MARINEWIND

Market Uptake Measures of Floating Offshore Wind Technology Systems (FOWTs)

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D4.3: MARINEWIND Action Plan for Public Acceptance of FOWT

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EXECUTIVE SUMMARY

This deliverable, D4.3 – "MARINEWIND Action Plan for Public Acceptance of Floating Offshore Wind Technologies (FOWT)", provides a comprehensive set of actions developed within the framework of the MARINEWIND project. The Action Plan aims at fostering public acceptance and accelerating the market uptake of FOWT across Europe, by addressing non-technological barriers and promoting inclusive stakeholder engagement.

The recommendations are divided according to their geographical relevance, encompassing both European-level actions and national-specific strategies for the five countries hosting the MARINEWIND Labs: Greece, Italy, Portugal, Spain, and the United Kingdom. This structure ensures that the proposed measures are tailored to the unique socio-political, environmental, and economic contexts of each country, while also contributing to a harmonised European approach.

The Action Plan builds upon the findings of multi-dimensional analyses and co-creation workshops conducted throughout the project, which explored barriers and enablers across policy, regulatory, social, environmental, financial, market, and technological dimensions. These insights were translated into actionable recommendations targeting the Quintuple-Helix stakeholder categories, i.e. industry, academia, public authorities, civil society, and green innovators.

Key thematic areas addressed include the mitigation of environmental impacts, enhancement of technological maturity, knowledge exchange with forerunner countries, reduction of EU dependency on critical raw materials, and the development of awareness campaigns to improve social acceptance. Each recommendation is accompanied by a detailed set of actions, implementation timelines, key actors, and measurable indicators to monitor progress.

By providing a strategic and operational roadmap, this deliverable supports policy makers, public authorities, and stakeholders in shaping a favourable environment for the deployment of FOWT, contributing to the European climate neutrality goals and the creation of a resilient, inclusive, and competitive offshore wind sector.

1 INTRODUCTION

Unlocking the full technological and physical potential of wind energy as renewable technology is crucial to enable Europe to reach the ambitious targets set for the reduction of carbon emissions by **at least 55% by 2030**, compared to the 1990 levels, and become **climate neutral by 2050**. Many documents guiding the EU decarbonisation pathway – such as the Climate Law, the Fit-for-55 package and the REPowerEU – have recognised offshore wind energy as a pan-European priority, further underlining its role and potential in the energy mix. The potential of the offshore wind deployment as part of the energy mix for the decarbonisation is reflected in the objectives set by the Commission in the **EU Strategy to harness the potential of offshore renewable energy for a climate neutral future** (2020)[1], with the ambition to achieve an installed capacity of **at least 60 GW of offshore wind by 2030,** rising to **300 GW by 2050.** However, to reach these targets, further actions should be implemented. The **European Wind Power Action Plan (2023)**[2] has identified five main factors hindering the full potential of the EU wind energy sector, namely:

- **The uncertain demand for wind turbines in the EU** due to the lack of a clear overview of the planned wind deployment at the national level, leading to inadequate planning of investments and the under-utilisation of the production capacities;
- **The complex permitting procedures** characterised by administrative burdens and long waiting times, leading to significant delays for the approval of new projects and a lack of a unified regulation for the transport of wind turbine parts across the EU.
- **The inadequate and heterogeneous design of national tenders** for the development of renewable energy, based mainly on price criteria rather than introducing penalties for non-execution of projects and non-price criteria, covering environmental and social aspects.
- **The increasing international competition** due to the role of China as supplier of raw materials to the EU while also emerging as a competitor in third country markets, causing a potential reduction of competitiveness and innovation on the EU market.
- **The limited availability of skilled workers (e.g., operators of vessels, cranes or heavy lifts) in the wind manufacturing sector** affecting the increase of the European production capacity.

Building upon the key barriers to the deployment of the wind energy sector emerging in the aforementioned European Wind Power Action Plan, this deliverable D4.3 - MARINEWIND Action Plan for Public Acceptance of FOWT aims at translating the recommendations developed within the project into actionable insights to guide the next steps of the Quintuple-Helix stakeholders to accelerate the market uptake of FOW.

In the framework of Task 4.2 Recommendations for MARINEWIND Stakeholders, the activities and results from the national co-creation workshops and the multi-dimensional analyses performed within the project – covering regarding barriers and enablers with respect to policy, regulatory, social,

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0741

[2] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52023DC0669

environmental, financial, market and technological dimensions - were valorised into a set of European and national-specific recommendations targeting the stakeholders Quintuple-Helix to guide them throughout the next steps for FOW deployment. The recommendations directly informed the drafting of the MARINEWIND Action Plan for Public Acceptance of FOWT to raise citizen's awareness and remove the non-technological barriers for the FOW access to the market.

The deliverable is structures into the following four chapters:

- **Chapter 1 – Introduction** provides introductory information about the context in which this report has been elaborated and describes its structure, along with an overview of the main barriers hindering the deployment of wind energy at European level.
- **Chapter 2 – Objectives and methodology** outlines the main objectives to be pursued and the methodology applied to draft the MARINEWIND Action Plan.
- **Chapter 3 – MARINEWIND Action Plan** provides an in-depth description of the key actions to be implemented at European and national levels to accelerate the uptake of FOW and enhance its public acceptance, identifying key actors to be involved, the timeline for their implementation and indicators the measures their achievement.
- **Chapter 4 – Conclusions** provides final reflexions arising from the document.

2 OBJECTIVES AND METHODOLOGY

This chapter provides a description of the main objectives and target groups of the MARINEWIND Action Plan, while outlining the methodology and the approach adopted in the drafting of the document.

2.1 Objectives and target groups

The MARINEWIND Action Plan aims at providing a set of actions to be implemented at European and national level, with regards to the five countries hosting the MARINEWIND Labs (Greece, Italy, Spain, Portugal, UK), to guide the different stakeholders categories in the next steps towards the acceleration of the market uptake of FOW, while raising public awareness and removing the existing barriers with respect to policy, regulatory, social, environmental, financial, market and technological dimensions.

The target groups of the MARINEWIND Action Plan follow the macro-categories of the Quintuple-Helix approach according to the specific thematic dimension of the recommendation. The stakeholders categories included are the following ones:

- **Industry**: FOW installation developers, engineering companies, tech/project developers, trade associations (fisheries and tourism).
- **Academia**: scientific community, research centres, universities.
- **Public authorities**: local authorities, national authorities, European authorities, local associations, national associations, European associations, maritime transport authorities, policy makers, municipalities.
- **Civil society**: NGOs, civil society organizations, citizens, foundations.
- **Green innovation**: public/private financial investors, insures, ecologists, environmental organisations, national natural parks.

2.2 Methodology

The MARINEWIND Action Plan builds on the set of recommendations presented in D4.2 Recommendations for MARINEWIND stakeholders, which were drafted by Q-PLAN, with the support from all partners, leveraging on the findings about the main barriers and enablers for FOW deployment resulting from the analyses performed in technical Work Packages (WPs), namely WP1 - Policy framework assessment and co-creation, WP2 - Social acceptance and environmental impact analysis and WP3 - Financing, techno-economic analysis and survey, and the outcomes of the three rounds of national co-creation workshops. Furthermore, the initial set of recommendations was informed by a preliminary desk research on the online literature, aiming at identifying success stories, best practices and additional areas of improvements to accelerate FOW deployment. Lastly, they were validated through a Mobilisation and Mutual Learning (MML) workshop, which succeed in bringing together stakeholders from the Quintuple-Helix to gather their feedback for the refining of the recommendations.

To translate the aforementioned recommendations into actionable European and national insights to foster FOW development and enhance public acceptance, APRE developed a template to gathering inputs from the MARINEWIND partners, especially the five Lab managers, as shown in Table 1.

Table 1 - Template for data collection

Recommendation #1	
High-level recommendation	*<Description provided in the recommendation>*
Context	*<Description provided in the recommendation>*
Description	*<Description provided in the recommendation>*
List of concrete actions to implement the recommendation #1 at national level.	*<Description of the action and relevant actors involved in its implementation>*
Proposed timeline for each specific action.	*<Specify short-medium-long-term>*
List of indicators to measure the achievement of the proposed actions.	*<Indicate at least one measurable indicator for each action>*
Relevant national and European documents.	*<Indicate the full title of the document, the link and specify to which action it is connected>*

Starting from the European and national-specific state of the art outlined in the aforementioned document, the partners were invited to identify a list of concrete actions to implement the specific recommendation at national level. Furthermore, for each action, they were asked to indicate the following aspects:

- The main actors to be involved in the implementation process, both at local, national, and European level;
- The timeline for the proposed action;
- Operational indicators to measure the achievement of the proposed action;
- Relevant documents and ongoing initiatives at local, national, and European level.

In order to assess the timeline for the implementation of the proposed actions included in the MARINEWIND Action Plan, the following criteria were provided:

- **Immediate**: 0-12 months.
- **Short-term**: 1-3 years.
- **Short to medium-term**: 2-5 years.
- **Medium-term**: 3-5 years.
- **Medium to long-term**: 5-10 years.
- **Long term**: 10+ years.

After collecting the inputs from the MARINEWIND partners, APRE systematised the materials received into a coherent and harmonised structure by linking the actions to the specific recommendation and shaping the final Action Plan.

3 MARINEWIND ACTION PLAN

Building on the key findings of the MARINEWIND project, this chapter aims at translating the national-specific and European recommendations identified in the D4.2 - Recommendations for MARINEWIND Stakeholders into a set of actions to guide the different stakeholders categories in accelerating the deployment of FOW across Europe. For each proposed action, the timeline of implementation and indicators to measure its achievement have been identified.

3.1 European level actions

This paragraph describes the actions to be undertaken at the European level to accelerate FOW deployment by tackling cross-border barriers and leveraging common enablers. The list of actions has been informed by the set of MARINEWIND recommendations, which summarised the results of the three-fold analysis performed by the projects, the Mobilisation and Mutual Learning workshop and the outcomes of the co-creation activities.

Recommendation #1

Mitigation of the negative environmental impacts on marine ecosystem.

The unique characteristics and scale of FOW projects introduce novel environmental conditions throughout their life-cycle, from construction to operation and eventual decommissioning. These conditions give rise to several environmental concerns, including acoustic and electromagnetic disturbances, impacts on seabird populations, alterations in atmospheric and oceanic dynamics, degradation of seabed integrity, and changes in water quality due to the movement of artificial structures. Additionally, the presence of mooring lines and subsea cables may influence the behaviour of marine species, while the increased use of marine space could elevate the risk of accidents. However, there are viable technological solutions to be applied to FOW developments, not only to mitigate adverse environmental effects on marine ecosystems but also to enhance potential positive outcomes.

Action 1: Identifying and implementing innovative and sustainable solutions balancing FOW deployment with the minimisation and mitigation of the environmental impacts on the marine ecosystem through exploration of co-use potential, environmental technology integration, dedicated funding mechanisms, mandatory socio-economic impact assessment and introduction of non-pricing criteria.

- **A1.1**: **Port infrastructure upgrades with co-use potential.** Invest in port facilities (quays, cranes, storage, deep-water access) not only for FOWT assembly but also to accommodate multipurpose uses, such as supporting fisheries logistics and local value chains. Actors: National ministries of transport and energy, port authorities, regional governments, fishing cooperatives, private investors.

  ⏰ **Short to medium-term (2–5 years).**

- **A1.2: Environmental technology integration.** Incorporate innovative technologies (cable shielding, non-toxic coatings, bird detection, noise dampening) into licensing requirements to reduce environmental impacts and accelerate approval procedures. Actors: National environmental agencies, energy regulators, research institutions, offshore wind developers.
  ⏰ **Immediate to short-term (1–3 years).**
- **A1.3: Dedicated funding mechanisms.** Establish targeted funding and incentives (e.g. through Recovery and Resilience Plans, Horizon Europe, or national green investment schemes) for FOWT-related port infrastructure and innovation. Actors: National ministries of finance and energy, European Investment Bank (EIB), national funding agencies.
  ⏰ **Short-term (1–3 years)** for funding schemes; ongoing for project implementation.
- **A1.4: Stakeholder engagement platforms.** Set up structured dialogue platforms at national and regional level to coordinate between offshore wind developers, fishers, port authorities, and local communities to identify potential conflicts and co-use solutions. Actors: National maritime spatial planning authorities, fisheries representatives, offshore wind developers, coastal municipalities.
  ⏰ **Short-term (1–2 years)** for platform establishment; ongoing thereafter.
- **A1.5: Mandatory socio-economic impact assessment**. Require socio-economic impact assessments (SEIA) for all FOWT projects at the licensing stage, with a focus on employment, fisheries displacement, community benefits, and cumulative impacts. Actors: National energy/environment ministries, maritime spatial planning authorities, social partners, fisheries organisations.
  ⏰ **Short-term (1–2 years)** with immediate introduction in licensing procedures.
- **A1.6: Tender non-pricing criteria for local socio-economic and environmental benefits.** Introduce non-price criteria in national offshore wind tenders, rewarding bidders who demonstrate tangible benefits for coastal communities (like jobs, training programmes, local supply chains, fisher engagement) and pose attention to environmental aspects and impacts throughout the project life-cycle (e.g., planning, materials construction, decommissioning). Actors: National energy regulators, ministries of economy, offshore wind developers, local authorities.
  ⏰ **Short-term (1–3 years).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Number of ports upgraded, share of upgraded ports including facilities benefitting fisheries and local communities.
2	Percentage [%] of new FOWT projects incorporating at least two mitigation technologies, and time reduction in environmental impact assessment procedures.
3	Amount of public/private funding mobilised, and the number of funded projects completed.
4	Number of stakeholder consultations held, plus the share of projects with formalised co-use agreements.

5	Percentage of licensed projects with a completed SEIA, and the number of mitigation or compensation measures integrated into permits.
6	Share of tenders including socio-economic and environmental criteria, as well as the proportion of contracts awarded with commitments for local benefit schemes.

Recommendation #2

Facilitate technological maturity for developing FOWTs

Fostering innovation in grid connection and power transmission is critical to foster FOW deployment across Europe. FOW farms are subject to specific challenges, including (i) higher costs for grid connection due to their distance from the coastline which require longer undersea cables and advanced technologies to minimize energy loss; (ii) the constant motion from waves and currents, demanding flexible yet durable cabling systems capable of withstanding harsh environmental conditions over their operational lifespans; (iii) challenges related to the installation of subsea cables, requiring careful consideration of varying water depths, seabed conditions, and potential conflicts with marine ecosystems or existing infrastructure, such as shipping lanes and telecommunications networks.

Action 2: Adopting advanced technologies to enhance grid connection, power transmission and technological maturity to deploy FOW through pilot projects, dedicated innovation fundings, national testbeds, and national knowledge sharing platforms to aligning technical standards and drawing on the lessons learned.

- **A2.1: Pilot and demonstration projects for advanced transmission technologies.** Supporting national-level pilot projects to test and validate advanced grid connection technologies (HVDC, MMCs, flexible DC systems) under real marine conditions. These technologies include Modular Multilevel Converters (MMCs) and High Voltage Direct Current (HVDC) systems can be used in flexible DC transmission. Results should feed directly into permitting and standardisation processes. Main actors are national energy ministries, transmission system operators (TSOs), offshore wind developers, research centres, technology providers.

  ⏰ **Short to medium-term (2–5 years)**.
- **A2.2: Innovation funding for robust and flexible cables and connectors.** Establishing targeted funding calls or tax incentives to stimulate the development of durable, dynamic and flexible subsea cables, connectors, and ancillary equipment designed for FOW. Key actors include national innovation agencies, ministries of energy/industry, cable manufacturers, offshore developers. These actions will increase efficiency, reliability, and durability of grid connections and power transmission for FOW projects, even under challenging environmental conditions.

  ⏰ **Short-term (1–3 years)** for funding programmes; **Short to medium-term (3–6 years)** for market-ready solutions.
- **A2.3: National testbeds for floating platform designs.** Creating dedicated offshore test zones to trial innovative floating platform designs and anchoring systems, hereby integrating environmental monitoring to assess impacts on ecosystems and co-use potential with other

maritime activities (such as fisheries). This action will require the involvement of national maritime authorities, research institutes, offshore developers, fisheries stakeholders.

⏰ **Medium-term (3–6 years).**

- **A2.4: Standardisation and knowledge-sharing platforms.** Developing national platforms to align technical standards for FOW components, drawing on lessons learned from pilots and ensuring interoperability across borders. Include structured exchanges with other marine sectors to anticipate and mitigate conflicts. Key actors involved include national standards bodies, ministries of energy/industry, offshore wind developers, European Committee for Standardisation (CEN-CENELEC).

  ⏰ **Short-term (1–2 years)** for platform creation; ongoing action for updates.

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Number of demonstration projects funded and completed; proportion of new FOWT projects adopting advanced transmission technologies.
2	Amount of funding allocated; number of patents, prototypes, or commercial solutions developed.
3	Number of testbeds established; share of FOWT platforms tested in national waters before commercial deployment.
4	Number of standards developed/adopted; level of cross-sector participation in knowledge-sharing platforms.

Recommendation #3

Closing the knowledge gaps in terms of technological solutions, skills needed, investments schemes and indication on how to shape a supportive regulatory and policy framework by leveraging on the insights provided by operating wind farms.

The path traced by forerunner countries to accelerate offshore wind deployment can be inspirational for the Mediterranean area, where FOW farms are still under planning. The delay in FOW deployment is influenced by diverse factors, including multiple and competing instances of different socio-economic sectors; the lack of a clear policy frameworks and financial incentives; limited availability of trained workforce; complex consenting processes; the lack of a shared vision amongst policymakers on the role of offshore wind in the energy mix. To tackle these obstacles, learning from the knowledge and technical expertise from forerunner countries, such as Denmark, Norway and the UK, and covering the technological, regulatory, financial and educational aspects, is crucial.

Action 3: Fostering the knowledge sharing with forerunner countries in the floating and offshore wind sector through knowledge exchange to inform the Mediterranean pathway towards FOW uptake and oriented towards the definition of reskilling opportunities, the shaping of clear policy frameworks and incentives, and a streamlined permitting process.

- **A3.1: Knowledge exchange mechanisms.** Establishing structured national programmes to exchange knowledge and best practices with forerunner countries (e.g. Denmark, Netherlands, Norway, UK) on regulatory design, permitting, stakeholder engagement, and socio-economic integration of FOWTs. Actors: National energy ministries, embassies, offshore wind clusters, fisheries organisations, research institutes.

  ⏰ **Short-term (1–3 years).**
- **A3.2: National skills and training initiatives.** Developing training programmes and study visits for local workers along the FOWT value chain (design, installation, maintenance), while also integrating training on coexistence with marine sectors and safety at sea. Actors: National education and labour ministries, vocational institutes, offshore wind developers, fisheries training schools.

  ⏰ **Medium-term (3–5 years).**
- **A3.3: Clear policy frameworks and incentives.** Introducing national strategies for offshore wind in the Mediterranean, aligned with EU targets, and supported by well-defined investment incentives (like feed-in premiums, or green investment schemes). Frameworks should mandate socio-economic impact assessments to ensure benefits for coastal communities. Actors: National energy ministries, finance ministries, regulators, local authorities.

  ⏰ **Short to medium-term (2–4 years).**
- **A3.4: Streamlined permitting with safeguards.** Simplifying permitting procedures by creating one-stop-shops, while ensuring early involvement of fishers and local communities to identify socio-economic and environmental risks. Actors: National maritime spatial planning authorities, permitting agencies, fisheries organisations, NGOs.

  ⏰ **Short-term (1–3 years).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Number of exchange programmes and joint workshops organised; number of policymakers, developers, and fisheries stakeholders involved.
2	Number of trained workers; share of local workforce employed in FOWT projects.
3	Publication of national offshore wind strategies; number of tenders launched with socio-economic criteria.
4	Reduction in the average permitting time; percentage of projects with structured stakeholder consultations.

Recommendation #4

Need to reduce the dependencies of the European Union in terms of supply of critical raw material and energy provision.

The European wind industry is currently facing major challenges, which are further aggravated by the geopolitical instability, growing competition from abroad due to the role of China as supplier of raw

materials to the EU and as an emerging competitor in third country markets and rapid technological changes. The main factors hindering the unlocking of the full potential of the EU wind industry could be summarised as follows: (i) uncertain demand for wind turbines in the EU leading to leading to an inadequate planning of investments and the under-utilisation of the production capacities; (ii) complex permitting procedures causing approval delays; (iii) difficulties in accessing raw materials and high inflation and price volatility; (iv) heterogeneous design of national tenders based on price-criteria, rather than giving value to environmental and social aspects; (v) limited availability of skilled workers in the wind manufacturing sector affecting the increase of the European production capacity.

By addressing the aforementioned gaps, Europe could accelerate the decarbonisation process and reach the climate targets in a cost-efficient way, while fostering the creation of a competitive environment for the EU wind manufacturers based on an EU-based supply chain.

Action 4: Implementing a common strategy for the creation of a European-based supply and value chain for FOW through strategic raw materials partnerships, introduction of non-price criteria and harmonised principles for tender design, skilled workforce trainings, cooperation platforms at EU and national levels, and refocusing the EU support towards clean tech manufacturing.

- **A4.1: Strategic raw materials partnerships and recycling hubs.** Establishing national hubs for recycling and recovery of critical raw materials (like rare earths, copper, aluminium) used in wind turbines, while fostering international partnerships with trusted suppliers to reduce dependence on imports. Key actors to be involved include national ministries of industry and environment, recycling companies, turbine manufacturers, research centres.

  ⏰ **Medium-term (3–5 years).**
- **A4.2: Smarter tender design with non-price criteria.** Introducing national offshore wind tenders that include non-price criteria (e.g. local content, sustainability standards, community benefits, penalties for non-execution) to stimulate investment in EU-based manufacturing and strengthen local value chains. Furthermore, the action should lead to the harmonisation of the principles adopted for the Member States' auction design. Key actors are national energy regulators, ministries of economy, offshore wind developers, financial institutions.

  ⏰ **Short-term (1–3 years).**
- **A4.3: National and European skills development and workforce strategies.** Developing targeted training and re-skilling programmes for the renewable energy sector, covering manufacturing, heavy-lift operations, offshore maintenance, and digitalisation, with a focus on retaining value in coastal communities. Key actors are national labour ministries, vocational training institutes, universities, industry clusters, fisheries training schools (for cross-sector mobility).

  ⏰ **Medium-term (3–5 years).**
- **A4.4: National and European cooperation platforms.** Facilitating the creation of national and regional platforms bringing together industrial players, investors, and public authorities to align deployment schedules with industrial capacity, de-risk investments, and coordinate infrastructure needs (such as ports, grids), while providing operational guidelines for the shaping of a favourable business environment to enable a strong EU wind industry. Key actors

are national energy/industry ministries, wind industry associations, investment banks, port authorities.

⏰ **Short-term (1–3 years).**

- **A4.5 Coordination amongst the Member States at the EU level.** Fostering renewables expansion through the introduction of joint and strategic environmental assessment procedures to replace the individual assessment per project, collaborative innovation in grid assets and processes through the financing of interconnectors regarded as Important Projects of Common European Interest (IPCEIs) to avoid barriers and delay at the national level and shaping an institutional framework to enable the reinforcement of the Energy Union, dentifying an EU coordinator to ensure the monitoring of the advancements. Key actors are national government and EU bodies.

  ⏰ **Short to medium-term (2–5 years).**

- **A4.6 Refocus the EU support towards clean tech manufacturing** by defining criteria at the EU level for orienting local production to the most innovative and sustainable solutions(e.g., creation of joint ventures or cooperation agreements for knowledge transfer and sharing between EU and non-EU companies) and establishing minimum quota for the local production of selected products and components in public procurement and in CfD auctions at the national level to ensure a predictable demand for the EU clean tech industry and to offset trade distorting policies abroad. The implementation of these actions requires the involvement of different actors, including national energy/industry ministries and EU bodies, wind industry associations, investment banks, port authorities.

  ⏰ **Short to medium-term (2–5 years).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Share of critical raw materials sourced domestically or from EU-based recycling; number of strategic supply agreements signed.
2	Percentage of tenders including non-price criteria; share of awarded projects with commitments to local supply chain development.
3	Number of workers trained/re-skilled; share of local workforce employed in FOWT-related industries.
4	Number of cooperation platforms established; alignment between national offshore wind roadmaps and manufacturing capacity.

Recommendation #5

Develop community-focused awareness campaigns to contextualize the visual impact of offshore wind farms and promote the long-term environmental benefits

According to public perceptions studies and inputs gathered during the MARINEWIND co-creation workshops, the visual impact of FOW farms is a significant concern amongst the coastal communities, who fear the potential disruption of the natural landscape, which may affect tourism and thus lowering local acceptance. Existing best practices show the role of community-focused awareness campaigns in deconstructing misperceptions. However, this requires a collaborative efforts between developers,

local governments, and the public to highlight the benefits of renewable energy while respecting cultural and aesthetic values.

Action 5: Addressing local communities' concerns connected to the visual impact of FOW through targeted awareness campaigns tying offshore wind projects to tangible socio-economic benefits and contextualising the visual impact as part of a bigger green transition narrative, as well as collaborative visual impact assessment, and community liaison committees.

- **A5.1: Launch local awareness and education campaigns.** Implementing campaigns in coastal communities to explain the environmental, economic, and climate benefits of offshore wind. Campaigns should use accessible formats (public meetings, schools, visitor centres, exhibitions, local media) and highlight positive examples from EU countries. Main actors include national energy and environment ministries, local authorities, wind developers, NGOs, schools and universities.

  ⏰ **Short-term (1–2 years).**
- **A5.2: Conduct visual impact assessments with community Input.** Requiring developers to carry out visual impact studies in collaboration with local communities, using tools such as virtual reality visualisations to simulate offshore wind projects before construction. This allows concerns to be addressed early and design adjustments to be made where possible. Key actors to be involved are developers, national permitting authorities, local governments, coastal community groups.

  ⏰ **Short-term (1–3 years)** during the project development phase.
- **A5.3: Promote Socio-Economic Benefit Narratives.** Developing communication strategies linking offshore wind projects to tangible socio-economic benefits (like job creation in ports, training for young workers, diversification opportunities for fishers, local tax revenues). The action will require the support of the national Ministries of energy and economy, regional development agencies, developers, fishers' organisations, tourism boards.

  ⏰ **Medium-term (2–4 years).**
- **A5.4: Establish community liaison committees.** Creating formal committees involving local residents, fishers, tourism representatives, and developers to provide ongoing dialogue, updates, and conflict resolution throughout the project lifecycle. The implementation of the action will be the result of a joint effort between local governments, developers, fishers' associations, community groups.

  ⏰ **Short-term (1–2 years).**
- **A5.5: Harmonizing energy development with coastal aesthetics** through the adoption of strategical approaches, including the integration of advanced design techniques, such as camouflaged or visually appealing turbine structures, and strategically positioning wind farms at greater distances from the shore. This action, will alleviate the aesthetic concerns of coastal populations, mitigating opposition and fostering a deeper sense of community collaboration and ownership over renewable energy initiatives.

  ⏰ **Short-term (1–2 years).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1. Number of awareness events organised; percentage of local residents reporting increased understanding/acceptance in surveys.
2. Number of projects integrating visual simulations; percentage of projects where community input resulted in design adjustments.
3. Share of campaigns that include socio-economic benefits; number of local jobs created linked to offshore wind.
4. Number of committees established; frequency of meetings; reduction in local opposition recorded during consultations.

Recommendation #6

Implement awareness campaigns to educate the public on the economic, social, and environmental benefits of offshore wind energy.

The establishment of an ongoing dialogue and engagement pathway of the local communities is crucial to tackle public misperceptions and false myths about FOW farms, fostering awareness on the opportunities and positive externalities, in terms of socio-economic and environmental benefits, brought by its development. Awareness raising campaigns, built on evidence-based results, play a strategic role in increasing social acceptance and participation in local projects, as well as promoting the creation of a more informed community that recognizes the benefits of clean energy, such as improved air quality, job creation, and energy cost reductions.

Action 6: Fostering a wider understanding of the socio-economic and environmental benefits for the local communities stemming from FOW farms through national information campaigns, the integration of FOW in trainings, and initiatives like demonstration sites, workshops and visitor centres.

- **A6.1: National information campaigns on offshore wind benefits.** Launching multi-channel campaigns (TV, radio, social media, exhibitions) to explain the role of FOW in achieving climate neutrality, stabilising energy prices, and creating domestic jobs, which are informed by research-driven messages. Furthermore, the use of Virtual Reality technologies can bridge the gap between abstract concepts and tangible benefits, allowing stakeholders to understand the scale, aesthetics, and impact of projects, enhancing engagement and support. Actors involved include national governments, energy ministries, communication agencies, renewable energy associations.

  ⏰ **Short-term (1–2 years).**
- **A6.2: Integrate offshore wind into education and training in collaboration with industrial partners.** Introducing modules on offshore renewable energy into school curricula and vocational training programmes, connecting the technology to climate change, energy security, and career opportunities. Actors to be involved include education ministries, vocational schools, universities, training providers, industry partners.

⏰ **Medium-term (2–5 years).**

- **A6.3: Public engagement through demonstration sites, workshops and visitor centres.** Developing visitor centres at key ports and coastal towns, and create digital platforms with live data from operating offshore wind farms to make benefits tangible and accessible. The implementation of the action will require the involvement of local authorities, offshore developers, tourism boards, NGOs.

  ⏰ **Medium-term (3–6 years).**

- **A6.4: Highlight local economic and social benefits.** Developing communication campaigns that showcase local case studies: new jobs created in shipyards and ports, training opportunities for young workers, and co-benefits for coastal economies as a result of a joint effort of regional development agencies, industry, chambers of commerce, and local governments.

  ⏰ **Short to medium-term (1–4 years).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Number of people engaged in the campaigns; percentage [%] increase in public awareness in surveys.
2	Number of schools/universities offering dedicated programmes; student participation rates; share of graduates entering offshore wind-related jobs.
3	Number of demonstration sites/centres created; annual visitors; public engagement metrics (e.g. website hits, app downloads).
4	Number of campaigns featuring local case studies; measured public acceptance rates in affected regions.

3.2 National specific actions

This paragraph describes the actions to be undertaken at the national level, with reference to the five MARINEWIND Labs, to accelerate FOW deployment by tackling cross-border barriers and leveraging common enablers. The list of actions has been informed by the set of MARINEWIND recommendations, which summarised the results of the three-fold analysis performed by the projects, the Mobilisation and Mutual Learning workshop and the outcomes of the co-creation activities.

3.2.1 Greece

Recommendation #1
Reduce the excessive duration of the licensing process

The excessive duration of the licensing process for offshore wind represents a pressing challenge in Greece, which is due to the complexity of the regulatory framework, the lack of leading experience in the FOW sector and the opposition of specific stakeholders categories. This bottleneck causes significant delays, further postponing the development of FOW farms.

Actions oriented towards the simplification and the reduction of duration of the licensing process would generate a more predictable, efficient, and investment-friendly environment. Thus, stakeholders would benefit from more predictable timelines and the reduction of costly delays associated with regulatory barriers or unexpected compliance requirements; lower perceived risks and uncertainty favouring the commitment to long-term projects; scalability and operational efficiency, enabling industrial players to expedite testing and deployment of innovative FOW technologies.

Actions 1: Developing a streamlined, transparent, and inclusive permitting framework to promote clarity, enhance investor confidence and accelerate the process for the market uptake of Floating Offshore Wind (FOW) technologies through transparent guidelines and standardised procedures, benchmarking, centralised digital platform and the simplification of the financial and legal requirements.

- **A1.1:** The Greek licensing authorities should conduct **comprehensive stakeholders consultations throughout the licensing process**, fostering the early and continuous engagement of all the actors involved in the process, including local communities, NGOs, industry developers, and regional authorities. This would help the governments to promote the public participation from the early stages of licensing process, reducing the opposition of some stakeholders categories.

  ⏰ **Immediate and continuous actions**: consultations should begin immediately (within 6 months) and be repeated regularly throughout the licensing process.
- **A1.2:** The Greek national and local governments, in close collaboration with the Regulatory Authority for Energy (RAE), the Hellenic Wind Energy Association (HWEA) and the Hellenic Hydrocarbons and Energy Resources Management Company (HEREMA) should be committed to the **development and publication of transparent guidelines for the permitting process**, which include a permitting roadmap, standardised and shared criteria, along with step-by-step procedures.

  ⏰ **Immediate (0-12 months)**: drafting can start immediately, with publication possible in the short-term.
- **A1.3:** The Greek government, with the support of the European Commission and relevant industrial players, should perform a **preliminary analysis and benchmarking of the success factors in the shaping of licensing frameworks across Europe**, with a special focus on the forerunner countries, mainly represented by the Member States that have fully operational FOW farms. This study would allow the governments to identify best practices at the European and national levels, exploring their potential of adoption and adaptation to the specific local contexts, while also contributing to overcome the lack of a consolidated experience in the sector.

  ⏰ **Immediate (0–12 months)**: The benchmarking analysis can be performed relatively quickly to collect information about good practices and success factors to guide the shaping of the permitting guidelines at national level.
- **A1.4:** The government should coordinate the next steps towards the development of a **centralised digital platform**, which would allow to digitalise the entire permitting process, thus facilitating the communications amongst the different entities involved and speeding up the timeline.

⏰ **Short-term (1–2 years)**: The implementation of a digital platform requires dedicated time for the design, procurement, and implementation of digital infrastructure, along with the need to provide the entities involved with adequate skills needed throughout the phases of the process.

- **A1.5:** The Transmission System Operator (ADMIE), in close collaboration with the licensing authority and building on the ongoing consultations with developers, should **set transparent criteria and timelines to streamline the grid connection approvals**. Process clarity through a clear permitting process to be administered by a competent and trusted entity will attract increased domestic and foreign investments.

  ⏰ **Short-term (1–2 years)**: The implementation of the action requires technical coordination between ADMIE and the licensing authority, in parallel to the reform of the permitting process, to be ready at the time when new projects enter the pipeline.
- **A1.6:** The Greek government and regulatory authorities, with the support of the Ministry of Finance, should undertake actions oriented towards the **simplification of the financial and legal requirements** to obtain the permits through the introduction of standardised contracts and the reduction of excessive guarantees.

  ⏰ **Short-term (1–3 years)**: The legal reforms and financial regulations typically require more time due to the need of inter-ministerial alignment and parliamentary approval, if needed.

The following list of indicators to measure the achievement of the proposed actions has been identified:

1. **Average total time for obtaining a FOWT license** (baseline vs. post-reforms).
2. **Number of new FOW project applications submitted annually** (growth signals confidence in the system).
3. **Domestic and foreign investment levels** in offshore wind (in € per year).

Recommendation #2

Reduction of negative impact on tourism industry.

The Greek economy is significantly reliant on tourism, attracting millions of visitors annually. For that reason, the deployment of FOW farms can cause resistance from local communities and stakeholders from the touristic sector, who are concerned visual pollution, noise, and perceived disruptions to natural landscapes and marine ecosystems, thus weaking the local tourism.

To mitigate such opposition to FOW farms development, the adoption of a strategic approach is required, enhancing community continuous engagement, properly communicating economic benefits for tourism entrepreneurs and implementing awareness raising campaigns to foster social acceptance and reducing local opposition, showing the potential of co-existence of FOW with other uses of the sea.

Action 2: Balancing FOW deployment with the instances of the tourism industry, fostering the co-existence between the sector though integrated MSP, regular engagement and consultation activities, benefit-sharing schemes for tourism entrepreneurs and ad hoc awareness raising campaigns.

- **A2.1:** The Ministry of Environment and Energy, in close collaboration with HEREMA, tourism associations, and local municipalities, should define **a clear Maritime Spatial Planning, including siting criteria that exclude highly frequented tourist zones**. This action will foster the co-existence between FOW and tourism, balancing the mutual interests and thus reducing the potential opposition of the whole sector.

  ⏰ **Immediate (0-12 months)**: The planning phase can begin immediately, with official criteria published within a year.
- **A2.2:** Regional and licensing authorities should organise and conduct **regular engagement and consultation activities (e.g., planning workshops) with tourism stakeholders and local communities**, fostering the participation of representatives from hoteliers, tour operators, NGOs, and FOW developers to jointly discuss siting, visual impact, and co-benefits and eventual mitigation measures.

  ⏰ **Immediate and continuous actions**: engagement and consultation activities should start from the early phases of the projects (preferably within 6 months) and be repeated regularly at key project stages.
- **A2.3:** The national and local governments, with the support of FOW developers, should **define clear benefit-sharing schemes for tourism entrepreneurs,** which could encompass lower electricity bills or taxes).

  ⏰ **Short-term (1–3 years)**: The design, approval, and implementation phases leading to the operationalisation of financial schemes will require the coordination between government and developers.
- **A2.4:** Under the coordination of the Ministry of Tourism al the local authorities, with a significant support from the HWEA, **public communication campaigns aimed at showcasing the potential co-existence between FOW and tourism should be created,** showing how the two socio-economic activities can complement each other in the same maritime space, taking inspiration from existing best practices at European level.

  ⏰ **Immediate (0–12 months)**: initial campaigns can start as soon as planning criteria are defined and the engagement process begins.
- **A2.5:** The tourism sector, supported by FOW developers and local municipalities, should explore **solutions to promote the integration of FOW with blue tourism**, which could include initiatives such as guided tours to offshore sites and actions towards the branding of Greece as a clean energy leader).

  ⏰ **Short-term (1–3 years)**: requires cooperation among tourism operators, municipalities, and developers, aligned with the installed projects or eventual demonstration sites.

The following list of indicators to measure the achievement of the proposed actions has been identified:

1. **Number of tourist zones with exclusion from FOW development** (reflects adherence to siting criteria).
2. **Number of engagement activities conducted** and **number of participants** (industry, local community, NGOs).
3. **Stakeholder perception of the co-existence between FOW and tourism** (survey-based, before and after engagement).
4. **Increase in mean revenue [%] through benefit-sharing schemes implemented** for tourism entrepreneurs.

Recommendation #3

Provision of financial support to reduce upfront costs and risks, thus accelerating the deployment of FOW projects

Securing financing for the deployment of FOW poses significant and peculiar challenges linked to high upfront costs, extended payback periods, and the perception of increased investment risks, often preventing investments in the sector. Furthermore, the attractiveness of FOW is limited by the growing competition with other renewable energy sources and global market dynamics. In fact, fluctuating energy prices, changes in subsidy schemes and evolving market conditions increase uncertainty about the economic viability of FOW projects.

To reduce the aforementioned risks and upfront costs, an integrated approach bridging policy interventions and the identification of innovative financing mechanisms to make FOW viable and attractive is required. As a result of these tailored actions, industrial stakeholders would benefit from risk mitigation mechanisms and an improved market competitiveness.

Action 3: Identifying innovative financial incentives to reduce upfront costs and mitigate investment risks, making FOW a viable option through comprehensive costs and risks assessment, grant programmes and competitive auctions.

- **A3.1:** The Ministry of Finance, along with financial institutions, should conduct a comprehensive cost and risk assessment of FOW projects in Greece. This analysis will provide a comprehensive knowledge of the sector from the financial perspective to inform the design of innovative financing schemes, which are capable of reducing uncertainty and mitigating risks related to energy prices, thus creating a more stable investment environment and encouraging long-term strategic planning.

  ⏰ **Immediate (0–12 months)**: assessment can start immediately to inform the design of support schemes.
- **A3.2:** The Ministries of Finance, together with the Ministry of Environment and Energy and the support from local governments and legal experts should **propose amendments to the existing legislation or regulatory frameworks to allow the identification of new support schemes**, which can include subsidies, grants, Feed-in Tariffs (FiTs), Power Purchase Agreements (PPAs), Public-Private Partnerships (PPPs), and tax incentives. These frameworks

will facilitate the design of incentive mechanisms along with eligibility criteria, support duration and levels. These actions would improve the market competitiveness, through financing mechanisms that enhance financial feasibility, allowing the industry to compete more effectively against other renewable energy sources and conventional fuels.

⏰ **Immediate (0–12 months)**: The legal and regulatory adjustments may require inter-ministerial coordination and approval processes.

⏰ **Immediate (0–12 months)**: The design of new incentive mechanisms should follow the cost/risk assessment and be aligned with legal frameworks.

- **A3.3:** The Ministry of Finance should **launch grant programs and competitive auctions**, providing clear guidelines for the procedure, the evaluation of applications and funding.

  ⏰ **Short-term (1–2 years)**:The implementation after legislation is in place and incentive mechanisms are fully designed.

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Number and total value of financial support schemes launched.
2	Number of FOW projects receiving financial support.
3	Total MW of FOWT capacity mobilized through supported projects.
4	Private investment leveraged per € of public support (indicates effectiveness of financial incentives).
5	Average time from application to funding approval for projects.

Recommendation #4

Facilitate technological maturity for developing FOW by revitalising and adapting the potential of the Greek supply chain for wind energy

To support the market uptake of FOW and to seize the opportunities offered in terms of socio-economic benefits for coastal communities, Greece has to strengthen its national supply chain and exploit its unlocked potential. In particular, the availability of decommissioned shipyards and ports across the country can be revitalised to serve the manufacturing and assembling of FOW components, while exploiting the internal expertise of the Hellenic Cables, which represents one of Europe's leading cable manufacturers, in producing high-quality cables, which are essential for FOW projects. Furthermore, Greece has a strong domestic production of steel and cement, regarded as critical materials for FOW construction. By relying on a national supply chain, costs can be reduced and reliance can be enhanced, ensuring that Greece covers a leading role in FOW development.

Action 4: Exploring and reinforcing the potential of the Greek supply chain for wind energy through the identification of domestic production capacities, the mobilisation of fundings to revitalise decommissioned infrastructures and the creation of Public and Private Partnerships, in line with the priorities defined by a national strategic roadmap to be developed.

- **A4.1:** The Ministry of Infrastructure and Transport, with the support from industrial actors, should lead the identification of domestic production capacities (e.g., steel, cement, composites) and the mapping of decommissioned infrastructure suitable to be reconverted for FOW manufacturing, assembly, and maintenance (e.g., shipyards, ports).

  ⏰ **Immediate (0–12 months)**: Initial mapping and feasibility assessment conducted through inter-ministerial working groups and industry consultations.
- **A4.2:** The Ministry of Infrastructure and Transport, informed by leading industrial actors and regulatory authorities, should **define a strategic roadmap for the development of a national "FOW Infrastructure Revitalization Plan"** through the preliminary identification of revitalisation priorities, investment needs, and target industrial partnerships.

  ⏰ **Short-term (1–2 years)**: Definition of the strategic roadmap and translation of the priorities identified into a comprehensive plan.
- **A4.3:** The Ministry of Finance, with support from regulatory authorities, should undertake actions aimed at mobilising public and private funding to be dedicated to the upgrade of infrastructure and equipment to serve FOW needs.

  ⏰ **Short to medium-term (3–5 years)**: Funding secured through national programs and private investors.
- **A4.4:** The joint collaboration amongst the Ministry of Finance, national and local governments and regulatory authorities should promote the **creation of Public and Private Partnerships** (PPPs), bringing together the local ecosystems and producers to enhance domestic production.

  ⏰ **Short-term (1–3 years)**: Operational partnerships established.

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	**Number of domestic companies participating** in the FOWT supply chain.
2	**Number of shipyards and ports revitalized** or repurposed for FOWT activities.
3	**Total public and private investment mobilized (€)** for infrastructure and manufacturing upgrades.
4	**Number of PPP agreements signed** between government and private sector.
5	**Number of new skilled jobs created in the offshore wind and manufacturing sectors.**
6	**Percentage of FOW components produced domestically (local content share).**

Recommendation #5

Develop a national strategic investment plan to modernise and repurpose key Greek ports and shipyards to support the entire lifecycle of FOWTs

A recent studies conducted by the Norwegian Offshore Wind on behalf of the Hellenic Wind Energy Association showed that the readiness of port infrastructure and their adaptation to FOW needs (e.g., operation and maintenance, assembly of the turbines) and requirements is pivotal to foster the

participation in the offshore wind industry. To date, Greek ports have limited availability of space, requiring massive interventions to expand their master plans and funding availabilities, which are often hindered by constraints linked to unavailability of funding programmes, management uncertainties, and governmental barriers. Actions in this regard will minimise delays during the construction phase of the projects related to component imports, insufficient infrastructure and supply chain logistics.

Action 5: Fostering the modernisation and adaptation of Greek ports and shipyards to support FOW deployment through the assessment of the existing infrastructures to be repurposed, the drafting of a National Strategic Plan for Infrastructure Modernisation, which includes clear incentives to private owners and guidelines to integrate digitalisation and automation technologies.

- **A5.1:** The government and ministries in collaboration with port authorities, and industry stakeholders should **conduct a mapping and assessment of the available national infrastructures** to identify ports and shipyards suitable for FOW-related activities, including assembly, installation.

  ⏰ **Immediate (0–12 months).**
- **A5.2:** Driven by the Ministry of Infrastructure and Transport, with support from regional authorities and industry, a **National Strategic Plan for Infrastructure Modernisation** that defines priority sites, technical requirements, and investment needs should be designed, adopted and implemented.

  ⏰ **Short-term (1–3 years).**
- **A5.3:** Providing a **clear incentives to private owners** (in ports and shipyards) to upgrade their facilities to support FOW activities.

  ⏰ **Short-term (1–3 years):** Drafting a set of clear incentives, mainly financial, defining straightforward terms and conditions to get the additional public funding.
- **A5.4:** Under the guidance of the Ministry of Digital Governance**, digitalisation and automation technologies**, such as smart port systems, shipyard automation, digital logistics tracking, should be integrated in relevant industries and infrastructure to foster their adaptation and readiness to address FOW needs.

  ⏰ **Short-term (1–3 years)***:* Gradual integration of digital technologies to facilitate the implementation of the National Strategic Plan for modernisation.

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	**Number of ports and shipyards assessed** for FOW readiness.
2	**Number of priority sites identified** in the National Strategic Plan.
3	**Number (or percentage) of modernization projects initiated or completed** under the national plan.

3.2.2 Italy

Recommendation #1

Foster the development of adequate infrastructures and ports for the production, assembly and delivery of FOW.

A significant barrier to the development of FOW in Italy is represented by the lack of adequate infrastructures, proper hubs and ports to be dedicated to the production, assembly and delivery of floating platforms. In addition, there are challenges connected to the logistical and administrative burdens linked to the adaptation of port facilities to FOW operations, as well as complex authorisation procedures requiring the coordination of several institutional actors, including the Port Authority, to approve the assignment of new functions to the port. The development of adequate infrastructures is further hindered by the lack of ad hoc funds to co-financing the development of ports in central and southern Italy to support the offshore wind supply chain.

So far, the Italian Government set additional measures, which were included in the Legislative Decree "Energy Security" (Art.8, Law n.181, 9 December 2023). In particular, the Ministry for the Environment and the Energy Security launched a call for expressions of interest to identify two ports in Southern Italy and additional areas to be designated as offshore wind hubs. As a result, the Port of Taranto and Augusta were selected (Interministerial Decree No. 167 of the Ministry of Infrastructure and Transport,

Ministry of Environment and Energy Security and Ministry of Economy and Finance, July 4, 2025), while Civitavecchia, Vasto, Crotone, and Brindisi may be selected as strategic hubs at a later stage.

Despite the governmental initiatives already implemented, the paths towards the development of adequate infrastructure requires additional strategic actions at the administrative, financial and operational levels.

Action 1: Accelerating the adaptation of key infrastructures, ports and industrial facilities for FOW through the provision of national fundings and tailored actions towards the creation of a single national coordination office, the designation of priority ports, the identification of ports master plans, and retraining programmes for ports personnel.

- **A1.1**: Creating a **single national office** or **an inter-ministerial task force** to coordinate ports, permitting procedures, grid infrastructure, industry, local and overall supply chain and logistics. This action would allow to identify strategic port hubs, manage grants and tenders, coordinate maritime spatial planning, liaise with regions and relevant ministries, thus strengthening the national governance and strategy for FOW.
  ⏰ **Immediate (0-12 months).**
- **A1.2: Harmonising the national port hub map and roadmap designating priority ports** to be dedicated to FOW manufacturing, assembly, marshalling and Operation & Maintenance (O&M), which has been partially established with the Maritime Spatial Planning.
  ⏰ **Immediate (0-12 months).**

- **A1.3:** Introducing a fast-track permitting lane for the upgrade of ports and industrial facilities dedicated to serve the needs of FOW.

  ⏰ **Short-term (1-3 years).**
- **A1.4: Identifying ports master plans**, composed by engineering studies, environmental assessments, dredging plans, breakwater upgrades, to shorten project preparation time and ensure compatibility with the national MSP.

  ⏰ **Medium-term (3-5 years).**
- **A1.5: Launching ports infrastructure national investments programmes** using state aids or leveraging on the funding allocated under the National Recovery and Resilience Plan.

  ⏰ **Medium-term (3-5 years).**
- **A1.6: Launching a national retraining programmes for ports personnel,** including trades, heavy-lift operators, offshore installation crews, cable technicians, in close collaboration with port authorities and universities.

  ⏰ **Medium-term (3-5 years).**
- **A1.7: Subsidising specialised vessels** to maritime stakeholders, such as heavy-lift installation vessels, service operation vessels and crew transfer vessels.

  ⏰ **Medium-term (3-5 years).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	1.1: Office established with clear mandate, published 12-month action plan (A1.1).
2	Ports roadmap and MSP updated (A1.2).
3	Updated authorization process issued (A1.3).
4	National ports master plans released (A1.4).
5	Number of ports upgraded to FOW-ready (A1.5).
6	Number of trained workers with certification for FOW assembly and installation (A1.6).
7	Subsidies grants released (A1.7).

Recommendation #2

Co-create adequate management practices and compensation measures for the fishing sector, instead of restrictive regulations, where possible.

The potential co-existence between FOW and the fishing sector is still a highly debated topic at the moment. The co-creation workshops performed in the Italian Lab gathered the opinions and concerns of the local fishermen, who are worried about the potential conflicts between offshore wind farms and traditional bottom trawling. The concerns expressed are further exacerbated in the framework of a more general and independent crisis faced by the Italian fishing sector.

To overcome the potential conflicts related to the multiple uses of the sea and accelerate the deployment of FOW, Italy has to consider the specific needs and expectations expressed by the different socio-economic categories, especially the fishing sector. The shaping of ad-hoc regulations and the provision of adequate compensation measures would foster a better use of the sea as renewable resource, reducing oppositions to new technologies such as FOW.

Action 2: Fostering the co-existence between FOW and the fishing industry to reduce conflicts with other uses of the sea through the active involvement of fishermen in the Maritime Spatial Planning and project creation, while promoting educational activities for their reskilling and testing the compatibility of new fishing gear and operations.

- **A2.1:** Ensuring that **fishermen play an active role in the Maritime Spatial Planning** which, in its future updates to include FOW, should seek to go beyond the mere definition of non-exclusive vocational zones. This action will provide well-defined and shared rules for the fishing sector, with a clear definition of the areas reserved to fishing, while enabling the exploration of new opportunities and synergies between the two sectors.

  ⏰ **Immediate (0-12 months).**

- **A2.2: Fostering the active involvement of fishermen** from the early planning stages of a new offshore wind farm. This action will reduced potential conflicts with other uses of the sea by addressing the specific needs from an early stage, decreasing the opposition of other socio-economic activities and speeding up the realisation of FOW farms.

  ⏰ **Immediate (0-12 months).**

- **A2.3: Promoting national and regional educational and training initiatives** as part of a general reskilling plan for the sector, which are aimed at the reskilling and upskilling of the fishermen to employ them in other sectors of the blue economy, such as blue tourism or sustainable aquaculture (production and supply chain).

  ⏰ **Short-term (1-3 years)**.

- **A2.4: Supporting small-scale artisanal fishing through the testing of new fishing gear and operations** to improve sustainability and compatibility with offshore wind farms, to be included in a general sustainable plan for the sector.

  ⏰ **Short-term (1-3 years)**.

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	FOW included in the national MSP.
2	Number of awareness campaigns and co-creation events involving the fisheries sector.
3	Number of active courses/number of workers in the fisheries sector reskilled and reemployed.
4	Quantity of fish caught in areas where wind farms are located.

Recommendation #3

Promoting a greater focus on the development of positive externalities for local communities to foster social acceptance.

The unlocking of the potential of FOW is hindered by a low level of social acceptance amongst the local coastal communities, which is due to widespread misconceptions and false myths on the technology and to a lack of a timely and tailored engagement pathway and the provision of information related to the realisation of offshore wind plants.

To tackle the widespread misconceptions related to FOW at the local level, Italy has to implement targeted actions to increase the level of social acceptance through the promotion of an ongoing dialogue with the local communities and key actors, based on the sharing of evidence-based information from the very initial phases of the project, the co-definition and proper communication of the socio-economic benefits, and the organisation of awareness raising campaigns.

Action 3: Co-defining, assessing and monitoring the positive externalities of FOW farms on the coastal communities through the establishment of frameworks and tailored actions to ensure the continuous involvement of local communities and a higher level of acceptance, by including non-pricing criteria in the auctions and exploring community ownership schemes.

- **A3.1:** National and regional authorities should **establish a regulatory framework that ensures the involvement of local communities** from the starting of the process. This actions will fostering investments by reducing the perceived risks and uncertainties linked to possible oppositions of the local community, increase their level of social acceptance by addressing the concerns and considering their needs, while increasing the public trust.
  ⏰ **Immediate (0-12 months).**
- **A3.2:** National, regional authorities, and trade associations should **establish a monitoring framework to assess the spill-over effects of FOW projects on the local economy** throughout their whole life-cycle, including job creation, reskilling opportunities and training, new local supply chains.
  ⏰ **Medium to long-term (5 - 10 years).**
- **A3.3:** National authorities should **include non-price criteria related to benefits for local communities** in the auctions. This action will provide warranties in terms of stable energy prices and production of green energy able to address the local consumption, while fostering the growth of the local economy through the creation of a local-based workforce and the renewal of the public space.
  ⏰ **Short-term (1-3 years).**
- A3.4: **National and regional authorities, in collaboration with developers and academia, should** explore community ownership schemes for offshore wind
  ⏰ **Medium-term (3-5 years).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Number of jobs created/installed MW.
2	Number of funded projects that include non-price criteria related to benefits for local communities.

Recommendation #4

Provide clear financial incentives to foster investments in the Italian FOW sector.

According to the stakeholders consulted throughout the MARINEWIND co-creation activities, Italy can play a role as a driver in the deployment of FOW. However, the Italian industry needs to be adapted to the needs of the FOW sector, thus requiring tailored financial incentives and state aids, which can contributing to reducing the high costs, investment risks and uncertainty.

For instance, the Italian metalwork sector has great capacity to be further exploited. However, to date, is located inland and is oriented towards other types of production, so it is not ready to be converted to the production of components for the wind industry in the short term. Furthermore, FOW is characterised by a lower level of technology readiness and lacks of track-record compared to onshore wind, while being capital-intensive compared to other type of technologies, due to the need to carry out preliminary analysis (e.g., geotechnical, environmental, design of floating foundation and dynamic cables for site-specific conditions). Actions to tackle the aforementioned challenges should be inserted in the framework of a clear long-term industrial vision with an ambitious objective for floating offshore wind, stimulating the development of dedicated supply chains.

Action 4: Implementing financial mechanisms to foster investments in FOW and the reconversion of key industrial sectors through a well-defined auction schedule, the consideration of indexation measures in the Contract for Difference (CfD) auction design, and the identification of new financial support schemes.

- **A4.1:** National authorities should **define a clear and updated auction schedule and calendar for OW farms**. According to the FER2 decree, 3.8 GW will be allocated by 2028, but no OW auction has been announced to date.
  ⏰ **Immediate (0-12 months).**
- **A4.2** National authorities should **consider indexation measures in the Contract for Difference (CfD) auction design** to address de-risking in project implementation.
  ⏰ **Short-term (1-3 years months).**
- **A4.3** National authorities should **consider new financial support schemes** such as Public-Private Partnerships (PPPs), green bonds and blended finance mechanisms which have proven effective in infrastructure projects but are not widespread in the renewable energy sector.
  ⏰ **Short-term (1-3 years).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Percentage [%] of OW capacity allocated by 2028.
2	Number of OW projects under construction by 2028.

Recommendation #5

Develop integrated planning strategies by including the environmental protection aspects and synchronising the national and regional objectives with the "developer-led" and decentralised approach taken so far to guide the deployment of FOW.

To accelerate the uptake of FOW and ensure the achievement of the energy targets, Italy has to guarantee a timely and integrated strategical planning, synchronising the national and regional objectives with the bottom-up approach promoted by the developers, while integrating insights from the environmental and geotechnical studies. A timely and integrated planning will reassure investors, align the objectives set for the energy transition and avoid the perception of conflicting competences.

However, the significant delays in the approval of an Italian Maritime Spatial Planning, which was adopted only on the 25th of September 2024 and previously replaced by a bottom-up approach led by the industrial developers, slowed down the deployment of FOW, due to the lack of an optimised use of the maritime space with the overlapping and potential conflicts among different projects; the lack of a common vision amongst policymakers and national stakeholders on the role of offshore wind in the energy mix; the lack of clear targets to be reached in terms of energy production at the national and local level. In July 2024, the new version of the Italian NECP was sent to the EC, setting a target of 2.1 GW to be installed by 2030, misaligned with the timeframe of the auction clearing.

Moreover, the drafting of a planning strategy for the offshore wind farms should integrate the environmental protection aspects, the assessment of visual impact, as well as the preservation of archaeological assets, regarded as a key concern in the Italian context. Thus, integrated planning strategies to balance biodiversity protection while fostering renewable energy development should be developed in collaboration with private technical developers, ensuring the effective management of the impacts generated by offshore projects.

Action 5: Integrating environmental-related aspects into strategical planning and development strategies for FOW, through the definition of a general framework for EIAs and indexes to evaluate the impacts, while developing guidelines to include their outputs into FOW site-selection and a open national platform to foster the availability of FAIR data.

- **A5.1:** Establishing a **national cooperation board** gathering policy makers, technical developers and researchers **for the definition of a general framework for the Environmental Impact Assessments (EIAs)**, based on regional and national environmental policies, informed by FAIR (Findable, Accessible, Interoperable e Reusable) data acquired within common monitoring protocols.

  ⏰ **Immediate (0-12 months).**
- **A5.2:** Integrating environmental protection into planning through the issue of **national guidelines to include the outputs of EIAs into FOW site-selection criteria** (sensitivity maps,

exclusion buffers for Marine Protected Areas/breeding grounds, shipping lanes, pipelines, and fishing grounds).

⏰ **Short-term (1-3 years).**

- **A5.3:** Identifying **standardised indexes to evaluate the severity of FOW impact** on the environment considering also Cumulative Impact Assessment.

  ⏰ **Immediate (0-12 months).**

- **A5.4:** Launching an **open national data platform hosting ecological, seabed, fishery and vessel traffic layers used in MSP and EIAs** by exploiting the results of the analyses performed by private technical developers and by research experimental campaigns. This action will require developers to deposit pre-construction monitoring data into the platform as part of the permitting conditions.

  ⏰ **Immediate (0-12 months).**

- **A5.5 Updating the national MSPs** or adding specific implementing annexes with FOW related zones by adopting three categories, namely preferred, conditional, exclusion.

  ⏰ **Immediate (0-12 months).**

- **A5.6** Adopting a **"One stop approach" to centralise all the administrative steps** related with the permitting process within a devoted task force.

  ⏰ **Short-term (1-3 years).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Board established with clear mandate, published 12-month action plan. Issue of shared regulations and best practices for the EIAs.
2	Guidelines for the inclusion of the outputs of EIAs into FOW site-selection criteria published.
3	Standard environmental impact indexes defined and published.
4	National data platform activated and populated with data available from developers in the pre-construction phase.
5	MSP updated.
6	"One stop shop" approach issued, task force members/offices identified.

3.2.3 Portugal

Recommendation #1

Address infrastructure bottlenecks, including ports and grid connections, to ensure readiness for the large-scale deployment of floating offshore wind technologies (FOWTs)

Infrastructure bottlenecks are a significant barrier to FOW deployment in Portugal, since key ports (e.g., Viana do Castelo, Figueira da Foz, and Sines) require substantial upgrades to handle the assembly, storage, and maintenance of large floating platforms and the national grid should be reinforced.

Actions oriented towards the infrastructure deployment will attract investments and ensure that Portugal can achieve its targets of 2 GW of installed capacity by 2030 and 10 GW auctioned by 2050.

Action 1: Enhancing infrastructure readiness to serve FOW development through ports upgrade, the creation of a port masterplan taskforce, the definition of a coordinated national offshore grid strategy, the identification of fast-track permitting procedures and ad hoc funds, and the R&D actions in innovative logistics for FOW to be tested in dedicated pilots.

- **A1.1: Strategic port upgrades**. Port authorities and the Ministry of Infrastructure, in collaboration with industry consortia (e.g. EDP, Ocean Winds) should modernize and expand port facilities in Viana do Castelo, Aveiro, Setúbal, Figueira da Foz, and Sines to handle the assembly, storage, and maintenance of floating platforms and large turbines (heavy-lift cranes, deep-water quays, assembly areas, wet storage/marshalling areas, heavy-duty laydown areas).

  ⏰ **Short-term (1-3 years)** for priority upgrades for national port infrastructure (Viana do Castelo) and interim use of Spanish ports; **long-term (10+ years)** for progressive upgrades in other national ports ensuring strategic national autonomy in offshore wind logistics.
- **A1.2: Industry - Government port masterplan taskforce.** The Ministry of Infrastructures, port authorities, offshore wind developers, and local municipalities should promote the creation of a joint taskforce to align port masterplans with offshore wind deployment timelines, ensuring transparency and predictability for investors.

  ⏰ **Immediate (0-12 months).**
- **A1.3: National offshore grid expansion plan.** Key national actors such as REN (National Electric Grid – the Portuguese TSO), ERSE (Energy Services Regulatory Authority), Ministry of Environment and Energy, with the support of European TSOs (ENTSO-E), should develop and implement a **coordinated national offshore grid strategy**, including reinforcement of onshore substations, new offshore hubs, and interconnections with Spain to manage projected 2–10 GW capacity.

  ⏰ **Short-term (1-3 years)** design and approval of grid plan for phase 1 – 2GW in 2030; 2028–2035 implementation of grid plan for phase 1; **Medium to long-term (5-10 years)** for the design and approval of grid plan for phase 2 – 10 GW in 2050; **Long-term (10+ years)** 2035-2040 implementation of grid plan for phase 2.
- **A1.4: Streamlined permitting and funding mechanisms.** The Ministry of Environment and Energy, APA (Portuguese Environment Agency), DGPM (General Directorate for Maritime Policy), BPF (Portuguese Development Bank), in close collaboration with the European Investment Bank (EIB) should establish **fast-track permitting procedures for port and grid upgrades and create a blended finance scheme** (including both EU and national funds) to accelerate investments. Furthermore, specific **trainings to human resources** should be foreseen, equipping them with the skills and confidence needed to move forward with permitting processes.

  ⏰ **Immediate (0-12 months)** for the 2025–2026 establishment of procedures and financing schemes.

- **A1.5**: **Development of green logistics solutions. Incentivising R&D in innovative logistics for FOWTs, including modular assembly strategies, floating-to-floating transfer systems, mobile port solutions, optimized vessel use, and digitalized supply chains**. Pilot projects at Portuguese ports to validate approaches. This actions should be realised by joint partnerships including Research and Innovation ecosystem (e.g., WavEC, FEUP, CoLAB +ATLANTIC), port administrations, developers (e.g. Ocean Winds, IberBlue Wind), shipyards and maritime industry (e.g. Lisnave), logistics and shipping companies (e.g. ETE Group), specialized vessel operators, manufacturing and engineering firms (e.g. A. Silva Matos), shipbuilding sector.
  ⏰ **Medium-term (3-5 years)** for pilot projects and integration in supply chain by 2030.

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Number of ports upgraded; added quay length and laydown area (m²); heavy-lift capacity installed (tons) (A1.1).
2	Establishment of taskforce (yes/no); frequency of joint meetings; publication of annual port masterplan updates (A1.2).
3	Grid capacity allocated for offshore wind (MW); km of new national transmission lines; number of interconnector projects approved (A1.3).
4	Average permitting time for port/grid upgrades (months); volume of funding mobilized (€) (A1.4).
5	Number of R&D projects funded; number of pilot logistics solutions tested; % reduction in assembly/transport time (A1.5).

Recommendation #2

Adopt non-price criteria in offshore wind auctions to promote sustainability, local supply chain development, and social acceptance.

The Portuguese government intends to auction up to 10 GW of offshore wind capacity by 2050, marking a substantial opportunity to advance the energy transition. However, existing auction frameworks tend to prioritise the lowest bid, frequently neglecting wider sustainability and socio-economic objectives. By aligning auction design with EU best practices and incorporating non-price criteria, floating offshore wind projects can deliver enduring environmental protection, stimulate local economic growth, and foster greater community trust, thus enhancing project success and reducing opposition. Furthermore, stakeholder input gathered during the MARINEWIND co-creation workshops underscored the importance of prioritising biodiversity conservation and community benefits.

Action 2: Defining, integrating and testing non-price criteria into FOW auctions, in combination with an effective monitoring system and compliance mechanisms.

A2.1 Define and integrate non-price criteria into auction frameworks. The Ministry of Environment and Energy, DGEG (General Directorate for Energy and Geology), DGRM (General Directorate for Natural Resources, Safety and Maritime Services), ERSE, legal experts, in close

collaboration with international advisors (e.g., IEA-OES International Energy Agency – Ocean Energy Systems, EU Commission, WindEurope) to ensure the alignment with EU practices, should establish clear sustainability-oriented criteria (e.g., biodiversity protection measures, job creation, community benefit schemes, strong integration of Portuguese suppliers) with transparent scoring methods.

⏰ **Immediate (0-12 months)** for the design and adoption of criteria.

- **A2.2 Pilot non-price criteria in upcoming auctions.** Testing and refining non-price criteria in the first offshore wind auctions, ensuring lessons learned are integrated into subsequent large-scale auctions. This action should be supported and implemented under the guidance of DGEG, DGRM, auction organizers, offshore developers, REN.

  ⏰ **Short-term (1-3 years).**

  A2.3 Monitoring and compliance mechanisms. Developing robust monitoring systems to verify that commitments (e.g., local suppliers, biodiversity, local jobs, community benefits) are implemented and indicators achieved. Introduce penalties or corrective measures in case of non-compliance. This action should be implemented by APA, DGEG, DGRM, in collaboration with independent auditors, Marine Research Centers, NGOs (e.g., environmental associations), and municipalities, which can provide relevant information and updated data.

  ⏰ **Immediate and continuous (0-12 months).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1. Number of non-price criteria formally integrated into auction rules; clarity of weightage (scorecards published) (A2.1).
2. Lessons learned reports published (A2.2).
3. Compliance rate with sustainability and community commitments; number of corrective actions enforced (A2.3).

Recommendation #3

Ensure co-existence by addressing conflicts with fishing and shipping industries through collaborative engagement and adaptive maritime spatial planning.

In Viana do Castelo, both the fishing and shipping sectors expressed concerns about the potential co-existence between their socio-economic activities and FOW, being worried about the restricted access to traditional fishing grounds, potential impacts on fish stocks, and the economic risks to coastal communities reliant on fishing. This requires actions oriented towards the proactive conflicts management and the establishment of an ongoing stakeholders dialogue, reducing opposition and potential delays and fostering the creation of added value for multiple maritime sectors.

Action 3: Implementing effective mechanisms to foster the co-existence between FOW and the shipping and fishing industries throught the creation of local stakeholders roundtables, the adaptive

integration of FOW in the MSP, piloting multi-use concepts and co-designing compensation mechanisms.

A3.1: Establish local stakeholder roundtables. The DGPM, DGRM, local municipalities, fishing associations (e.g. ANOP, APROPESCA), port authorities, and offshore wind developers should promote and participate in permanent dialogue platforms in regions like Viana do Castelo, Leixões and Figueira da Foz, involving fishermen's associations, shipowners, developers, and authorities to discuss concerns, share data, and co-develop mitigation measures.

⏰ **Immediate and continuous (0-12 months).**

A3.2: Adaptive maritime spatial planning (MSP). The DGPM, DGRM, APA, IMO (International Maritime Organization) for shipping standards, developers, and REN for grid planning should facilitate the integration of FOW into national MSP, including cyclical updates that can be adjusted based on monitoring of ecological and socio-economic impacts and mitigation measures efficiency, ensuring navigational safety and access to fishing areas where feasible.

⏰ **Short-term (1-3 years)** and five-years updates.

- **A3.3: Pilot multi-use concepts.** Launching pilot projects combining floating offshore wind with static fisheries, aquaculture, artificial reefs, or fisheries enhancement zones, demonstrating co-benefits for marine ecosystems and local communities. This action should be promoted and realised by the local R&I ecosystem, aquaculture cooperatives, offshore developers, and leverage on previously and newly-funded Horizon Europe programmes.

  ⏰ **Short to medium-term (2-5 years)** for pilot projects launched and evaluated.

- **A3.4: Compensation and livelihood transition schemes.** Developing transparent frameworks for compensating fishermen affected by spatial restrictions and support alternative livelihoods (e.g. O&M support to offshore wind projects, aquaculture, maritime tourism). Funding from developers and public programmes should be combined. Key actors for the realisation of this action include the Ministry of Sea, DGPM, BPF, industry consortia, fishermen associations, local NGOs.

  ⏰ **Short-term (1-3 years)** for the design and implementation of schemes.

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Number of stakeholder roundtables established; frequency of meetings; satisfaction of participants (survey-based) (A3.1).
2	Number of adaptive MSP updates; reduction of spatial conflicts (measured by number of complaints/legal disputes) (A3.2).
3	Number of multi-use pilot projects launched; evidence of biodiversity or fish stock improvements; number of jobs created in aquaculture/marine tourism (A3.3).
4	Percentage [%] of affected fishermen compensated; number of alternative livelihood initiatives funded; income diversification indicators. (A3.4).

Recommendation #4

Enhance the capacity and readiness of local supply chains to meet the unique requirements of floating offshore wind technologies, ensuring resilience, reducing dependency on external suppliers, and fostering local economic benefits.

Despite the huge opportunities offered by Portugal's ambition to auction 10 GW of offshore wind capacity by 2030 (revised to 2 GW in operation and 10 GW of leased projects by 2030), the local supply chain faces significant gaps to be addressed, which include: the lack of industrial readiness and technical expertise, limited availability of installation and maintenance vessels; the need to upskill and reskill the local workforce and delays in material procurement.

Considering the pivotal role played by the supply chain in FOW deployment, actions to foster its development and adaptation are needed through targeted investments to address the aforementioned gaps in production capacity, logistics, and workforce skills.

Action 4: Tackling existing gaps to foster the creation of a robust and resilient supply chain for FOW through the analysis of the state-of-the-art, the creation of PPPs and the provision of financial incentives to adapt installation and maintenance vessels, reskill the local workforce and promote the use of sustainable materials.

- **A4.1: National supply chain mapping and gap analysis.** Conduct a comprehensive mapping of Portuguese industrial capabilities (fabrication, dynamic cables, vessels, steelworks, coatings, port logistics, etc.) to identify gaps and opportunities for local suppliers. Key actors for its implementation include DGEG, AICEP (Portuguese Agency for Investment and Foreign Trade), industry associations (e.g. AIP, AIMMAP), research and innovation ecosystem.

  ⏰ **Immediate (0-12 months).**

  A4.2: Incentivise industrial investments and Public–Private Partnerships. Provide financial incentives (tax breaks, grants, EU funds) and establish PPPs to stimulate investment in heavy-lift capacity, specialized logistics, modular and automated welding/assembly lines, manufacturing capacity for dynamic subsea cables and connectors, shipbuilding and repair capacity and floating infrastructure manufacturing. This action requires the collaboration amongst different actors, including the Ministry of Economy, BPF, ANI (National Innovation Agency), IAPMEI (Competitiveness and Innovation Agency), offshore wind developers, shipyards (e.g. Lisnave, WestSea).

  ⏰ **Short to medium-term (2-5 years).**

  A4.3: Develop specialised offshore wind vessels. Shipbuilding sector, IMT, Portuguese Navy, maritime cluster associations, and developers should support the construction or retrofitting of installation and maintenance vessels in Portuguese shipyards, ensuring availability for FOW deployment.

  ⏰ **Short to medium-term (2-5 years).**
- **A4.4: Workforce upskilling and training programmes**. The IEFP (Institute for Employment and Vocational Training) and academia (e.g. FEUP, IST, UMinho), CoLABs (+ATLANTIC, S2AQUAcoLAB), in close collaboration with developers, Launch tailored training programmes in collaboration with universities, polytechnics, and vocational schools to equip workers with

skills in floating foundations, dynamic cables, digital maintenance, environmental monitoring, and HSE (Health, Safety, Environment).

⏰ **Immediate and continuous (0-12 months).**

- **A4.5: Supply chain resilience and sustainability measures.** Promote circular economy approaches, use of sustainable materials, and local alternatives to imported critical raw materials. Establish monitoring of supply chain risks and contingency planning. Actors include the Ministry of Environment and Energy, European partnerships (e.g. ERMA – European Raw Materials Alliance), innovation agencies, industry consortia.

  ⏰ **Immediate and continuous monitoring (0-12 months).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Supply chain mapping report published (A4.1).
2	Volume of private and public investments mobilised (€); number of PPPs established (A4.2).
3	Number of vessels constructed/retrofitted; % of planned offshore operations serviced by Portuguese vessels (A4.3).
4	Number of workers trained and certified; employment growth in offshore wind-related sectors (A4.4).
5	Percentage [%] of sustainable materials used; number of contingency plans adopted. (A4.5).

Recommendation #5

Mandate rigorous and transparent Environmental Impact Assessments (EIAs) for floating offshore wind projects, ensuring that they address biodiversity, marine ecosystems, and cumulative impacts, while promoting stakeholder engagement.

The potential impact of FOW on the marine environment needs to be further explored, with regards to sensitive habitats, biodiversity, and ecosystem dynamics. The co-creation workshops realised in the Portuguese Lab highlighted the need to assess such impacts from a cumulative perspective and starting from the beginning of the projects, while properly communicating the results to foster public awareness. To date, Portugal faces a lack of baseline data on marine biodiversity and a transparent process for comprehensive Environmental Impact Assessments (EIAs), thus requiring the definition of clearer frameworks for EIAs and additional studies on the topic.

Action 5: Fostering the understanding of the potential environmental impacts of FOW through the establishment of a national baseline data and monitoring programmes, the development of advanced tools to monitor and mitigate ecological impacts by leveraging on existing best practices and data, while further advancing knowledge.

- **A5.1: Establish national baseline data and monitoring programmes**. The IPMA (Portuguese Institute for the Ocean and Atmosphere), research and innovation ecosystem (e.g. CIIMAR,

WavEC) should create long-term biodiversity monitoring programmes and baseline datasets for marine ecosystems in offshore wind zones (e.g., fish stocks, seabirds, marine mammals).

⏰ **Short-term (1-3 years).**

A5.2: Promote meeting with stakeholders at regional levels to improve public participation. Developers, municipalities, fishing associations, NGOs, APA should ensure structured stakeholder consultations (fisheries, local communities, NGOs) and publish results in accessible formats to build trust and foster a wider understanding of the environmental impacts associated with FOW.

⏰ **Immediate (0-12 months).**

- **A5.3: Promote innovation in monitoring and mitigation**. Support the development, testing and adoption of advanced tools (e.g., Autonomous and AI-based monitoring, acoustic sensors, biodiversity-enhancing foundations) to monitor and mitigate ecological impacts. Key actors include ANI, the R&I ecosystem leveraging on the outcomes of specific Horizon Europe projects, technology developers, and the offshore wind industry.

  ⏰ **Short to medium-term (2-5 years).**
- **A5.4: Incorporate lessons from pilot projects and promote open databases with results from previous projects**. Systematically review EIAs and monitoring results from WindFloat Atlantic and future demonstration projects to refine best practices for larger-scale deployments. Key actors are developers (e.g. Ocean Winds), WavEC, APA, European expert groups (e.g. OES-Environmental).

  ⏰ **Short-term (1-3 years).**
- **A5.5: Advance knowledge on potential environmental effects.** Fostering the knowledge and understanding of the environmental impacts generated by FOW to tackle existing uncertainties, providing confidence to regulators and stakeholders, while accelerating permitting. This action requires the commitment of the environmental permitting agency (APA) and nature conservancy agencies (ICNF), maritime space authorities (DGRM), and environmental NGOs (SPEA, ZERO, LPN).

  ⏰ **Medium-term (3-5 years)**.

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Availability of open-access baseline datasets; number of monitoring stations active (A5.1).
2	Percentage [%] of EIAs with documented stakeholder participation; public satisfaction with transparency (survey-based) (A5.2).
3	Number of innovative tools tested (A5.3).
4	Number of best practice guidelines updated and number of project developers sharing data (A5.4).
5	Number of R&D projects funded, number of guidance's and/or best practices published on environmental impact assessment (A5.5).

3.2.4 Spain

Recommendation #1

Enhance collaboration between offshore wind developers and local fisheries to mitigate socio-economic impacts.

Fostering the co-existence between FOW and local fishery is a pressing need to be addressed in the Spanish context. In fact, in the framework of the co-creation workshop realised in the Spanish Lab, fishermen expressed their worries about restricted access to fishing zones, the potential ecological disruptions that may affect fish stocks and the lack of involvement in the decision-making process.

Best practices across Europe suggest that, by promoting policy-oriented actions and strategies to preserve the livelihoods of coastal fishing communities and implementing collaborative approaches, conflicts can be minimised in favour of a mutually beneficial co-existence amongst different socio-economic sectors.

Action 1: Implementing policy-oriented and strategic actions to foster the co-existence between FOW developers and the local fishing sector through the organisation of regular meetings, the drafting of stakeholders engagement protocols, and the establishment of a dedicated fisheries liaison office.

- **A1.1: Regular meetings between developers and fisheries.** Setting up a recurring forum for open dialogue, information sharing, and joint problem-solving between offshore wind developers and local fisheries. In specific cases it is positive to include local governments in these meetings due to their strategic relevance. These roundtables will facilitate the communication amongst the different actors involved in FOW deployment and foster a deeper understating of the needs and concerns of the fishing sector, thus allowing the co-design of common strategies and reducing local opposition. Such regular meetings should be initiated at the earliest project stages and maintained throughout the project life-cycle.

  ⏰ **Immediate (0-12 months).**
- **A1.2: Define and implement responsible stakeholder engagement protocols**. Developing clear operational guidelines to guide the consultation and involvement stakeholders, especially representatives of the fishing sector, throughout the project lifecycle. The guidelines should outline innovative approaches and setting a specific timeline of the stakeholders engagement. Such guidelines should be developed during the planning phase and updated as needed.

  ⏰ **Immediate (0-12 months).**
- **A1.3: Establish a fisheries liaison office** to be ideally represented a respected member of the fisheries community or someone who knows well fisheries community to facilitate communication, mediate disputes, and represent fisheries' interests in project planning and implementation. The responsible of the fisheries liaison office should be appointed before project permitting and remain active through construction and operation.

  ⏰ **Immediate (0-12 months).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Number of regular meetings held and participation rates.
2	Existence and application of stakeholder engagement protocols.
3	Number of appointment and number of issues resolved to measure the effectiveness of the fisheries liaison office.

Recommendation #2

Ensure offshore wind projects respect cultural heritage sites through comprehensive impact assessments and stakeholder consultations.

The impact of FOW farm and their potential overlapping with local and national cultural heritage sites has been regarded as a major concern in the Mediterranean area. In fact, coastal communities expressed concerns about the loss of historical integrity and cultural identity, following the installation of FOW farms near these sites. Thus, actions to tackle these barriers should properly consider protected maritime zones and cultural heritage sites in the planning and the definition of optimal areas for FOW deployment, thus aligning the renewable energy goals with the cultural preservation instances.

Action 2: Establishing an assessment and monitoring framework to balance sustainable FOW deployment and cultural heritage preservation through preliminary mappings, multi-sector advisory boards, and guidelines development.

- **A2.1: Mapping of sensitive cultural heritage areas.** Identifying and mapping the cultural heritage sites along the coastlines that may overlap with potential offshore wind development zones. This preliminary mapping should be completed within the first phase of national offshore wind planning and inform the MSP.

  ⏰ **Immediate (0-12 months).**
- **A2.2: Assessments of the cultural impact of FOW.** Realising an accurate assessment of the impact of FOW farms on cultural heritage sites as a mandatory part of environmental studies for offshore wind projects, indicating principal vector that defined or conditioned cultural heritage in order to better address it among all stakeholders. This assessment should be integrated as a standard requirement before project approval and maintained throughout the permitting process.

  ⏰ **Short-term (1-3 years).**
- **A2.3: Establishment of a multi-sector advisory committee.** Creating a working group which is capable of gathering local communities, heritage experts, wind industry representatives, and public authorities to guide project planning and resolve conflicts that may arise from the overlapping of optimal for offshore wind development and cultural heritage sites. This committee should be established at the outset of planning and maintained as a permanent consultative body.

⏰ **Immediate (0-12 months).**

- **A2.4: Development of guidelines based on best practice**. Identifying best practices at national, European and international level to inform the drafting of technical and operational guidelines based on successful experiences in balancing cultural preservation and renewable energy deployment. The guidelines should be developed during the initial implementation phase and updated periodically, in close cooperation with heritage organisations and local communities.

  ⏰ **Immediate (0-12 months).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Percentage of offshore wind projects including a cultural impact assessment.
2	Number of mapped heritage sites considered in offshore wind planning.
3	Number of advisory committee meetings and diversity of stakeholders involved.
4	Number of best practice guidelines published and adopted.

Recommendation #3

Promote research initiatives and technological innovation to enhance co-existence between marine biodiversity and offshore wind farms.

The MARINEWIND Recommendations for the Spanish Lab highlighted the need to advance knowledge on the interactions between FOW farms and marine biodiversity, due to a lack of robust data to effectively predict and mitigate impacts. In particular, potential risks to be further investigate include disruptions to marine habitats, noise pollution, and interference with migratory species. Technological advancements, such as wildlife monitoring systems and eco-friendly turbine designs, as well as best practices from similar projects in the Baltic and North Seas can be inspirational to address this barrier and mitigate ecological impacts.

Action 3: Developing R&I programmes to understand and mitigate ecological impacts while optimising FOW energy production through multidisciplinary studies, data sharing, supportive technologies deployment and pilot actions.

- **A3.1: National research programs on offshore wind and biodiversity.** Design, fund and coordinate multidisciplinary research projects to study the ecological impacts of offshore wind farms and develop mitigation strategies. To be initiated at the early stages of offshore wind planning and maintained as an ongoing effort to advance knowledge on the topic, bringing together public authorities, ministries, developers and industry, environmental organisations and academia.

  ⏰ **Medium-term (3-5 years).**

- **A3.2: Promote innovation.** Supporting and promoting the development, testing and deployment of technologies such as wildlife monitoring systems, noise reduction solutions,

and biodegradable materials as mitigation solutions. Innovation at national and local levels should be promoted continuously, with regular funding calls and technology reviews, in close collaboration with industrial actors and environmental organisations.

⏰ **Medium-term (3-5 years).**

- **A3.3:** Draft completed and approved by relevant authorities. **Establish collaborative platforms for data sharing.** Collecting and creating open-access databases and regular forums for sharing research findings, monitoring data, and best practices among stakeholders. To be established during the initial phase and maintained as a permanent resource.

  ⏰ **Short-term (1-3 years).**
- **A3.4: Implement pilot projects for innovative solutions.** Test and evaluate new technologies and management approaches in selected offshore wind sites to assess their effectiveness in minimizing ecological impacts. To be launched in parallel with research programs and scaled up based on results.

  ⏰ **Medium-term (3-5 years).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Number of national-funded research projects addressing offshore wind and biodiversity.
2	Number of new technologies developed and tested.
3	Collaborative data-sharing platforms available and related usage rates.
4	Number of pilot projects for innovative solutions implemented.

Recommendation #4

Speed up the definition and implementation of a clear, coordinated regulatory framework for FOW in Spain.

The absence of a clear, coordinated and timely regulatory framework is a key barrier hindering the full deployment of FOW in Spain and the achievement of energy targets set at national level. In particular, the lack of a coherent roadmap for FOW development can result in the insufficient coordination between the Spanish government and private developers, generating conflicts amongst overlapping projects, as well as different visions on the role of OW in the future energy mix amongst policy makers and national industrial stakeholders. This leads to uncertainty around national and regional energy production targets, limiting investments and increasing risks for the developers. Although the updated Spanish National Energy and Climate Plan set a target of 3 GW of OW capacity by 2030, no timeline for auctions has been defined to date.

Action 4: Developing a coherent roadmap to speed up the authorisation process and guide FOW deployment through a binding auction calendar with competitive tendering criteria, the implementation of a single-window permitting system and reinforced inter-ministerial and public-private coordination.

- **A4.1: Publish a binding auction calendar.** Defining and communicating a clear timeline for offshore wind auctions, including designated zones, capacity volumes, and expected dates. This will provide visibility and certainty for investors and developers. It should be published during the initial phase of offshore wind planning and updated regularly to reflect evolving national targets and designated maritime zones.

  ⏰ **Short-term (1-3 years).**
- **A4.2: Define competitive tendering criteria.** Identifying and publishing the rules for competitive tendering, including technical requirements, financial guarantees, and socio-economic criteria to ensure transparent and fair project selection. The criteria should be defined in parallel with the auction calendar and revised periodically to incorporate technological and socioeconomic advances.

  ⏰ **Short-term (1-3 years).**
- **A4.3: Implement a single-window permitting system.** Establishing a centralised process for submitting Environmental Impact Assessments (EIAs), maritime area permits, and grid connection requests through a unified application. The system should be piloted early in the regulatory rollout and maintained as a permanent mechanism for streamlining administrative procedures and inter-agency coordination, attracting investments and speeding up FOW deployment.

  ⏰ **Short-term (1-3 years).**
- **A4.4: Create a public-private coordination platform.** Establishing a permanent multi-stakeholder forum, following the inspirational example of the France Énergies Marines, to align public authorities, developers, industry, academia, and civil society around a shared offshore wind roadmap. The platform should be established at the outset of national offshore wind strategy development and sustained as a long-term resource for stakeholder alignment and collaborative planning.

  ⏰ **Short-term (1-3 years).**
- **A4.5: Strengthen inter-ministerial coordination.** Setting up an inter-ministerial commission to harmonise energy, environmental, maritime, and defense policies, avoiding administrative bottlenecks and conflicting mandates. The commission should be convened at the early stages of framework definition and maintained as a continuous governance structure to ensure policy coherence across sectors.

  ⏰ **Short-term (1-3 years).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Existence of a published and regularly updated offshore wind auction calendar.
2	Publication of official tendering guidelines including technical and socioeconomic criteria.
3	Number of projects processed through the single-window system.
4	Number of meetings held and participants engaged across sectors.
5	Formal creation of an inter-ministerial commission for offshore wind.

Recommendation #5

Boost the Spanish supply chain by capitalising on the country's capabilities in naval construction and the steel industry to support the deployment of FOW.

Spain has significant industrial strengths, especially linked to the naval construction and steel manufacturing sectors, along with well-established shipyards on the coast to be further developed, adapted and exploited to serve FOW deployment needs. In particular, existing challenges to be addressed include: the limited specialisation in the manufacturing of critical FOW components (e.g., floating platforms, dynamic cables, anchoring systems); the lack of alignment between production capacities and project timelines; the lack of financial incentives to favour facility upgrades and digitalisation; the fragmentation of the supply chain. The situation is further aggravated by the lack of a clear regulatory framework and uncertainty in auction calendars, which are , discouraging long-term industrial planning and investments in the FOW sector.

Action 5: Fostering national supply chain readiness through the mapping of existing industrial capabilities, targeted investments programmes for facility upgrades and developing regional industrial hubs and ports to support FOW deployment.

- **A5.1: Map and assess national industrial capabilities.** Conducting a comprehensive mapping of existing shipyards, steel manufacturers, and offshore engineering companies to identify their readiness and gaps in producing FOWT components. The assessment should be initiated during the early stages of offshore wind strategy development and updated periodically to reflect evolving industrial capacity and supply chain needs.
  ⏰ **Short-term (1-3 years).**
- **A5.2: Launch targeted investment programmes for facility upgrades.** Providing public funding and incentives for upgrading shipyards and steel fabrication facilities to meet the precision, scale, and digitalization requirements of FOWT manufacturing. The programmes should be defined and launched following the initial mapping phase and maintained as a recurring funding mechanism to support strategic upgrades aligned with floating offshore wind technology requirements.
  ⏰ **Short-term (1-3 years).**
- **A5.3: Establish regional industrial hubs linked to strategic ports.** Designating key ports (e.g., A Coruña, Tarragona, Castellón) as offshore wind industrial hubs, integrating logistics, fabrication, and assembly activities for FOWT components. The ports should be designated during the mid-term planning phase and developed progressively as offshore wind deployment accelerates, integrating logistics, manufacturing, and assembly activities.
  ⏰ **Medium-term (3-5 years).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Completion and public availability of a national industrial capabilities map.

2	Number of shipyards, steel manufacturers, and offshore engineering firms assessed.
3	Number of facilities receiving public funding or incentives for upgrades.
4	Volume of public and private investment mobilised.
5	Volume of FOW components produced or assembled in designated hubs.

3.2.5 United Kingdom

Recommendation #1

Address the critical need for upgrading grid connections to reduce bottlenecks and facilitate the rapid integration of new floating offshore wind generation.

The outdated grid connection represents a critical bottleneck in the UK, hindering the rapid integration of new FOW generation and its deployment, as well as posing challenges to achieve the UK's renewable energy targets. This pressing need has been identified also in the latest Electricity Networks Commissioner (ENC) report and the National Electricity System Operator (NESO). Uncertainty and delays in grid connections are causing gaps to be addressed, which include: (i) curtailments, with excess power generated by wind farms may need to be curtailed, leading to wasted renewable energy and reduced efficiency, (ii) prolonged timelines for grid connection approvals and construction can delay the commissioning of new wind projects, impacting overall energy targets, and (iii) loss of investors' confidence. Furthermore, a long and complex planning processes for grid infrastructure upgrades causes additional delays in project timelines, exacerbating bottlenecks and increasing costs.

Action 1: Upgrading grid connections to facilitate the efficient connection of new generation capacity through the acceleration of the plan for the upgrade of grid infrastructures and the enhanced cooperation amongst key actors.

- **A1.1 Accelerate the plan for the upgrade of the grid infrastructure** as part of the implementation of the Transmission Acceleration Action Plan and recommendations from the *Beyond 2030*[3] report drafted by the National Energy System Operator (NESO), ensuring that new generation capacity can be connected efficiently and at pace. Key national actors to be involved include the Department for Energy Security and Net Zero of the UK Government (DESNZ), the National Energy System Operator (NESO), the Office of Gas and Electricity Markets (Ofgem) working as the energy regulator for Great Britain to protect the interests of energy consumers, and the National grid ESO.
  - ⏰ **Medium-term (3-5 years)** for the initial upgrade.
  - ⏰ **Medium to long-term (5-10 years)** for the full deployment.
- **A1.2 Facilitate a multi-actors collaboration platforms between policy makers, grid operators, and green innovation** to guide the identification of critical bottlenecks and co-develop

[3] *Beyond 2030 Report, Planning and Infrastructure Bill*.

innovative and sustainable solutions for efficient grid connections for FOW. The involvement of the academia in the collaboration will provide an added value from the research perspective, offering insights to advance grid management technologies and technical expertise to support grid upgrades.

⏰ **Short-term (1-3 years).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	MW of floating wind capacity connected to the grid.
2	Reduction in curtailment rates.
3	Number of grid connection applications processed annually.

Recommendation #2

Implement comprehensive policy and market reforms to create a conducive environment for the rapid deployment of floating offshore wind projects in the UK.

The full deployment of FOW in the UK is hindered by several challenges linked to the complex and long planning and permitting processes, insufficient financial incentives, and market uncertainties that limit investments. Looking at the documents drafted by relevant industrial actors and resulting from governmental analyses, such as the Nick Winser ENC report and the recommendations from the National Grid ESO (Electricity System Operator), a well-defined list of gaps should be urgently addressed to accelerate FOW deployment, including: (i) long approval processes delaying project timelines and increasing costs; (ii) unavailability of adequate financial incentives; (iii) unpredictable market conditions and regulatory changes limiting investments; (iv) mismatch between existing regulatory frameworks and the peculiarity of FOW.

Action 2: Creating a stable regulatory environment to support the growth of FOW in the UK through a streamlined consenting process and the provision of financial incentives to ensure long-term market stability.

- **A2.1:** The Department for Energy Security and Net Zero (DESNZ) and the Department for Environment, Food & Rural Affairs (DEFRA) of the UK Government, in cooperation with organisations dealing with the marine management, should take action to **accelerate and streamline the consenting process** via the Planning and Infrastructure bill[4]. The document, sponsored by the Ministry of Housing, Communities & Local Government, is a bill to make provision about: infrastructure, town and country planning, schemes for a nature restoration levy payable by developers administered by Natural England, development corporations, compulsory purchase of land; environmental outcomes reports, and for connected purposes.

[4] https://bills.parliament.uk/bills/3946.

⏰ **Immediate (0-12 months)** for the legislation.

⏰ **Short-term (1-3 years)** for the effective implementation.

- **A2.2: Providing operational guidance** for the creation of a stable regulatory environment and **identifying adequate financial incentives**, in the forms of subsidies or tax incentives, which are capable of ensuring long-term market stability, thus accelerating the deployment of FOW in the UK.

  ⏰ **Short-term (1-3 years).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Average time to consent offshore wind projects.
2	Number of projects approved annually.

Recommendation #3

Address the critical need for robust port and grid infrastructure to support the large-scale deployment of floating offshore wind farms in the UK.

Insufficient infrastructure is impeding the deployment of floating offshore wind farms in the UK, particularly in Scotland and Wales. Ports in these areas require specialised facilities capable of handling the large-scale components of floating wind turbines, such as floating platforms and mooring systems.

In addition, the current grid infrastructure must be upgraded to accommodate the increased power output and ensure efficient transmission to onshore networks. Addressing these shortcomings is vital for the successful commercialisation and scaling-up of floating offshore wind technology, especially in light of the ambitious targets set by ScotWind in Scotland.

Action 3: Upgrading port and grids infrastructures to support FOW deployment through the co-design, funding and implementation of ad hoc investment programmes, FOW integration into the Local Area Energy Planning and multi-actors collaborations to identify innovative facilities and logistics solutions for FOW components.

- **A3.1:** Fostering collaboration amongst regional and local actors, including local councils, port authorities, the private sector, the government and environmental bodies, to **co-design, fund and implement ad hoc port infrastructure investment programmes,** leveraging on the Supply Chain Accelerator fund of the Crown Estate. Collaborations with the Crown Estate and Crown Estate Scotland are strongly encouraged for the implementation of the actions, due their crucial role in accessing fundings.

  ⏰ **Short-term (1-3 years)** for the funding and planning phases.

  ⏰ **Medium-term (3-5 years)** for the construction phase.
- **A3.2:** The local authorities, in close collaboration with strategical actors such as the NESO and listening to the needs of the coastal communities, should favour the **integration of FOW into**

the Local Area Energy Planning (LAEPs) to align local energy needs with national targets. This action will provide local authorities with the social license to operate and ensure that the positive externalities and spill-over effected generate from FOW projects are shared locally.

⏰ **Immediate (0-12 months)**.

- **A3.3:** Enhancing the collaboration between industry, port authorities and academia to advance knowledge and **guide the development specialised facilities and logistics solutions** for FOW components, leveraging on the insights and technical expertise of research organisation. For instance, Offshore Renewable Energy Catapult could provide a significant support as an innovation and research centres supporting the development and commercialisation of offshore renewable energy technologies, including FOW.

  ⏰ **Immediate (0-12 months)**.

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Number of ports upgraded.
2	Increase in port capacity (tonnage, berth depth).
3	Number of LAEPs incorporating offshore wind.
4	Local renewable energy generation targets met.

Recommendation #4

Introduce diversified funding mechanisms such as Contract for Difference (CfD) schemes, Public-Private Partnerships (PPPs) and green bonds to bridge financial gaps, reduce investor risks, and catalyse private sector engagement.

FOW technologies are capital-intensive due to high capital expenditures (CAPEX) and operational costs (OPEX), which deter private investments and making the financial viability of project a significant barrier to its deployment. The UK has already mechanisms such as the Public-Private Partnerships (PPPs) that have demonstrated success in co-financing large-scale infrastructure projects globally, providing a shared-risk model that aligns public interest with private efficiency. For instance, Hywind Scotland leveraged innovative financing to lower its LCOE and build investor confidence. Green bonds and blended finance mechanisms have been proven effective in infrastructure projects, but are underutilised in the renewable energy sector.

Action 4: Adopting innovative and diversified funding mechanisms to enhance the financial viability of FOW projects.

- **A4.1: Tailoring CfD schemes for FOW to account for high-risk technologies**, creating incentives for green bonds, **expanding the adoption of PPPs** to ensure resource pooling and **promoting green bonds**. These measures will mitigate financial risks, attract diversified investments, and foster long-term economic sustainability for FOWT deployment in the UK. PPP models, which were successfully used in infrastructure development, can align

stakeholder interests and share financial risks, reducing the Levelized Cost of Energy (LCOE).Key actors to be involved include the HM Treasury, UK Infrastructure Bank, private investors.

⏰ **Short-term (1-3 years)** for the policy design phase.

⏰ **Medium term (3-5 years)** for the deployment phase.

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Number of floating wind projects funded.
2	Volume of green bonds issued.

Recommendation #5

Develop a targeted investment programme to modernise port infrastructure across the UK, focusing on facilities supporting floating offshore wind turbines (FOWTs). Utilize blended financing mechanisms to enhance the supply chain, reduce costs, and establish the UK as a leader in offshore wind logistics.

The adaptation and modernisation of the port infrastructures to accelerate FOW deployment requires a coordinated strategies, reducing logistical costs, strengthening the domestic supply chain and fostering investors' confidence. To date, the majority of UK ports faced barriers due to the lack of the necessary capabilities, such as deep-water access, heavy-lift capacity, and storage for large components.

Recent success stories, such as the upgrades to Scotland's Port of Nigg and Port of Cromarty Firth, demonstrate the potential for UK ports to transform into offshore wind hubs. These ports have invested in facilities specifically designed for renewable energy, including deep-water quays and laydown areas. Similarly, Able Seaton Port in England has emerged as a key player in the offshore wind sector, hosting assembly and deployment operations for major projects such as Dogger Bank.

Action 5: Modernising port infrastructures to address FOW requirements through a Port Infrastructure Investment Programme, which provides innovative and blended financing mechanisms, the creation of partnerships and the piloting of new technologies for port operations.

- **A5.1: Drafting of a Port Infrastructure Investment Programme** able to provide a coordinated strategy to upgrade and expand port infrastructures, focusing on the identification of strategic port locations, public and private funding to modernise facilities for FOWT manufacturing, assembly, and deployment. The program will contribute to address supply chain inefficiencies and high logistical costs while promoting regional economic development.

  ⏰ **Short-term (1-3 years).**
- **A5.2:** The UK industry should facilitate the establishment of **partnerships with public authorities in PPP models to co-finance large-scale FOWT projects**, leveraging on green bonds

and hybrid PPP as pivotal financing structures to secure long-term capital. The integration of PPP models will ensure that governments, industry, and local communities collaborate effectively, enhancing project transparency and facilitating the managing of fundings and port upgrades. Furthermore, the industry should **invest in co-located manufacturing and assembly facilities at upgraded ports** to reduce logistical inefficiencies.

⏰ **Immediate (0-12 months).**

- **A5.3:** Local and national public authorities and governments should guide the **re-designing of CfD auctions** to attract PPP participation by incorporating risk-sharing mechanisms and providing financial guarantees to PPP projects to mitigate investor risks and improve credit ratings. This action will contribute to improve revenue predictability for high-risk projects, reducing financial risks and providing long-term price guarantees. Furthermore, enhanced CfD schemes coupled with PPP-driven investments attract large-scale projects, stimulating local economies, creating jobs in coastal regions, and supporting supply chain development.

  ⏰ **Short-term (1-3 years).**
- **A5.4: Local and national banks should provide structured finance options tailored to the FOW sector,** including low-interest loans or revolving credit lines for port infrastructure upgrades, project finance or syndicated loans.

  ⏰ **Short-term (1-3 years).**
- **A5.5:** Green innovators across the UK should **pilot new technologies for port operations** aimed at improving efficiency and reducing costs, in close partnership with the academia, who can provide insights from specific studies on the optimisation of port layouts and operations for FOWT deployment.

  ⏰ **Medium-term (3-5 years).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Draft of the Programme completed and approved by relevant authorities; number of strategic ports securing fundings.
2	Numbers of partnerships established.
3	Number of CfD auction rounds redesigned; Volume of PPP-backed FOWT projects awarded through these auctions.
4	Number of structured finance instruments issued by banks specifically targeting FOW sector investments.
5	Number of new technologies for port operations piloted.

Recommendation #6

Develop and implement a coordinated strategy to modernize ports and streamline the supply chain for floating offshore wind turbines (FOWTs), exploiting existing investments, fostering public-private collaborations, and utilizing advanced logistics and manufacturing innovations to reduce costs and accelerate deployment.

Insufficient port infrastructure, combined with supply chain inefficiency, are threatening FOW deployment in the UK, resulting in delays and increased costs for developers. To achieve the UK targets for OW, setting 50 GW of offshore wind by 2030, including 5 GW of floating wind, urgent actions should be undertaken. UK can leverage on existing good practices and programmes, such as the Crown Estate's £50 million Supply Chain Accelerator Fund and regional development, as well as the success cases represented by the Port of Nigg and Able Seaton Port.

Action 6: Implementing an integrated strategy to modernise ports, upgrade infrastructures and improve supply chain efficiency through tailored financing mechanisms, co-investments and partnerships.

- **A6.1** National and local banks should provide **tailored low-interest loans to UK port authorities and FOW developers** to upgrade critical facilities, such as deep-water berths and heavy-lift cranes, while **fostering collaborations with other banks** to pool resources for large-scale port modernization projects. Furthermore, **green project financing under programs like the Bank of England's Green Financing Framework,** specifically targeting FOWT infrastructure should be further expanded. These actions will ensure risk-sharing and efficient capital allocation.
  ⏰ **Short-term (1-3 years).**
- **A6.2:** Institutional Investors should allocate capital to UK government or port authority-issued infrastructure bonds for port and supply chain upgrades, while **fostering public-private co-investments** in collaboration with UK government-led initiatives, such as the British Investment Bank, to support large-scale projects with public guarantees. These actions will provide stable and sustainable returns and contributing to mitigate investment risks.
  ⏰ **Short-term (1-3 years).**
- **A6.3** Capital Investors and venture funds should providing **fundings to innovative UK industrial companies** working on modular assembly techniques, digital supply chain tools, and advanced logistics technologies to enhance FOWT deployment efficiency, streamlining turbine manufacturing and reducing transport costs. The fundings will contribute to accelerate the innovation scaling up.
  ⏰ **Short-term (1-3 years).**

The following list of indicators to measure the achievement of the proposed actions has been identified:

1	Number of tailored low-interest loans and collaborative financing agreements issued for FOWT-related port infrastructure upgrades.
2	Number of public-private co-investments implemented; number of large-scale projects supported.
3	Number of UK companies receiving the fundings; number of innovative solutions under development.

4 CONCLUSIONS

The MARINEWIND Action Plan offers a comprehensive and operational roadmap to address the non-technological barriers that hinder the deployment of FOW across Europe. Developed through a participatory and evidence-based process, the deliverable reflects the strategic ambition of the MARINEWIND project to foster inclusive governance, accelerate market uptake, and ensure that offshore wind development is socially accepted, environmentally sustainable, and economically viable.

The critical analysis carried out in the document started from the assumption that public acceptance is not a peripheral issue, but a central determinant of success for FOWT deployment. The co-creation workshops conducted in the five MARINEWIND Labs consistently demonstrated that local communities are not passive recipients of energy infrastructure but active agents whose perceptions, concerns, and expectations must be integrated into planning and decision-making processes. The Action Plan rightly positions stakeholder engagement as a structural component of FOWT development, advocating for the institutionalisation of community liaison committees, structured dialogue platforms, and awareness campaigns that contextualise offshore wind within broader narratives of climate action and local benefit.

The deliverable also considered the limitations of current regulatory and planning frameworks: across the five countries analysed, i.e. Greece, Italy, Portugal, Spain, and the United Kingdom, there is a clear necessity for more coherent, transparent, and streamlined permitting procedures. In Greece, the excessive duration of licensing processes and the lack of consolidated experience in the sector have created significant bottlenecks. In Italy, the fragmented governance and delayed Maritime Spatial Planning have slowed down deployment and created uncertainty for developers. Portugal has made progress in auction design and infrastructure planning but must address supply chain gaps and ensure co-existence with traditional maritime sectors. Spain faces challenges in reconciling offshore wind development with cultural heritage preservation and in establishing a clear regulatory roadmap. The United Kingdom, despite its leadership in offshore wind, must upgrade its grid and port infrastructure and reform its financial mechanisms to support large-scale FOW deployment.

These national disparities point to a broader structural issue: the absence of a harmonised European approach to FOWT deployment. Indeed, while the European Commission has set ambitious targets, i.e. 60 GW of offshore wind by 2030 and 300 GW by 2050, the implementation at Member State level remains uneven. Therefore, the Action Plan calls for greater coordination among Member States, including joint strategic environmental assessments, collaborative innovation in grid assets, and the establishment of an EU-level coordinator to monitor progress. These recommendations are not only timely but essential to avoid duplication, reduce delays, and ensure that offshore wind contributes effectively to the EU climate and energy objectives.

From a quantitative perspective, the Action Plan introduces a robust set of indicators to monitor the implementation and effectiveness of the proposed actions, including metrics such as the number of ports upgraded, the percentage of tenders incorporating non-price criteria, the volume of public and private investment mobilised, and the share of local workforce employed in FOWT-related industries. These indicators provide a valuable framework for accountability and adaptive management. However, their operationalisation will require the establishment of national and European monitoring platforms,

the integration of data collection into permitting procedures, and the commitment of public authorities to transparency and continuous improvement.

The analysis carried out in this deliverable also highlights the strategic importance of supply chain resilience: indeed, the revitalisation of local industries (e.g., shipyards, steel manufacturing, and cable production) is not only an economic opportunity but a necessity to reduce dependency on external suppliers and enhance the competitiveness of Europe. Therefore, the Action Plan proposes targeted investments, public-private partnerships, and the introduction of local content quotas to stimulate industrial development: these measures are particularly relevant in the context of growing international competition and geopolitical instability, which have exposed the vulnerabilities of the European energy supply chains. However, their success will depend on the alignment of industrial roadmaps with deployment schedules, the availability of skilled labour, and the capacity to innovate and adapt to evolving technological requirements.

Another critical insight emerging from the MARINEWIND analysis is the need to balance speed with inclusivity, as the urgency to deploy FOWT in line with climate targets must be reconciled with the imperative to uphold environmental standards, respect local livelihoods, and ensure democratic participation. The proposal to introduce fast-track permitting procedures and “one-stop-shop” systems is pragmatic and potentially effective, but it must be accompanied by safeguards that prevent the marginalisation of affected communities and the dilution of impact assessments. The recommendation to mandate socio-economic impact assessments and integrate non-price criteria into tenders is particularly valuable in this regard, as it ensures that projects deliver tangible benefits beyond energy generation.

MARINEWIND analysis also underscored the importance of knowledge transfer and policy learning: the Mediterranean countries, in particular, are encouraged to draw lessons from forerunner nations such as Denmark, Norway and the UK, not only in terms of technological solutions but also with respect to regulatory design, stakeholder engagement and socio-economic integration. The establishment of structured exchange programmes and joint workshops is a pragmatic and cost-effective way to accelerate capacity-building and avoid repeating past mistakes. However, such exchanges must be institutionalised and supported by dedicated funding and coordination structures to ensure continuity and impact.

In conclusion, the MARINEWIND Action Plan provides a detailed and actionable framework to guide stakeholders in overcoming the non-technological barriers to FOWT deployment. Its strength lies in its ability to combine strategic vision with operational detail, while remaining sensitive to the diverse realities of the countries involved. For policy makers, public authorities, and stakeholders, the key takeaways are clear: public acceptance must be actively cultivated through inclusive engagement; regulatory frameworks must be streamlined and harmonised; environmental and socio-economic impacts must be rigorously assessed and mitigated; supply chains must be strengthened through targeted investments; and progress must be monitored through transparent and accountable mechanisms.