (reskilling); and patient financing (EIB/guarantees/PPP) for infrastructure.

- **Emphasise the territorial and collaborative nature of MIVs**

By recognising the role of local ecosystems and public-private partnerships, MIVs would build on initiatives like the Ocean Pact, supporting both the resilience of coastal communities and the development of circular economy clusters. These could include sustainable ship dismantling, remanufacturing, and component reuse. Measures are also needed to tackle the shortage of skilled human resources in the maritime sector's green transition.

- **Support Open Innovation, Living Labs and Test Facilities**

Those MIVs could facilitate Open Innovation, Living Lab and Tast Facilities sharing. SMARTDEC points to the importance of making innovation support ecosystems more visible, connected and accessible at European scale, not only within the Atlantic Area but across all maritime regions of Europe. Increasing transparency on *where* innovations can be tested, *under which conditions*, and *with which partners* would significantly reduce time-to-market and duplication of efforts.

- **Use SMARTDEC as a foundation**

The project has already connected key regional ecosystems, including maritime clusters (Pôle Mer Bretagne Atlantique, Fórum Oceano, Clúster Marítimo de Andalucía), incubators (Atlanpole, Bilbao

PortLab), public authorities (regional actors via CPMR, national agencies such as IMDO), and academic institutions (e.g., University of Aveiro). These networks offer valuable guidance for establishing MIVs and identifying trends in green shipping.

The SMARTDEC networking and matchmaking platform has the potential to evolve into a sectoral reference point, acting as a single window for matchmaking between innovators and solution providers, end users seeking to decarbonise (ports, terminals, shipowners, industrial actors), and innovation support infrastructures (labs, living labs, test facilities).

- **Engage the European Parliament**

The Parliament should organise hearings with maritime regions and stakeholders to refine and formalise the MIV concept, and advocate for it in discussions with the European Commission on the EU Maritime Industry Strategy and EU Ports Strategy. The Parliament may consider launching a dedicated pilot initiative for Maritime Industry Valleys under the 2027 budget.

2. Specific Recommendations to the Atlantic Member States

Insights from the SMARTDEC project

Users and investors require clear **guidance on the best decarbonisation strategies** and associated **budgetary resources**. In the Atlantic area, developers and end-users favour **electrification, sustainable alternative fuels and ports' related technologies** as the main pathways to maritime decarbonisation. Energy efficiency (optimization systems) is considered a high-priority technology. Electrification technologies most commonly quoted are **solar energy, lithium-ion batteries, and electric generators**. Alternative fuels identified most of the times are **Biodiesel, methanol, and green hydrogen**. Through its open call for innovations, SMARTDEC partners selected 11 promising innovations ranging from **real-time port operation optimisation** and **biofouling prevention**, to **electric and hydrogen powered catamarans** and Hybrid **solar-wind wings,** and **'mini-container' storing solar energy** aboard vessels. These innovations will now enter a mentorship programme to connect with potential users and clients.

Based on these findings, the SMARTDEC partners recommend:

- **Leverage results at Atlantic Strategy level**

Atlantic Member States should use the next Atlantic Strategy Committee meeting to explore how the Strategy can capitalise on SMARTDEC outcomes and foster structured action around preferred maritime transport decarbonisation pathways.

- **Integrate into Pillar I "Ports"**

The action plan under this pillar should be updated to reflect SMARTDEC results in the short term, with regional authorities and relevant stakeholders directly involved in shaping Atlantic-wide green shipping corridors.

- **Align funding opportunities**

Member States should coordinate funding mechanisms to support pilot transfers of SMARTDEC-identified innovations to Atlantic shipbuilders, shipping companies, and ports.

- **Promote innovation through Blue Invest**

National Hubs should support the connexion of SMARTDEC start-ups and SMEs with the Blue Invest initiative, strengthening their growth potential and capacity to transfer innovation.

- **Define indicators for monitoring progress**

Member States should establish concrete measures under Pillar I "Ports as hubs of the blue economy and gateways to Europe," with specific indicators reflecting the role of Maritime Industry Valleys in advancing Atlantic green shipping. They should also provide more transparency and a common framework that allows reliable benchmarking of environmental and energy performance across ports and maritime operators.

- **Ensure strong political backing**

A European maritime industrial renaissance requires firm support from the Council. SMARTDEC partners therefore suggest that Council conclusions on the EU Maritime Industry Strategy explicitly endorse the Maritime Industry Valley concept.

- **Involve shipping and regional value chains**

The shipping sector and coastal regional ecosystems should be directly engaged in the design of National and Regional Partnerships to align investment priorities with maritime competitiveness and the green transition. Cohesion Policy should remain central in fostering place-based innovation ecosystems and infrastructure upgrades across maritime regions.

3. Specific Recommendations to the Interreg Atlantic Area programme

Insights from SMARTDEC project
The project has launched an Atlantic **interactive platform** designed both as a technology showcase and networking hub for opportunities. As of September 2025, the platform already counts **75 registered users**, who engage across thematic areas including: Design & Retrofitting, Digital Green, Electrification, Energy Efficiency, Logistics, On-board Carbon Capture, Ports, Sustainable Alternative Fuels.

Building on this achievement, the SMARTDEC partners recommend:

- **Capitalise on SMARTDEC results**

Ensure project outcomes benefit a wide Atlantic audience by considering new dedicated calls for innovation transfer, memoranda of understanding with similar projects (including those funded by other EU programmes), and incentives for stakeholders to jointly apply for funding to scale up results.

- **Integrate the interactive platform into long-term Atlantic frameworks**

Incorporate the SMARTDEC tool into the **INTERREG Atlantic Area programme** and the **Atlantic Strategy** to secure its continuity beyond the project lifetime. This would maintain stakeholder collaboration, provide updates, and support scaling and capacity building. A service contract, backed by technical assistance, could support the SMARTDEC project leader in maintaining the tool.

- **Link SMARTDEC to the GRAAL project**

Integration with the "Governance and Regional Atlantic Area Lighthouse" (GRAAL) project would strengthen the impact of Interreg Atlantic Area initiatives on environmental protection, prosperity, and climate resilience. GRAAL could specifically support identifying ideas for future calls for proposals related to **maritime industry decarbonisation** and **ports' energy transition** to upscale SMARTDEC.

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ANNEX

SMARTDEC project: Main findings and results

The SMARTDEC project has already provided to the Atlantic maritime industry ecosystem:

1. **An identification of gaps, needs, stakeholders and technology providers/users in maritime decarbonization.**

   The SMARTDEC research consisted in studying completed research and on-going EU projects on green shipping to identify what is currently missing in the Atlantic Area to bring up possible solutions. The report showcased a notable lack of involvement from the Atlantic region in **engineering and deep tech projects** focused on decarbonization. In contrast, EU funding programs such as Interreg North Sea Region have a higher number of R&D projects dedicated to decarbonizing waterborne transportation when compared to Interreg Atlantic. Alternative fuels are still in the **very early stages of development**, and ships continue to rely heavily on high fuel consumption and fossil fuels. Additionally, logistical management is crucial for reducing emissions in ports, and there is a pressing need for investment and research **into charging stations for ports**. The **high initial costs** of implementation of new sustainable technologies at the full value chain scale also presents a significant barrier. Lastly, **partnerships and agreements** between stakeholders from different categories were identified as essential for advancing these initiatives.

2. **A scientific and technological innovation assessment and forecasting innovation trends**;

The report built up on the analysis of patents and 9 workshops with stakeholders at national levels showed the following trends for Atlantic green shipping:

- Most **patents come from outside the EU** or the EU Atlantic area, belonging to Asian techology developers making the EU lagging behind in this market.
- The preferred decarbonisation strategies by developers and end-users in the Atlantic area are **electrification, sustainable alternative fuels and ports' associated technologies;**
- **Energy efficiency (optimization systems)** is considered a high-priority technology, despite having fewer participants that are working with it;
- The most common electrification technologies are **solar energy, li-ion batteries, and electric generators;**
- The most common alternative fuels are **Biodiesel, methanol, and green hydrogen**;
- The most common port tools are **onshore power supply (OPS), recharging and transhipment points for batteries and bunkering** of sustainable alternative fuels;

- The main decarbonisation challenge in the Atlantic Area is the **lack of technology availability/maturity**.
- The **absence of clear regulations and a legal framework** on how to achieve the set goals is also seen as a major challenge.
- Users and investors want guidance on the best decarbonisation strategies. The main obstacle to boosting technology readiness is the **lack of appropriate monetary resources**.
- Participants highlight the need to prioritise financial levers in policies. The transnational approach of SMARTDEC, bridging the gap between tech developers and end-users was seen very positively by stakeholders

As a follow-up, the SMARTDEC project will draw a Regional matching analysis of decarbonisation needs with identified technology profiles (not yet available at the time of the Political recommendations).

3. **An Atlantic interactive platform** to serve as a technology showcase and networking and opportunity tool

Already 75 users are registered (September 2025). They have the opportuniy to interact on specific thematic areas : Design & Retrofitting, Digital Green, Electrification, Energy Efficiency, Logistics, On-Board carbon capture, Ports and Sustainable Alternative Fuels.

4. **An open call for Atlantic solution providers** to select the most promising technologies;

11 innovative solutions from green shipping have been sourced in Ireland, France, Spain and Portugal and selected for their excellency and innovation potentials. A business support scheme has been implemented since November 2025 to upgrade the selected Atlantic promising innovations. It is now in the phase of capitalizing its products and services so that it benefits a wider EU community.