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“Adriatic-Ionian Offshore Wind Network of Excellence”

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Joint Transnational R&I Strategy Document

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Contents

Abbreviation	Full Term
ADRION	Adriatic–Ionian Programme
ADRIONWIND	Adriatic–Ionian Offshore Wind Network of Excellence
AI	Artificial Intelligence
B2B	Business-to-Business
CAPEX	Capital Expenditure
DEA	Danish Energy Agency
EC	European Commission
EDP	Entrepreneurial Discovery Process
EEN	Enterprise Europe Network
EMODnet	European Marine Observation and Data Network
EPBiH	Elektroprivreda Bosne i Hercegovine
ERDF	European Regional Development Fund
ESG	Environmental, Social and Governance
EU	European Union
EUSAIR	EU Strategy for the Adriatic and Ionian Region
FOW	Floating Offshore Wind
GDP	Gross Domestic Product
GIS	Geographic Information System
GW	Gigawatt
GWh	Gigawatt-hour
HR	Croatia (country code)
ICT	Information and Communication Technologies
IEA	International Energy Agency
Interreg	European Territorial Cooperation Programme
IPA	Instrument for Pre-Accession Assistance
IPTO	Independent Power Transmission Operator (Greece)
JTP	Just Transition Plan
JTM	Just Transition Mechanism
KPI	Key Performance Indicator
LNG	Liquefied Natural Gas
MSP	Maritime Spatial Planning
MW	Megawatt
MWh	Megawatt-hour
NECP	National Energy and Climate Plan
NGO	Non-Governmental Organisation
NRRP	National Recovery and Resilience Plan
O&M	Operations and Maintenance
OPEX	Operational Expenditure
OW	Offshore Wind
OWE	Offshore Wind Energy
OWF	Offshore Wind Farm
PPA	Power Purchase Agreement
PPs	Project Partners
R&D	Research and Development
R&I	Research and Innovation
RES	Renewable Energy Sources
RIS3	Research and Innovation Strategy for Smart Specialisation
RVO	Netherlands Enterprise Agency (Rijksdienst voor

	Ondernemend Nederland)
S3	Smart Specialisation Strategy
SEA	Strategic Environmental Assessment
SME	Small and Medium-sized Enterprise
SWOT	Strengths, Weaknesses, Opportunities and Threats
TCP	Technology Collaboration Programme
TSO	Transmission System Operator
UNIZAG FSB	University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture
VET	Vocational Education and Training
WP	Work Package

Partnership

No.	Name of the Partner in English	Country	Partner abbreviation
LP1	University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture	Hrvatska (HR)	UNIZAG FSB
PP2	Fenice Foundation NGO	Italia (IT)	FENICE
PP3	KINNO INNOVATION INTERMEDIARIES LTD	Elláda (EL)	KINNO
PP4	National Agency of Natural Resources	Shqipëria (AL)	AKBN
PP5	Adria Innovation Harbour	Hrvatska (HR)	AIH
PP6	FEAC Engineering Private Company	Elláda (EL)	FEAC
PP7	University of Donja Gorica	Crna Gora (ME)	UDG
PP8	Regional Agency for Technology and Innovation	Italia (IT)	ARTI
PP9	Public Company Elektroprivreda BiH d.d. – Sarajevo	BiH (BA)	EPBiH

1. Strategy Framework

1.1. Project Background

The development of offshore wind energy is central to European (EU) policies promoting sustainable energy, decarbonization, and regional economic transformation. Key EU strategies such as the Green Deal, the EU Strategic Energy Technology (SET) Plan, and the REPowerEU Plan emphasize the need for an accelerated transition toward clean energy sources, fostering energy independence and economic resilience. Offshore wind, as a rapidly growing sector, plays a crucial role in this transformation, contributing to climate neutrality, energy security, and regional development. The European Commission has set ambitious targets, aiming for 300 GW of offshore wind capacity by 2050, underscoring its commitment to integrating offshore wind into the EU's energy infrastructure. The offshore wind sector in Europe has been expanding swiftly. As of 2023, the EU had an installed offshore wind capacity of approximately 19.4 GW, accounting for 8.8% of the total wind energy capacity. In 2023 alone, Europe added 2.9 GW of offshore wind capacity, reflecting the sector's rapid growth.

Several European funding instruments and frameworks support the advancement of Research & Innovation (R&I), industrial development, and policy coordination in offshore wind energy. Initiatives such as the Clean Energy Industrial Forum, European Industrial Alliances (e.g., the Offshore Renewable Energy Alliance), Important Projects of Common European Interest (IPCEIs) on Renewable Energy, and Transnational Energy Research Networks drive technological innovation, knowledge transfer, and cross-border collaboration. These efforts aim to accelerate offshore wind deployment across diverse European regions, particularly those with high untapped wind energy potential.

The Adriatic-Ionian region presents a unique opportunity for offshore wind energy development. With its long coastline, favourable wind conditions, and increasing political commitment to renewable energy, the region is well-positioned to integrate offshore wind into its energy mix. However, several challenges hinder its full-scale deployment:

- Regulatory and administrative complexities that slow down permitting processes.
- Limited regional capacity in offshore wind expertise, including workforce skills, industry readiness, and innovation ecosystems.
- Underdeveloped infrastructure, particularly related to grid integration, port logistics, and supply chains.

At the same time, these challenges open pathways for targeted R&I, investment attraction, and industrial capacity building. Studies have shown that offshore wind development can create tens of thousands of jobs in coastal regions through specialized activities such as marine engineering, installation and maintenance of turbines, grid connection technologies, and digital monitoring systems. This transition requires a coordinated, transnational effort that leverages regional strengths while addressing common obstacles.

The ADRIONWIND project is designed to bridge the gap between policy, industry, research, and investment, fostering a transnational Network of Excellence for offshore wind energy. By joining forces among six Adriatic-Ionian countries, ADRIONWIND aims to:

- Establish a digital collaboration platform to connect policymakers, industry stakeholders, research institutions, and SMEs.

- Develop a Joint R&I Strategy to guide the sustainable and regionally adapted growth of offshore wind.
- Support SMEs in the offshore wind value chain, ensuring that smaller players can contribute meaningfully to sectoral innovation and growth.
- Enhance knowledge transfer and capacity building, enabling regional actors to develop the necessary skills and expertise for offshore wind deployment.
- Mobilize public and private investment to scale up offshore wind initiatives in the region, maximizing the impact of funding programs.

The six participating countries in ADRIONWIND are at different stages of offshore wind development but share the common goal of fostering a resilient and sustainable blue economy. Several of these countries have begun integrating offshore wind into their National Energy and Climate Plans (NECPs), but concrete strategies and support mechanisms remain fragmented.

By leveraging existing Smart Specialization Strategies (S3), Regional Innovation Strategies (RIS3), and national energy transition frameworks, ADRIONWIND will ensure alignment with EU and national policy priorities. The project will also facilitate multi-stakeholder consensus building, ensuring that offshore wind development benefits local communities, industries, and innovation ecosystems. In doing so, ADRIONWIND contributes to the long-term transformation of the Adriatic-Ionian region into a leader in offshore wind energy, accelerating the transition to a low-carbon, knowledge-driven economy while strengthening the region's role in Europe's renewable energy future.

1.1.1. Key Concepts

Regional Innovation Ecosystems

Over the past 25 years, the concept of innovation ecosystems has gained prominence, accompanied by a rapidly expanding body of literature that mostly originates from business and strategy perspectives. In the field of innovation studies, the notion of innovation systems has also been widely employed, often with different qualifiers such as "national innovation systems" or "sectoral innovation systems."

The conceptual evolution of innovation ecosystems differs markedly from that of innovation systems. The concept began to flourish after the publication of a Harvard Business Review article by Adner, which also provides perhaps the most cited definition of innovation ecosystems: "the collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution." It primarily draws on the related idea of business ecosystems, as discussed by James F. Moore (1993) and others.

In recent years, several additional definitions or descriptions of innovation ecosystems have emerged. Some focus on economic causal factors rather than limiting themselves strictly to technological innovations. One sectoral view portrays a system (group) of firms that develop and produce a sector's offerings and generate or utilize its technologies. Likewise, one can define a corporate innovation ecosystem as a network of actors, activities, resources, institutions, and causal interrelations that are crucial for the innovative performance of a single corporation or groups of cooperating companies and additional entities (e.g., universities, institutes, agencies, regional excellence hubs). Different sets of components—actors, activities, resources, and institutions—are commonly distinguished to highlight subsystems such as the actor system within and around the corporation.

Other definitions adopt a more geographic perspective, emphasizing spatial factors like location and physical proximity in R&D, innovation, and diffusion, leading to regional clusters and networks supported by agglomeration economies. One of the key ideas relevant to this project—Regional Innovation Ecosystems—also derives from this geographic focus. It can be viewed as the institutional infrastructure fostering innovation within a region's production framework. The project is scientifically linked to the roots of "Diffusion of Innovation theory," W. Arthur Lewis's theory of economic growth, and more recent concepts in Paul Krugman's New economic geography.

Projects funded under the European Innovation Ecosystems Work Programme advance this agenda by reinforcing connectivity within and among innovation ecosystems, promoting sustainable business growth, and encouraging women's leadership in deep technology fields. Put simply, the programme's goal is to equip Europe to develop new technologies and tackle the most pressing societal challenges—mirroring the project's chief aim: to foster innovation excellence in guiding coal regions toward climate-neutral, thriving economies.

Sustainable Energy Systems

The undeniable reality of climate change, coupled with the increasing frequency of climate-induced disasters and diminishing fossil fuel reserves, has propelled the development and implementation of sustainable energy systems to the forefront of political agendas in the EU and globally. Substantial investments in emerging energy technologies are poised to transform societies and economies in the coming decades.

Virtually all energy-dependent applications—such as lighting, electrical installations, refrigeration, telecommunications, water pumping and purification, food processing, grain milling, and various other uses—can be powered or influenced by technologies that utilize renewable and sustainable sources. Moreover, renewable energy technologies often offer greater technical and financial flexibility than conventional options, with lower operating costs and reduced susceptibility to fuel price fluctuations once deployed. The widespread adoption of renewable energy not only enables local production—creating job opportunities as a secondary benefit—but also delivers environmental advantages and drives technological advancements.

Sustainable energy refers to energy sources that are not expected to be depleted within a timeframe relevant to humanity, thereby supporting long-term sustainability for all species. Sustainable energy systems—particularly district heating and cooling systems powered by renewable sources such as solar and biomass, or through waste heat recovery (co-generation)—serve as key mechanisms for integrating clean and sustainable energy into urban environments. The energy generated can serve various sectors, including residential, industrial, and urban agriculture, or any domain requiring hot or cold water. A primary technical goal is to decouple the energy consumption of residential and inner-city economic activities from the main energy system, resulting in substantial environmental, climatic, economic, and social benefits.

Establishing a sustainable energy system is fundamental to achieving broader sustainability objectives. Several critical factors must be addressed to transition toward sustainable energy, including securing reliable energy resources, utilizing efficient energy carriers, enhancing system performance, minimizing environmental impacts throughout an energy system's lifecycle, and tackling nontechnical aspects such as living standards, lifestyle changes, economic feasibility, societal acceptance, and equity.

Just Transition and Regional Transformation

To achieve carbon neutrality by 2050, as outlined in the European Green Deal, the European Union (EU) must undergo a comprehensive decarbonization of its economy. This transition will disproportionately affect certain regions, particularly those heavily reliant on fossil fuel industries. For instance, in 2018, the coal sector employed approximately 238,000 individuals across the EU. Projections indicate that by 2025, 20% of these jobs (around 49,000 positions) could be lost, with an additional 35% (approximately 83,000 jobs) at risk by 2030. Consequently, about one-third (around 78,000) of the current workforce may remain employed in the coal industry post-2030.

Recognizing these challenges, the EU established the Just Transition Mechanism (JTM), aiming to mobilize around €55 billion between 2021 and 2027 to support the regions most affected by the transition. The JTM comprises three pillars:

- **Just Transition Fund (JTF):** With an allocation of €17.5 billion (in 2018 prices), the JTF provides grants to support economic diversification and reconversion in affected territories.
- **A dedicated scheme under InvestEU:** This pillar leverages private investments to support projects that contribute to the transition, including energy and transport infrastructure.
- **Public Sector Loan Facility:** Combining €1.3 billion in grants from the EU budget with loans from the European Investment Bank (EIB), this facility aims to mobilize between €13.3 and €15.3 billion for public investments in affected regions.

Access to these funds requires the development of Territorial Just Transition Plans (TJTPs), which outline the transition process, identify the most affected territories, and propose operations to address the socio-economic impacts.

The six countries participating in the ADRIONWIND project—Croatia, Italy, Greece, Albania, Montenegro, and Bosnia and Herzegovina (BiH)—are pivotal to the successful implementation of the Just Transition Mechanism. Country-relevant information can be found below:

Figure 1: Geographical scope of the ADRIONWIND Partnership

Croatia

Croatia has been actively working on integrating more renewable energy projects to reduce its reliance on fossil fuels. The national energy mix is diverse, with significant contributions from renewable sources, particularly hydropower. As of 2023, hydropower accounted for approximately 34% of the country's electricity production. In addition to hydropower, Croatia has been expanding its renewable energy portfolio, with wind energy contributing around 13.6% and solar energy about 1% to the electricity mix. Croatia is actively exploring offshore wind energy to diversify its renewable energy portfolio. A study financed by the European Bank for Reconstruction and Development (EBRD) identified the potential for installing up to 25 GW of offshore wind capacity in the Adriatic Sea. In line with this, an Ireland- and UK-based developer is assessing the feasibility of a 500 MW offshore wind project off the coast of Istria County. Additionally, Croatia and Italy are jointly considering a 300 MW offshore wind farm in the Northern Adriatic Sea, with preparatory studies underway. These initiatives underscore Croatia's commitment to expanding its renewable energy sources through offshore wind development.

Italy

Italy is actively advancing its offshore wind energy sector to transition towards sustainable energy sources. In April 2022, the country inaugurated its first offshore wind farm, Beleolico, near Taranto in the Puglia region. This facility comprises ten turbines with a total capacity of 30 MW, producing over 58,000 MWh annually, sufficient to meet the energy needs of approximately 60,000 people. To further bolster offshore wind development, Italy has approved environmental impact assessments for two significant projects off the Emilia-Romagna coast: the 700 MW Agnes-1-2 project near Ravenna and the 330 MW Energia Wind 2020 project off Rimini. These approvals enable the projects to participate in upcoming renewable energy auctions. Additionally, the Italian government has introduced a Contracts for Difference (CfD) scheme, aiming to incentivize the construction of 4.6 GW of new renewable energy projects by the end of 2028, including both fixed-bottom and floating offshore wind farms.

Greece

Greece has set a binding target to phase out lignite for electricity generation by 2028, necessitating the decommissioning of lignite power plants and mines, particularly in regions like Western Macedonia, where 80% of the country's lignite is produced. To address the economic and employment challenges in these areas, the government has developed a comprehensive just transition strategy, emphasizing the development of renewable energy projects and other sustainable industries. As part of its renewable energy expansion, Greece is actively exploring offshore wind energy. The country has set a target to install 2 GW of offshore wind capacity by 2030. In July 2022, the Hellenic Parliament passed Law 4964/2022, establishing a framework for offshore wind development. This law outlines a two-stage licensing procedure, with the Hellenic Hydrocarbons and Energy Resources Management Company (HEREMA) responsible for designating Offshore Wind Farm Organized Development Areas (OWF-ODA). The first tenders for offshore wind power capacity are anticipated to be held in 2027, offering six zones for deployment.

Albania

Albania's energy sector is predominantly hydroelectric, with hydropower accounting for nearly 100% of its electricity generation - not to be confused with its share in consumption, which was 44% in 2022, with hydroelectric power having the predominant role. To diversify its energy mix and enhance energy security, Albania is actively exploring offshore wind energy projects. In 2022, the government initiated studies for its first offshore wind farm, supported by the EBRD, aiming to harness the country's significant wind potential. In a notable development, Albania, Italy, and the United Arab Emirates signed a trilateral agreement in January 2025 to produce renewable energy, including wind power, in Albania. This energy will be transmitted to Italy via an underwater cable across the Adriatic Sea, with the project valued at approximately €1 billion and expected to be operational within three years.

Montenegro

Montenegro's energy sector has historically been dominated by coal, particularly from the Pljevlja region, which is a significant source of employment. The country faces challenges in transitioning to renewable energy due to its existing infrastructure and economic dependence on coal. However, Montenegro has expressed commitment to the green transition and is exploring opportunities to diversify its energy sources, including investments in hydropower and solar energy. In recent years, Montenegro has been actively assessing its offshore wind energy potential. A study titled "Winds of Change: A Study on the Resource Viability of Offshore Wind Energy in Montenegro" identified suitable offshore areas in the Montenegrin part of the Adriatic Sea for wind farm construction, estimating a potential capacity of approximately 2,300 MW. To facilitate the development of renewable energy projects, including offshore wind, Montenegro introduced a Renewable Energy Law in August 2024.

BiH

BiH's energy sector has historically been dominated by coal, particularly in regions like Tuzla and Zenica, where coal-fired thermal power plants generate approximately 58% of the country's electricity. This reliance on coal presents challenges in transitioning to a low-carbon economy, necessitating substantial investments in renewable energy infrastructure and strategies to mitigate socio-economic impacts on communities dependent on coal-related employment. In its National Energy and Climate Plan (NECP) presented in April 2023, BiH set ambitious goals to reduce greenhouse gas emissions by 41% compared to 1990 levels. A key component of this plan is the installation of 2 GW of renewable energy capacity, comprising 1.5 GW of solar power and 0.5 GW of wind power, to shift the energy mix towards more sustainable sources.

Regional Excellence Hubs

Excellence hubs are designed to enhance regional innovation by strengthening place-based innovation ecosystems. These ecosystems encompass core cities, industrial zones, agglomeration structures, settlement networks, and cross-border collaborations built around common strategies or value chains. Place-based innovation ecosystems bring together companies, research institutions, government bodies, and societal actors, fostering mutual reinforcement within a defined territorial setting. This interconnectedness raises regional innovation excellence while benefiting from geographic proximity, which encourages strong links between academia and business.

Excellence hubs form part of the European Excellence Initiative, complementing open science-oriented schemes such as Teaming, Twinning, ERA Chairs, and the European Excellence Initiative for universities by adding a dedicated innovation component. These hubs prioritize innovation by enabling ecosystems in Widening countries and beyond to collaborate, strengthening ties between academia, business, government, and society. By doing so, they promote a true place-based innovation culture in Widening countries, guided by a strategic agenda aligned with regional or national smart specialisation strategies. In this context, synergies will be sought with European Innovation Ecosystems and the European Institute of Innovation & Technology (EIT).

Regional Excellence Hubs are expected to achieve the following outcomes:

- Establishing excellent and sustainable place-based innovation ecosystems in Widening countries and beyond in key areas of advanced science and innovation.
- Developing long-term joint R&I strategies backed by concrete European-relevant action plans.
- Creating common R&I investment plans, including infrastructures, that leverage national, regional, and European funds alongside private capital.
- Launching R&I pilot projects aligned with joint strategies and regional or national priorities, particularly regional innovation strategies for smart specialisation (RIS3).
- Enhancing competencies and skills for researchers, entrepreneurs, and professionals in R&I-intensive fields.
- Strengthening connections between science and business.
- Creating talent hubs in catching-up regions and countries.
- Facilitating knowledge transfer and fostering entrepreneurial skills.
- Encouraging the adoption of innovative technologies.
- Generating new business opportunities, particularly for SMEs, and boosting employment.

Smart Specialisation Strategies (RIS3)

The concept of Smart Specialisation Strategies (RIS3) has had a widening adoption over the past decade, especially within European regional policy contexts. Originally introduced by the European Commission as an ex-ante conditionality for accessing EU Structural and Investment Funds, RIS3 involves regions identifying and prioritizing their unique strengths and competitive advantages to foster targeted innovation and sustainable economic development.

The RIS3 approach differs substantially from general innovation policies by its explicit focus on regional specificity, emphasizing existing capabilities, knowledge bases, and distinct competitive assets. Regions are encouraged to specialize strategically, channelling investment into prioritized sectors and technologies to maximize economic and innovation outcomes.

Smart Specialisation Strategies involve systematic stakeholder collaboration among public authorities, industry, academia, and civil society to align regional resources effectively. The RIS3 methodology comprises identifying regional strengths and potential, defining a clear vision, setting strategic priorities, and implementing robust monitoring and evaluation mechanisms.

Within this project's context, RIS3 is highly relevant, as it directly supports the creation of tailored regional development pathways, enhancing innovation capacity, and promoting the economic resilience of the Adriatic-Ionian offshore wind sector.

Offshore Wind Value Chain

The concept of Offshore Wind Value Chain has become increasingly prominent over the last two decades, paralleling the rapid growth of renewable energy sectors globally. Originating within industry-focused and innovation-oriented literature, offshore wind value chains encompass the interconnected activities, stakeholders, technologies, and resources involved throughout all phases of offshore wind energy development—from early-stage research and innovation (R&I) to commercialization, installation, and full-scale deployment.

A widely referenced framework for value chain analysis in renewable energy contexts was initially provided by Porter (1985), who introduced the concept as the full range of activities required to bring products or services from conception to end-use. Recent literature specifically tailored to offshore wind expands this definition to include specialized supply chains, cross-sector collaborations, and complex logistical infrastructures.

The offshore wind value chain typically comprises multiple stages, including resource assessment, technological R&D, manufacturing of turbine components, logistics, installation, operation and maintenance (O&M), and eventual decommissioning. Key stakeholders involved in these stages range from technology developers, manufacturers, and service providers to research institutions, policymakers, regulatory authorities, and local communities.

Several studies emphasize the strategic importance of well-integrated value chains for regional economic development, job creation, and industrial innovation, particularly highlighting successful cases in Northern Europe, such as Denmark and the United Kingdom. Within the ADRIONWIND project, understanding and mapping the offshore wind value chain will be crucial to strategically positioning the Adriatic-Ionian region in the broader European renewable energy landscape.

Within the ADRIONWIND project, these concepts are not treated as purely theoretical constructs, but as operational frameworks guiding the development of the Joint Transnational R&I Strategy. In particular, the notion of regional innovation ecosystems, combined with the structure of offshore wind value chains and the principles of smart specialisation, provides the analytical foundation for identifying strategic priorities, structuring stakeholder engagement, and designing coordinated transnational actions.

The integration of these concepts ensures that the strategy moves beyond fragmented national approaches and instead promotes a systemic, place-based, and innovation-driven model for offshore wind development in the Adriatic-Ionian region.

1.2. Objectives and Goals

The objectives and goals of the ADRIONWIND Joint Transnational R&I Strategy are grounded in the analytical findings of the SWOT analysis (D2.2.1) and further informed by stakeholder engagement and consultations carried out under Activities 2.3 and 2.4. They reflect both the structural challenges and the strategic opportunities identified across the Adriatic-Ionian region, and aim to translate these into a coherent framework for coordinated action, innovation support, and ecosystem development in the offshore wind sector. The participating countries of the Adriatic-Ionian region share both challenges and opportunities in the development of offshore wind energy. ADRIONWIND seeks to leverage this momentum and facilitate a collaborative approach by enhancing regional innovation capacities, strengthening synergies among stakeholders, and ensuring the inclusion of SMEs in the sector's evolution. By fostering transnational cooperation, mutual learning, and knowledge transfer, ADRIONWIND paves the way for a unified and forward-looking strategy, setting a strong foundation for the sustainable advancement of offshore wind energy in the region. In analysing the collaborative efforts of the Adriatic-Ionian countries in offshore wind energy development, several key commonalities emerge, underscoring the transformative potential of a Joint Transnational R&I Strategy to drive sustainable growth in the sector. By addressing shared challenges through collective action, ADRIONWIND enables the region to establish a unified, resilient, and forward-looking framework for offshore wind innovation.

1.3. Strategy Principles

The ADRIONWIND Joint Transnational R&I Strategy is based on the premise that offshore wind development in the Adriatic-Ionian region requires coordinated transnational action rather than fragmented national responses. While participating countries are at different stages of market, regulatory, and technological maturity, they share a common maritime space, comparable structural constraints, and a strong interest in accelerating the energy transition through innovation-led growth.

The strategy therefore follows a set of core principles that shape both its content and its implementation.

- First, it is **evidence-based**. The strategy builds on the analytical results of Deliverable D2.2.1 – *SWOT Analysis Report for the Offshore Wind Energy Sector*, as well as on stakeholder engagement and consultations carried out under Activities 2.3 and 2.4. This ensures that the strategic priorities identified are grounded in the actual conditions, capacities, and needs of the participating countries.
- Second, it is **transnational in orientation**. The strategy is designed to identify commonalities, complementarities, and shared priorities across countries, with a view to creating added value through cooperation. This transnational perspective is particularly important in offshore wind, where infrastructure needs, innovation ecosystems, supply chains, and policy frameworks benefit from regional coordination.
- Third, it is **innovation-driven**. ADRIONWIND treats offshore wind not only as an energy transition objective, but also as a field for research, technology uptake, business development, and regional industrial transformation. The strategy therefore places particular emphasis on strengthening research and innovation capacities, supporting knowledge transfer, and improving the conditions for market uptake of innovative solutions.
- Fourth, it is **inclusive and ecosystem-based**. The strategy recognises that offshore wind development depends on the interaction of multiple actors, including public authorities, research institutions, industry stakeholders, SMEs, and civil society. For this reason, it adopts a quadruple helix approach and aims to reinforce regional innovation ecosystems capable of supporting long-term development.
- Fifth, it is **implementation-oriented**. The strategy is not conceived as a purely conceptual document, but as a framework for future action. Its purpose is to guide priorities for cooperation, identify intervention areas, support the design of future joint initiatives, and provide a common basis for national adaptation and follow-up investment decisions.

On this basis, the strategy has been developed through a progressive logic. It starts from the national context analysis and the comparative assessment of strengths, challenges, and gaps across the participating countries. It then identifies areas of common strategic interest and translates them into a transnational framework for cooperation. Finally, it provides the basis for future national specialization, ensuring that the joint framework can be adapted to the realities and priorities of each participating country. In this respect, the ADRIONWIND Joint Transnational R&I Strategy does not replace existing national or regional strategies. Rather, it complements them by introducing a transnational layer of coordination, knowledge exchange, and strategic alignment focused specifically on offshore wind energy and its related innovation ecosystem. Overall, the strategy aims to support a transition from dispersed initiatives and uneven capacities toward a more coherent regional approach, in which offshore wind development is linked to innovation, competitiveness, SME participation, and sustainable territorial transformation across the Adriatic-Ionian region. The operationalisation of these principles is reflected in the subsequent chapters of the strategy, which move from national context analysis to comparative assessment, strategic design, and future national specialization.

1.4. Governance Structure

The ADRIONWIND Joint Transnational R&I Strategy is supported by a governance structure designed to ensure coordinated implementation, effective monitoring, and continuous adaptation. The governance framework defines the roles and responsibilities of project partners, while also establishing the procedures required to support the strategy's application beyond the project duration. The governance structure builds on the foundations established under Deliverable D211 Guiding Principles and Strategic Framework Document and reflects the need for a multi-level and participatory approach, involving actors from the quadruple helix. It ensures that the strategy is not only developed in a coordinated manner within the project, but can also be operationalised through continued collaboration among stakeholders at regional, national, and transnational levels. The governance framework is structured around three core functions:

- Implementation
- Monitoring
- Feedback

These functions are interrelated and collectively support the long-term effectiveness and adaptability of the ADRIONWIND strategy.

1.4.1. Implementation Process

The implementation process defines how the ADRIONWIND Joint Transnational R&I Strategy is developed, coordinated, and progressively applied. It distinguishes between governance within the project and governance conditions required for future uptake.

1.4.1.1 Suitable Governance Structures

During the project lifetime, the implementation of the strategy is ensured through the ADRIONWIND partnership structure. The Lead Partner provides overall coordination, while KiNNO, as Work Package 2 Leader, is responsible for guiding the development and consolidation of the Joint Transnational R&I Strategy.

Project partners contribute through:

- the provision of national inputs and data
- participation in analytical and consultation activities
- validation of findings and strategic priorities
- In addition, thematic working structures and stakeholder engagement mechanisms contribute to the refinement of the strategy, ensuring that it reflects both technical expertise and practical needs.

Beyond the project, implementation is not assigned to a single formal body but is expected to be carried forward through the continued engagement of participating institutions, networks, and stakeholders. In this respect, the governance structure enables rather than prescribes implementation, allowing flexibility in how the strategy is used and adapted.

1.4.1.2 Coordination at Different Governance Levels

Effective implementation of the strategy requires coordination across multiple governance levels.

- At **local and regional level**, implementation is linked to the involvement of innovation actors, SMEs, research organisations, and local authorities, who contribute to the territorial uptake of offshore wind-related initiatives.

- At **national level**, coordination depends on alignment with policy frameworks, regulatory conditions, and national research and innovation priorities. National authorities and institutions play a key role in integrating the strategy's orientations into existing programmes and initiatives.
- At **transnational level**, coordination is essential to ensure coherence between countries, facilitate knowledge exchange, and support joint actions. The ADRIONWIND framework provides a basis for continued collaboration, allowing countries to build on complementarities and shared priorities.

This multi-level coordination reflects the transboundary nature of offshore wind development and the need for aligned action across the Adriatic-Ionian region.

1.4.1.3 Capacity Building at Local, Regional & National Levels

The implementation of the strategy is closely linked to the capacity of institutions and stakeholders to engage with offshore wind development and innovation processes.

Capacity-building is therefore a key enabling component of the governance framework. It includes:

- strengthening institutional capabilities for planning and coordination
- supporting stakeholder knowledge and technical expertise
- facilitating knowledge transfer between countries and sectors

Particular emphasis is placed on supporting emerging ecosystems, where offshore wind is still at an early stage of development. In these contexts, capacity-building contributes to reducing structural gaps and enabling more effective participation in transnational initiatives.

1.4.2. Monitoring Process

The monitoring process ensures that the implementation of the ADRIONWIND Joint Transnational R&I Strategy can be followed, assessed, and progressively refined. It provides the basis for evaluating progress and identifying areas where adjustments may be required.

1.4.2.1 Design of Indicators and Intervention Logic

Monitoring is based on a set of indicators aligned with the objectives of the strategy. These indicators support the assessment of:

- progress in implementation
- development of offshore wind innovation capacities
- stakeholder engagement and cooperation
- alignment with policy and investment priorities

An intervention logic links strategic priorities with expected outcomes, enabling a structured understanding of how actions contribute to broader objectives. This approach supports evidence-based assessment and facilitates the identification of gaps or delays.

1.4.2.2 Capacity Challenges of Datasets Availability & Mitigation Measures

A key limitation for monitoring in the Adriatic-Ionian region is the uneven availability and comparability of data related to offshore wind development, innovation systems, and investment conditions.

To address this, the monitoring approach combines:

- available quantitative indicators, where reliable data exists
- qualitative assessments, based on stakeholder input and expert judgement

Mitigation measures include improving data collection practices, encouraging data sharing among partners, and aligning indicators across countries where possible. This ensures that monitoring remains functional and realistic despite structural data constraints.

1.4.2.3 Mobilizing Relevant Actors

Monitoring is supported by the active involvement of stakeholders across the quadruple helix. Public authorities contribute to assessing policy alignment and regulatory developments. Industry actors and SMEs provide insights into market conditions and implementation challenges. Academic and research institutions contribute expertise on technological and innovation aspects. Civil society actors support the assessment of social and environmental dimensions. This participatory approach ensures that monitoring is not limited to technical indicators but reflects real-world developments and stakeholder perspectives.

1.4.3. Feedback Mechanism

The feedback mechanism ensures that the ADRIONWIND strategy remains adaptable over time, allowing lessons learned and new developments to inform future adjustments.

1.4.3.1 Internal Interfaces (PPs)

Project partners play a central role in providing feedback on the implementation and relevance of the strategy. Through their involvement in analysis, consultations, and coordination activities, they can identify inconsistencies, gaps, and opportunities for improvement.

Internal feedback supports:

- refinement of strategic priorities
- alignment between national and transnational perspectives
- improvement of coordination mechanisms

1.4.3.2 External Interfaces (Ecosystem Support)

External stakeholders from the broader offshore wind ecosystem provide an additional layer of feedback. This includes actors from industry, research, policy, and civil society who are directly affected by or involved in offshore wind development.

Their input contributes to:

- identifying emerging challenges and opportunities
- capturing market and technological developments
- ensuring the continued relevance of the strategy

1.5. Conclusions

Chapter One has established the strategic foundation of the ADRIONWIND Joint Transnational R&I Strategy. It has set out the rationale for coordinated action in the Adriatic-Ionian offshore wind sector, clarified the objectives and principles guiding the strategy, and outlined the governance conditions required for its implementation, monitoring, and future adaptation. The chapter confirms that offshore wind development in the Adriatic-Ionian region cannot be effectively addressed through fragmented national approaches alone. Although the participating countries differ in terms of market maturity, regulatory readiness, industrial capacity, and research specialisation, they share common structural challenges and a growing strategic interest in offshore wind as a driver of energy transition, innovation, and regional development. On this basis, the ADRIONWIND strategy is positioned as a transnational framework designed to complement national and regional priorities rather than replace them. Its added value lies in creating a shared strategic logic across countries, strengthening coordination, promoting knowledge transfer, and supporting the emergence of a more connected offshore wind innovation ecosystem across the region. The strategy framework presented in this chapter also makes clear that ADRIONWIND is not limited to the production of a policy-oriented document. Rather, it establishes the basis for future cooperation, investment orientation, stakeholder mobilisation, and the gradual integration of SMEs, research actors, and public institutions into a common offshore wind development perspective. The following chapters build on this strategic foundation. Chapter Two moves to the national context analysis, examining the policy, innovation, employment, investment, and internationalisation conditions that shape offshore wind development in each participating country. These national analyses provide the evidence base for the comparative and strategic chapters that follow.

2. National Context Analysis

2.1. Introduction

This section presents the national context analyses that form the basis of the strategy. The purpose of these analyses is to provide a structured and evidence-based understanding of the institutional, regulatory, economic, technological and societal conditions shaping the development of offshore wind energy in each participating country. By examining national frameworks in a comparable manner, the strategy ensures that subsequent priorities and actions are grounded in realistic implementation environments rather than abstract policy ambitions.

Each national analysis reflects the specific maturity level of offshore wind deployment, the structure of the energy market, existing maritime spatial planning arrangements, grid infrastructure capacity, industrial capabilities, and the degree of stakeholder acceptance. Particular attention is given to policy coherence across energy, climate, maritime and environmental domains, as well as to administrative procedures and permitting systems that may either facilitate or hinder investment. The analyses also consider innovation ecosystems, research and technological competences, supply chain readiness, and the availability of skilled workforce, as these factors directly influence the feasibility and scalability of offshore wind projects.

Beyond technical and regulatory aspects, the national contexts are assessed through a socio-environmental lens. Issues such as biodiversity protection, cumulative impacts on marine ecosystems, public perception, and stakeholder engagement practices are examined in order to identify both risks and enabling conditions for sustainable deployment. This perspective ensures that the strategy addresses long-term environmental integrity and social legitimacy.

2.2. Croatia Context Analysis

2.2.1. EU & Global Framework

The development of offshore wind energy in Croatia is embedded within the broader European and global transition towards climate neutrality. As an EU Member State, Croatia's policy direction is strongly influenced by key EU frameworks such as the European Green Deal, the Fit-for-55 package, and the REPowerEU plan. These initiatives set binding and indicative targets for decarbonisation, renewable energy deployment, and energy security, shaping Croatia's strategic positioning in the Adriatic-Ionian basin. While Croatia does not yet have a fully developed offshore wind sector, its policy trajectory reflects growing alignment with EU ambitions and increasing recognition of offshore wind as a potential contributor to long-term energy transition goals. Globally, offshore wind has emerged as a cornerstone technology in achieving net-zero targets, with rapid expansion in Northern Europe, Asia, and increasingly in Mediterranean basins. Croatia's engagement with offshore wind remains at an early stage compared to more mature markets, yet it is gradually integrating into this global momentum through policy alignment, participation in EU initiatives, and exploratory research activities. The Adriatic Sea, including Croatian waters, presents both opportunities and constraints, with moderate wind resources, relatively deep waters in certain areas, and significant environmental and maritime-use considerations. Data availability remains limited, particularly for high-resolution offshore wind resource assessments in Croatian waters, which constitutes a key uncertainty for future planning.

Links to National Contexts

Croatia's climate and energy framework is closely aligned with EU legislation, primarily through the Energy Strategy and the updated National Energy and Climate Plan (NECP, 2025). These set ambitious targets for renewable energy deployment and emissions reduction, reflecting the country's commitment to the European Green Deal. The national legal framework has transposed key EU renewable energy directives, with recent amendments focusing on simplifying procedures and enabling broader participation in energy production. However, offshore wind in Croatia is still not governed by a dedicated sector-specific framework. Projects continue to rely on the general legal regime for renewable energy, maritime domain, spatial planning and concessions, which leaves important offshore-specific issues unresolved. The legal context has also become more restrictive with the new Spatial Planning Act (NN 155/25), which entered into force on 1 January 2026. Article 69(5) prohibits the planning and implementation of solar and wind power plants on maritime domain, while Article 71(5) provides that in marine areas no construction or placement of solar and wind power plants may be planned. Accordingly, Croatia's offshore-wind context should currently be treated not only as an early-stage regulatory gap, but as a legally restrictive planning environment for near-term siting and permitting.

At the same time, the maritime spatial planning process has advanced procedurally. The EEZ Spatial Plan process was enabled by earlier legislative changes, and on 3 July 2025 the Government adopted the Proposal of the Spatial Plan of the Exclusive Economic Zone of the Republic of Croatia in the Adriatic Sea for public debate (Official Gazette 98/25). Public consultation on the proposal was held in September 2025, and the public-debate report was issued in April 2026. This means that Croatia has moved beyond a purely preparatory MSP phase, but the planning process is still not complete and does not in itself remove the current restrictions introduced by the Spatial Planning Act.

Policy alignment and emerging reforms: Croatia has also updated its general renewable-energy framework through the 2025 amendments to the Act on Renewable Energy Sources and High-Efficiency Cogeneration (NN 78/25). These amendments reinforce procedural principles such as objectivity, transparency, proportionality, equal treatment and consideration of the specificities of renewable technologies, and they require planning for designated grid and storage infrastructure needed for RES integration. These are positive enabling steps, but they do not create an offshore-specific permitting regime and do not override the current spatial-planning constraints affecting offshore wind.

Implications for offshore wind development: Offshore wind in Croatia remains in a preparatory phase, but it should now be described more cautiously. National strategies and the updated NECP recognize offshore wind within broader RES planning, yet the current spatial-planning framework materially constrains near-term deployment. Croatia should therefore currently be framed as a medium- to long-term offshore-wind prospect and a regulatory-learning case, pending future legislative or planning changes.

Key gaps and uncertainties: The pace of offshore wind development will depend on addressing several critical gaps:

- absence of a dedicated offshore-specific regulatory and permitting framework
- current spatial-planning restrictions affecting wind power plants on maritime domain and in marine areas
- EEZ maritime spatial plan still in the adoption process
- lack of defined offshore wind capacity targets
- need to reconcile state, county and local planning documents with any future offshore-wind pathway

Closing these gaps is essential if Croatia is to move from policy alignment and strategic preparation toward a future implementation pathway in the Adriatic–Ionian offshore wind landscape.

Coordination Mechanisms with Countries

Croatia is actively involved in cross-border initiatives and coordination mechanisms that accompany the development of renewable energy at EU and regional level. Under the revised TEN-E Regulation, priority offshore grid corridors have been designated, and the Adriatic Sea is covered by two: the Southern and Western Offshore Corridor (covering the western Mediterranean) and the Southern and Eastern Offshore Corridor (covering the Adriatic, Ionian and Black Seas). Croatia, together with Italy, Slovenia, Greece, Malta, Cyprus, Bulgaria and Romania, participates in the latter corridor, formalised through a memorandum of understanding among seven countries signed in 2023. This non-binding agreement set an indicative joint target of 25.9 GW of offshore renewables by 2050 for the participating states—with an indicative allocation for Croatia of 0.51 GW by 2030, 1.2 GW by 2040 and 3 GW by 2050. Although not legally binding, these targets provide important guidance and a political commitment that complements national plans.

ENTSO-E, the association of transmission system operators, prepares offshore grid development plans by sea basins, defining future investments in transmission infrastructure to integrate offshore wind farms. In this context, Croatia's transmission system operator (HOPS) cooperates with Italy's Terna and others on regional plans—for example, the possibility of new subsea interconnections is being considered to enable the export/import of electricity generated offshore in the Adriatic. Cross-border cooperation is clearly illustrated by Project Adria Wind: the first key joint project between Croatia and Italy in the field of offshore wind. INA (the Croatian oil company) and Italian partners, with EU support (Connecting Europe Facility—CEF), are carrying out a feasibility study for an offshore wind farm of around 300 MW between the Istrian coast and Italy (Ravenna). Co-financed as a cross-border renewable energy project, the study not only assesses technical parameters for nearly 2.7 GW of potential sites, but also establishes a formal cooperation mechanism between the two countries. The project also examines how to share costs and benefits between Croatia and Italy, alongside stakeholder engagement activities on both sides of the border. This cooperation model could become a template for future joint projects (e.g., wind farms located in the middle of the Adriatic that would supply several countries). The current Croatian spatial-planning framework materially changes the domestic legal context for any future Croatian siting or authorisation linked to such cross-border concepts. The Croatia–Italy case should therefore presently be read primarily as a governance, infrastructure-planning and regulatory-learning reference, rather than as an immediately deployable Croatian project pipeline.

Beyond infrastructure coordination, Croatia also participates in broader regional clean energy initiatives. The Clean Energy for EU Islands initiative is one example: in 2020 Croatia co-signed the Split Memorandum, which implements the Valletta Political Declaration on Clean Energy for EU Islands. This facilitates the exchange of experience with other island communities and provides technical assistance for renewable energy projects on islands (which may also include smaller offshore projects, such as nearshore turbines supplying islands). Croatia is also part of the North Adriatic Hydrogen Valley together with Slovenia and Italy. This project (launched in 2023) includes 17 pilot projects aimed at producing more than 5,000 tonnes of green hydrogen per year, including those that will use wind energy. Cooperation on such a project integrates offshore wind (as an energy source for electrolysers) into a broader regional hydrogen value chain—an important step towards internationalising the business opportunities stemming from offshore wind farms.

R&I National Priorities

Croatia's research and innovation (R&I) priorities in offshore wind are still emerging, reflecting the early stage of sector development. While earlier national strategies only briefly referenced offshore wind, recent policy updates and market interest are bringing more concrete priorities into focus.

- A key national focus is the adaptation of offshore wind technologies to Adriatic conditions. Due to predominantly deep waters, floating wind solutions are considered essential, requiring innovation in platform design, mooring systems and materials suited to moderate wind speeds and specific wave regimes. At present, detailed site-specific data on wind potential and marine conditions remain limited, highlighting the need for further measurement campaigns and targeted research.
- The National Energy and Climate Plan (NECP) 2021–2030 and Smart Specialisation Strategy define broader R&I priorities that are directly relevant to offshore wind, including advanced renewable technologies, energy system flexibility, and strengthening domestic value chains. Offshore wind is therefore approached as part of an integrated energy system, linked to grid development, energy storage and emerging sectors such as green hydrogen.
- Digital technologies and "smart" solutions are also emerging as national R&I priorities for offshore wind, as they can reduce operating costs and improve reliability in marine conditions. Croatian scientists and start-ups have an opportunity to contribute to the development of predictive maintenance algorithms, digital twins of wind turbines, advanced sensors and drones for inspection—areas where there is a strong pool of ICT expertise. Furthermore, Croatia places importance on researching environmental impacts and developing low-impact technologies. In the context of 37% of its land area and 16% of its marine territory being protected (Natura 2000), a priority is the development of methodologies and equipment that enable the coexistence of wind farms and ecosystems. This includes bird and marine mammal monitoring systems, noise-reduction techniques during construction, and materials and coatings for turbines that reduce risks to birds. Already, before any offshore wind farm has been built, baseline research is being carried out—for example, INA's LIDAR wind-measurement project in the northern Adriatic (2022–2023) simultaneously collected wind data and initiated monitoring of marine species at locations of future projects. Such synergy between R&I activities (collecting resource and environmental data) and commercial plans is considered best practice that Croatia aims to apply systematically.
- Another dimension of R&I priorities is strengthening industrial capacities and the supply chain through innovation. Croatia's industry (metalworking, electrical equipment, shipbuilding) seeks to position itself in the new sector—for example, the Brodosplit shipyard has in recent years focused on manufacturing components for floating wind farms and related equipment for foreign markets. To reinforce such initiatives at national level, research into new materials is needed (e.g., the use of high-strength, corrosion-resistant steels for floating platforms) and

the development of prototypes through collaboration between industry and universities. This points to the need for pilot projects: one of the national R&I objectives is to stimulate demonstration wind projects

- Finally, R&I priorities extend to governance and regulatory innovation. Improving permitting processes, digitalising administrative procedures, and establishing clearer frameworks for offshore development are recognised as critical enablers. This "process innovation" is considered equally important as technological development for accelerating project implementation.

Croatia's R&I priorities address the main challenges of offshore wind development across technological, environmental, industrial and governance dimensions. This multidisciplinary approach is essential for building domestic capacity and reducing reliance on external expertise. However, the current lack of pilot projects, specialised research infrastructure and dedicated offshore testing facilities remains a key gap. Strengthening these capacities—potentially through regional cooperation initiatives—will be critical for moving from planning to implementation. Overall, Croatia's R&I strategy is oriented toward adapting technologies to local conditions while increasing domestic participation in the offshore wind value chain. Continued alignment with EU programmes and funding instruments will be essential to accelerate this transition and position Croatia as an active contributor within the Adriatic–Ionian offshore wind ecosystem.

Table 1 Policies and regulatory instruments in Croatia – framework for offshore wind farms

Instrument / document	Year	Content and significance	Link to offshore wind energy
Energy Strategy of the Republic of Croatia (to 2030, with a view to 2050)	2020	Main strategic document guiding low-carbon transition; foresees RES growth and fossil fuel phase-down.	Recognises offshore wind as a decarbonisation option (implicitly). Provides long-term strategic legitimacy, with a 2050 vision that likely requires offshore deployment.
Integrated National Energy and Climate Plan (NECP)	2021 / 2025	Operational plan to 2030; sets RES and emissions targets; defines sectoral measures.	Includes actions to integrate RES into spatial planning and identify maritime areas. No explicit offshore targets, but establishes key preconditions (MSP, site identification).
Act on Renewable Energy Sources and High-Efficiency Cogeneration	Act on Renewable Energy Sources and High-Efficiency	Core RES framework, most recently amended by NN 78/25. The 2025 amendments reinforce principles	Relevant enabling framework for renewable projects in general, but it still does not create an offshore-specific category or

(ZOIEiVK)	Cogeneration (ZOIEiVK)	of objectivity, transparency, proportionality, equal treatment and consideration of the specificities of renewable technologies in permitting and certification procedures, and require planning for designated grid and storage infrastructure needed for RES integration.	dedicated offshore authorisation route.
Maritime Domain and Seaports Act	2003–2023	Regulates use of maritime domain and concession procedures; updated to align with spatial planning reforms.	Offshore wind requires maritime concessions. Establishes legal basis for construction and operation, including environmental obligations.
EEZ Spatial Plan process / Government Decision on Proposal for public debate	EEZ Spatial Plan process / Government Decision on Proposal for public debate	The 2023 legal changes enabled preparation of the EEZ spatial plan; on 3 July 2025 the Government adopted the Proposal of the Spatial Plan of the Exclusive Economic Zone of the Republic of Croatia in the Adriatic Sea for public debate (OG 98/25); public consultation followed in September 2025, and the public-debate report was issued in April 2026.	This is the key national maritime-spatial-planning instrument for offshore activities, but it is still in the adoption process and does not by itself resolve the current legal constraints affecting offshore wind siting.
Spatial Planning Act (NN 155/25)	2025 (in force from 1 January 2026)	New central planning law governing land, maritime-domain and marine-area	Currently the most important legal constraint for offshore wind siting in Croatia; it shifts offshore wind

		planning. Article 69(5) prohibits the planning and implementation of solar and wind power plants on maritime domain, while Article 71(5) prohibits the construction or placement of solar and wind power plants in marine areas.	from a near-term deployment issue to a medium- to long-term regulatory and planning issue unless the framework changes.
Investment Promotion Act	2015–	Provides tax incentives and financial support for large investments, including R&D and job creation.	Offshore wind qualifies as a strategic investment, benefiting from tax exemptions and incentives, improving project viability.
EU Offshore Renewable Energy Strategy	2020	EU framework targeting large-scale offshore deployment; promotes investment, grid development and regional planning.	Shapes Croatian policy direction; supports MSP development and cross-border cooperation. Enables access to EU funding and regional initiatives.
Memorandum of Understanding on offshore renewable cooperation (ADRION countries – planned)	2025 (planned)	Regional agreement to strengthen cooperation, data exchange and alignment of standards.	Reinforces transnational coordination, supports joint projects and R&I, and signals regional commitment to investors.

2.2.2. National Energy Transition Priorities

National Operational Programmes

Croatia's energy transition is guided by the NECP and the Energy Strategy to 2050, both aligned with EU Energy Union priorities. The updated NECP (2025) sets ambitious targets, including a 42.5% share of renewable energy by 2030 and significant emissions reductions, reflecting strengthened EU climate objectives. The transition is framed as a multi-sectoral process requiring a diverse mix of measures. Key priorities include scaling up renewable energy (primarily solar and onshore wind), improving energy efficiency, strengthening grid infrastructure, and developing new areas such as hydrogen and electrification of transport. Existing instruments, including the National Recovery and Resilience Plan, continue to support renewable deployment and grid upgrades.

Although offshore wind is still not framed through a quantified national capacity target, the final updated NECP makes the planning dimension more explicit. Under measure OIE-2 (Spatial planning requirements for using RES), Croatia foresees supplementing the spatial-planning framework by defining the framework for placing offshore wind farms in spatial plans and by supplementing the EEZ Spatial Plan and coastal county plans with provisions and locations for the research and placement of offshore wind farms. In policy terms, offshore wind is therefore more visible in the 2025 NECP than in earlier strategic documents.

At the same time, this strategic direction now coexists with the new Spatial Planning Act (NN 155/25), which restricts the planning of wind power plants on maritime domain and in marine areas. Croatia's transition framework thus provides strategic recognition and preparatory planning hooks for offshore wind, but not yet an operable legal pathway for near-term siting and authorisation. Future revisions will need not only to define clearer offshore deployment pathways and funding priorities, but also to reconcile them with the spatial-planning restrictions currently in force.

Operational programmes provide the financial backbone for implementation. The Competitiveness and Cohesion Programme (2021–2027) supports renewable energy, storage, grid development and innovation, while the Modernisation Fund allocates significant resources for energy system upgrades. To date, these instruments have mainly supported onshore technologies, but they are also applicable to early offshore projects, particularly in areas such as feasibility studies, pilot developments and infrastructure. Additional programmes targeting island energy transition further reinforce system flexibility and decentralisation. Given the importance of islands in Croatia's energy system, offshore wind—particularly nearshore or hybrid solutions—could contribute to achieving energy independence through integration with storage and other renewable sources.

Croatia's transition framework provides strong overall support for renewable energy, but offshore wind remains at a preparatory stage within national planning. Current programmes offer indirect support through general funding instruments, yet the absence of dedicated offshore measures and targets limits strategic clarity. This represents a key gap. Without explicit capacity targets or tailored support mechanisms, offshore wind risks remaining secondary to more mature technologies. Future revisions of national plans should address this by defining clear offshore deployment pathways and integrating them into funding priorities. At the same time, the existing policy and funding framework creates a favourable foundation. If key prerequisites—such as spatial planning, permitting frameworks and pilot projects—are established in the near term, offshore wind will be able to compete for available financing and become part of Croatia's broader energy transition.

National Operational Alignment

Delivering Croatia's energy transition still requires strong alignment between national strategies and regional/local implementation. For offshore wind, however, the competence picture is now more explicitly structured by the Spatial Planning Act. Article 70 provides that marine areas are planned through the State Spatial Development Plan, the Spatial Plan of the Exclusive Economic Zone, relevant county spatial plans, and local/urban plans that encompass marine areas. This means that offshore wind planning cannot be treated solely as a county-level issue. At the same time, the prohibitions in Articles 69(5) and 71(5) mean that simple inclusion of sites in local or county planning documents is no longer sufficient to create a near-term implementation pathway. In practical terms, regional initiatives such as those associated with Istria should presently be understood as preparatory, analytical and investment-positioning efforts rather than evidence of an immediately actionable siting regime.

This does not remove the value of regional alignment; rather, it changes its function. Regional and local authorities remain essential for evidence-based planning, stakeholder dialogue, environmental coordination and future scenario preparation, but their role must now be read considering the tighter legal framework currently in force.

Croatia is pursuing both vertical coordination (state–regional–local) and horizontal integration across sectors. This includes aligning energy policy with environmental protection, spatial planning and climate adaptation strategies. For offshore wind, this integrated approach is particularly important to balance development with ecosystem protection and other maritime uses. Local initiatives also illustrate how national priorities are operationalised. The "Energy Independent Island of Krk" programme is a notable example, aiming for climate neutrality through renewable energy deployment. While currently focused on solar and local systems, such initiatives create a framework in which offshore or nearshore wind solutions could contribute to energy security and system stability.

Effective alignment between national frameworks and regional planning is a critical condition for offshore wind deployment. Where coastal regions integrate offshore wind into spatial and development plans, project implementation becomes more feasible in terms of permitting, grid connection and social acceptance. Conversely, weak coordination can lead to delays or project stagnation if national priorities are not reflected at local level. Early engagement with regional authorities and communities is therefore essential to avoid conflicts and ensure timely development. For the research and innovation sector, improved alignment enhances the relevance and uptake of studies, data and technical solutions. By supporting evidence-based planning and stakeholder dialogue, the R&I community plays a key role in bridging national objectives with local realities. Overall, a coordinated and multi-level governance approach—linking policy, planning, environmental management and skills development—is necessary to enable offshore wind to develop in a sustainable and integrated manner within Croatia's energy transition.

2.2.3. R&I National & Regional Capacities

Croatia's wind energy sector is in a phase of preparation, with growing research activity. While no offshore wind farms are yet operational, strong investor interest is evident. According to data from the Croatian Energy Regulatory Agency and the Ministry of Economy, by early 2024 requests for grid connection had been submitted for wind projects with a total capacity of over 4 GW (mostly onshore)—several times more than the approximately 1.1 GW installed at the time. This signals momentum but also highlights the need to strengthen R&I capacities to avoid bottlenecks in skills, infrastructure and project delivery.

R&I Support Infrastructures

Croatia already possesses important industrial, logistical and research infrastructures that can support offshore wind development, although further adaptation is required. Industrial and maritime infrastructure: Shipyards represent a key asset. Facilities such as Uljanik and Brodosplit have demonstrated capabilities relevant to offshore windApoll, including the construction of installation vessels and floating platform components. Brodosplit's involvement in international floating wind projects and development of offshore measurement units illustrates Croatia's integration into the global supply chain. These capabilities provide a strong foundation for domestic offshore deployment, although additional investments (e.g.

port upgrades, heavy-lift capacity) are needed for large-scale production. Ports and grid infrastructure: Major ports such as Rijeka and Ploče offer potential as logistics hubs for offshore wind, given their location and capacity for expansion. However, dedicated offshore wind terminal infrastructure is not yet in place. Planned adaptations—such as storage areas, assembly zones and heavy-lift equipment—will be critical.

On the energy side, Croatia's coastal transmission network is relatively well developed, but significant reinforcements will be required to integrate future offshore capacity. Planned grid upgrades include new substations and stronger coastal connections, with long-term potential for offshore grid solutions. Research institutions and scientific capacity: Croatia has a solid academic base in engineering, energy and marine sciences. Key institutions include the University of Zagreb (Faculty of Mechanical Engineering and Naval Architecture), the Hrvoje Požar Energy Institute, and marine research organisations such as the Institute of Oceanography and Fisheries. These bodies contribute to energy system modelling, offshore wind planning, and environmental monitoring. While existing laboratories and testing facilities can be adapted, a dedicated offshore wind testing environment is currently lacking, representing a notable gap.

Regional energy agencies and project support: Regional agencies play an important coordination role. IRENA (Istria) is particularly active in offshore wind, supporting site identification and stakeholder engagement. Other agencies contribute through project development, training and local coordination, helping bridge national strategy and regional implementation.

Data and digital infrastructure: Croatia increasingly relies on European data platforms (e.g. EMODnet, Copernicus) and is developing national GIS tools to support renewable energy planning. These systems are essential for offshore wind siting, environmental assessment and spatial planning.

Croatia's existing infrastructure provides a strong starting point for offshore wind development, particularly through its shipbuilding industry, ports and research institutions. However, targeted upgrades and better integration are required to fully support offshore deployment. Key gaps remain, including the absence of dedicated offshore test sites, limited specialised port infrastructure, and the need to strengthen links between research and commercial application. Addressing these gaps—through investment, international cooperation and initiatives such as ADRIONWIND—will be critical to ensure that Croatia can effectively support the first wave of offshore projects and maximise domestic value creation.

Table 2 Key Performance Indicators (KPIs) – Offshore wind and the energy transition in Croatia

Indicator	Value	Note / Source
Installed offshore wind capacity	0 MW	No active offshore projects (2025).
Technical offshore wind potential (total)	~17–25 GW	Estimates vary; ~17 GW (24% fixed-bottom, 76% floating)[10]; ~25 GW
Planned offshore capacity (2030 / 2050)	0.51 GW / 3 GW (indicative)	According to the regional agreement (7 countries, 2023)
Installed onshore wind capacity	1.19 GW (2024)	End of 2024: 1.19 GW (12.5% of electricity generation)
Installed solar PV capacity	0.88 GW (2024)	Rapid growth (40% increase in 2024); 1 GW exceeded in 2025.

Share of renewables in electricity generation (2024)	73.7%	High, thanks to hydropower share >50%
Target share of renewables in gross final consumption (2030)	42.5%	National target in the NECP (aligned with the EU)
LCOE of offshore wind (estimate)	~€100/MWh (data gap)	No local data; EU average 2023 ~€87/MWh (floating >€120)
Potential investment value of the first offshore project	~€2 bn	500 MW project in Istria, the largest investment in Croatia
Workforce in the wind energy sector (current)	~500–800 (estimate)	~135,000 in the EU (wind) 2023; significantly lower in Croatia – requires a sector survey

Key Technologies Progress

Technological progress in offshore wind in Croatia is developing along two main paths: the transfer and adaptation of international solutions, and emerging domestic innovation in selected niches. As Croatia has not yet deployed offshore wind farms, most expertise is currently acquired through international partnerships. Projects such as the planned Istrian development involve experienced foreign partners, enabling knowledge transfer in areas such as large-scale turbines (12–15 MW), floating platforms and advanced mooring systems. At the same time, adaptation to Adriatic conditions is essential. Compared to the North Sea, the Adriatic features moderate wind speeds, lower wave intensity, and high environmental sensitivity. This requires tailored technological solutions, including optimised turbine designs for medium wind regimes, environmentally sensitive installation techniques, and integrated monitoring systems for marine ecosystems.

Croatia has already taken initial steps in adapting and applying offshore technologies. The deployment of offshore LiDAR systems has enabled high-quality wind resource measurement, reducing uncertainty for investors and improving modelling of local wind conditions. These efforts also contribute to understanding specific regional phenomena such as Bora and Sirocco winds. In floating wind, Croatian industry has gained valuable experience through participation in international projects. Domestic shipyards have contributed to the manufacturing of floating platform components and offshore measurement systems, demonstrating capability in high-precision offshore engineering. This positions Croatia to participate in future floating wind developments, particularly in manufacturing and assembly segments. One technology area experiencing rapid progress, and in which Croatia can participate, is offshore cables and grid systems. Globally, long-distance HVDC cables are being developed to connect offshore farms to shore and to each other, offshore “grid hub” systems, and offshore energy storage technologies (such as subsea batteries) to provide stabilisation.

While turbine manufacturing remains external, Croatia is developing capabilities in supporting technologies. These include offshore measurement systems, structural components, and potential contributions to electrical systems such as transformers and grid equipment. Experience gained through cross-border projects is strengthening expertise in offshore grid integration, including subsea connections and interconnection planning. Digital technologies also represent an emerging strength. Croatian companies and research groups are active in areas such as data analytics, visualisation tools and predictive maintenance solutions. These capabilities can support offshore wind through improved system management, operational efficiency and stakeholder communication.

Uljanik in 2018 built and delivered a specialised self-elevating vessel "Apollo" for installing offshore wind turbines (800-ton crane capacity, capable of operating in waters up to 70 m deep), the first vessel of this kind produced in Croatia and an indication that domestic shipbuilding can meet the high requirements of the offshore industry.Key technological gaps remain, including the absence of domestic turbine manufacturing, limited installation vessel capacity, and the need for further development of offshore-specific infrastructure. However, Croatia's existing industrial base—particularly in shipbuilding—offers potential for future expansion into specialised vessels or offshore components.

Global technological advances enable Croatia to adopt state-of-the-art offshore wind solutions without passing through earlier development stages. This "late-mover advantage" allows immediate deployment of advanced floating systems, large turbines and digital tools. At the same time, strong reliance on external expertise highlights the need to strengthen domestic innovation capacity. Priorities include localising key components of the value chain—such as platforms, mooring systems, cables and digital solutions—to increase domestic participation and reduce costs. Overall, Croatia is gradually positioning itself within the offshore wind technology landscape, not as a turbine producer but as a contributor in specialised segments. Continued participation in international R&I networks and targeted investments will be essential to close remaining gaps and ensure that technological benefits are retained within the national economy.

Good Practices Adoption

Although offshore wind in Croatia is still at an early stage, several good practices are already being applied, drawing on international experience and regional cooperation. A key example is early and structured stakeholder consultation. In planned projects (e.g. in Istria), engagement with local communities, fisheries, tourism actors and environmental organisations begins at the site screening stage. This approach allows project design to incorporate local concerns from the outset, reducing the risk of opposition and delays. It also creates feedback loops for research, for example, identifying the need for targeted environmental or socio-economic studies.

Environmental considerations are being embedded early in project planning. Baseline monitoring of marine species has already been initiated in potential offshore areas, supporting future impact assessments. In parallel, circularity principles—such as full decommissioning and recycling of infrastructure—are being integrated into planning frameworks. These practices align with Mediterranean examples and contribute to long-term environmental sustainability, even if they increase initial project complexity.

Offshore wind is increasingly considered in connection with other sectors, particularly hydrogen production and industrial decarbonisation. Participation in regional initiatives such as the North Adriatic Hydrogen Valley highlights the potential for linking offshore wind generation with emerging energy value chains. Early integration of such synergies improves project viability and system efficiency. Efforts to streamline governance are also evident.

Coordination between energy and spatial planning authorities, alongside regulatory updates requiring consideration of renewable energy in planning processes, reflects a move towards more efficient and predictable permitting frameworks. The adoption of these practices shifts the focus from purely technical deployment to integrated and sustainable development. Research and innovation activities increasingly address environmental mitigation, system integration and social acceptance alongside engineering challenges.

At the same time, applying good practices helps identify remaining knowledge gaps—particularly in environmental data (e.g. offshore biodiversity and migration patterns)—which require further study. Addressing these gaps through targeted research and international cooperation will be essential for reducing risk and ensuring informed decision-making. Overall, early adoption of stakeholder engagement, environmental safeguards and cross-sector integration strengthens the foundation for offshore wind development in Croatia, improving project acceptance, reducing delays and aligning the sector with broader sustainability objectives.

2.2.4. Employment Capacities

Existing Workforce

The energy transition is creating new employment opportunities, and Croatia already has a solid workforce base in related sectors that can be redirected towards offshore wind. With around 1.1 GW of onshore wind and about 1 GW of solar capacity by 2025, employment in renewables is more modest—estimated at around 7,000 jobs across all renewable sectors. Within this, the wind sector itself is relatively small, employing an estimated 500–800 people, mainly in development, construction and operation of onshore wind farms.

This workforce includes engineers, technicians and workers in related industries such as component manufacturing (e.g. steel tower production by Đuro Đaković Montaža). However, data on employment by specific renewable technologies remain fragmented, representing a data gap that limits precise workforce planning.

A key strength is the existing base of technical and industrial skills. Onshore wind development has already created competencies in turbine installation, grid connection and maintenance, with companies such as E.ON Croatia and HEP training technical teams. These workers form a natural foundation for offshore development, although additional training will be required for offshore conditions (e.g. safety at sea, vessel operations).

Croatia also benefits from a strong maritime and shipbuilding workforce, including shipyards such as Uljanik & Brodosplit, as well as a globally recognised seafaring workforce. As traditional shipbuilding declines, offshore wind offers a strategic opportunity to redeploy these skills. This transition has already begun: Brodosplit has retained and engaged workers through participation in floating wind platform manufacturing, while subsea service companies are adapting their capabilities towards offshore energy activities.

Importantly, offshore wind can generate employment beyond coastal areas through supply chain effects. Industrial regions such as Slavonia and central Croatia can contribute through electrical equipment manufacturing (Končar), steel structures (Đuro Đaković) and logistics. International estimates suggest that 1 GW of floating wind can generate around €2.8 billion in added value and up to 17,000 jobs across the lifecycle, indicating significant potential even at smaller scales.

At the same time, several challenges exist:

- an ageing industrial workforce and outmigration of younger workers,
- limited offshore-specific skills (e.g. GWO-certified personnel),
- dispersion of relevant competencies across sectors and regions.

Croatia's workforce provides a strong starting point, but requires coordinated upskilling and workforce planning. Offshore projects will increasingly require specialised profiles (e.g. offshore technicians, wind data analysts, HSE coordinators), and without timely preparation there is a risk of reliance on foreign labour. R&I activities can support this transition by mapping skills needs, forecasting labour demand and supporting targeted training programmes. With adequate preparation, offshore wind can become a significant source of high-quality domestic employment.

Wind Energy Professionals

The wind energy sector requires a diverse and interdisciplinary set of professionals, including engineers, project managers, financial and legal experts, environmental specialists and safety coordinators. In Croatia, this professional base exists but remains limited and is primarily oriented towards onshore wind. Experience has been built through onshore projects (e.g. Velika Popina, Senj, Danilo), with professionals now transitioning into consulting, development and planning roles for offshore projects. Expertise also exists in financing and regulatory processes (e.g. renewable auctions, PPAs), providing a solid foundation for more complex offshore investments.

However, offshore-specific expertise is still lacking. Croatia currently has limited experience in areas such as offshore installation engineering, subsea cable deployment, and offshore certification. As a result, projects rely on international expertise (e.g. DNV, Bureau Veritas), although local professionals are increasingly gaining experience through participation in international projects and companies.

The education system is beginning to respond. Universities such as the Faculty of Mechanical Engineering and Naval Architecture (FSB) and FER in Zagreb include renewable energy topics, while institutions like FESB in Split are developing specialised modules related to island energy systems. Through ADRIONWIND, a regional training programme for offshore wind professionals is planned, aiming to develop a first generation of specialised experts with multidisciplinary knowledge.

A particularly important opportunity lies in the transfer of expertise from the oil and gas sector. Croatia has decades of experience in offshore hydrocarbons, and companies such as INA are already redirecting engineers towards offshore wind projects. These professionals bring valuable experience in offshore operations, safety standards and project management.

The current pool of experienced wind professionals is relatively small—estimated at around 100 individuals with more than five years of experience—highlighting the need for rapid expansion.

Developing a strong base of wind energy professionals is essential for reducing dependence on external expertise and increasing local value creation. This requires expanding education and certification programmes, strengthening links between academia and industry, and supporting international knowledge transfer. R&I initiatives can play a key role in defining required competencies and supporting the development of specialised training pathways.

Wind Energy Training Programs

Education and training systems in Croatia are still adapting to the needs of the wind energy sector, particularly offshore. At present, there are no dedicated study programmes focused exclusively on wind energy, representing a clear data gap. Instead, relevant knowledge is embedded within broader engineering and energy programmes.

Some progress is visible at higher education level. Universities incorporate elements of wind energy into existing curricula—for example, grid integration (FER), turbine design (FSB), and energy systems (FESB). However, offshore-specific skills—such as offshore logistics, marine operations and specialised safety training—are largely absent from formal education and are currently acquired abroad.

Several initiatives are underway to address these gaps:

- ADRIONWIND is developing a skills mapping framework;
- plans exist to integrate wind-related modules into vocational education, particularly in electrical, mechanical and maritime schools;
- cooperation between industry and education authorities is increasing to align curricula with sector needs.

In lifelong learning, certification plays a critical role. Global Wind Organisation (GWO) training is the industry standard, and Croatia has begun developing capacity in this area. A first training centre has been established (focused on onshore modules), while offshore-specific training (e.g. sea survival) is still conducted abroad. Plans are underway to establish a coastal training centre capable of delivering full offshore certification.

Practical, project-based learning is also essential. Croatia aims to leverage international project participation to train engineers and technicians through internships and on-site experience in foreign offshore projects. In parallel, initiatives such as student competitions, hackathons and study visits are being used to attract young talent and raise awareness of career opportunities in wind energy.

Without adequate training programmes, workforce shortages could become a major bottleneck for offshore wind development. Strengthening education and training systems is therefore a priority, requiring coordinated action between academia, industry and public authorities. R&I institutions play an important role in ensuring that training content reflects technological developments and industry needs. Through targeted investments in education and skills development, Croatia can build a sustainable talent pipeline and maximise the socio-economic benefits of offshore wind.

2.2.5. Offshore Wind Energy Investment Opportunities

Tax Incentives

A supportive tax framework can significantly influence the profitability of offshore wind investments. In Croatia, there are currently no tax incentives specifically designed for offshore wind projects, and renewable energy investments are generally subject to standard taxation, including corporate income tax and VAT. However, investors can benefit from broader incentives available under the Investment Promotion Act, which provides corporate income tax reductions—potentially down to 0% for up to 10 years—for large investments that generate employment.

Given the scale of offshore wind projects, these incentives are highly relevant. A project of €150–300 million would likely qualify for the highest level of relief, particularly if elements such as operations or maintenance centres are located in less developed regions. This can significantly improve project economics, provided that eligibility conditions—such as job creation and maintaining the investment—are met. VAT on equipment (25%) is generally recoverable and does not represent a major barrier, while customs duties are negligible due to EU internal market rules.

Targeted green tax incentives, such as accelerated depreciation or tax relief linked specifically to renewable electricity generation, are not yet formally in place, although discussions on green taxation frameworks have emerged. At local level, authorities may offer limited support through reduced communal charges for onshore infrastructure, but offshore projects mainly operate under maritime concession regimes. Previous infrastructure projects, such as the LNG terminal on Krk, demonstrate that special arrangements (e.g. VAT exemptions or free-zone treatment during construction) are possible and could be replicated for offshore wind.

Overall, while the tax framework is generally supportive, it remains non-specific. Investors can already optimise project structures to benefit from existing incentives, but there is clear scope for introducing targeted measures—such as reduced concession fees or offshore-specific tax relief—to strengthen Croatia's attractiveness.

Fundings

Financing offshore wind projects in Croatia relies heavily on EU funding instruments, complemented by national and private sources. The Adria Wind project illustrates this well, having received support from the Connecting Europe Facility (CEF) for feasibility studies, covering a significant share of early-stage costs and reducing investor risk.

Looking ahead, several EU instruments are particularly relevant. The CEF programme can support both preparatory studies and infrastructure investments, especially for cross-border projects. The Modernisation Fund provides substantial resources for renewable energy and grid development and could co-finance offshore projects, particularly those contributing to regional energy security. The National Recovery and Resilience Plan has so far focused on solar, onshore wind and hydrogen, but future revisions could include offshore pilot projects. Additional support is available through cohesion policy programmes and innovation funding instruments.

At national level, support schemes such as renewable energy auctions and market premiums will be essential for offshore wind deployment. Offshore projects are not yet included in the current auction framework, but adapting the system—through dedicated auctions or higher reference prices—will be necessary given higher offshore costs. Such mechanisms are critical not only as support tools but also for enabling access to financing by ensuring predictable revenue streams.

International financial institutions play a central role. The EIB and the EBRD already finance renewable projects in Croatia and are well positioned to support offshore investments through long-term loans. The Croatian Bank for Reconstruction and Development (HBOR) also co-finances renewable projects and could act as a key domestic partner. In addition, there is growing interest in innovative financing models, including regional co-investment and citizen participation schemes, which could increase local acceptance and economic benefits. Overall, Croatia has access to a strong funding ecosystem, but effective utilisation depends on timely project preparation and alignment with EU priorities. A coordinated approach combining grants, loans and support mechanisms will be essential.

Loans

Debt financing will be central to offshore wind investments, typically covering a large share of total project costs. In Croatia, this will involve a combination of development banks, commercial banks and potentially institutional investors. Given the scale of offshore projects, financing will likely be structured through syndicated loans involving multiple lenders. Development banks such as the EIB, EBRD and HBOR are expected to play a leading role due to their favourable lending conditions and experience in renewable energy. Their participation can also attract commercial banks by reducing perceived risks. Croatian banks, including Erste, OTP, PBZ and Zagrebačka Banka, already have experience in financing onshore wind projects and may participate in offshore developments, particularly through group-level expertise. A key requirement for securing loans is revenue stability. Offshore projects will therefore likely rely on long-term power purchase agreements or adapted premium schemes to ensure predictable cash flows. Additional financial instruments, such as EU guarantees (e.g. InvestEU), can further reduce risk and improve lending conditions. Green bonds and refinancing mechanisms may also play a role, particularly in attracting institutional investors such as pension funds.

Offshore projects also involve specific financing structures, including construction loans that convert into operational loans upon completion, and contractual requirements involving experienced international contractors. Managing these risks effectively is essential for achieving financial close. In this context, Croatia's banking sector provides a solid basis, but offshore projects will require more complex financial structuring and early engagement with financial institutions. Combining domestic and international financing sources will be key to securing favourable conditions.

VCs/Angels

Venture capital (VC) and business angel investment are not primary financing sources for offshore wind farms, which rely mainly on large-scale project finance. However, they play an important role in supporting innovation and developing the broader offshore wind ecosystem. In Croatia, the cleantech venture capital landscape is still relatively small but evolving. Funds such as Fil Rouge Capital and South Central Ventures have invested in energy-related start-ups, although direct investment in wind-specific technologies remains limited. Similarly, business angels—organised through networks such as CRANE—have mainly focused on ICT and digital innovation, with growing but still limited interest in green energy. A few angels with an energy background (e.g., former managers from energy companies) are interested in investing in projects such as small turbine innovations or production forecasting platforms. The amounts angels can invest are smaller (typically up to €200k per angel), which is negligible for large projects but can be decisive for the pre-seed stage of innovation. The main opportunity lies in supporting start-ups developing technologies and services relevant to offshore wind, such as monitoring systems, digital tools, advanced materials or maintenance solutions. Early-stage initiatives exist, often linked to universities and research institutions, but many have not yet reached the stage of attracting venture funding. At the same time, international developers entering the Croatian market bring elements of venture capital models, investing in early project development and potentially exiting at later stages. Corporate actors can also contribute by supporting innovation through internal programmes or partnerships with start-ups. This segment is still emerging in Croatia but could become more important as offshore wind development progresses.

2.2.6. Internationalization Initiatives

Connections to International Value Chains

Integrating Croatia into international offshore wind value chains is a strategic priority for scaling domestic capacities and ensuring long-term sector sustainability. These value chains span the full lifecycle of offshore wind—from component manufacturing and engineering to installation, operation and decommissioning. Croatia already holds several important positions within this system, supported by its industrial base and geographical location.

A key example is the Brodosplit shipyard, which has successfully positioned itself within global offshore wind supply chains. Through manufacturing steel structures for floating wind platforms in projects such as EolMed in France and developing specialised equipment like the OCG-Data buoy, Brodosplit has demonstrated compliance with demanding international standards. Partnerships with companies such as BW Ideol and Qair have created lasting business relationships, increasing the likelihood that Croatian industry will continue to contribute to international projects, either through manufacturing or logistics support. This integration ensures a steady inflow of work that is not dependent solely on domestic project development.

Other Croatian companies are also embedded in the value chain. Končar, with its global presence in electrical engineering, is developing equipment adapted for offshore applications, including transformers designed for marine environments. Dalekovod is seeking to expand from overhead transmission into subsea cable installation, including potential investments in vessels and partnerships with foreign specialists. If realised, this would position the company as a regional contractor for offshore grid infrastructure.

In addition to industrial capacities, Croatia contributes through knowledge-intensive services. IT and engineering companies, including ABB Croatia and Siemens Croatia, already participate in international offshore projects through their parent organisations. Croatian engineers have contributed to software systems for offshore wind farms abroad, building expertise and references that can be leveraged domestically.

Institutionally, Croatia is strengthening its integration into the European wind sector. Membership of WindEurope provides access to industry networks, working groups and knowledge exchange platforms. Croatian stakeholders are increasingly involved in discussions on floating wind and offshore development, while international companies are exploring Croatia as a potential hub for servicing offshore wind projects in the Adriatic. Interest from major turbine manufacturers in establishing regional service bases further highlights Croatia's growing role in the value chain.

At the regional level, initiatives such as ADRIONWIND support deeper integration of value chains across the Adriatic–Ionian area. The logic is to combine complementary strengths—Italy's manufacturing and vessel capacity with Croatia's shipbuilding and port infrastructure—to optimise regional cooperation. Concepts such as joint manufacturing programmes or shared logistics hubs illustrate how value chains could be coordinated across borders.

Participation in global value chains enables Croatian companies to acquire technology, certifications and experience, strengthening their competitiveness. It also provides resilience, allowing companies to operate internationally even if domestic projects are delayed. However, a key challenge is moving towards higher value-added activities, such as design, assembly and innovation, rather than remaining in lower-value segments. This requires continued investment, partnerships and capacity building.

ADRIONWIND Prospects

The ADRIONWIND project provides a structured platform for international cooperation and strategic alignment among Adriatic–Ionian countries in offshore wind development. While national analyses form the basis, the project's added value lies in integrating these into a shared transnational R&I strategy.

One of the main benefits for Croatia is access to knowledge transfer and good practices. Through cooperation with partners such as Italy and Greece, Croatian stakeholders gain insight into regulatory processes, project development challenges and technological solutions. This allows Croatia to anticipate potential bottlenecks and align its framework with regional developments, improving predictability for investors.

ADRIONWIND also creates opportunities for joint projects. Early discussions include the possibility of a cross-border demonstration offshore wind farm involving multiple countries. Although still at a conceptual stage, such projects could benefit from stronger political support and improved access to EU funding instruments. Participation in a regional pilot project would position Croatia within the first wave of offshore developments in the Mediterranean.

Another important dimension is the coordinated development of the regional value chain. The project foresees defining specific roles for different regions based on their strengths—for example, Croatia's potential role in platform assembly or maritime logistics. Proposals such as establishing regional centres for training, testing or manufacturing are being explored, reflecting a move towards more structured cooperation.

For the research community, ADRIONWIND promotes the creation of transnational research networks. Croatian institutions are expected to participate in joint R&I projects and Horizon Europe consortia, gaining access to broader funding opportunities and shared infrastructure. This includes potential collaboration on technologies adapted to Mediterranean conditions, such as floating foundations suited to seismic and environmental constraints.

At the policy level, ADRIONWIND strengthens regional coordination and advocacy. By presenting a unified regional perspective, participating countries can increase their influence in EU discussions and promote policies tailored to the specific characteristics of the Adriatic–Ionian basin. Planned joint declarations and coordinated policy positions signal long-term commitment to offshore wind development.

From an investment perspective, the project also contributes to positioning the region as a more attractive and integrated market. Presenting the Adriatic–Ionian area as a single investment space, rather than fragmented national markets, increases its visibility and potential scale for investors. Initiatives such as regional data platforms and investment forums further support this objective.

ADRIONWIND enables Croatia to develop offshore wind within a broader regional framework, benefiting from shared knowledge, resources and financing opportunities. It reduces the limitations of a relatively small national market and supports more efficient capacity building. At the same time, realising these prospects will depend on continued political commitment and implementation of project outcomes beyond its formal duration.

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2.3. Italy Context Analysis

2.3.1. EU & Global Framework

The EU's energy and climate transition agenda is firmly embedded within the broader framework of global sustainable development governance. At the international level, the Paris Agreement (2015) under the UNFCCC provides the main reference point, committing the EU and its Member States to limit global warming to well below 2°C and pursue efforts towards 1.5°C. In this context, the EU has pledged to reduce greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels. EU climate and energy policies also contribute directly to the United Nations 2030 Agenda, particularly SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action), while supporting SDG 9 (Industry, Innovation and Infrastructure), SDG 14 (Life Below Water), and SDG 17 (Partnerships). Offshore wind plays a key role in this framework, contributing both to decarbonisation and to the sustainable use of marine resources.

At EU level, the European Green Deal (2019) sets the objective of climate neutrality by 2050, while the "Fit for 55" package provides the legislative tools to reach the 2030 targets. The REPowerEU plan (2022) further accelerates renewable deployment and reduces dependence on fossil fuels, particularly in response to recent energy security challenges. Complementary instruments such as Smart Specialisation Strategies and the Just Transition Fund support a balanced and inclusive transition across regions.

Offshore wind is central to achieving these objectives and strengthening Europe's energy security and industrial competitiveness. By 2023, installed offshore wind capacity in the EU had reached approximately 19 GW, demonstrating both significant progress and substantial remaining potential. To accelerate deployment, the European Commission adopted the Offshore Renewable Energy Strategy in 2020, setting targets of at least 60 GW by 2030 and 300 GW by 2050. Subsequent policy developments have further increased ambition, with Member States collectively aiming for around 88 GW by 2030 and up to 360 GW by 2050. The revised TEN-E Regulation supports these goals through the development of offshore grid corridors, enhancing cross-border integration and system resilience.

Within this framework, Italy's offshore wind potential is shaped by specific geographic conditions. Deep waters and relatively moderate wind speeds make floating wind technologies more suitable than fixed-bottom solutions. Combined with its long coastline, central Mediterranean position, and strong port infrastructure, this creates favourable conditions for Italy to emerge as a key hub for floating offshore wind. However, the Italian case also highlights challenges in translating EU and global ambitions into practice. Persistent issues include complex permitting procedures, fragmented governance, and delays in maritime spatial planning. These gaps limit the effective implementation of EU requirements and may slow down project development. At the same time, Italy is actively involved in regional cooperation under the TEN-E framework, particularly through the South & West and South & East Offshore Grid corridors. These initiatives strengthen coordination with neighbouring countries such as Greece, Croatia, Slovenia, Malta, France, and Spain, contributing to integrated energy markets and shared infrastructure development.

In this context, offshore wind—especially floating technologies—represents a strategic link between national resources, European policy frameworks, and global climate objectives. It positions Italy, and the wider Adriatic-Ionian region, as a potential hub for innovation, cross-border cooperation, and sustainable energy development

Links to National Contexts

Regulatory & planning framework Italy's regulatory framework for climate and energy policy reflects continuous alignment with EU legislation, while adapting to national conditions. A central pillar is Legislative Decree No. 199/2021, which transposes the RED II Directive into national law and aligns with the European Climate Law. It establishes the legal, financial, and administrative framework to accelerate renewable energy deployment and supports Italy's targets of a 55% emissions reduction by 2030 and climate neutrality by 2050. The decree is closely linked with key national instruments such as the Integrated National Energy and Climate Plan (PNIEC) and the National Recovery and Resilience Plan (PNRR), ensuring coherence between EU priorities and domestic implementation.

Within this framework, Article 23 introduces specific provisions for offshore renewable energy. It assigns permitting authority to the Ministry of the Environment and Energy Security (MASE), in coordination with other ministries, and defines criteria for identifying suitable maritime areas. This builds on Italy's implementation of the Maritime Spatial Planning Directive, aiming to balance competing uses of maritime space—such as fisheries, tourism, navigation, and environmental protection—while enabling offshore renewable development. The decree also introduces simplification and digitalisation measures to streamline permitting procedures.

To support implementation, MASE adopted in March 2025 a dedicated "Vademecum" for offshore wind, providing guidance on procedures, documentation, and technical requirements, including grid connection. In parallel, Legislative Decree No. 190/2024 further harmonises authorisation procedures, introducing a single permitting process covering both offshore installations and associated grid infrastructure. The regulatory framework has been further reinforced by the 2023–2024 Energy Decree, which introduced measures to accelerate renewable deployment. Notably, temporary simplifications of Environmental Impact Assessment procedures were extended, allowing certain projects in pre-identified areas to benefit from streamlined processes. These measures aim to reduce administrative delays while maintaining environmental safeguards.

At the strategic level, Italy's energy transition is guided by the updated PNIEC (2024), which outlines national trajectories across the five dimensions of the Energy Union. The plan sets a target of 28.1 GW of total wind capacity by 2030, including 2.1 GW offshore. It also emphasises enabling conditions such as permitting simplification, grid reinforcement, and competitive support schemes, while linking offshore wind development to broader objectives including industrial growth, job creation, and environmental protection. In parallel, Italy is investing in enabling infrastructure. A 2025 inter-ministerial decree designates Augusta and Taranto as primary offshore wind hubs, supported by €78.3 million in public funding for port upgrades and logistics. Additional ports, including Brindisi and Civitavecchia, are identified as complementary nodes. These hubs are expected to support the assembly and deployment of floating wind components, with industrial activity ramping up towards the end of the decade.

Regional and EU instruments further strengthen this framework. Smart Specialisation Strategies (S3) align research and innovation with renewable energy priorities, with regions such as Puglia explicitly recognising offshore wind and hydrogen as strategic sectors. At the same time, the Just Transition Fund—particularly in Taranto—supports reskilling, industrial diversification, and territorial regeneration. Together, these instruments position offshore wind not only as an energy objective, but also as a driver of industrial transformation and regional development.

Resource and market potential Italy's offshore wind trajectory is also shaped by significant natural potential and a strong industrial base. The Mediterranean offers substantial wind energy resources, with particularly favourable conditions around Sardinia, southern Sicily, and parts of the Adriatic and Ligurian seas. Most promising areas are located in deep waters, making floating wind technology the dominant solution. Average wind speeds in key areas reach around 7–8 m/s, supporting the viability of large-scale deployment. Despite this potential, current installed offshore capacity remains limited to the 30 MW Beleolico wind farm in Taranto, commissioned in 2022. However, market interest has grown rapidly. By early 2024, grid connection requests for offshore wind projects had reached approximately 90 GW, with dozens of projects under environmental assessment. A large share of these proposals is concentrated in southern regions—Sicily, Sardinia, and Apulia—which together account for the majority of Italy's floating wind potential.

At the same time, national targets remain relatively modest. The PNIEC's 2.1 GW offshore target represents only a small share of Italy's overall renewable ambitions, indicating a gap between technical potential and policy ambition. This is particularly notable given Italy's extensive maritime area and strategic location in the Mediterranean. Italy benefits from a strong industrial ecosystem capable of supporting offshore wind development. Companies such as Prysmian (subsea cables), Saipem (offshore engineering), Fincantieri (shipbuilding), and Acciaierie d'Italia (steel production) are already active in relevant sectors and could anchor a domestic supply chain for floating wind technologies. These capabilities align with EU priorities on industrial competitiveness and strategic autonomy. Nevertheless, key challenges remain. Administrative complexity, fragmented governance, and the absence of long-term targets beyond 2030 continue to create uncertainty for investors. Addressing these gaps—particularly through clearer long-term planning and more efficient permitting—will be essential for unlocking Italy's offshore wind potential and strengthening its contribution to European and global climate goals.

Coordination Mechanisms with Countries

Italy's offshore wind development is embedded in a multi-level governance system that connects European strategies, cross-border coordination, and national and regional processes.

At the European level, the revised TEN-E Regulation provides the main framework for transnational energy infrastructure. Italy plays a central role in two priority offshore grid corridors—the South & West and South & East Offshore Grids—which aim to integrate offshore wind capacity across the Mediterranean and strengthen interconnections with countries such as Greece, Spain, France, Malta, Slovenia, and Croatia. These corridors are supported by ENTSO-E's Offshore Network Development Plans, which define long-term, basin-level infrastructure needs. Italy's geographical position and existing cross-border interconnections reinforce its role as a regional electricity hub. The European Grid Action Plan (2023) further operationalises these objectives by addressing infrastructure gaps and accelerating grid development. It highlights the need for large-scale investment and modernisation to accommodate growing electricity demand and renewable integration. For Italy, this translates into reinforced grid planning and investment strategies led by the national transmission system operator, Terna, aligned with European priorities for interconnection and system flexibility.

Italy has also endorsed broader EU initiatives such as the European Wind Charter and the Wind Power Action Plan, which focus on improving permitting processes, strengthening supply chains, and creating more stable investment conditions. Together, these instruments link infrastructure planning with market and regulatory measures, forming a coherent framework for offshore wind development. Despite this strong strategic positioning, implementation remains uneven. Progress is constrained by delays in maritime spatial planning, complex permitting procedures, and the absence of operational cross-border projects. These challenges highlight the gap between European-level coordination and national execution, particularly in areas such as shared maritime space management and environmental assessment.

At the national level, coordination involves multiple institutions. The Ministry of the Environment and Energy Security (MASE) leads authorisation processes and offshore planning, working closely with the Ministry of Infrastructure and Transport and the Ministry of Agriculture on maritime and fisheries-related aspects. Terna plays a key role in grid development and cross-border interconnections, ensuring alignment with European planning frameworks. Regional authorities are increasingly involved, particularly in integrating offshore wind into regional energy and environmental plans, identifying suitable maritime areas, and managing stakeholder engagement. Their role is especially important in the Adriatic and Ionian basins, where planning decisions must be consistent across borders and sensitive to local economic activities such as tourism and fisheries. Institutional coordination is further supported by EU-funded cooperation platforms, including Interreg ADRION and Horizon Europe projects, which facilitate collaboration between governments, research institutions, and industry actors across the region. These platforms help harmonise technical approaches and share knowledge, although they do not fully compensate for structural governance challenges.

A key limitation remains the fragmentation of responsibilities between national and regional authorities, often leading to overlapping procedures and delays. This complexity, combined with lengthy environmental assessments, continues to affect project timelines and investor confidence. The lack of authorised cross-border offshore projects, despite strong planning activity and a large project pipeline, illustrates this implementation gap. Looking ahead, Italy has the potential to strengthen its role as a Mediterranean hub for offshore wind by leveraging its strategic location, port infrastructure, and industrial base. Achieving this will require more effective coordination across governance levels, faster implementation of maritime spatial planning, and the development of joint projects with neighbouring countries. Addressing these issues would enable Italy to move beyond its current targets and play a more prominent role in regional energy integration and European decarbonisation efforts.

R&I National Priorities

Italy's research and innovation (R&I) priorities in offshore wind increasingly reflect the specific challenges and opportunities of deploying marine renewables in Mediterranean conditions. National strategies emphasise the need to develop technologies adapted to deep waters, variable wind regimes, and specific marine characteristics, highlighting the importance of tailored innovation rather than direct replication of Northern European solutions.

Within the framework of PNIEC, Italy promotes R&I in clean energy technologies across different time horizons. While priorities are defined qualitatively rather than through fixed targets, this approach provides flexibility to support emerging technologies and guide their progression towards market readiness. A central priority is the development of floating wind technologies, particularly platforms and mooring systems suitable for deep-water environments.

In parallel, Italy is strengthening its industrial base to support offshore wind development. A key milestone is the 2024 agreement between the Ministry of Enterprises and Made in Italy, the developer Renexia, and the turbine manufacturer MingYang, establishing a joint venture for wind turbine production in Italy. This initiative, involving significant investment and job creation, represents a strategic step towards building a domestic value chain for floating offshore wind and reducing reliance on external suppliers.

The economic potential of offshore wind further reinforces this strategic direction. Estimates suggest that large-scale deployment could generate substantial added value and employment, positioning offshore wind as a key component of Italy's energy system by mid-century. Italy's strong metallurgical and mechanical engineering sectors provide a solid foundation for developing competitive industrial capabilities in this field.

Digitalisation is another important dimension of R&I priorities. The integration of advanced monitoring systems, digital twins, and predictive maintenance tools is expected to improve operational efficiency and reliability, particularly in challenging marine environments. These innovations are closely linked to broader efforts to strengthen the national supply chain and enhance competitiveness in global clean energy markets. At the same time, Italy's R&I agenda places strong emphasis on governance and regulatory innovation. Improving permitting procedures, clarifying site selection criteria, and enhancing coordination across institutions are seen as essential conditions for accelerating deployment. Recent reforms introducing faster authorisation processes for renewable projects represent an initial step in addressing long-standing administrative barriers.

Environmental sustainability is a cross-cutting priority. Research focuses on minimising ecological impacts through life-cycle assessments, monitoring of marine ecosystems, and the development of low-impact technologies. Particular attention is given to issues such as underwater noise, biodiversity protection, and the recyclability of materials, ensuring that offshore wind expansion is aligned with environmental protection objectives. Overall, Italy's R&I priorities for offshore wind form a comprehensive and integrated framework, spanning technological innovation, industrial development, environmental sustainability, and governance improvements. This approach aligns with broader European objectives while remaining adapted to the specific conditions of the Mediterranean, positioning Italy to play a significant role in the future development of floating offshore wind.

2.3.2 National Energy Transition Priorities

National Operational Programmes

National energy transition priorities are anchored in PNIEC, updated June 2024, which aligns closely with EU's ambition to accelerate decarbonisation and achieve climate neutrality by 2050. The Plan reflects Italy's commitment not only to reducing emissions, but also to strengthening Europe's global leadership in clean energy and sustainable industrial development. At the same time, it acknowledges the complexity of the transition, emphasising that it requires a diversified and flexible mix of measures rather than a single predefined pathway.

While solar photovoltaics and onshore wind remain the dominant contributors due to their maturity and cost competitiveness, the Plan highlights the importance of innovative solutions such as offshore wind and hybrid systems (e.g. agrivoltaics and offshore renewables integrated with storage). These technologies are seen as essential for diversifying the energy mix and ensuring long-term sustainability.

Italy's broader transition priorities include the expansion of renewable energy, electrification of transport and industry, improvements in energy efficiency, strengthening of grid infrastructure and storage, and reduction of fossil fuel dependence. In this context, European instruments such as the PNRR and Important Projects of Common European Interest (IPCEI) play a crucial role by supporting both deployment and the development of industrial supply chains.

The PNRR, particularly Mission 2 ("Green Revolution and Ecological Transition"), is central to operationalising these priorities. With substantial funding, it supports port modernisation, grid digitalisation, and energy infrastructure upgrades—all of which are essential for offshore wind deployment. Within Mission 2, Component M2C2 ("Renewable Energy, Hydrogen, Grid and Sustainable Mobility") allocates €23.78 billion to increasing renewable capacity, strengthening grid infrastructure, promoting hydrogen, supporting sustainable transport, and building industrial leadership in clean technologies.

Within this component, Sub-component M2C2.1 focuses specifically on increasing the share of renewable energy. It includes investments in agrivoltaics, energy communities, innovative renewable systems (including offshore wind), and biomethane development. Offshore wind is explicitly supported under Investment 1.3, which promotes innovative renewable plants combining mature and emerging technologies, often integrated with storage systems. This investment aims to deliver approximately 200 MW of additional capacity and generate around 490 GWh annually, contributing to long-term decarbonisation objectives.

Additional support is provided under Sub-component M2C2.5, which focuses on strengthening industrial value chains and innovation ecosystems. This includes funding for start-ups and venture capital in green sectors, supporting the development of new technologies and business models relevant to offshore wind.

Complementing the PNRR, the National Programme for Research, Innovation and Competitiveness (PN RIC) 2021–2027 provides a further strategic framework, particularly for Southern Italy. With a total budget of €5.6 billion, co-financed by the European Regional Development Fund, the Programme supports innovation, renewable energy deployment, and energy storage systems. Its governance involves coordination between key ministries, ensuring alignment between industrial, research, and environmental policies. At the same time, the IPCEI framework enables cross-border cooperation in strategic sectors, including offshore wind, facilitating large-scale projects and strengthening European industrial competitiveness.

A key national instrument specifically targeting offshore renewables is the FER 2 decree, which provides financial incentives for innovative renewable technologies. It foresees up to 4.6 GW of new installations by 2028, of which 3.8 GW is allocated to offshore wind. The scheme offers tariff-based incentives designed to support floating wind development and stimulate the creation of a domestic supply chain. It also supports flagship projects such as the Med Wind floating wind farm, expected to play a major role in Mediterranean offshore deployment. The expected economic impact is significant, with investments under FER 2 projected to generate substantial added value and contribute to both decarbonisation and industrial growth. Offshore wind is therefore positioned not only as an energy solution, but also as a driver of economic development and technological innovation. Finally, EU-level financial instruments further reinforce national programmes. These include support for innovation and manufacturing through initiatives such as the European Innovation Council (EIC) Accelerator and investment aid under the Temporary Crisis and Transition Framework. Together, these mechanisms help mobilise capital, strengthen supply chains, and support the scaling of offshore wind technologies

National Operational Alignment

The national PNIEC defines the Italian objectives in terms of energy and climate, while the PEAR of the Puglia Region (Regional Environmental Energy Plan) is the plan that translates these objectives at regional level, integrating the specificities of the Apulian territory through the adoption of concrete measures, the identification of priority actions and the development of local projects to achieve the decarbonisation, energy efficiency and energy security targets defined at the national level.

The energy policy articulated in the PEAR rests on four fundamental pillars. First, it prioritises the reduction of energy consumption across all sectors. Second, it seeks to minimise land use and landscape impacts associated with the installation of new energy plants. Third, it focuses on the decarbonisation of the electricity production system. Finally, it places citizens and local communities at the very centre of the energy transition, recognising their active role as key drivers of change.

The Plan establishes a time horizon extending to 2030, setting out a pathway of measures and targets to be achieved by that date.

Key two points for the integration are:

1. **Goal Alignment:** The Puglia Region, through its PEAR (Regional Environmental Energy Plan), must align its plans and strategies with the objectives of the national NECP (National Integrated Plan for Energy and Climate). This means that Puglia's PEAR must contribute to national goals in terms of reducing CO_2 emissions, increasing the share of renewable energy, improving energy efficiency, and developing energy security.
2. **Definition of specific actions:** The PEAR not only incorporates national objectives, but also defines the **concrete actions** and policies that will be implemented in

Puglia to achieve these goals.
This may include:

- **Support for renewable energy sources**: Incentivize the development of photovoltaic and wind power, sectors in which Puglia is already a leader in Italy.
- **Energy efficiency measures**: Promote energy efficiency in public and private buildings, industry and transport.
- **Energy Network Development**: Modernize and strengthen electricity and gas networks to better integrate renewable sources and ensure system security.
- **Developing sustainable mobility**: Promoting electric mobility and the use of low-impact means of transport.
- **Taking into account territorial specificities:** The PEAR must take into account Puglia's specific socioeconomic conditions, natural resources, and production capabilities. For example, the region's strong agricultural vocation can be complemented by bioenergy measures or technological innovation in the agricultural sector.
- **Monitoring and evaluation:** Both plans include monitoring mechanisms to assess progress towards the objectives. Puglia's PEAR will therefore monitor and report on regional progress, providing a more detailed picture of the impact of energy policies on the region.
- **Consistency and synergy:** Integration ensures that regional interventions are consistent with the national strategic framework and that there is synergy between energy policies at all levels of government, contributing to an effective energy transition in the country.

2.3.3 R&I National & Regional Capacities

Italy's offshore wind sector is entering a phase of rapid expansion in both project development and research activity, driven by growing industrial interest and increasing policy attention to the energy transition. According to Terna, grid connection requests for offshore wind projects increased nearly twentyfold between 2020 and 2023, exceeding 90 GW. This surge reflects strong investor confidence and highlights the country's substantial untapped potential, particularly for floating offshore wind technologies suited to deep Mediterranean waters.

The majority of proposed projects are concentrated in southern regions—Sardinia, Sicily and Apulia—confirming their role as emerging hubs for offshore deployment and supply-chain development. More than 80 GW of projects are currently under assessment, with around 87 undergoing environmental evaluation by the Ministry of the Environment and Energy Security. Despite this momentum, no project has yet completed the full authorisation process, pointing to persistent bottlenecks in permitting and the absence of a clear long-term strategy beyond 2030. This gap continues to constrain industrial scaling and innovation planning.

Terna's Fit-for-55 scenario projects up to 8.5 GW of offshore capacity by 2030—aligned with EU objectives but still modest compared to Italy's technical potential. Bridging this gap will require stronger coordination between infrastructure investment, industrial development and research and innovation capacities at both national and regional levels. Against this backdrop, Italy's R&I capacities—particularly in regions such as Puglia—are becoming increasingly important in supporting offshore wind deployment, spanning infrastructure, technology development and good practices.

R&I Support Infrastructures

Italy has begun establishing a network of strategic port hubs to support the offshore wind supply chain, with Taranto and Augusta designated as primary hubs, complemented by facilities in Civitavecchia and Brindisi. These ports are intended to function as integrated centres for manufacturing, assembly, pre-commissioning and logistics of floating platforms and electrical components. They also support near-to-market research activities, including large-component handling, storage, and testing operations, and are expected to play a central role in enabling industrial scale-up toward 2030. At regional level, PEAR integrates offshore wind into spatial and energy planning, identifying suitable maritime areas off Manfredonia, Bari and Brindisi. The plan links port infrastructure with research and industrial development, supporting pilot activities such as cable qualification, anchoring systems, and offshore operations and maintenance training. This integrated approach strengthens the connection between spatial planning, infrastructure investment and R&I programmes. Secondary ports also play a complementary role. Manfredonia, for example, has developed into a logistics hub with significant storage capacity (around 60,000 m^2), equipment for handling large components (up to 90 metres), and integrated services for customs, assembly and transport. While currently supporting onshore wind logistics, such infrastructure can be adapted to offshore needs, reinforcing the broader port network and supporting large-scale deployment.

Key Technologies Progress

Technological progress in Italy's offshore wind sector is increasingly centred on floating offshore wind (FLOW), reflecting the country's deep-water conditions and limited suitability for fixed-bottom installations. While the Beleolico project in Taranto remains the only operational offshore wind farm, national efforts are now focused on developing scalable floating solutions capable of operating efficiently in Mediterranean conditions.

Large-scale initiatives such as the Med Wind project illustrate Italy's ambition to deploy multi-gigawatt floating wind farms and position itself as a regional leader. In this context, Puglia plays a key role, combining existing pilot experience, strategic port infrastructure and regional planning frameworks that support innovation and industrial development.

A major technological advancement is represented by the HEXAFLOAT platform, a semi-submersible floating structure designed for deep waters and large-capacity turbines (15 MW and above). Its tubular configuration, combined with a pendulum-type stabilisation system and simplified mooring lines, ensures high stability and reduced sensitivity to wave motion. The design also facilitates serial production, an important step toward developing a domestic industrial supply chain.

The HEXAFLOAT concept has received Approval in Principle from Bureau Veritas and has undergone successful prototype testing with the support of the National Research Council (CNR). A scaled prototype was installed in 2021, while a full-scale demonstrator (Mistral project) is currently under development. These efforts are supported by European programmes such as the Interreg AFLOWT project, aimed at validating floating technologies and reducing risks for large-scale deployment.

This technological progress is reinforced by national policy instruments, including the PNIEC and the forthcoming FER2 scheme, which provide targeted support for demonstration projects, permitting acceleration and grid integration. Together, these measures aim to create a competitive ecosystem linking research, industry and infrastructure, enabling Italy to transition from pilot projects to commercial-scale offshore wind deployment.

Good Practices Adoption

The Beleolico offshore wind farm in Taranto represents a key example of good practice in Italy and the Mediterranean. Developed by Renexia and operational since 2022, the project consists of 10 turbines with a total capacity of approximately 30 MW, generating around 58 GWh annually and supplying electricity to roughly 18,500 households. Beyond its technical achievement, Beleolico demonstrates how offshore wind can be integrated with environmental protection and local development. A structured collaboration with the Jonian Dolphin Conservation organisation enabled continuous monitoring of marine species before and after construction, confirming the compatibility of the project with local ecosystems.

The project also contributed to the revitalisation of the Port of Taranto as a logistics and industrial hub, supporting local employment and economic activity. Educational and outreach initiatives further strengthened public awareness and acceptance of offshore wind. Importantly, Beleolico incorporates circularity principles, having been designed for full dismantling and recycling after its operational life. Extensive pre-construction research on marine impacts has generated valuable data that can inform future offshore developments across the Adriatic-Ionian region. Overall, Beleolico provides a replicable model combining technological innovation, environmental sustainability and socio-economic benefits—demonstrating how offshore wind can be deployed responsibly while supporting regional development

2.3.4 Employment Capacities

Existing Workforce

According to data from ANEV (2023), the wind energy sector in Italy employs approximately 17,000 workers, including around 5,500 direct and 11,500 indirect jobs, marking steady growth in recent years. The majority of these professionals are currently engaged in onshore wind projects, covering a wide range of roles—from engineering, installation and maintenance to grid integration, environmental assessment and regulatory compliance.

As offshore wind begins to develop, the professional landscape is expanding significantly. Beyond traditional technical roles, the sector increasingly requires expertise in maritime engineering, subsea infrastructure, port logistics and offshore operations. At the same time, digitalisation is reshaping the skills profile, creating demand for data analysts, meteorologists and GIS specialists capable of optimising resource assessment and predictive maintenance through advanced modelling and artificial intelligence tools.

In parallel, business and legal professionals remain essential to the sector's functioning, supporting financing, navigating complex permitting processes and structuring large-scale energy projects. The transition toward offshore wind—particularly floating technologies—will further expand this ecosystem, introducing new professional profiles such as specialists in floating platforms, subsea cabling, offshore data management and community energy engagement.

The broader industrial base linked to offshore wind significantly amplifies employment potential. Key supply chains—including metallurgy, steel production, advanced mechanics, naval engineering and port infrastructure—already generate approximately €255 billion in value and employ around 1.3 million workers in Italy. These sectors provide a strong foundation for scaling offshore wind, particularly given Italy's leadership in steel structures and maritime industries.

Employment projections confirm the scale of this opportunity. Estimates suggest that achieving Italy's floating offshore wind ambitions could generate between 71,000 and 119,000 full-time equivalent (FTE) jobs by 2030, rising substantially by 2050 as deployment expands. Under a scenario of 20 GW installed capacity by mid-century, offshore wind could create tens of thousands of new jobs across development, construction and operations phases. More specifically, the implementation of the FER2 Decree is expected to have a significant employment impact, particularly in Southern Italy. Around 11,400 direct jobs could be created during the construction phase (rising to over 45,000 when including the supply chain), alongside approximately 2,000 long-term positions during the operational phase. A majority of these jobs are expected to be regionally concentrated, reinforcing the role of southern regions as industrial and employment hubs.

Wind Energy Professionals

From a functional perspective, offshore wind projects require a highly diversified workforce across all phases of development. These include early-stage roles such as project development managers, environmental and permitting specialists, financial analysts and legal advisors; engineering and design professionals specialising in floating platforms, hydrodynamics, electrical systems and mooring technologies; and construction and installation roles such as logistics coordinators, port operators, offshore technicians and marine engineers.

During the operational phase, the workforce shifts towards asset management, maintenance, monitoring and performance optimisation, supported by digital systems such as SCADA and condition monitoring tools. Across all stages, health, safety and environmental (HSE) expertise remains critical, reflecting the complexity and risk profile of offshore environments.

In addition to these technical and operational roles, leadership and management positions—such as project managers, programme directors and senior executives—play a central role in coordinating large-scale investments and ensuring alignment between industrial, financial and regulatory dimensions.

The analytical report carried out by La Sapienza University in collaboration with ANEV (Italian National Wind Energy Association), published in 2025 and entitled *"Assessment of the economic, employment and social impacts of the development of floating offshore wind in Italy"*, distinguishes the professional profiles involved in the various phases of Floating Offshore Wind (FOW) development as follows:

Phase	**Identified Professional figures**
Development	1. Development manager 2. Floating Wind Resources Analyst 3. Environmental Specialist 4. Permitting Specialist 5. Stakeholder Manager 6. Financial Analyst 7. Legal Advisor
Design	1. Design Engineer (Floating Platforms) 2. Structural Engineer 3. Hydrodynamics Engineer 4. Mooring Engineer 5. Cable Engineer 6. Electrical Engineer 7. Mechanical Engineer 8. Geotechnical Engineer 9. Naval Architect 10. SCADA Engineer

	11. MetOcean Specialist 12. HSE Engineer 13. Consultant Engineer
Construction	1. Construction Manager 2. Logistics Coordinator 3. Quality Assurance Specialist 4. Heavy Lift Operator 5. Port Operations Manager 6. Surveyor (Marine and Subsea) 7. HSE Manager 8. Procurement Manager 9. Supply Chain Manager
Installation	1. Installation Manager 2. Marine Operations Manager 3. Offshore Installation Technician 4. Mooring Technician 5. Dynamic Cable Installation Technician 6. Electrical Technician 7. Mechanical Technician 8. Offshore Survey Engineer 9. Diver/Rigger 10. Commissioning Manager 11. HSE Officer
O&M	1. Operations Manager 2. Maintenance Manager 3. Wind Turbine Technician 4. SCADA Technician 5. Condition Monitoring Engineer 6. Asset Manager 7. Performance Analyst 8. HSE Manager 9. Environmental Compliance Officer
Leadership and Management	1. Project Manager 2. Program Director 3. Head of Floating Wind Development 4. General Manager 5. CEO/COO

Overall, Italy already possesses a solid base of wind energy professionals and a strong industrial workforce capable of supporting offshore wind expansion. However, the transition to offshore—particularly floating wind—requires a rapid scaling of specialised skills, stronger integration between industry and education systems, and the development of dedicated training pathways. Without this, there is a risk that the sector will rely heavily on external expertise, limiting domestic value creation and slowing deployment.

Wind Energy Training Programs

To respond to the growing demand for advanced skills in the renewable energy sector—particularly those highlighted in relation to offshore wind development—Italy has developed a multi-layered training ecosystem that combines vocational excellence, higher education, and specialised professional training. Within this system, the ITS Academy (Higher Technological Institutes) network plays a central role in bridging the gap between education and industry needs.

The ITS Academies represent a key pillar of Italy's post-secondary technical education system, producing highly specialised professional figures such as project developers, site managers, commissioning managers, and operations and maintenance (O&M) specialists across renewable energy sectors, including wind and solar. These profiles are particularly valuable because they occupy the intermediate level between strategic management and operational workforce—roles that companies frequently report as difficult to fill. Structured as public–private, non-profit foundations funded at regional level, ITS Academies operate under a dual training model that combines classroom learning with extensive in-company experience. Their programmes, typically lasting two years, lead to diplomas recognised at European level (EQF Levels V and VI) and are closely aligned with regional economic priorities and Smart Specialisation Strategies. This strong connection with industry ensures that training remains responsive to labour market demands and technological developments. The energy sector represents one of the ten strategic technological areas defined by national policy, and as of 2024, a network of ITS Academies dedicated to energy efficiency and renewable systems is active across the country. These institutions provide specialised training in areas such as energy systems management, sustainable construction, and renewable technologies, forming a distributed national infrastructure for workforce development.

At regional level, Puglia stands out for its proactive approach to building skills in emerging sectors such as floating offshore wind. As highlighted in the Blue Vision 2030 Strategy, the region is positioning itself as a hub for advanced training in energy transition technologies, supported by a network of ITS Academies and regional cooperation initiatives. In particular, the ITS Green Energy Puglia Academy delivers targeted programmes in energy efficiency and renewable systems, training professionals capable of managing, maintaining and optimising energy plants. These technicians are equipped with competencies spanning system installation, energy management, and Industry 4.0 applications, making them directly relevant for offshore wind operations and maintenance.

Complementing the ITS system, Italy offers a wide range of university-level programmes that provide the advanced engineering and scientific expertise required by the offshore wind sector. Degree courses in Energy Engineering—such as those offered by the Politecnico di Bari in collaboration with the University of Salento—focus on renewable energy systems, hydrogen technologies, and sustainable energy infrastructure. These programmes aim to train engineers capable of designing and managing complex energy systems in line with decarbonisation goals.

Additional academic pathways contribute to the multidisciplinary nature of offshore wind training. Mechanical and aerospace engineering programmes support turbine design and structural analysis, while civil and naval engineering courses address foundations, floating platforms, and port infrastructure. Electrical and automation engineering programmes provide essential expertise in grid integration, power electronics, and control systems, while environmental sciences and engineering focus on impact assessment and ecosystem management. Economics and energy management programmes complete the picture by developing skills in project financing, regulation, and market design.

Beyond formal degree programmes, several Italian universities—including the Politecnico di Milano, Politecnico di Torino, and universities in Pisa, Bologna, Rome and Bari—offer specialised master's courses in renewable energy and energy transition. These programmes often include modules on offshore wind and are increasingly developed in collaboration with industry stakeholders. Sectoral organisations such as ANEV also contribute by offering professional training courses and continuous education programmes, supporting the upskilling of engineers and practitioners. In addition, national research institutions such as ENEA provide targeted training and professional development activities in areas directly relevant to wind energy, including energy systems, sustainability and technological innovation. These initiatives support lifelong learning and ensure that professionals remain aligned with evolving technologies and regulatory frameworks.

2.3.5 Offshore Wind Energy Investment Opportunities

In Italy, when assessing investment opportunities in offshore wind energy, the main challenge remains high investment and operational costs. The deployment of floating offshore wind (FOW) is currently constrained by elevated CAPEX and OPEX, even though its medium- to long-term cost competitiveness is expected to surpass that of fossil fuels. The carbon price is projected to exceed €100 per metric ton of CO_2 after 2026, which, combined with economies of scale, industrialization, and technological maturity, will significantly reduce the Levelized Cost of Electricity (LCOE) over time. Italy's strategy therefore focuses on establishing a stable incentive framework to de-risk early investments and accelerate the formation of a domestic supply chain.

Tax Incentives

A central pillar of Italy's investment framework is the FER2 Decree (June 2024, valid until December 2028), which represents the main national support mechanism for innovative renewable technologies, including offshore wind. The Decree specifically targets less mature but strategically important technologies, recognising their higher generation costs but also their long-term contribution to decarbonisation and industrial development. The FER2 framework establishes a dedicated target of approximately 3.8 GW of offshore wind capacity by 2028, to be allocated through competitive auctions. It has been formally approved by the European Commission as compatible with EU state aid rules, providing regulatory certainty for investors.

The support mechanism is based on long-term price stabilisation through competitive bidding procedures managed by the Energy Services Manager (GSE). Offshore wind projects benefit from a reference tariff initially set at €185/MWh, granted for a period of 25 years, which reflects the typical operational lifetime of offshore installations. This long-duration support is essential for ensuring bankability and attracting institutional investors.

At the same time, the system introduces gradual cost discipline: bidders must offer at least a small discount on the reference tariff, and tariffs are scheduled to decrease annually from 2025 onward. Projects are also required to reach operation within defined timelines (typically within five years), ensuring that incentives translate into actual deployment. The FER2 scheme is complemented by broader national measures under the National Recovery and Resilience Plan (NRRP), including incentives for innovation, industrial development, and foreign investment. Instruments such as the Scale-Up Act further enhance attractiveness by providing tax advantages for equity investments in high-growth and innovative sectors, including clean energy technologies.

Overall, while Italy does not rely on classic tax exemptions, it provides a quasi-fiscal incentive framework through long-term revenue stabilisation, which is often more impactful for capital-intensive infrastructure such as offshore wind.

Fundings

Public funding—particularly from European sources—plays a crucial role in reducing investment risk and supporting early-stage development.

At EU level, CEF Energy offers significant opportunities, especially for projects with a cross-border dimension. With a multi-billion-euro budget, the programme can co-finance up to 50% of eligible costs, particularly for grid infrastructure and offshore interconnections in strategic basins such as the Adriatic and Ionian Seas. This is highly relevant for Italy, given its role in Mediterranean offshore grid corridors.

In parallel, the Recovery and Resilience Facility (RRF) provides substantial resources for industrial transformation. In the offshore wind context, these funds are being used to strengthen domestic manufacturing capacity, support innovation and pilot projects for floating wind, and upgrade port infrastructure. This approach not only reduces costs but also enhances Italy's strategic autonomy in clean technologies.

A particularly important element of the funding landscape is the public investment in port infrastructure, formalised through national planning instruments. Ports such as Taranto and Augusta have been designated as primary hubs for offshore wind deployment, supported by additional facilities in Brindisi and Civitavecchia. Public funding is being directed towards dredging, quay reinforcement, logistics platforms, and assembly areas, creating the physical backbone for industrial-scale offshore deployment.

Loans

The EIB plays a central role, often providing long-term loans at favourable rates. In cooperation with commercial banks such as Intesa Sanpaolo, the EIB has established financing schemes supported by guarantees that can mobilise up to €8 billion in wind sector investments. These mechanisms significantly reduce financial risk, especially during the construction phase.

At the same time, Italy's transmission system operator Terna is implementing an ambitious €16.5 billion investment plan (2024–2028) aimed at strengthening grid infrastructure, enhancing interconnections, and enabling the integration of large volumes of renewable energy, including offshore wind. Grid readiness is a critical precondition for project bankability, and Terna's investments directly support the scalability of offshore projects.

Additional financial support is available through national initiatives such as the Invest in Italy programme, which offers loan instruments that can partially convert into grants for strategic projects. These tools are particularly relevant for attracting foreign direct investment and supporting large-scale industrial initiatives within the offshore wind value chain.

Overall, the combination of development bank financing, guarantees, and infrastructure investments creates a relatively robust environment for securing long-term debt under favourable conditions.

VCs/Angels

In Italy, venture capital (VC) and angel investments in offshore wind remain limited but are gaining traction as the sector matures. Most investors are currently developers themselves, such as:

- Renexia, which developed Italy's first operational offshore wind farm (*Beleolico*, Taranto).
- Enel Green Power, developer of the *Portoscuso* offshore wind project in Sardinia.

The surge in grid connection requests—notably in Sicily, Puglia, and Sardinia—indicates growing investor confidence and opportunities for supply chain development. A notable industrial player is LEITWIND, Italy's only manufacturer of megawatt-class wind turbines, which designs, builds, and installs turbines across Europe, positioning Italy to expand its domestic production base for offshore wind components. Moreover, strategic ports such as Taranto, Augusta, Brindisi, and Civitavecchia are evolving into investment hubs for offshore wind, as designated by the Ports Decree. These hubs are expected to attract venture and equity funding for innovation ecosystems, digital port operations, and supply chain start-ups specializing in mooring, O&M robotics, and environmental monitoring.

2.3.6 Internationalization Initiatives

Connections to International Value Chains

Italy is the third-largest potential floating offshore wind market globally, attracting international interest and investment. International expertise and technology transfer are crucial for developing this rapidly expanding market. While domestic sectors like metal manufacturing are poised to benefit, the need to accelerate deployment and meet aggressive 2030 targets necessitates international collaboration, and technology transfer, which also creates domestic supply chain opportunities and jobs.

Italy's connection to the international offshore wind value chain is characterized by an emerging national focus, and strategic partnerships with international players like China's MingYang Smart Energy for turbine production, and Renexia, to build domestic turbine manufacturing facilities and create a national supply chain for its burgeoning floating offshore wind sector. In this scenario, the Puglia Region is taking on an increasingly prominent role.

Several international companies are involved in offshore wind development in Puglia, including Falck Renewables and BlueFloat Energy, which are jointly developing floating wind farms through a strategic partnership. Other companies active in the region include SSE Renewables, which is constructing nearshore wind farms, and Acciona, which has a substantial offshore project pipeline in Puglia. Additionally, Iron Solar is advancing a floating wind farm project currently in the early planning stages.

ADRIONWIND Prospects

Italy is keen to expand its energy transition internationalization by focusing on strategic partnerships, such as the "Mattei Plan" with African nations for energy security and green development, and by promoting global initiatives like the 3DEN initiative for energy efficiency and decarbonization in developing countries. Italy also seeks to strengthen its role as a Mediterranean gas hub through infrastructure investments while accelerating renewable energy deployment via mechanisms like the MAX auction for energy storage. Furthermore, the country engages with the EU via the RePowerEU plan and updates its National Energy and Climate Plan (PNIEC) to align with global climate goals and to promote interconnections with neighbouring countries for energy and flexibility exchange. Puglia is a national reference region for offshore wind energy thanks to its high wind potential, the presence of port infrastructures and cutting-edge floating technology. The region has already hosted the launch of innovative projects such as the Taranto floating wind farm and is attracting investment in new farms, aiming to leverage its wind energy resources for the energy transition. In this framework the participation in the ADRIONWIND project can boost Puglia Region energy transition initiatives towards a broader Adriatic and Mediterranean prospect.

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2.4. Greece National Context Analysis

2.4.1 EU & Global Framework

The development of offshore wind in Greece is strongly shaped by the European climate and energy framework. The European Green Deal set the objective of climate neutrality by 2050, while subsequent initiatives such as the Fit-for-55 package and the REPowerEU plan have significantly increased the EU's 2030 renewable energy targets. In response, Greece has updated its national strategy, with the revised National Energy and Climate Plan (NECP) aiming at a substantial expansion of renewable energy, including a projected share of over 80% of electricity generation from renewables by 2030.

Offshore wind forms an integral part of this transition. Greece's initial target of 2 GW by 2030 has been reaffirmed and contributes to the EU's broader offshore ambitions. The country's maritime areas, including both the Aegean and Ionian Seas, offer favourable wind conditions, supporting its potential role in the Mediterranean offshore wind market. In the Ionian Sea, wind resources are generally moderate but stable (around 6–7 m/s), although detailed site-specific data remain more limited compared to the Aegean.

EU policies have directly influenced the development of Greece's offshore wind regulatory framework. A key milestone was the adoption of Law 4964/2022, which established the first comprehensive framework for offshore wind development, including provisions for site allocation, permitting, and competitive procedures. This reform was closely linked to the implementation of Greece's Recovery and Resilience

Facility (RRF), which included specific commitments to complete the legal and planning framework for offshore wind.

Links to National Contexts

Within this context, the National Offshore Wind Farm Development Programme, presented in 2023, identified 25 potential offshore areas with an estimated capacity of 12.4 GW. Initial development efforts focus on a limited number of high-priority zones, primarily in the Aegean, alongside pilot areas such as the Ionian Sea (Diapontia Islands), which are considered suitable for early deployment of floating wind technologies. This approach reflects the broader European strategy of diversifying offshore development across all sea basins and promoting innovative solutions.

The Ionian Sea holds strategic importance within Greece's offshore wind development, not only at national level but also within the wider Adriatic–Ionian macro-region. Its geographical position enables potential synergies with neighbouring countries, particularly Italy, supporting cross-border electricity flows and integration into the European energy market. Planned expansions of interconnection capacity between Greece and Italy are expected to enhance the viability of offshore projects in this area.

At the same time, the Ionian region remains at an earlier stage of development compared to the Aegean, with limited data availability and infrastructure readiness. Addressing these gaps through further research, environmental assessments, and grid planning will be essential to fully unlock its potential.

In conclusion, Greece's offshore wind strategy is closely aligned with EU policy objectives and supported by European funding instruments. While significant progress has been made in establishing the regulatory and planning framework, the effective deployment of projects—particularly in emerging areas such as the Ionian Sea—will depend on addressing existing data, infrastructure, and investment challenges.

Coordination Mechanisms with Countries

The implementation of offshore wind in Greece relies on multi-level coordination between EU institutions, national authorities, and neighboring countries. This coordination is ensured through policy alignment mechanisms, dedicated national institutions, and participation in regional cooperation frameworks, all of which are particularly relevant for the development of the Ionian Sea.

At the core of EU–Greece coordination is the NECP, which serves as the main instrument for aligning national energy targets with EU climate objectives. The NECP is subject to periodic review by the European Commission, ensuring consistency with evolving EU policies and targets. This process creates a structured feedback loop through which Greece adjusts its renewable energy trajectory, including offshore wind deployment, in line with EU priorities. In parallel, EU directives—such as those on maritime spatial planning and renewable energy—have been transposed into national legislation, ensuring that Greece's offshore wind framework follows common European standards in areas such as permitting, environmental assessment, and competitive allocation procedures.

A central role in coordinating offshore wind development is played by HEREMA (Hellenic Hydrocarbons and Energy Resources Management Company), which acts as the national authority responsible for planning, site identification, and investor coordination. Functioning as a "one-stop shop," HEREMA ensures compliance with EU regulatory requirements while facilitating interaction between national stakeholders and international investors. It also engages with counterparts in other European countries to exchange best practices and align technical and regulatory approaches. This role is particularly important in the Ionian Sea, where geographical proximity to Italy introduces a cross-border dimension to offshore wind planning. Although no formal joint development zones currently exist, the existing framework allows for coordination on spatial planning and potential infrastructure synergies.

Coordination is further reinforced at the regional level through the integration of offshore wind priorities into Smart Specialisation Strategies (RIS3). Regions such as the Ionian Islands and Western Greece are increasingly incorporating "blue energy" into their development strategies, supported by EU cohesion policy funds. This approach links national energy objectives with regional innovation ecosystems, encouraging the development of local capabilities in areas such as marine engineering, environmental monitoring, and offshore services. It also facilitates interregional cooperation, including partnerships with other Adriatic–Ionian regions facing similar challenges and opportunities.

At the transnational level, initiatives such as ADRIONWIND provide an additional layer of coordination. This Interreg IPA-ADRION project brings together stakeholders from across the Adriatic–Ionian macro-region to develop a joint research and innovation strategy for offshore wind. Through this platform, participating countries exchange data, align policy approaches, and explore opportunities for joint actions. For the Ionian Sea, this includes the potential alignment of spatial planning and the identification of shared infrastructure needs, contributing to a more coherent regional development of offshore wind.

Beyond these mechanisms, Greece participates in broader European and international coordination platforms. These include EU-level forums on offshore renewable energy, as well as cooperation through transmission system operator networks and bilateral energy dialogues, particularly with Italy. Such frameworks support the alignment of grid development, technical standards, and market integration, which are essential for the future export of offshore wind energy from the Ionian region.

R&I National Priorities

Research and innovation (R&I) is a key pillar of Greece's offshore wind strategy, supporting the development of domestic capabilities while addressing the country's specific geographical and technical conditions, including deep waters, seismic activity, and island-based energy systems. As a newcomer to offshore wind, Greece focuses on building capacity in areas that enable the cost-effective deployment of floating wind technologies, while aligning with European R&I frameworks such as Horizon Europe, the SET Plan, and the Clean Energy Transition Partnership.

At the national level, R&I efforts are primarily centred on floating offshore wind technologies, which are essential due to the depth of most viable sites in Greek waters. Universities and research institutions are actively working on platform design, mooring systems, and structural stability under Mediterranean metocean and seismic conditions. These activities are complemented by participation in European research projects, contributing to the broader advancement of floating wind solutions.

Another priority area is wind resource assessment and site optimisation. While initial studies indicate strong potential across Greek seas, including the Ionian, detailed site-specific data remain limited. Ongoing initiatives, including the deployment of floating measurement systems, aim to improve data availability and reduce uncertainty in project design and performance.

Grid integration and energy system innovation also play a central role in Greece's R&I agenda. Given the country's fragmented geography and island systems, research focuses on integrating offshore wind into the national grid, including through storage solutions and hybrid systems. Emerging concepts such as offshore energy hubs and hydrogen production are being explored, reflecting alignment with broader EU priorities on sector coupling and system flexibility.

Environmental sustainability represents an additional R&I focus. Greece is developing methodologies to assess and mitigate the environmental impacts of offshore wind, particularly in sensitive marine ecosystems. While progress has been made, baseline environmental data—especially for the Ionian Sea—remain limited, highlighting the need for continued research and monitoring.

At the regional level, the Ionian coastal areas present specific opportunities for applied R&I. These include port and infrastructure adaptation for floating wind deployment, the development of hybrid energy systems for island applications, and the exploration of cross-border grid solutions with neighbouring countries such as Italy. These activities position the Ionian region as a potential testing ground for innovative offshore wind applications within the Adriatic–Ionian basin.

Despite these advancements, several gaps remain. These include limited long-term wind and environmental data, early-stage development of the domestic supply chain, and the absence of operational pilot projects. Addressing these challenges will require sustained investment in R&I, as well as continued participation in European funding and collaboration frameworks.

2.4.2 National Energy Transition Priorities

Under the updated NECP, the country aims to install approximately 2 GW of offshore wind capacity by 2030, with long-term scenario projections reaching around 15–17 GW by 2050. These targets complement broader objectives of achieving climate neutrality by 2050, phasing out lignite power by 2028, and reaching a renewable electricity share of over 80% by 2030.

National Operational Programmes

The national policy framework for offshore wind has been significantly strengthened in recent years. Law 4964/2022 established the first dedicated regulatory framework, introducing a structured approach to site allocation, permitting, and competitive procedures. Building on this, the National Offshore Wind Farm Development Programme (2023) identified 25 potential offshore areas, corresponding to an estimated 12.4 GW of capacity. These are progressively filtered into priority areas and initial deployment zones, creating a phased and investment-oriented development pathway.

The Ionian Sea remains a priority within this framework, primarily allocated as a strategic zone to test floating technology before broader commercial rollout. The Programme applies a three-tier structure: 25 candidate zones (national potential), 10 priority areas (technical and environmental optimization), and 5 commercial deployment zones supported by pilot sites (See Figure 4). This cascade anchors a predictable, investment-ready development pathway.

To support deployment, Greece is leveraging a combination of national and EU instruments. The Recovery and Resilience Facility (RRF) plays a central role, financing preparatory studies, grid upgrades, and infrastructure development. However, the sector is currently facing delays due to rising costs and supply chain constraints, which have shifted the expected timeline for competitive tenders to the period 2028–2029. In response, a Special Purpose Vehicle (SPV) managed by HEREMA has been introduced to accelerate data collection and de-risk project development, ensuring readiness for future investment phases.

On the regional level, Greece's Just Transition strategy also links to offshore wind development. Supply chain investments are planned in Western Macedonia, while port upgrades are targeted in coastal regions to support the shift toward renewable energy. The Ionian Sea region is explicitly included in national planning, with an indicative 450 MW site, creating both opportunities and obligations for regional integration into the offshore wind value chain.

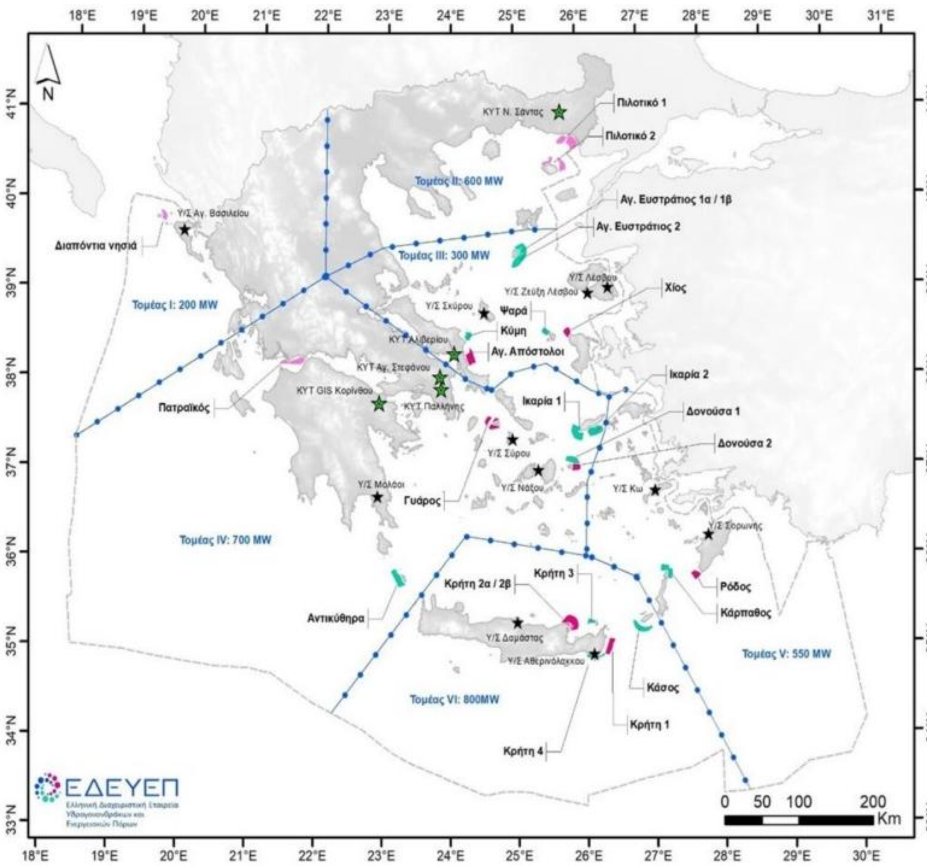

Figure 2 The National Offshore Wind Farm Development Programme (25 zones). Note: The initial implementation phase focuses on a subset of ~5 commercial zones and pilot areas (including the Ionian/Diapontia pilot) (source: HEREMA, 2023)

National Operational Alignment

These ambitions are closely aligned with EU climate and energy policies, including the European Green Deal, Fit-for-55, and REPowerEU. While Greece's contribution remains modest in absolute terms, it positions the country as an emerging player in the Mediterranean offshore wind market and supports EU-wide targets for offshore renewable energy deployment.

Greece's policy toolbox - from spatial planning and streamlined licensing via HEREMA to financial incentives and grid investments - demonstrates a strong alignment between national priorities and EU frameworks. National targets (such as 2 GW by 2030) reinforce EU objectives, while EU directives and funding instruments provide additional momentum and support.

This alignment extends to the regional level. The Ionian Islands and Western Greece are increasingly integrating offshore wind into their development strategies. The Ionian Islands' Smart Specialisation Strategy (RIS3) has evolved to include elements of the blue economy and renewable energy, encouraging linkages with national research institutions and innovation networks. Pilot actions are being considered for integrating renewable energy into marine sectors such as aquaculture and eco-tourism, while recognising existing gaps in local R&D capacity.

Coordination mechanisms further support this alignment. The Ionian Islands' Operational Programme 2021–2027 identifies the "Blue-Green transition" as a priority area, enabling funding for feasibility studies, infrastructure upgrades, and skills development related to offshore wind. At the macro-regional level, the EU Strategy for the Adriatic-Ionian Region (EUSAIR) promotes cooperation in blue energy, encouraging Greece to engage with neighbouring countries such as Italy and Croatia on joint initiatives.

This is closely aligned with the ADRIONWIND project's vision of transnational coordination. Greece is exploring opportunities to synchronise offshore wind development in the Ionian Sea with neighbouring markets, potentially enabling shared infrastructure and cross-border projects. One example under discussion is the development of an offshore wind hub in the Adriatic-Ionian basin connecting both Greek and Italian grids.

Key Figures – Greece Offshore Wind (Baseline, 2030, 2050)

2024 - Baseline
• Installed offshore wind capacity: **0 MW** • RES share in electricity generation: **~57%** • National Offshore Wind Programme: **25 designated areas** covering **2,712 km²** with **~12.4 GW** indicative potential • Priority development areas (HEREMA): **10 areas**, approx. **4.9 GW** consolidated potential
2030 - Outlook
• Offshore wind capacity planned for commissioning: **~2 GW** (combining early commercial deployment and pilot floating projects) • RES share in electricity (NECP projection): **~82%** • Modelled employment impact: **~44,000 FTEs/year** (direct, indirect, induced) • Grid and port mobilisation: implementation of the **IPTO 10-year Development Plan**, targeted **RRF-supported upgrades**, and preparatory works in candidate ports
2050 - Long-term Perspective
• Offshore wind capacity in national scenario exercises: **~15–17 GW** (floating-dominant expansion) • Estimated cumulative investment volume: **EUR 18–22 billion** across generation assets, port adaptations, grid reinforcement, and logistics • Sustained employment footprint: **30,000+ FTEs/year** in construction, O&M, and supply chain activities • Strategic Ionian role: progression from pilot deployment zone to commercial cluster linked to **GritA2** and wider Adriatic–Ionian integration

Ionian Sea Focus - Strategic Summary

Role in National Programme: Identified within the initial 25 zones and retained among the priority sites for early floating-wind deployment (~450 MW indicative potential)
Strengths: Moderate but steady wind resource, proximity to Italy and integration potential via the GRITA and GRITA-2 interconnectors; access to Western Greece's ports (Patras, Astakos) and university capacity (Patras, Ionian University)
Constraints: Limited high-resolution metocean and environmental baselines; early-stage port readiness, competing maritime uses; absence of prior offshore renewable deployment in the basin

Strategic Function: Serves as Greece's pilot-to-commercial transition zone for floating wind, enabling technology demonstration, environmental monitoring, and cross-border system integration	
Regional Relevance: Acts as a natural corridor for Adriatic–Ionian cooperation, with shared opportunities for joint planning, supply-chain complementarity, and transnational grid optimisation	

2.4.3 R&I National & Regional Capacities

Developing a domestic offshore wind industry requires strong research and innovation (R&I) capacities, and Greece is actively building these at both national and regional levels. Although Greece's offshore wind sector is nascent, the country can leverage its significant academic and industrial expertise in related fields (onshore wind, marine engineering, digital tech) to drive innovation in offshore wind. This section assesses the key institutions and capacities for R&I in offshore wind, highlights emerging technologies under development, and showcases good practices and models, with an emphasis on capabilities relevant to the Ionian Sea region.

R&I Support Infrastructures

At the core of Greece's R&I landscape are several key institutions. The National Technical University of Athens (NTUA) plays a leading role, particularly through its work on floating structures and mooring systems, focusing on adapting offshore wind technologies to Mediterranean conditions, including seismic activity and local wave patterns. The University of Patras, located in Western Greece and therefore closely connected to the Ionian region, contributes expertise in structural and environmental engineering, with a strong focus on seismic resilience and offshore foundation design.

Complementing these academic actors, the Centre for Renewable Energy Sources and Saving (CRES) provides applied research on wind potential, grid integration, and system optimisation, while the Hellenic Centre for Marine Research (HCMR) contributes essential knowledge on marine ecosystems and environmental impacts.

Alongside academia, industry engagement is gradually expanding. Greek shipyards, engineering firms, and energy companies are beginning to collaborate with research institutions to explore floating wind solutions adapted to local conditions. Partnerships with experienced international developers are facilitating knowledge transfer, while a small but growing number of startups are focusing on digital solutions such as turbine monitoring and predictive maintenance. Although still in a formative phase, this interaction between research and industry is a positive indicator of ecosystem development.

Within this broader context, the Ionian region represents an emerging but still developing node in the R&I landscape. While it does not yet host major offshore wind research infrastructure, it is increasingly connected to national and European networks. The Ionian University and regional stakeholders contribute in areas such as environmental assessment, spatial planning, and social acceptance, while regional strategies emphasise blue growth and encourage stronger links with national research hubs. As offshore wind projects progress, the region is expected to develop complementary capacities, including environmental monitoring, workforce training, and support services linked to maritime activities.

Key Technologies Progress

R&I efforts in Greece are concentrated on a set of technologies that reflect the country's specific geographic and technical constraints. Floating wind platforms are central, given that most viable sites are located in deep waters. Research focuses on optimising platform designs—such as spar, semi-submersible, and tension-leg systems—for Mediterranean conditions, including seismic considerations.

In parallel, innovation in mooring systems and subsea cables aims to address challenges related to depth, seabed conditions, and platform movement. Digitalisation is another emerging priority, with the development of digital twins, AI-based maintenance tools, and remote inspection technologies intended to improve operational efficiency once projects are deployed.

At the system level, research is also addressing grid integration, storage solutions, and hybrid applications, including the potential coupling of offshore wind with hydrogen production or island energy systems. Environmental research remains equally important, with ongoing efforts to improve baseline knowledge and develop mitigation measures for marine biodiversity.

Good Practices Adoption

To support these developments, Greece is adopting a number of collaborative and institutional practices. Pilot and demonstration projects are being used as learning platforms to test technologies and regulatory approaches before large-scale deployment. At the same time, closer cooperation between academia and industry is being fostered through informal clusters and joint initiatives, ensuring that research responds to practical needs.

A particularly important role is played by HEREMA, which acts not only as a planning authority but also as a facilitator of early-stage research by coordinating data collection, environmental assessments, and site investigations. This approach helps reduce uncertainty and lowers entry barriers for investors.

In addition, Greece is actively engaged in transnational cooperation frameworks, including ADRIONWIND and other EU-funded initiatives, which enable knowledge exchange and alignment with broader regional strategies. Education and training initiatives are also emerging, with universities and vocational centres beginning to integrate offshore wind topics into their programmes.

Greece's R&I capacities for offshore wind are evolving in a structured and increasingly coordinated manner. The combination of strong academic foundations, growing industry participation, and alignment with European research programmes provides a solid basis for future development. The Ionian Sea, in particular, stands to benefit from these efforts as a potential testing ground for new technologies and cross-border solutions. While the ecosystem remains in a capacity-building phase, continued investment, participation in EU programmes, and effective coordination between national and regional actors will be essential to translate research into deployment and ensure the long-term competitiveness of Greece's offshore wind sector.

2.4.4 Employment Capacities

Greece's renewable energy sector already supports a substantial workforce, and the expansion of offshore wind is expected to further strengthen green employment across the country. To date, most jobs have been generated by onshore wind and solar development, with employment concentrated in regions hosting existing infrastructure and industrial activity. However, the rollout of offshore wind introduces new geographical dynamics, particularly for coastal regions such as Western Greece and the Ionian Islands, which have so far had limited involvement in wind energy.

Existing Workforce

The inclusion of the Ionian Sea in Greece's Offshore Wind Development

Programme marks an important shift in this regard. Priority zones identified around the Diapontia Islands and potentially the Patraikos Gulf (that may lead to 450 MW inn early phases projects) create opportunities for new employment hubs along the western coast. Ports such as Patras and Astakos are expected to play a key role as logistics and maintenance bases, extending the benefits of the energy transition to regions previously outside the core wind energy landscape. While detailed regional employment data remain limited, it is widely anticipated that these areas will capture a growing share of jobs as offshore projects progress.

Employment projections indicate substantial growth potential. According to economic modelling, large-scale offshore wind deployment in Greece could support on average around 40,000–45,000 jobs annually over the period to 2050, including direct, indirect, and induced employment. In the shorter term, progress toward the 2030 target of approximately 2 GW is expected to generate several thousand jobs, particularly during construction phases. Individual projects can have a significant local impact; for example, a single large-scale offshore wind farm may create thousands of full-time equivalent positions depending on the degree of domestic supply chain participation. As capacity expands toward long-term scenarios exceeding 15 GW, offshore wind is expected to evolve into a major employment pillar, contributing to the emergence of a sustained “blue economy” workforce. These trends align with broader European projections, which foresee significant growth in offshore wind employment across the EU.

Wind Energy Professionals

Offshore wind development requires a broad range of skills across the entire project lifecycle. Employment opportunities span engineering and technical roles, including electrical, mechanical, civil, and marine specialisations; construction and installation activities involving offshore crews, technicians, and vessel operators; and port and logistics services supporting the transport and assembly of large components. Environmental and marine expertise is also essential, particularly for impact assessments and monitoring, while long-term operations and maintenance create sustained demand for skilled technicians and remote monitoring specialists.

In addition to these direct roles, significant indirect employment is expected in manufacturing, supply chain services, and support industries, including shipbuilding, safety training, and specialised equipment provision. This diversity highlights the need for a workforce that combines maritime experience with advanced energy and digital competencies.

Despite these opportunities, workforce readiness remains a key challenge. Greece’s existing expertise is largely rooted in onshore wind, and the offshore segment introduces new technical and operational requirements. Industry stakeholders have identified gaps in specialised skills, particularly in areas such as deep-water installation, marine operations, and offshore safety. In the early stages, this may necessitate reliance on international expertise, underlining the importance of building domestic capacity through targeted training and education.

Wind Energy Training Programs

Efforts to address these gaps are already underway. Greek universities are gradually expanding their focus on renewable energy and offshore engineering, with institutions such as NTUA and the University of Patras providing relevant academic training in wind energy, structural design, and energy systems. At the vocational level, training centres are introducing courses in wind turbine maintenance, high-voltage systems, and offshore safety standards.

EU-supported initiatives are also playing a crucial role. Programmes such as

SHOREWINNER aim to establish Centres of Vocational Excellence for offshore renewable energy, fostering collaboration between education providers and industry to develop specialised curricula and upskilling pathways. In parallel, professional development is being supported through European research and training programmes, including Erasmus+ and Horizon Europe, which facilitate knowledge transfer from more mature offshore wind markets.

Industry actors are also contributing, with major energy companies planning to invest in workforce training as part of project development. Workshops, partnerships, and international collaborations are helping to expose Greek professionals to best practices and operational experience.

In conclusion, offshore wind development represents a significant opportunity to expand and diversify Greece's renewable energy workforce. The Ionian Sea region, in particular, stands to benefit from new employment in port activities, logistics, and long-term operations. Realising this potential will depend on the timely development of skills and training systems capable of supporting the sector's growth. While gaps remain, current initiatives indicate a clear trajectory toward building a qualified workforce that can support Greece's offshore wind ambitions and contribute to the broader European energy transition.

2.4.5 Offshore Wind Energy Investment Opportunities

The development of offshore wind in Greece will require substantial capital mobilisation, and the country's investment landscape is gradually aligning to support this emerging sector. A combination of public funding instruments, regulatory incentives, and growing private sector interest is beginning to create a more favourable environment for large-scale deployment. This evolving framework is particularly relevant for new development areas such as the Ionian Sea, where early-stage projects could attract both domestic and international investors.

Tax Incentives

Greece provides a range of horizontal incentives for renewable energy investments, which are expected to extend to offshore wind as the sector matures. These include accelerated depreciation schemes and subsidised financing under national development law frameworks. Investors may also benefit from tax credits or exemptions, such as relief on equipment import duties, particularly for projects classified as strategic investments.

The Development Law 2022 explicitly includes renewable energy projects among eligible categories for capital subsidies and tax offsets. Although no offshore wind project has yet reached a final investment decision, large-scale developments are expected to qualify as "Strategic Investments," enabling fast-track licensing procedures alongside fiscal incentives.

In addition to these measures, the government is preparing dedicated support mechanisms to enhance revenue stability. Chief among these is the planned introduction of Contracts for Difference (CfDs), which would guarantee a fixed price for electricity generated, thereby reducing market risk and improving project bankability. This mechanism is expected to be operational by the time the first offshore wind auctions are launched (currently anticipated around 2028–2029).

Fundings

Public funding mechanisms, particularly those supported by the European Union, play a central role in reducing investment risk and enabling early-stage offshore wind development in Greece.

The National Recovery and Resilience Facility (RRF) is a cornerstone instrument in this regard. Offshore wind has been explicitly included in Greece's recovery plan, with the RRF supporting both regulatory reforms and preparatory investments. The National Offshore Wind Development Programme, launched in 2023, was financed under this framework and provides support for marine spatial planning, permitting processes, and early-stage project development. In addition, RRF resources are directed towards enabling infrastructure, including port upgrades. A notable example is the allocation of €24 million for the modernisation of Alexandroupolis port as an offshore wind marshalling hub, with similar investments potentially extendable to Ionian ports such as Patras or Igoumenitsa.

The Just Transition Fund (JTF) also contributes indirectly to offshore wind development. While primarily targeted at coal-dependent regions, it supports renewable energy investments and workforce reskilling initiatives that strengthen the broader energy transition. Although Ionian regions are not direct beneficiaries, JTF-funded activities—such as grid upgrades and training programmes—can create enabling conditions for offshore wind deployment.

Additional EU funding streams further complement this landscape. The Connecting Europe Facility (CEF) can co-finance cross-border grid infrastructure, which is particularly relevant for offshore wind projects in the Ionian Sea that may connect to Italy or the Balkans. Horizon Europe and the Innovation Fund offer grant opportunities for innovative offshore technologies, including floating wind systems. These instruments can support demonstration projects and help reduce technological risks in early deployments.

Loans

Loan-based financing is expected to play a critical role in scaling offshore wind investments, particularly as projects move from planning to construction and operation phases. The EIB has indicated its readiness to support offshore wind development in Greece through low-interest loans and financial guarantees. Such instruments are essential for reducing the cost of capital, especially in a market that is still perceived as higher risk compared to more mature offshore wind regions.

At the national level, Greek banks are increasingly active in renewable energy financing. Institutions such as the National Bank of Greece and Eurobank have already developed significant green portfolios and are expected to participate in syndicated financing structures for offshore wind projects. The availability of stable revenue mechanisms—such as CfDs or long-term power purchase agreements—will be crucial in enabling these financial institutions to commit capital at scale.

Grid infrastructure investments also fall within this financing category. The Greek transmission system operator (IPTO) has outlined a ten-year development plan involving approximately €4 billion in grid upgrades by 2030. This includes island interconnections and the development of a second Greece–Italy interconnector (GRITA2), a €1.9 billion project that will significantly enhance cross-border electricity flows. Financing for such infrastructure is expected to combine regulated investments, EU funding, and institutional lending.

VCs / Angels

While large-scale offshore wind projects are primarily financed through institutional and project finance mechanisms, there are emerging opportunities for venture capital and early-stage investment, particularly in supporting technologies and supply chain innovation.

The Greek startup ecosystem is beginning to engage with offshore wind-related innovation. A notable example is FloatMast Ltd, which has developed a floating wind measurement platform and secured €2 million in EU innovation funding. Such ventures demonstrate the potential for niche technological solutions—ranging from metocean data collection to digital monitoring systems—to attract venture capital and angel investment.

As the offshore wind sector develops, additional opportunities are expected to emerge in areas such as advanced materials, autonomous inspection systems, artificial intelligence for operations and maintenance, and digital twin technologies. These segments are particularly attractive for smaller investors due to their scalability and lower capital requirements compared to full-scale energy projects.

The presence of international developers and industrial partners further enhances the investment ecosystem, creating opportunities for local startups to integrate into global value chains. Over time, this could stimulate a more dynamic innovation environment, supporting both technological development and economic diversification in regions such as the Ionian Sea.

2.4.6 Internationalization Initiatives

International Value Chains

Offshore wind development in Greece is closely linked to international value chains, both in terms of infrastructure integration and participation in global supply networks. As a relatively new entrant to the sector, Greece is positioning itself not only as a future producer of offshore wind energy but also as an active contributor to the broader European and Mediterranean offshore wind ecosystem.

A central pillar of this integration is cross-border infrastructure. Greece's geographical position—particularly in the Ionian Sea—places it at the intersection of energy flows between Eastern and Western Europe. The existing Greece–Italy interconnector already enables electricity exchange across the Ionian basin, and the planned GRITA2 subsea cable will significantly expand this capacity by 2030. This enhanced interconnection is critical for offshore wind development, as it allows future projects in the Ionian Sea to access larger electricity markets, improving project economics and reducing curtailment risks. Additional interconnections with Balkan countries and the planned EuroAsia link further reinforce Greece's role as a regional energy hub.

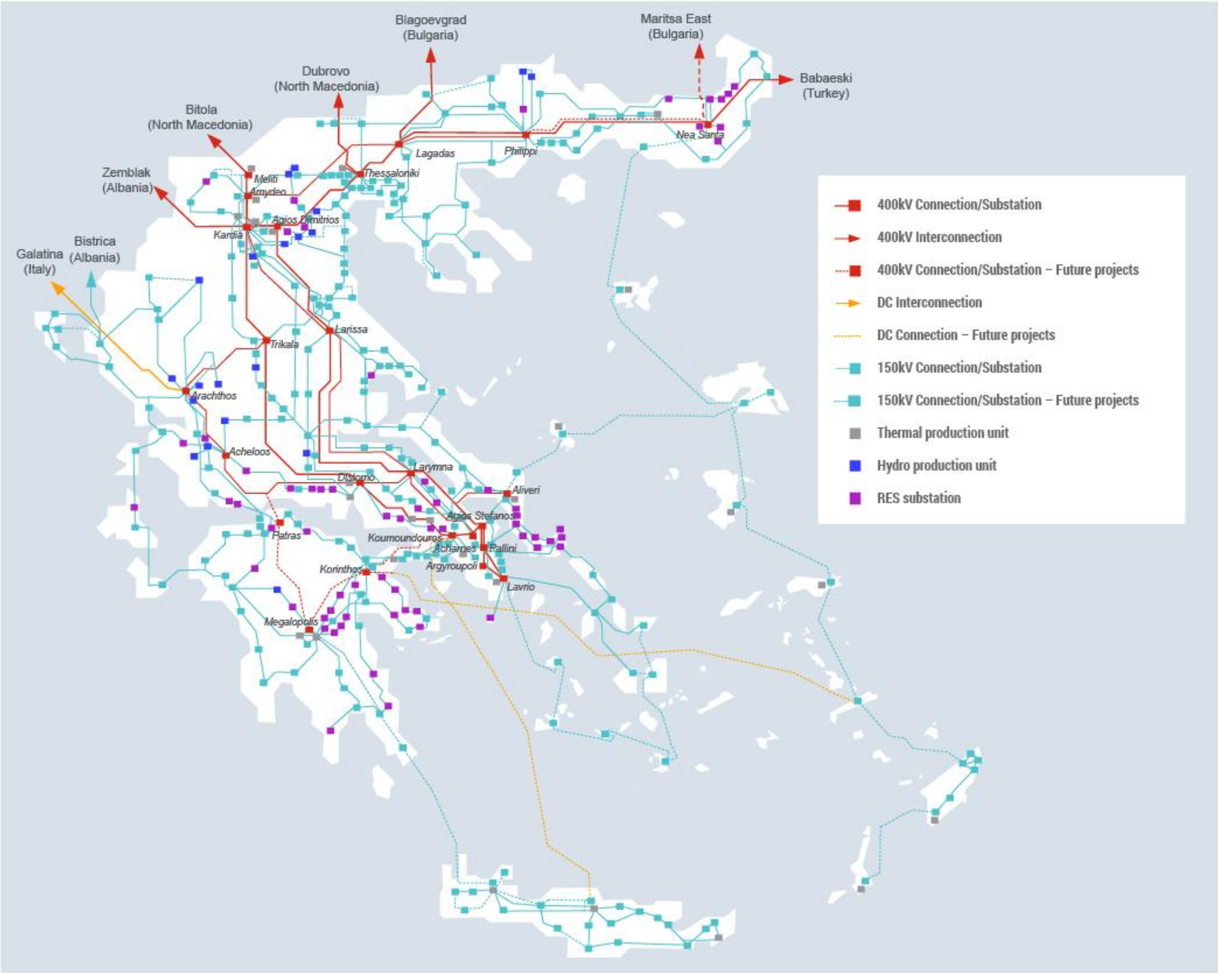

Figure 3 The Electrical Interconnection System of Greece. Notable interconnections with Italy (Arachthos-Galatina), crossing the Ionian Sea, and Albania (Bistrica, Zemblak)(source: IPTO "Ten-Year Network Development Plan 2019-2028", 2019)

Beyond infrastructure, Greece is increasingly embedded in international offshore wind supply chains. Domestic industrial actors are already contributing to projects abroad, particularly in manufacturing subsea cables, steel structures, and turbine components. Companies such as Hellenic Cables and Greek steel fabricators are supplying materials to offshore wind projects in Northern Europe, demonstrating that Greece can play a competitive role in specific segments of the value chain. These activities not only generate economic benefits but also build technical know-how that can be applied domestically as the Greek offshore wind market matures.

International partnerships are further strengthening this positioning. Greek energy companies are forming joint ventures with experienced foreign developers, combining local knowledge with international expertise and capital. These collaborations are particularly important for floating wind, where technological complexity and financial risk remain high. At the same time, participation in European research and demonstration projects allows Greek institutions and companies to gain experience and visibility within the global offshore wind sector.

For the Ionian Sea region, integration into international value chains is especially significant. Its proximity to Italy creates opportunities for shared infrastructure, coordinated development, and access to established supply networks. Ports in

Western Greece, such as Patras and Astakos, could evolve into logistics and service hubs linked to both Greek and Italian offshore wind activities. In this sense, the Ionian region is not only a site for energy generation but also a potential node within a wider transnational value chain.

Overall, Greece's approach to offshore wind development is inherently outward-looking. By strengthening interconnections, participating in supply chains, and fostering international partnerships, the country is embedding its emerging offshore wind sector within a broader European and global context, enhancing both its competitiveness and resilience.

ADRIONWIND Prospects

The ADRIONWIND project itself is a key internationalization effort for the region's offshore wind innovation ecosystem. Funded by the Interreg ADRION programme, ADRIONWIND (Adriatic-Ionian Offshore Wind Network of Excellence) links six countries -Italy, Croatia, Bosnia-Herzegovina, Montenegro, Albania, Greece- in a joint initiative to develop offshore wind R&I capacity. Through ADRIONWIND, Greek stakeholders (Kythnos Wind Energy Center, universities, SMEs) are exchanging knowledge with their regional counterparts, conducting comparative analyses, and harmonizing strategies. One of ADRIONWIND's goals is to map each country's strengths and gaps in the offshore wind sector and foster a collaborative approach rather than isolated national efforts. For example, if Croatia has port facilities and Greece has cable manufacturing, these could complement each other in a regional supply chain. By creating a transnational network of experts and organizations, ADRIONWIND helps Greek entities to internationalize - SMEs get exposure to foreign markets and partners, and researchers form links for future EU projects. Importantly, ADRIONWIND is not the only pathway for internationalization but part of a broader mosaic: Greece is also a member of the International Energy Agency's Wind TCP, participates in WindEurope's working groups, and engages in diplomatic energy cooperation (such as the East Mediterranean Gas Forum, which is expanding its scope to include renewables cooperation). ADRIONWIND thus complements these by focusing on the Adriatic-Ionian region's specific context. It demonstrates Greece's approach of aligning its offshore wind strategy with regional initiatives - acknowledging that success will come easier through cross-border collaboration. In essence, Greece is using projects like ADRIONWIND to ensure that as it builds its offshore wind industry, it does so in tandem with neighbours, learning from them and also contributing its own expertise (for instance, Greece's experience in maritime industries and island grids). This cooperative spirit extends to addressing common challenges like environmental protection: Greece and Italy share the Ionian Sea, so they benefit from joint marine spatial planning and environmental impact assessments. Under ADRIONWIND and EUSAIR auspices, there are discussions of developing a regional data-sharing platform for marine environmental data (wind resource maps, biodiversity hotspots, etc.), which would help optimize site selection in a coordinated way.

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2.5. Albania National Context Analysis

2.5.1 EU & Global Framework

Renewable energy in Albania plays an increasingly important role in the context of climate targets and energy security needs. Wind energy, in particular, is expected to contribute to accelerating the rollout of renewable energy and supporting the country's green transition. Its development is also linked to broader considerations, including public acceptance—generally higher for offshore wind—environmental protection, biodiversity impacts, and coexistence with other economic activities.

In line with global and European energy transition dynamics, renewable energy is gaining strategic importance in Albania as a means to reduce dependency on imported fossil fuels. The expansion of carbon-free power generation technologies is essential to achieving greenhouse gas (GHG) emission reduction targets. Consequently, significant investments are required in renewable energy-based systems and related technologies to support the country's transition.

Links to National Contexts

Albania has been an official candidate for European Union membership since June 2014, with accession negotiations formally launched in July 2022. Within this framework, the country has intensified efforts to align its legal and policy structures with the EU acquis in the fields of energy, climate, and environment. Regional cooperation initiatives have also played an important role. The Berlin Process and the Sofia Declaration on the Green Agenda for the Western Balkans (2020) have reinforced Albania's commitment to achieving climate neutrality by 2050 in alignment with EU objectives. At the global level, Albania has also engaged in climate action processes such as COP26, further integrating energy considerations into its broader climate policy framework.

A comprehensive legislative framework is in place to support this transition. Key instruments include the Law on Renewable Energy (No. 24/2023), the Law on Energy Efficiency (No. 124/2015, amended), the Power Sector Law (No. 43/2015), the Climate Change Law (No. 155/2020), and additional legislation related to energy labelling and emissions control. Ongoing efforts focus on aligning secondary legislation with EU directives, including the Energy Performance of Buildings Directive and the EU Emissions Trading System (ETS). Institutional and market reforms have also progressed. The establishment of the Albanian Power Exchange (ALPEX), operational since April 2023, represents a significant step toward market integration, particularly with Kosovo. The unbundling of key energy operators and alignment with the EU Third Energy Package further strengthen market transparency and competitiveness.

Strategic policy documents, including the National Energy and Climate Plan (NECP 2020–2030), mitigation action plans, and sectoral strategies, outline targets for renewable energy expansion, energy efficiency improvements, and GHG emissions reduction. However, some institutional structures—such as dedicated renewable energy agencies and operators—remain under development.

The transition toward renewable energy is expected to generate substantial economic benefits. Investments in energy infrastructure and clean technologies are projected to stimulate economic growth, increase sectoral GDP, and create new employment opportunities across multiple sectors. The expansion of renewable energy is also fostering the emergence of new industries, including wind and solar-related manufacturing and services. At the same time, reduced dependence on energy imports contributes to improved energy security and macroeconomic stability. The development of green technologies is further driving innovation and supporting the creation of new markets aligned with sustainability objectives.

National climate policies in Albania prioritize emissions reduction, renewable energy deployment, and energy efficiency improvements. These efforts are complemented by measures aimed at protecting biodiversity and ecosystems, ensuring that energy development is compatible with environmental sustainability. Key priorities include climate change mitigation, sustainable energy security, and improved energy efficiency across sectors. Policies also emphasize the importance of minimizing environmental impacts of energy infrastructure, particularly in sensitive ecosystems. Public engagement is considered an important component of the transition, ensuring that local communities are involved in decision-making processes and that energy diversification is socially accepted.

Coordination Mechanisms with Countries

Recently, the Albanian government has compiled national energy strategy with a special focus on promoting the use of renewable energy sources (RES) which identifies a target of 42% of the final energy consumption from RES by 2030. In this paper, analyses are conducted in order to investigate to which extent and way the absorption capacity of the power system from RES electricity can be improved. As an effective approach of implementing wind power, fostering the accommodation of renewable energy sources, especially on large-scale, a detailed techno-economic analysis of the 164 MW installed grid-connected wind farm, considered as a potential source, Korça district is analyzed. Conjoining two different types energy tools, RETScreen, a tool used on plant scale level and EnergyPLAN model applied for large energy system on national level including all energy sectors an optimization process is notably focused to attain 42% of the final energy consumption from RES by 2030, which was highly preformed in EnergyPLAN model. The results execute in EnergyPLAN identifies that the wind power capacity should be at least1850 MW and an installation cost not more than 1.1m€/ MW considering a bench mark price of electricity €76/MWh. The results of the study highlight the importance of high levels of RES integration which not only reduces greenhouse gases but will technically favor the creation of a flexible and sustainable energy system over time. Finally, the need for a sustainable and clear national energy model is inevitable, reshaping key points factors that hamper the integration on large-scale of wind power in Albania.

R&I National Priorities

Research and innovation (R&I) are increasingly recognised as critical enablers of Albania's wind energy development. The sector is still at an early stage, and targeted R&I efforts are needed to address existing technical, financial, and systemic challenges. Offshore and onshore wind development presents opportunities not only for clean energy generation but also for economic growth, job creation, and technological advancement. However, the effectiveness of R&I activities depends on improved prioritisation and increased funding, both from public and private sources. Strengthening R&I capacities can support cost reductions, improve system efficiency, and enhance the competitiveness of renewable energy technologies. Without coordinated investment in innovation, Albania may face difficulties in meeting its climate and energy targets within the required timeframe.

2.5.2 National Energy Transition Priorities

National Operational Programmes

Albania's energy transition is primarily guided by the National Energy Strategy 2018–2030 and the National Energy and Climate Plan (NECP) 2020–2030, approved by Decision of the Council of Ministers No. 480 (2018) and No. 872 (2021), respectively. These frameworks establish the core policy direction for the country's energy transition, focusing on security of supply, diversification of energy sources, and improved energy efficiency. The NECP provides an integrated policy framework for decarbonisation, aligning national objectives with European climate and energy goals. It sets a target of at least 42% of total final energy consumption (TFEC) from renewable energy sources by 2030. The plan has been continuously refined during 2022–2024 to reflect developments in the energy sector and evolving obligations under the Energy Community framework. The NECP is developed in coherence with broader national and international strategies, including the National Energy Strategy, the National Strategy for Development and Integration (NSDI II), the United Nations Framework Convention on Climate Change (UNFCCC), and the Energy Community acquis. Together, these instruments form the backbone of Albania's operational approach to energy transition.

National Operational Alignment

Albania's national priorities are closely aligned with EU climate and energy policy directions, particularly the European Green Deal. The transition is framed not only in terms of decarbonisation, but also in terms of ensuring a just and inclusive process that supports economic development and social cohesion. Within this context, renewable energy expansion is a central priority. Albania aims to reduce its reliance on energy imports and increase domestic electricity generation through diversification beyond hydropower, with a growing focus on solar and wind energy. This strategy also reflects the country's ambition to become a net electricity exporter by 2030, positioning renewable energy as both an environmental and economic driver. To support implementation, institutional coordination mechanisms have been established, notably the Inter-Ministerial Energy and Climate Committee (IECC), which ensures that policies and measures are feasible and aligned with national priorities. In parallel, the development of investment-friendly frameworks aims to attract foreign direct investment (FDI) into the renewable energy sector. Overall, Albania's operational alignment reflects a gradual but consistent effort to harmonize national policies with EU objectives, while adapting them to domestic conditions and development needs.

2.5.3 R&I National & Regional Capacities

R&I Support Infrastructures

Albania's research and innovation (R&I) framework is primarily guided by the National Strategy of Science, Technology and Innovation (STI) 2022–2030. This strategy defines the overall vision, policy priorities, and strategic objectives for strengthening the national innovation ecosystem. It is considered a horizontal policy instrument, as it directly supports the development of economic, social, and cultural sectors. The STI Strategy focuses on improving the legal, institutional, and financial framework for research and innovation, promoting cooperation between academia and the business sector, and strengthening awareness of the role of innovation in national development. It also emphasizes the importance of enhancing cooperation at regional, European, and global levels. Institutionally, the National Agency for Scientific Research and Innovation (NASRI) plays a central role in funding and supporting research activities. Operating under the Ministry of Education, Sports and Youth, NASRI aims to strengthen scientific research, promote technological development, and support integration with higher education institutions. Complementing this, the National Agency for Higher Education Financing (NAHEF) allocates public funding to higher education institutions and supports students through scholarships and targeted funding schemes. It also contributes to strengthening priority study areas and enhancing human capital development in sectors relevant to innovation and energy transition.

Key Technologies Progress

Information on specific technological progress in offshore or wind energy remains limited. However, the broader STI framework highlights the importance of advancing research and innovation capacities that can support emerging sectors, including renewable energy technologies. Current efforts are primarily focused on strengthening research systems and increasing participation in international research programmes, which can indirectly contribute to technological development. In this context, the development of renewable energy technologies, including wind energy, is expected to benefit from improved research capacity and increased access to external expertise and funding.

Good Practices Adoption

Albania's participation in European research programmes represents a key mechanism for knowledge transfer and capacity building. As an associated country, Albania has been actively involved in EU Framework Programmes, starting with FP7 and continuing with Horizon 2020. Under FP7, Albanian entities participated in 39 projects, receiving approximately €2.27 million in funding. Participation increased under Horizon 2020, with 49 approved projects and €5.27 million in EU contributions. This upward trend indicates a growing integration into the European Research Area and improved engagement of national institutions in international research initiatives. Such participation contributes to the adoption of good practices, including collaborative research, exposure to advanced methodologies, and alignment with European innovation standards. These elements are particularly important for emerging sectors such as renewable energy, where domestic capacities are still developing.

2.5.4 Employment Capacities

Existing Workforce

The deployment of renewable energy in Albania is expected to generate a range of socio-economic benefits, including employment creation, income generation, and broader contributions to economic development. While parts of the renewable energy value chain are currently sourced from outside the country, a significant share of activities, and particularly in transport, construction, and supporting services, can be covered by the domestic workforce. Local industries can therefore play an immediate role in supporting renewable energy deployment, contributing to job creation and local income. Estimates suggest that with adequate skills, a substantial proportion of the workforce required for renewable energy projects can be sourced locally, strengthening regional economies and supporting broader socio-economic development.

Wind Energy Professionals

As renewable energy projects scale up, there is increasing potential for the development of a more specialised workforce. In wind energy projects, particularly offshore, a significant share of jobs relates to operation and maintenance activities, which can largely be performed by locally based professionals if appropriate skills are available. For example, in a typical offshore wind project, a considerable portion of the workforce is dedicated to long-term operation and maintenance, offering opportunities for sustained local employment. However, specialised expertise—particularly in advanced technical areas—may still require external support, reflecting the current stage of sector development in Albania. Public acceptance of renewable energy projects is generally positive, with communities showing openness toward wind and solar development. However, concerns have been raised regarding planning procedures, particularly in relation to permitting processes in environmentally sensitive areas without comprehensive environmental assessments. These issues highlight the importance of strengthening governance and professional standards within the sector.

Wind Energy Training Programs

Information on structured training programmes for wind energy in Albania remains limited. While there is recognition of the need for a skilled and certified workforce, particularly for installation, operation, and maintenance activities, dedicated training systems are still developing. Strengthening workforce capacity will require increased efforts in skills development, including the provision of training programmes, certification schemes, and greater awareness of the economic and environmental benefits of renewable energy. In this context, the role of government is critical in supporting capacity building through transparent processes, appropriate financial mechanisms, and the development of sustainable business models that can support long-term sector growth.

2.5.5 Offshore Wind Energy Investment Opportunities

Tax Incentives

Albania's renewable energy investment environment is supported by a developing legislative framework aimed at improving market transparency and reducing regulatory risk. Law No. 24/2024 on the stimulation of renewable energy resources introduces competitive, market-based mechanisms—primarily through auctions—for solar, wind, and hybrid energy development. This approach supports transparent price discovery and enhances investor confidence. The broader legal framework includes provisions for investor protection under Law No. 55/2015, which ensures fair treatment and access to international arbitration mechanisms. In addition, Albania's EU candidate status and ongoing alignment with EU Directive 2018/2001 contribute to regulatory stability, reducing uncertainty for long-term investments in the renewable energy sector.

Fundings

Public policy and national planning instruments play a key role in shaping investment opportunities. The National Energy and Climate Plan (NECP 2021–2030) establishes legally binding targets, including increasing the renewable energy share to 54.4% by 2030 and expanding non-hydro renewable capacity, with a focus on solar and wind energy. The implementation of competitive auctions has already demonstrated the mobilisation of investment capital. The 2023 auctions awarded 300 MW of generation capacity and attracted approximately €350 million in confirmed investment, indicating active market participation and providing pricing benchmarks for future projects. Favourable natural conditions, particularly strong solar irradiance, further enhance project economics by enabling higher capacity factors compared to other European regions. Combined with relatively low land and labour costs, these factors contribute to improved financial viability for renewable energy projects.

Loans

The regulatory framework supports bankable financing structures, particularly through Power Purchase Agreements (PPAs), which provide revenue certainty for investors. Both government-backed and corporate PPAs are available, depending on project scale and investor preferences, facilitating access to debt financing. At the same time, financing conditions are influenced by infrastructure-related factors. Albania's power system is undergoing a transition toward increased complexity due to the growing share of renewable energy. Transmission system operators face challenges related to congestion management and unscheduled cross-border flows, reflecting the need for further grid investment and modernisation. The absence of advanced control technologies, such as phase-shifting transformers, in parts of the transmission system highlights ongoing infrastructure gaps. These elements are relevant for lenders and investors, as grid capacity and connection timelines directly affect project bankability. Currency exposure is another consideration, as Albania operates outside the Eurozone. However, relative currency stability and the structure of power revenues may provide partial mitigation of this risk.

VCs/Angels

Private investment interest in Albania's renewable energy sector is supported by favourable project economics and emerging market opportunities. Cost advantages—including lower land acquisition costs, competitive construction pricing, and favourable labour rates—contribute to higher potential returns compared to more mature European markets. Albania's position within the regional electricity grid, with interconnections to Montenegro, Kosovo, North Macedonia, and Greece, enhances opportunities for power export and integration into wider energy markets, further increasing investment attractiveness. Successful project development often depends on the involvement of experienced local partners who can navigate regulatory processes, permitting requirements, and grid connection procedures. In this context, support services such as market entry advisory, project identification, due diligence coordination, and asset management play an important role in facilitating investment.

2.5.6 Internationalization Initiatives

Connections to International Value Chains

Albania's integration into international value chains in the renewable energy sector is primarily driven by the active involvement of International Financial Institutions (IFIs) and Development Finance Institutions (DFIs). These actors play a central role in enabling project development while reducing perceived investment risks. The EBRD is a key player, having invested over €2.2 billion across various sectors in Albania. Its role extends beyond financing, providing technical assistance, governance standards, and a degree of political risk mitigation. In the energy sector, the EBRD supports the diversification of generation sources, particularly solar and wind, as part of Albania's broader transition toward a decarbonised energy system. The introduction of offshore wind as a potential technology is seen as contributing to a more stable and predictable energy mix, especially in a system historically dominated by hydropower. Albania's connection to international financing structures is further strengthened through EU co-financing mechanisms. Renewable energy projects often combine loans from international institutions with EU investment grants, improving financial viability and reducing equity requirements. For example, a 50 MWp solar project is being developed with an EBRD sovereign-guaranteed loan of up to €30 million, complemented by an EU grant of up to €8 million. The presence of these institutions has enabled the development of a functioning project finance environment, allowing investors to structure bankable projects with appropriate leverage. This is reinforced by a growing pipeline of successfully implemented projects, such as the 140 MW Karavasta solar park (operational in 2024) and the Spitalla solar project (connected in 2025), which demonstrate Albania's capacity to deliver large-scale renewable energy investments and integrate them into the grid.

ADRIONWIND Prospects

Within the context of regional cooperation, Albania's engagement in offshore wind and broader renewable energy development presents opportunities to align with initiatives such as ADRIONWIND. While the current national focus remains primarily on solar and onshore wind, the exploration of offshore wind is increasingly recognised as part of a longer-term diversification strategy. Offshore wind offers several system-level advantages for Albania, including more stable and predictable generation patterns and complementarity with hydropower. These characteristics are particularly relevant in the Adriatic-Ionian context, where cross-border coordination and shared infrastructure could enhance overall system efficiency and resilience. Through participation in regional initiatives, Albania can benefit from knowledge transfer, technical cooperation, and alignment with emerging Adriatic-Ionian offshore wind strategies. The involvement of international financial institutions and EU-supported frameworks further positions the country to gradually integrate into regional energy networks and innovation ecosystems, supporting future participation in collaborative projects and transnational value chains.

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2.6. Montenegro National Context Analysis

2.6.1 EU & Global Framework

Montenegro's energy transition is deeply shaped by both EU and global frameworks, reflecting its dual position as a Contracting Party of the Energy Community Treaty and as a candidate country for EU accession. This dual status places the country under obligations to progressively align its legislation and strategic documents with the EU acquis on climate, energy, and the environment, while also benefiting from international cooperation and pre-accession support.

At EU level, Montenegro's policy environment is strongly influenced by the European Green Deal (2019), which sets the vision of climate neutrality by 2050. This overarching framework is operationalised through a set of more specific initiatives: the Fit-for-55 Package, which requires ambitious greenhouse gas reductions and a higher share of renewables by 2030; the REPowerEU Plan, designed to accelerate renewable deployment and reduce fossil fuel dependency; and the EU Offshore Renewable Energy Strategy (2020), which defines concrete capacity targets for offshore wind across Europe (60 GW by 2030 and 300 GW by 2050). In addition, the Maritime Spatial Planning Directive provides an important reference point for Montenegro, given its Adriatic coastline and the potential for offshore wind integration into broader marine spatial planning processes.

For Montenegro, these frameworks are not abstract obligations but concrete drivers of national policy reform. The country is currently preparing its first National Energy and Climate Plan (NECP), which will define the national pathway for 2030 and 2050 in line with EU expectations. Existing strategies, such as the Energy Development Strategy until 2030 and the recently adopted Law on Renewable Energy Sources (2024), already reflect this process of alignment. Furthermore, Montenegro's access to financial and technical support through IPA III, Interreg ADRION, Horizon Europe, and CEF Energy ensures that the ambitious goals set at EU and global level can be gradually translated into practice.

Links to National Contexts

Montenegro's energy transition policies are directly shaped by the global and EU agendas described above, while remaining grounded in the country's own strategic, legal, and institutional framework. As a member of the Energy Community, Montenegro has committed to adopting large parts of the EU energy acquis, while as an EU candidate state it is progressively aligning its domestic policies with the requirements of the accession process.

A central element of this alignment is the preparation of the National Energy and Climate Plan (NECP), which will for the first time provide an integrated roadmap for renewable energy deployment, decarbonisation, and energy efficiency up to 2030 and 2050. Although still under preparation, the NECP is expected to follow the structure defined by the European Commission and will therefore embed Montenegro firmly into the wider European transition trajectory.

In parallel, several existing documents already link Montenegro to EU priorities. The Energy Development Strategy until 2030 sets the direction for diversifying the energy mix and expanding renewable capacity, while the recently adopted Law on Renewable Energy Sources (2024) provides the legislative foundation for supporting renewable deployment, including wind. Offshore wind is not yet explicitly mentioned in these documents, but the legislative and strategic basis now in place creates the conditions for its consideration in the near future.

Another relevant dimension is maritime policy. The Law on Maritime Property regulates the use of Montenegro's coastal and marine space and will be critical for enabling future offshore wind projects. Its alignment with the EU's Maritime Spatial Planning Directive represents a key step toward integrating energy production into broader coastal management.

Finally, Montenegro benefits from its participation in EU and regional funding frameworks. Through IPA III, Interreg ADRION, Horizon Europe, and CEF Energy, Montenegro gains access to financial support, technical expertise, and transnational cooperation opportunities that directly link its national policies to the EU's decarbonisation agenda.

Coordination Mechanisms with Countries

Montenegro's integration into the EU and global energy transition framework is not only a matter of aligning national strategies with European policies, but also of participating in structured coordination mechanisms that facilitate this process. As a Contracting Party to the Energy Community Treaty, Montenegro is legally bound to adopt large parts of the EU energy acquis, including directives on renewable energy, energy efficiency, electricity market reforms, and climate policies. This treaty functions as the main gateway through which EU obligations are extended to non-EU countries in the Adriatic–Ionian region, ensuring that Montenegro's energy transition evolves in parallel with that of EU Member States.

Beyond the Energy Community, Montenegro benefits from EU pre-accession instruments, most notably the IPA III programme, which provides both financial and technical support for projects in renewable energy, infrastructure, and innovation. Participation in cross-border and transnational cooperation programmes, particularly Interreg ADRION, has created opportunities for Montenegro to work jointly with neighbouring countries on renewable projects, maritime spatial planning, and capacity building.

Montenegro is also linked to the EU's broader research and innovation ecosystem through Horizon Europe and Connecting Europe Facility (CEF) Energy. These instruments allow Montenegrin institutions and companies to participate in joint R&I projects and infrastructure development, building synergies with EU partners. At the macro-regional level, the EU Strategy for the Adriatic and Ionian Region (EUSAIR) represents another important mechanism, as it explicitly integrates clean energy and blue economy priorities into regional cooperation. For Montenegro, this means that offshore wind can be developed not in isolation, but as part of a shared Adriatic–Ionian vision involving Italy, Croatia, Albania, Greece, and BiH.

R&I National Priorities

Montenegro's national R&I priorities in this context focus on renewable energy deployment, with offshore wind positioned as a medium-term opportunity; grid modernisation and regional interconnection with Italy, Croatia, Albania, and Serbia; research and innovation in marine energy technologies supported by universities and institutes; capacity building and workforce reskilling in line with Smart Specialisation priorities; and strengthened regional cooperation through EUSAIR and the Energy Community.

R&I priorities are increasingly shaped by its EU accession process and by support from regional cooperation initiatives. While offshore wind remains at an early conceptual stage, the broader energy transition agenda is creating the conditions for it to emerge as a medium-term priority. A central framework in this regard is the Smart Specialisation Strategy (S3), which Montenegro has been developing in recent years. The S3 process identifies energy and sustainable technologies as key pillars for innovation-driven growth, opening space for offshore wind to be positioned as a niche within the wider blue economy. Although not yet fully operationalised, the S3 framework provides a policy anchor for research institutions and SMEs to engage in renewable and maritime technology development. The Just Transition Mechanism (JTM) is less directly applicable compared to coal-dependent economies, but the principle of workforce reskilling remains highly relevant. As Montenegro reduces reliance on fossil fuels and increases the share of renewables, there is a growing need to retrain technical staff and prepare new generations of engineers, planners, and technicians for emerging fields such as offshore energy.

Montenegro also benefits from IPA III funding and other EU pre-accession instruments, which are essential for building R&I and infrastructure capacities. The forthcoming National Energy and Climate Plan (NECP) is expected to be the main vehicle for integrating these R&I priorities, reflecting the targets of the European

Green Deal and Fit-for-55 while providing a roadmap for renewable deployment, grid modernisation, and innovation support. Montenegro's R&I priorities therefore focus on renewable energy deployment, workforce reskilling, and integration into regional and EU research networks, with offshore wind positioned as an emerging area within the Smart Specialisation Strategy and future NECP.

2.6.2 National Energy Transition Priorities

Montenegro's energy transition priorities are determined by a combination of domestic policy commitments and the country's obligations as an EU candidate state and Energy Community Contracting Party. The strategic direction is clear: to diversify the energy mix, expand the share of renewable sources, strengthen grid infrastructure, and progressively decarbonise the economy in line with European standards. The central policy process in this regard is the preparation of the National Energy and Climate Plan (NECP), which will provide a comprehensive roadmap for 2030 and beyond. Although still under development, the NECP is expected to define concrete targets for renewable energy deployment, energy efficiency, emissions reduction, and research and innovation priorities. It will serve as the main national anchor for alignment with the European Green Deal, Fit-for-55 Package, and REPowerEU Plan. Existing frameworks already point towards these priorities. The Energy Development Strategy until 2030 outlines goals for increasing the share of renewables, modernising the grid, and integrating with regional energy markets. The recently adopted Law on Renewable Energy Sources (2024) strengthens the legislative basis by setting rules for incentives, grid connection, and certification of renewable projects.

While offshore wind is not yet explicitly included, the law creates an enabling environment for future projects by providing clarity on permitting, support schemes, and investor security. Maritime policy also plays a relevant role. The Law on Maritime Property governs the management of Montenegro's coastal and marine zones, making it a key instrument for any future offshore wind deployment. Its harmonisation with the EU Maritime Spatial Planning Directive may enable the designation of offshore energy zones in the Adriatic, balancing energy development with environmental protection and tourism. Operational programmes complement this strategic framework. Montenegro has adopted action plans for renewable energy, energy efficiency, and climate adaptation, which provide a short-term basis for implementation. Participation in IPA III and Interreg ADRION further supports pilot initiatives, stakeholder engagement, and knowledge transfer. Montenegro's energy transition priorities are therefore framed by the forthcoming NECP, the Energy Development Strategy, and the Renewable Energy Law, with offshore wind emerging as a potential medium-term component through alignment with EU climate and maritime policies.

National Operational Programmes

Montenegro has adopted several operational programmes and planning instruments that guide its energy transition and create the foundation for integrating offshore wind into future strategies. These programmes are linked both to domestic priorities and to obligations stemming from the Energy Community and EU accession process. At the national level, the Energy Development Strategy until 2030 provides a roadmap for diversification of the energy mix, increased deployment of renewables, and gradual reduction of dependency on fossil fuels. While it focuses mainly on hydropower, onshore wind, and solar, it establishes the principle of expanding renewable energy capacity, thereby opening space for offshore wind as a future option.

The National Renewable Energy Action Plans (NREAPs) and Energy Efficiency Action Plans set short- and medium-term targets for renewable deployment and energy savings. Prepared within the Energy Community framework, these documents establish binding obligations for Montenegro, particularly in electricity generation and grid integration. A significant step forward has been made with the adoption of the Law on Renewable Energy Sources (2024), which introduces support schemes for renewable projects, regulates grid connection procedures, and strengthens investor confidence. Although offshore wind is not explicitly addressed, the framework is sufficiently flexible to accommodate new technologies as the market evolves.

National Operational Alignment

Montenegro's operational programmes and legislative framework are increasingly aligned with the broader European energy transition agenda. This alignment is both a political requirement, linked to EU accession, and an economic necessity, given the country's dependence on regional electricity trade and investment flows.

The forthcoming NECP will serve as the main instrument for aligning national targets with the European Green Deal and the Fit-for-55 Package. By defining binding targets for greenhouse gas reductions, renewable deployment, and energy efficiency, Montenegro will ensure that its national trajectory mirrors EU ambitions for 2030. Important steps in this direction have already been taken through the introduction of renewable support schemes and the adoption of the Law on Renewable Energy Sources (2024).

Alignment with the REPowerEU Plan is reflected in efforts to accelerate renewable deployment and strengthen regional interconnections. Cross-border links with Italy, Croatia, Albania, and Serbia are essential for energy security and for enabling large-scale renewable integration, including future offshore wind. Participation in the Energy Community's Decarbonisation Roadmap further reinforces this alignment by ensuring that Montenegro follows similar principles to EU Member States in phasing out fossil fuels and modernising the grid.

Maritime and spatial planning frameworks also contribute to this process. The Law on Maritime Property provides a basis for integrated coastal management, which can be aligned with the EU Maritime Spatial Planning Directive to open space for offshore renewable development in the Adriatic. This illustrates how energy and maritime policies are increasingly interconnected.

Beyond legislation, alignment is supported through participation in IPA III, Interreg ADRION, Horizon Europe, and CEF Energy. These programmes facilitate project financing, research collaboration, and infrastructure development, embedding Montenegro's priorities within transnational initiatives.

Overall, Montenegro's operational framework is progressively harmonised with EU climate and energy policies, with the NECP, Renewable Energy Law, and maritime legislation acting as key bridges between national priorities and the objectives of the European Green Deal, Fit-for-55, and REPowerEU.

2.6.3 R&I National & Regional Capacities

Montenegro's R&I capacities in the energy sector are still developing, but the country has established a solid foundation for regional cooperation and gradual integration into European research networks. These capacities are shaped by domestic institutions, participation in regional platforms, and access to EU pre-accession instruments.

R&I Support Infrastructures

Montenegro's capacity to participate in offshore wind development is underpinned by a combination of research institutions, government agencies, and emerging innovation infrastructures. While still modest compared to larger economies, these structures provide a foundation for building expertise and supporting integration into the Adriatic–Ionian offshore wind ecosystem.

The higher education sector plays a central role. The University of Donja Gorica (UDG) contributes expertise in innovation management, renewable energy policy, and entrepreneurship, while the University of Montenegro (UoM) provides technical know-how through its Faculty of Electrical Engineering and the Institute of Marine Biology in Kotor. These institutions also participate in EU-funded projects, ensuring knowledge transfer and regional cooperation.

Government bodies and agencies form another essential component. The Ministry of Energy and Mining is responsible for strategic planning and regulatory alignment with EU frameworks, while the Energy Regulatory Agency (REGAGEN) oversees the electricity market and renewable support schemes. The Environmental Protection Agency contributes through environmental impact assessments and climate adaptation measures, both critical for offshore wind development.

Innovation support infrastructures are modest but growing. The Innovation Fund of Montenegro, along with science and technology parks in Podgorica, provides support for start-ups and SMEs developing new technologies, some of which are relevant to renewable energy and ICT solutions that could be applied in the offshore wind sector. Although Montenegro does not yet have specialised offshore energy clusters, its industrial sectors — particularly port operations in Bar, ship repair facilities, and electrical equipment industries — represent transferable capacities that could be adapted to offshore wind supply chains.

Key infrastructures with offshore relevance include Luka Bar (Port of Bar), with logistics and maritime handling capacities, and ship repair facilities that could be adapted for turbine assembly and maintenance. While not yet tailored to offshore renewables, these assets represent important building blocks for future supply chains.

Key Technologies Progress

Montenegro has made notable advances in renewable energy technologies, particularly in onshore wind and solar, which provide valuable experience for potential offshore wind development. These developments demonstrate the country's capacity to manage permitting, investor engagement, and grid integration for variable renewable energy sources.

Onshore wind has seen tangible progress. The Krnovo Wind Farm (72 MW) has been operating since 2017, followed by the Možura Wind Farm (46 MW) in 2019. Together, they represent almost 120 MW of installed capacity and provide practical experience in planning, environmental permitting, and integration into the transmission system.

Grid modernisation is progressing but remains a key challenge. The transmission system operator CGES has invested in strengthening infrastructure and completed the undersea interconnector with Italy in 2019. This link significantly enhances Montenegro's role in the regional energy market by enabling greater flexibility in exporting and importing electricity. For offshore wind, such interconnections are particularly important as they provide balancing capacity for variable generation.

Although offshore wind projects are not yet in place, certain industrial sectors show adaptability. Ship repair facilities, steel fabrication capacities, and port logistics in Bar could be mobilised for offshore wind assembly, maintenance, and supply chain activities. While limited in scale, this industrial base provides a starting point for developing offshore-related competencies.

Good Practices Adoption

Montenegro has increasingly adopted good practices from the EU and regional partners to strengthen its renewable energy transition and prepare for offshore wind development. While offshore projects have not yet been implemented, several areas demonstrate effective knowledge transfer.

A key development is the alignment of coastal management with the EU Maritime Spatial Planning Directive. The Law on Maritime Property regulates marine space use, and ongoing efforts aim to integrate energy production with environmental protection. This is essential for enabling offshore renewable zones while balancing tourism, fisheries, and biodiversity.

Participation in EU-funded projects, particularly under Interreg ADRION, IPA, and Horizon Europe, has facilitated the transfer of best practices from countries with established offshore wind sectors, such as Denmark, the Netherlands, and Germany. These include approaches to stakeholder engagement, transparent permitting, and the use of digital tools for environmental monitoring and grid management.

Community engagement is another area of learning. Public acceptance is critical in a small country where energy projects can face environmental and social concerns. Drawing on experiences from countries such as Croatia and Greece, Montenegro is gradually improving consultation processes and exploring ways to ensure local benefits from renewable investments.

Finally, Montenegro is strengthening links between academia, industry, and policy through participation in transnational R&I consortia. This helps introduce advanced technical and policy practices into the national context.

2.6.4 Employment Capacities

The energy Montenegro's Adriatic coastline, experience with variable renewables, and integration with EU energy policy create a credible pathway for offshore wind as a medium-term investment opportunity. While no offshore projects are currently under development, a combination of regulatory clarity, grid planning, port upgrades, and appropriate financing instruments could enable pilot and commercial investments in the coming years. The country's deep-water conditions naturally point toward floating offshore wind as the most suitable technology.

Existing Workforce

Montenegro's energy sector employs a workforce with a strong industrial and technical background, primarily concentrated in the Electric Power Company of Montenegro (EPCG), transmission system operator CGES, and related utilities. Additional employment is tied to port operations in Bar, ship repair facilities, and small manufacturing industries, all of which could be relevant for the offshore wind supply chain. Although there is no offshore workforce yet, these existing capacities provide a transferable base for future development.

Wind Energy Professionals

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Wind Energy Training Programs

Higher education institutions are beginning to adapt. The University of Montenegro (Faculty of Electrical Engineering) and the University of Donja Gorica (UDG) both offer programmes in energy systems, while the Institute of Marine Biology provides expertise in marine ecosystems and environmental monitoring. These programmes could evolve into specialised offshore curricula. Vocational training centres also provide skills in welding, electrical installation, and heavy machinery, which are directly transferable to offshore wind construction and maintenance.

International support is available through Erasmus+ mobility programmes, EIT InnoEnergy, and Interreg ADRION projects, which create opportunities for joint training and exchange with EU countries that already have established offshore wind sectors.

Montenegro's workforce is technically skilled but lacks specialised offshore expertise. Universities, vocational centres, and international programmes provide a solid base for reskilling and training, enabling the country to prepare its labour market for potential offshore wind deployment.

2.6.5 Offshore Wind Energy Investment Opportunities

Tax Incentives

Montenegro's investment framework for renewable energy is primarily defined through the Law on Renewable Energy Sources (2024), general energy legislation, and supporting regulatory instruments. While specific offshore wind tax incentives are not yet explicitly defined, the broader legislative framework provides the basis for investor security through clear permitting procedures, grid connection rules, and certification mechanisms.

Investor protection is further supported through transparent regulatory oversight and alignment with EU energy and state-aid frameworks, which reduces regulatory uncertainty and enhances long-term investment predictability. As offshore wind develops, secondary legislation is expected to further clarify seabed leasing, permitting timelines, and financial obligations, contributing indirectly to a more attractive investment environment.

Fundings

Public and blended funding instruments represent a key pillar for offshore wind development in Montenegro, particularly in early-stage and pilot phases. Given the first-of-a-kind nature of offshore projects, access to EU and international funding mechanisms is essential for de-risking investments.

Available funding sources include:

- IPA III, supporting capacity building, early-stage studies, and institutional development
- Interreg ADRION, facilitating regional cooperation, pilot projects, and knowledge exchange
- Horizon Europe and the Innovation Fund, supporting demonstration of floating offshore wind technologies and low-carbon solutions
- Connecting Europe Facility (CEF Energy), financing grid infrastructure and cross-border energy assets

These instruments can be combined to support feasibility studies, environmental assessments, and early deployment phases, particularly for pilot-scale offshore wind projects.

Loans

Loan-based financing, particularly through international financial institutions (IFIs), is expected to play a central role in Montenegro's offshore wind investment landscape. Institutions such as the EIB, EBRD, and KfW are identified as key potential lenders for infrastructure and energy projects.

These loans are particularly relevant for:

- grid expansion and reinforcement
- port upgrades (e.g., Port of Bar)
- early-stage offshore wind capital expenditure

The use of blended finance structures, combining concessional loans with grants and guarantees, is highlighted as essential to reduce financing costs and improve project bankability. Risk-sharing tools, including guarantees and first-loss mechanisms, can further support investor confidence, particularly in early deployment phases.

VCs / Angels

Equity investment in offshore wind in Montenegro remains at an early stage, with no dedicated venture capital or angel investment ecosystem specifically targeting offshore renewable energy. However, the broader innovation landscape, supported by the Innovation Fund of Montenegro and regional cooperation initiatives, provides a foundation for future participation of SMEs and private investors.

Opportunities for equity participation are expected to emerge primarily through:

- partnerships with international developers
- participation of local SMEs in supply chains (e.g., maritime services, fabrication, logistics)
- involvement in innovation-driven components such as digital monitoring, environmental assessment tools, and offshore services
- Soft local content approaches—such as encouraging collaboration with local suppliers and research institutions—can facilitate gradual integration of domestic actors into offshore wind value chains without imposing rigid investment constraints.

Contextual Investment Enablers

Beyond direct financial instruments, Montenegro's investment attractiveness is shaped by several enabling conditions. The regulatory and permitting pathway, including seabed leasing, environmental assessments, and grid connection procedures, remains a critical factor for investor confidence.

Grid and interconnection capacity, particularly the existing subsea interconnector with Italy, enhances the country's ability to integrate offshore wind into regional electricity markets. At the same time, the Port of Bar represents a strategic infrastructure asset that, with targeted upgrades, could support offshore wind logistics, assembly, and maintenance activities.

Environmental and social safeguards, including early baseline studies and stakeholder engagement, are also essential to reduce project risk and ensure alignment with EU standards. Finally, the gradual development of local industrial and maritime capacities offers potential for participation in offshore wind supply chains.

2.6.6 Internationalization Initiatives

Internationalisation is central to Montenegro's positioning within the offshore wind sector. As a small energy system with limited domestic demand, the country cannot rely solely on national projects to develop offshore capacities. Instead, its future role will depend on how effectively it integrates into regional value chains, international markets, and transnational R&I cooperation frameworks.

Connections to International Value Chains

Montenegro's geographic position, industrial base, and port infrastructure provide tangible opportunities to integrate into offshore wind supply chains across the Adriatic and Mediterranean. The Port of Bar, in particular, has the potential to function as a logistics hub for floating platform assembly, operations and maintenance (O&M), and component storage. Existing capacities in metalworking, ship repair, and electrical installations could be leveraged to support offshore wind activities, allowing Montenegro to position itself as a niche supplier—such as in maritime services, mooring systems, or environmental monitoring—rather than competing directly with larger EU manufacturing centres.

At the regional level, Montenegro's participation in EUSAIR strengthens its integration into coordinated offshore wind development. EUSAIR promotes cooperation in blue economy, clean energy, and sustainable transport, all of which are directly relevant to offshore wind. Through this framework, Montenegro can align its policies with neighbouring countries—Italy, Croatia, Albania, and Greece—particularly in areas such as maritime spatial planning, environmental standards, and grid interconnections.

The existing subsea interconnector with Italy further reinforces Montenegro's role in cross-border electricity markets. This infrastructure creates opportunities for future offshore wind projects to be integrated into hybrid systems combining generation and transmission assets, enhancing both export potential and system flexibility.

In parallel, Montenegrin universities and research institutions actively participate in Interreg ADRION and Horizon Europe projects, enabling collaboration with leading EU actors in offshore wind technologies. These partnerships support knowledge transfer and capacity building in areas such as floating wind engineering and marine environmental assessment.

Internationalisation is also supported through access to European and international financing instruments. Montenegro can benefit from programmes such as IPA III, Horizon Europe, CEF Energy, and the Innovation Fund, while international financial institutions—including the EIB, EBRD, and KfW—provide access to loans and guarantees. In addition, EU-based innovation platforms and funds, such as EIT InnoEnergy and Climate-KIC, offer pathways for Montenegrin SMEs and start-ups to engage in European clean energy ecosystems

ADRIONWIND Prospects

The ADRIONWIND project represents a key instrument for advancing Montenegro's internationalisation in the offshore wind sector. Through its digital platform, B2B matchmaking activities, and the development of a joint R&I strategy, ADRIONWIND enhances the visibility of Montenegrin stakeholders and facilitates connections with partners across the Adriatic-Ionian region.

In the medium term, the project can act as a catalyst for demonstration projects, training initiatives, and pilot actions, enabling Montenegro to move from a knowledge recipient to an active contributor within the regional offshore wind ecosystem. By fostering collaboration between academia, industry, and public authorities, ADRIONWIND supports the gradual integration of Montenegro into regional value chains and innovation networks.

Overall, Montenegro's internationalisation pathway is based on leveraging strategic assets such as the Port of Bar, strengthening SME participation in cross-border supply chains, aligning policies through EUSAIR and the Energy Community, and actively engaging in EU-funded research and innovation programmes. Within this framework, ADRIONWIND provides a structured platform for cooperation, knowledge exchange, and long-term sector development

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2.7. Bosnia & Herzegovina National Context Analysis

2.7.1 EU & Global Framework

Links to National Contexts

The global energy transition is primarily driven by the Paris Agreement (2015), which commits signatory countries to limiting global warming and accelerating the deployment of renewable energy sources. As a Contracting Party to the Energy Community Treaty, BiH is required to transpose significant parts of the EU energy acquis, making these global and EU-level frameworks directly influential on its national policies.

At the European level, key initiatives such as the European Green Deal, the Fit-for-55 Package, REPowerEU, and the EU Offshore Renewable Energy Strategy provide the strategic backbone for decarbonisation and renewable energy expansion. In particular, the Offshore Renewable Energy Strategy sets ambitious targets of at least 60 GW of offshore wind capacity by 2030 and 300 GW by 2050, shaping both investment trends and regulatory developments across Europe.

For ADRION countries—including BiH—these frameworks influence policy design, access to funding, and grid integration requirements. Although BiH does not currently develop offshore wind projects, the increasing deployment of offshore wind in neighbouring countries such as Croatia, Montenegro, and Italy, combined with interconnected regional power systems, makes offshore wind increasingly relevant for its long-term energy transition.

Coordination Mechanisms with Countries

The interaction between EU and global frameworks and national energy systems in the ADRION region is facilitated through several key coordination and funding mechanisms. The Energy Community Treaty serves as the primary vehicle for aligning BiH with EU legislation on renewable energy, energy efficiency, electricity markets, and climate policies.

In parallel, EU financial instruments such as Cohesion Policy funds and IPA III provide essential support for renewable energy development, grid modernisation, and innovation, indirectly contributing to offshore wind readiness. At the macro-regional level, the EU Strategy for the Adriatic and Ionian Region (EUSAIR) promotes cooperation in blue economy sectors, linking clean energy development with maritime spatial planning and regional sustainability objectives.

Cross-border and transnational programmes—including Interreg ADRION, Horizon Europe, and the Connecting Europe Facility (CEF Energy)—further strengthen cooperation by enabling joint research, pilot projects, and infrastructure planning. For BiH, which is not yet an EU Member State, participation in these mechanisms is particularly important for aligning national systems with EU standards and accessing financial and technical support for the energy transition.

R&I National Priorities

Regional cooperation initiatives play a key role in shaping R&I priorities and directing funding toward energy transition objectives. Smart Specialisation Strategies (S3) across the ADRION region increasingly identify clean energy as a priority area, while BiH is still in the process of developing its own S3 framework.

The Just Transition Fund (JTF) is also relevant, particularly given BiH's reliance on coal, as it supports economic diversification and workforce reskilling toward cleaner energy sectors. In addition, IPA III cross-border and transnational cooperation programmes provide opportunities for joint R&I activities and capacity building in emerging areas such as offshore renewable energy.

Finally, National Energy and Climate Plans (NECPs) serve as key instruments for aligning national strategies with EU climate goals. While offshore wind is not explicitly included in BiH's draft NECP, it is indirectly supported through broader priorities such as renewable energy expansion, grid enhancement, and the development of blue economy approaches

2.7.2 National Energy Transition Priorities

BiH's energy transition priorities are shaped by its obligations under the Energy Community framework and its EU accession trajectory. The country is currently preparing its first NECP, which is expected to define decarbonisation pathways up to 2030 and align national policies with key EU directives, including RED II/III, the Energy Efficiency Directive, and electricity market reforms.

National Operational Programs

A number of national and sub-national programmes support BiH's transition toward a more sustainable energy system. Renewable Energy Action Plans, developed within the Energy Community framework, set binding targets for renewable energy deployment, with a primary focus on hydropower, solar, and onshore wind.

At the strategic level, the draft state-level Energy Strategy and NECP (2021–2030) prioritise the expansion of renewable energy, improvements in energy efficiency, diversification away from coal, and the modernisation of grid infrastructure. These priorities are further supported by entity-level plans in the Federation of BiH (FBiH) and Republika Srpska (RS), which include measures to promote renewable energy deployment, building renovation, and upgrades to district heating systems. In addition, early-stage transport and industry decarbonisation roadmaps are being developed, linking heavy industry to emerging EU low-carbon standards. These initiatives may also open opportunities for future integration into broader regional value chains, including those related to offshore wind.

National Operational Alignment

BiH is progressively aligning its operational frameworks with EU climate and energy policies. The influence of the European Green Deal and the Fit-for-55 Package is reflected in the country's gradual preparation for carbon pricing mechanisms, including steps toward compatibility with the EU Emissions Trading System (ETS), which is expected to improve the competitiveness of renewable energy sources.

At the same time, the REPowerEU agenda—transmitted through the Energy Community—supports regional electricity market integration and the strengthening of cross-border interconnections, which are essential for managing increasing shares of renewable energy.

Through its participation in the EU Strategy for the Adriatic and Ionian Region (EUSAIR), BiH is also engaging with the Sustainable Blue Economy agenda, strengthening cooperation with Adriatic neighbours. While the country does not have direct offshore wind deployment, this regional alignment contributes to long-term readiness for participation in offshore energy systems and supports broader clean energy transformation.

2.7.3 R&I National & Regional Capacities

BiH's R&I capacities in the energy sector are strongly supported by regional cooperation frameworks, including the Energy Community, EUSAIR, and EU-funded programmes such as Interreg ADRION. Through these platforms, the country gains access to research networks, technical expertise, and infrastructure relevant to renewable energy deployment, including emerging offshore wind developments in the wider Adriatic–Ionian region.

R&I Support Infrastructures

R&I support infrastructures in BiH are primarily anchored in its higher education and research institutions. Universities in Sarajevo, Banja Luka, Tuzla, and Mostar conduct research in areas such as renewable energy integration, power systems, and energy efficiency. These institutions form the backbone of the country's scientific capacity in the energy domain.

In parallel, emerging innovation clusters—particularly in the ICT and energy efficiency sectors—represent potential entry points for future engagement in offshore wind-related technologies, especially in areas such as digitalisation and system optimisation.

Regional cooperation platforms further strengthen these infrastructures. Participation in EU-funded programmes enables BiH to engage in joint research activities, knowledge exchange, and early-stage planning related to offshore wind and other renewable energy technologies.

Key Technologies Progress

BiH has made measurable progress in renewable energy technologies, particularly in onshore wind. Existing operational capacity, such as the Podveležje wind farm, along with additional projects currently in permitting, demonstrates growing experience in wind energy development.

At the system level, grid modernisation efforts are underway, led by the transmission system operator NOSBiH. These include digitalisation and the introduction of smart grid solutions, which are essential for integrating higher shares of renewable energy and are directly relevant for any future offshore wind integration.

The country also shows potential industrial readiness in sectors such as steel fabrication and cabling, which could be integrated into offshore wind supply chains. In addition, early-stage developments in energy storage and system flexibility—including battery storage and pumped hydro—are being explored to support long-term balancing of renewable energy systems.

Good Practices Adoption

BiH benefits from the transfer of good practices from EU Member States and neighbouring countries, particularly through its participation in regional and European cooperation initiatives.

In the area of maritime and spatial planning, approaches inspired by the EU Maritime Spatial Planning Directive are being considered, with potential future relevance for offshore energy zones. Participation in joint R&I projects enables the country to benefit from experience gained in more mature offshore wind regions, including North Sea countries, particularly in areas such as system integration and environmental management.

In addition, community engagement models from neighbouring countries are gradually being adapted, supporting more inclusive approaches to renewable energy development and helping to build public acceptance for future projects.

27.4 Employment Capacities

BiH's energy transition has significant implications for employment, particularly given the country's continued reliance on coal and thermal power generation. The shift toward renewable energy sources is expected to reshape labour market demands, creating both challenges and opportunities, especially in regions dependent on fossil fuel industries.

Existing Workforce

The existing workforce in BiH's energy sector is substantial, with approximately 30,000 workers employed in coal and thermal power generation. This workforce is characterised by strong industrial and technical skills, many of which are transferable to renewable energy sectors. Competencies in heavy industry, construction, and logistics could be adapted to support future offshore wind value chains, especially in areas such as component manufacturing, transport, and infrastructure development.

Wind Energy Professionals

Current expertise in wind energy within BiH is primarily concentrated in onshore wind development. While this provides a useful foundation, there are notable gaps in specialised skills required for offshore wind, including marine engineering, offshore installation, and subsea cabling. Addressing these gaps will be essential for future integration into offshore wind value chains. Regional cooperation offers a pathway to bridge these deficiencies, with partnerships—particularly with Croatian and Montenegrin maritime institutions—providing opportunities for knowledge transfer and skills development.

Wind Energy Training Programs

Education and training systems in BiH are gradually adapting to the needs of the energy transition. Universities offer energy-related degree programmes, with emerging modules focused on renewable energy and wind technologies. At the vocational level, training centres provide practical skills such as welding and electrical installation, which are directly transferable to offshore wind construction and maintenance activities. In addition, participation in EU-supported programmes—including Erasmus+, EIT InnoEnergy, and Interreg initiatives—enhances mobility and access to specialised training, particularly in offshore wind technologies. These programmes play an important role in building capacity and aligning the workforce with EU standards.

2.7.5 Offshore Wind Energy Investment Opportunities

Although BiH does not have direct offshore wind development potential, it can still benefit from the sector through regional integration, supply chain participation, and access to EU funding and financing mechanisms. Its role is therefore likely to be indirect, focusing on supporting activities linked to offshore wind deployment in the wider Adriatic–Ionian region.

Tax Incentives

Current tax and incentive mechanisms in BiH are primarily oriented toward onshore renewable energy projects, with no dedicated provisions specifically targeting offshore wind. Existing frameworks include renewable support schemes at the entity level, which provide financial support for energy transition investments. Looking ahead, potential incentive mechanisms could include feed-in premiums, accelerated depreciation schemes for renewable energy assets, and tax reductions for equipment imports. While these are not yet in place for offshore wind, they represent possible avenues for aligning national incentives with emerging regional opportunities.

Fundings

BiH has access to a wide range of EU and international funding instruments that can support its indirect participation in offshore wind development. At the European level, programmes such as Horizon Europe, the Innovation Fund, the Connecting EU Facility (CEF Energy), IPA III, and Interreg ADRION provide financial support for research, infrastructure development, and cross-border cooperation. At the national level, renewable energy support schemes—primarily implemented at the entity level—continue to support investments in clean energy. In addition, regional frameworks such as EUSAIR offer financing opportunities linked to the blue economy and emerging offshore renewable energy initiatives.

Loans

Loan-based financing is an important component of BiH's energy investment landscape. International financial institutions, including the EIB and the EBRD, are already active in the country, providing financing for renewable energy and infrastructure projects. These instruments could also support offshore wind readiness, particularly in areas such as grid modernisation and system integration. Other institutions, such as the World Bank and KfW, contribute through loans targeting grid development and renewable energy integration, which indirectly support the conditions necessary for offshore wind participation. At the domestic level, banks are gradually developing green credit lines, often in cooperation with international financial institutions, further expanding financing options for energy transition projects.

VCs / Angels

Equity investment in offshore wind-related activities remains at an early stage in BiH, with limited presence of dedicated venture capital or angel investors in this field. However, niche opportunities exist in areas connected to offshore wind value chains.

These include digital monitoring and predictive maintenance tools, steel fabrication and logistics services, as well as emerging concepts such as green hydrogen pilots linked to renewable energy systems. EU-based venture capital platforms and innovation ecosystems, such as EIT InnoEnergy and Climate-KIC, could play a role in catalysing investment and supporting the integration of local actors into broader European offshore wind supply chains.

2.7.6 Internationalization Initiatives

Internationalization is a cornerstone of BiH's strategy to integrate into European offshore wind value chains and benefit from regional cooperation within the Adriatic–Ionian (ADRION) area. Given the absence of domestic offshore wind deployment, the country's approach focuses on positioning itself within cross-border supply chains, regional energy markets, and transnational research and innovation networks.

Links to International Value Chains

BiH has several structural advantages that support its integration into international offshore wind value chains. Its heavy industry base, particularly in steel production and mechanical engineering in regions such as Zenica and Tuzla, provides capabilities that could be leveraged for the manufacturing of offshore wind components. In addition, although the country does not have direct access to the sea, cooperation with Adriatic ports in neighbouring Croatia and Montenegro enables BiH to participate in maritime logistics related to offshore wind deployment. Through such partnerships, the country can position itself as a supporting logistics and industrial partner within the regional offshore wind ecosystem. At the energy system level, BiH's integration into regional electricity markets, including participation in day-ahead market coupling with EU neighbours, facilitates renewable energy trade and contributes to system balancing. This interconnectedness is particularly relevant in the context of offshore wind, where cross-border flexibility is essential for managing variable generation.

ADRIONWIND Prospects

ADRIONWIND represents a key platform for strengthening BiH's international engagement in offshore wind development. Through its activities, the project supports joint research and innovation initiatives in offshore technologies, including floating wind, and promotes cross-border collaboration among stakeholders in the Adriatic–Ionian region.

ADRIONWIND also enables the development of training programmes focused on offshore wind skills, contributing to workforce capacity building. In addition, it supports the creation of test sites and demonstration projects at the regional level, offering opportunities for BiH to participate in pilot initiatives despite the absence of domestic offshore installations.

By facilitating the integration of Bosnian industries into European offshore wind supply chains, ADRIONWIND contributes to enhancing competitiveness, fostering innovation, and strengthening regional cooperation. In this way, the project can support BiH's transition from a passive observer to an active participant in the Adriatic offshore wind ecosystem.

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3. Comparative National Analysis

Chapter 3 translates the findings of the national context analyses into a structured and actionable strategic framework for offshore wind development in the Adriatic–Ionian region. Building upon Chapter 2, it moves from country-level assessment to comparative analysis and to the formulation of suggested actions.

3.1. Excellence

3.1.1 National Excellence on R&I Capacities

Across the ADRION countries, R&I capacities in offshore wind and the broader energy transition landscape are unevenly developed, reflecting differences in industrial maturity, infrastructure availability, institutional capacity, and policy implementation. Based on the national analyses, excellence is not concentrated in a single country but it is distributed across domains.

Croatia's excellence is primarily linked to its industrial and maritime capabilities in shipbuilding, marine engineering, offshore services, and applied research. Shipyards such as Uljanik and Brodosplit have participated in international offshore wind projects, including the construction of floating platform components, specialised offshore vessels, and offshore measurement units, positioning Croatia as a capable contributor to international offshore wind supply chains. Croatia also has strong academic and applied research institutions, including the University of Zagreb and the Hrvoje Požar Energy Institute, alongside increasing use of digital tools and marine data platforms such as EMODnet and Copernicus for spatial planning and environmental monitoring. At the same time, the current Croatian spatial-planning framework significantly constrains near-term offshore wind deployment within national waters. Croatia should therefore presently be understood primarily as a supply-chain, industrial adaptation, and regulatory-learning contributor within the Adriatic–Ionian offshore wind ecosystem, rather a near-term offshore deployment market.

Italy demonstrates the highest level of infrastructure and technological readiness within the ADRION area. The country has established strategic port hubs such as Taranto and Augusta to support offshore wind manufacturing, assembly, logistics, and maintenance, particularly for floating offshore technologies. Italy also has advanced industrial ecosystems and regional planning frameworks that integrate energy planning, spatial management, and R&I activities. Significant progress has been made in floating offshore wind technologies such as the HEXAFLOAT platform and projects including Med Wind. These developments are supported by national industrial strategies, EU-funded programmes, and strong participation from technology providers.

Greece demonstrates excellence in academic research and early-stage technological innovation, particularly in adapting offshore wind technologies to Mediterranean environmental conditions. Institutions such as the National Technical University of Athens (NTUA) and the University of Patras are actively engaged in research on floating structures, mooring systems, seismic resilience, and hybrid renewable energy systems. This scientific base is reinforced by organisations such as the Centre for Renewable Energy Sources and Saving (CRES) and the Hellenic Centre for Marine Research (HCMR), which contribute expertise in marine ecosystems, environmental monitoring, and offshore system integration. Although industrial deployment does not exist, Greece has developed a research-oriented ecosystem that combines digitalisation, environmental assessment, and offshore engineering capabilities readying itself for future deployment.

Montenegro, while still at an emerging stage, demonstrates strengths in regional integration, general renewable deployment experience, and infrastructure. The country has operational experience through the Krnovo and Možura onshore wind farms, providing practical knowledge in permitting, grid integration, and renewable energy management. Research and academic support is provided by institutions such as the University of Montenegro, the University of Donja Gorica (UDG), and the Institute of Marine Biology in Kotor, all of which participate in EU-funded cooperation projects that facilitate knowledge transfer and capacity building. Montenegro also has some strategic infrastructure assets, including the Port of Bar, ship repair facilities, and the subsea electricity interconnector with Italy, which strengthens regional electricity integration and could support future offshore wind logistics and balancing services.

BiH exhibits more limited R&I capacities, particularly in academic research, industrial skills transition potential, and regional cooperation. Universities in Sarajevo, Banja Luka, Tuzla, and Mostar contribute to research on renewable energy systems, grid integration, and energy efficiency, while industrial sectors such as steel fabrication, heavy engineering, and electrical equipment manufacturing provide potential entry points into offshore wind supply chains. Ongoing grid modernisation and digitalisation initiatives led by NOSBiH strengthen more technical capacities relevant to renewable integration. In addition, BiH's substantial workforce in coal and thermal power generation creates opportunities for just transition and workforce reskilling toward renewable energy industries.

Albania's R&I capacities remain at an earlier stage of development and are associated with institutional strengthening, renewable energy planning, and participation in EU research programmes. National institutions such as NASRI and NAHEF support research funding and higher education development, while participation in Horizon 2020 and other EU programmes has improved integration into European research networks. Albania has also developed capacities in renewable energy system modelling and integration studies, including the use of tools such as RETScreen and EnergyPLAN for assessing future renewable deployment scenarios.

Table 3 Comparative Overview of National Excellence in R&I Capacities

Country	Key R&I Strengths	Type of Excellence	Level of Maturity
Italy	Strategic port hubs, floating wind technology pathways, HEXAFLOAT, Med Wind pipeline, strong industrial actors	Infrastructure, Technology Development & Industrial R&I	Medium–High
Croatia	Shipbuilding, offshore supply-chain participation, specialised offshore vessels, marine research, LiDAR/data use, regulatory-learning experience	Industrial, Applied Research & Supply-Chain Potential	Medium
Greece	NTUA, University of Patras, CRES, HCMR,	Academic & System Innovation	Medium

	floating wind, mooring systems, seismic resilience, environmental monitoring		
Montenegro	UDG, University of Montenegro, Institute of Marine Biology, Port of Bar, Italy interconnector, onshore wind experience	Regional Integration, Maritime Infrastructure & Renewable Experience	Emerging
BiH	Energy universities, steel/electrical industries, grid modernisation, coal-transition skills base	Academic, Industrial & Just Transition Potential	Emerging
Albania	STI framework, NASRI/NAHEF, Horizon participation, RES integration modelling, renewable energy planning	Institutional, Programme & System-Planning Capacity	Early Stage

3.1.2 National Excellence in Employment Capacities

Croatia's has excellence thanks to its industrial workforce and maritime skills base, which are highly transferable to offshore wind activities. The country's shipbuilding provides a strong pool of workers experienced in heavy engineering, welding, steel fabrication, and marine construction, all of which are directly relevant for offshore and floating wind technologies. Croatia's growing onshore wind sector has also created a base of professionals familiar with wind energy development, grid integration, and operations and maintenance activities. Although the current spatial-planning framework constrains domestic offshore wind deployment, Croatia retains significant workforce potential as a regional offshore manufacturing, logistics, engineering, and supply-chain contributor.

Italy demonstrates the highest level of workforce maturity and workforce–industry alignment within the ADRION region. Its established renewable energy sector, combined with dedicated offshore port hubs and expanding floating wind project pipelines, creates demand for specialised labour across engineering, logistics, manufacturing, environmental assessment, operations, and maintenance. Italy also has links between industry, universities, vocational institutions, and regional development strategies, particularly in southern regions where offshore wind activities are expected to concentrate.

Greece demonstrates strong potential in employment diversification and specialised training development. Existing expertise from the country's mature onshore wind and solar sectors provides a valuable workforce base that can be adapted to offshore. Universities, research centres, and vocational training institutions are increasingly incorporating renewable and offshore-related competencies. EU-supported initiatives contribute to workforce upskilling and knowledge transfer.

Montenegro demonstrates transferable technical skills and targeted workforce reskilling. The country's existing energy workforce, concentrated in EPCG, CGES, and related utilities, possesses strong engineering and operational expertise relevant to renewable energy integration. Additional capacities linked to port operations in Bar, ship repair facilities, and maritime logistics provide transferable skills applicable to offshore wind supply chains. University of Montenegro and University of Donja Gorica (UDG), together with vocational training centres, already provide programmes in energy systems, electrical engineering, welding, and heavy machinery operation. Participation in Erasmus+, Interreg ADRION, and other EU-supported initiatives further strengthens opportunities for workforce development and international knowledge exchange.

BiH has significant workforce transition potential due to the scale of employment currently concentrated in coal and thermal power generation. The country's large industrial labour has strong transferable skills in heavy industry, construction, engineering, logistics, and energy system operations, many of which are relevant for renewable energy and offshore wind supply chains. Universities and vocational training centres already provide education in engineering and technical disciplines, & participation in EU-funded programmes supports upskilling.

Albania's employment capacities are characterised by workforce adaptability and growing renewable energy participation. National assessments indicate that a substantial share of labour requirements for renewable energy projects can potentially be sourced domestically, particularly in construction, installation, and operations and maintenance activities.

Table 4 Comparative Overview of National Excellence in Employment Capacities

Country	Key Employment Strengths	Type of Excellence	Level of Maturity
Italy	Established renewable workforce, strong industry–training links, port and offshore industrial development	Workforce–Industry Alignment	High
Croatia	Shipbuilding and maritime workforce, offshore engineering exposure, transferable industrial and marine-construction skills	Industrial, Maritime & Offshore Supply-Chain Skills	Medium
Greece	Growing offshore-related training, renewable energy expertise, academic–industry collaboration	Diversified Workforce & Training Ecosystem	Medium
Montenegro	Skilled utility workforce, port and maritime capacities, EU-supported training participation	Transferable Skills & Reskilling Potential	Emerging
Bosnia & Herzegovina	Large industrial workforce, coal-transition reskilling	Workforce Transition & Industrial Skills	Emerging

	potential, technical education base		
Albania	Workforce adaptability, domestic participation potential in renewable projects	Local Workforce Availability & Adaptability	Early Stage

3.1.3 National Excellence on Wind Energy Investment Opportunities

Croatia's investment potential is primarily supported by its geographic position, maritime industry capabilities, and growing investor interest in offshore wind development. Although the current spatial-planning framework materially constrains near-term offshore wind deployment within Croatian waters, investor interest and preparatory activities continue to demonstrate long-term strategic relevance. Cross-border initiatives such as the Croatia–Italy Adria Wind feasibility study illustrate Croatia's importance in regional offshore energy cooperation, infrastructure planning, and future Adriatic interconnection concepts. Croatia owns developed port and maritime infrastructure, industrial capacities linked to shipbuilding and marine engineering, and access to EU funding.

Italy demonstrates the highest level of investment maturity and market attractiveness within the ADRION region. Strong investor interest is reflected in offshore grid connection requests exceeding 90 GW, positioning Italy among the most dynamic emerging offshore wind markets in the Mediterranean. The country benefits from policy support mechanisms (PNIEC, FER2), renewable energy auctions, and industrial policies linked to the energy transition. Strategic infrastructure assets, including offshore-oriented port hubs such as Taranto and Augusta, further reinforce Italy's attractiveness for large-scale investments. Major projects such as Med Wind demonstrate the country's ability to attract long-term capital and international partnerships for floating offshore wind deployment.

Greece stands out in terms of public support mobilisation, strategic planning, and a growing international investor interest. The country has established a National Offshore Wind Development Programme coordinated by HEREMA, which provides a structured framework for identifying offshore development areas helping investors. Investment conditions include public and European funding sources (RF, EU structural funds, CfDs) designed to reduce investor risk. Strong interest from international energy companies and investors, including partnerships involving global offshore wind actors, further reinforces Greece's attractiveness. In addition, planned interconnections with Italy strengthen long-term opportunities.

Montenegro's investment strengths are primarily linked to enabling conditions and strategic positioning for future offshore wind development. Although no offshore wind projects are currently under implementation, the country is aligned to EU climate and energy policies, participates in regional cooperation mechanisms, and has access to EU and international financing instruments. The adoption of the Law on Renewable Energy Sources (2024) and the preparation of the NECP improve regulatory clarity and investor confidence for future renewable energy investments. Montenegro has infrastructure assets, including the subsea electricity interconnector with Italy and the Port of Bar, which could support future offshore wind logistics, assembly, and maintenance activities. Access to funding instruments such as IPA III, Interreg ADRION, Horizon Europe, CEF Energy, and financing from institutions such as the EIB and EBRD strengthens the country's long-term investment readiness.

Albania runs renewable energy auctions and also has gained support from international financial institutions, particularly the EBRD and EU co-financing instruments, that have strengthened investor confidence in the renewable sector more generally. The NECP provides visibility for renewable energy deployment and policy alignment with European climate objectives. However, offshore wind remains undeveloped, with no dedicated regulatory framework, project, or specialised infrastructure currently in place.

BiH demonstrates emerging investment potential primarily through access to European and international funding mechanisms and the presence of industrial sectors relevant to renewable energy supply chains. While the country does not possess direct offshore wind deployment potential, participation in programmes such as IPA III, Horizon Europe, Interreg ADRION, and EUSAIR provides access to financing, technical support, and regional cooperation opportunities. International financial institutions, including the EIB, EBRD, KfW, and the World Bank, are already active in supporting renewable energy, grid modernisation, and infrastructure investments within the country.

Table 5 Comparative Overview of National Excellence in Wind Energy Investment Opportunities

Country	Key Investment Strengths	Type of Excellence	Level of Maturity
Italy	Large project pipeline, strong investor interest, advanced policy support (PNIEC, FER2), offshore-oriented port infrastructure	Investment Scale & Market Attractiveness	High
Greece	Public funding mobilisation (RRF, EU funds), offshore planning framework, international investor engagement, interconnections	Policy Support & Investor Engagement	Medium–High
Croatia	Maritime and industrial integration, cross-border energy cooperation, shipbuilding and logistics capacities, strategic Adriatic location	Industrial Integration & Regional Cooperation Potential	Medium
Montenegro	Renewable Energy Law, NECP preparation, Italy interconnector, Port of Bar, EU funding access	Investment Readiness & Strategic Positioning	Emerging
Albania	Renewable energy investment framework, competitive auctions, IFI support, improving policy alignment	Early-Stage Investment Readiness	Early Stage
Bosnia & Herzegovina	Access to EU and IFI funding, industrial supply-chain potential, grid modernisation investments	Funding Access & Industrial Integration	Emerging

3.1.4 National Excellence Internationalization Initiatives

Croatian shipyards and engineering companies have already participated in international offshore wind supply chains, contributing components and technical expertise to offshore and floating wind projects abroad. At the same time, Croatia's participation in EU programmes and macro-regional frameworks such as EUSAIR strengthens cooperation with neighbouring countries and supports integration into offshore wind initiatives. Its strategic Adriatic location further makes Croatia a bridge between Southeast Europe and more mature European offshore wind markets.

Italy demonstrates the highest level of internationalization maturity in the ADRION region. Italy's participation in EU research, infrastructure, and financing programmes is supported by its capacity to host large-scale offshore projects integrated into European supply chains. Port hubs such as Taranto and Augusta, together with offshore manufacturing activities, reinforce Italy's role as a Mediterranean offshore wind hub within international offshore energy value chains.

Greece demonstrates strong internationalization capacity through participation in European energy and research frameworks, including EUSAIR, Horizon Europe, and the EU Offshore Renewable Energy Strategy. The country is increasingly positioning itself within regional offshore wind cooperation networks in the Adriatic–Ionian and Eastern Mediterranean areas. Greece also benefits from growing international partnerships and joint ventures involving global renewable energy companies and participation in EU-funded R&I initiatives related to floating offshore wind technologies. The upcoming grid connection with Italy, will further increase the country's internationalization potential.

Montenegro leverages its geographic location and maritime assets, particularly the Port of Bar and the subsea interconnector with Italy, to position itself as a potential logistics and service hub within future Adriatic offshore wind value chains. Participation in the Energy Community, EUSAIR, Interreg ADRION, Horizon Europe, and other EU-supported initiatives facilitate policy alignment, access to knowledge networks, and integration into regional cooperation frameworks.

BiH demonstrates emerging internationalization potential through cooperations and participation in transnational industrial value chains. Although the country does not possess great offshore wind deployment potential, its participation in the Energy Community, EUSAIR, Interreg ADRION, and EU-funded programmes connects BiH to broader European energy transition initiatives. In addition, the country's industrial base offers some opportunities to participate indirectly in offshore wind supply chains.

Albania demonstrates early-stage internationalization potential mainly through its integration into regional electricity markets and alignment with EU energy and climate frameworks. Participation in Energy Community mechanisms and increasing involvement in EU-supported renewable energy initiatives contribute to the country's gradual integration into the wider European energy system.

Table 6 Comparative Overview of National Excellence in Internationalization Initiatives

Country	Key Internationalization Strengths	Type of Excellence	Level of Maturity
Italy	Integration into international offshore wind value chains, large-scale projects, strategic	Industrial & Market Integration	High

	port hubs, strong EU participation		
Greece	Cross-border interconnections, EU framework participation, international partnerships, offshore R&I cooperation	Policy & Infrastructure Integration	Medium–High
Croatia	Shipbuilding integration into offshore supply chains, maritime expertise, EU and regional cooperation participation	Supply Chain & Maritime Integration	Medium–High
Montenegro	Port of Bar, subsea interconnector with Italy, participation in Energy Community and EU regional initiatives	Infrastructure Connectivity & Regional Positioning	Emerging
Bosnia & Herzegovina	Participation in Energy Community and EU programmes, industrial supply-chain potential, regional cooperation	Regional Cooperation & Industrial Potential	Emerging
Albania	Regional electricity market integration, EU policy alignment, participation in renewable energy cooperation frameworks	Institutional & Market Integration	Early Stage

3.2. Challenges and Gaps

Despite the presence of relevant research institutions and growing participation in EU-funded programmes, ADRION countries continue to face important structural, institutional, technological, and regulatory challenges in developing fully operational R&I ecosystems for offshore wind. The level and nature of these challenges differ significantly depending on industrial maturity, infrastructure readiness, and policy integration.

3.2.1 National Challenges and Gaps on R&I Capacities

In Croatia the current spatial-planning framework hinders offshore wind deployment within Croatian marine areas. Although there are maritime industries, shipbuilding expertise, and academic capacities, there are no operational offshore wind test sites, demonstration facilities, or port infrastructures specifically adapted for offshore wind assembly and maintenance, created the major gaps. In addition, offshore wind remains insufficiently integrated into the national regulatory and spatial planning framework, leading to uncertainty for long-term R&I and industrial investments.

Italy demonstrates advanced technological and industrial capacities but continues to face some governance and implementation challenges, like lengthy and complex permitting procedure and lack of coordination between strategic planning and project implementation. Offshore wind projects encounter delays linked to environmental authorisations, maritime spatial conflicts (fisheries, tourism, shipping activities) and administrative fragmentation between national and regional authorities. In addition, grid readiness and transmission reinforcement remain constraints for large-scale deployment.

Greece possesses strong academic and research capacities in floating wind technologies, marine systems, and environmental monitoring, but practical deployment experience is still limited with a gap between research and industrial application, particularly in manufacturing, offshore installation and supply-chain integration. In addition, Greek ports have not yet been fully adapted to function as offshore wind logistics and assembly hubs. Regulatory complexity and the need for stronger coordination between public authorities and private stakeholders also remain important challenges for accelerating offshore wind deployment.

Montenegro faces challenges associated with short institutional potential, R&I capacity, and the absence of offshore-specific research and industrial frameworks, although participation in EU programmes provides access to knowledge transfer and regional cooperation networks. Offshore wind is not yet formally integrated into national R&I priorities, and specialised expertise in offshore technologies, marine engineering, and applied industrial research remains limited. Additional gaps are the country's relatively small market size, limited industrial diversification, and the early-stage development of innovation support infrastructures.

BiH faces structural and strategic challenges due to fragmented governance, weak coordination between academia and industry, and the absence of offshore wind within national R&I priorities. While universities and industrial sectors are researching offshore wind, their assets are unused. Offshore wind is not yet a strategic R&I area, reducing BiH's ability to integrate into emerging Adriatic offshore value chains and limiting its opportunities for cooperation.

Albania faces significant challenges related to limited R&I funding and the absence of offshore wind within national research and industrial priorities. The country lacks specialised research centres, testing facilities, industrial capacities, and targeted innovation frameworks dedicated to offshore renewable energy. In addition, limited financial resources and relatively weak research–industry linkages constrain Albania's ability to develop a competitive offshore wind R&I ecosystem in the short to medium term.

Table 7 Comparative Overview of National Challenges and Gaps in R&I Capacities

Country	Key Challenges & Gaps	Type of Gap	Level of Constraint
Italy	Permitting delays, lack of long-term strategic clarity, disconnect between R&I and deployment	Regulatory & Strategic Coordination	High
Croatia	Spatial-planning restrictions, lack of offshore test sites, limited specialised port infrastructure, absence of offshore-specific framework, weak research–industry integration	Regulatory, Infrastructure & Integration Constraints	Medium–High
Greece	Limited industrial integration,	Ecosystem	Medium

	early-stage offshore ecosystem, lack of deployment experience	Maturity	
Montenegro	Limited R&I scale, absence of offshore-specific research framework, constrained institutional capacity	Capacity & Scale	Medium
Bosnia & Herzegovina	Weak coordination between academia and industry, lack of offshore focus in R&I priorities	Structural & Strategic Alignment	Medium
Albania	Limited R&I funding, low prioritisation of offshore wind, underdeveloped technological focus	Funding & Prioritisation	Medium

3.2.2 National Challenges and Gaps in Employment Capacities

Despite the presence of a solid industrial and technical workforce across the ADRIONWIND countries, several common employment gaps can be identified, including the lack of offshore-specific training programmes, limited experience in marine and deep-water operations, and insufficient integration between education systems and industry needs.

Croatia's main gap is based on the absence of specialised offshore wind training programmes and the lack of an operational offshore market capable of absorbing and developing specialised skills. While shipbuilding and engineering skills are relevant, they are not yet adapted to offshore wind requirements, particularly in areas such as offshore safety, subsea operations, and floating wind technologies. In addition, the current restrictive spatial-planning framework and uncertain deployment outlook reduce incentives for long-term workforce specialisation and limit the emergence of a stable domestic offshore labour market.

Italy faces challenges in scaling its existing specialised offshore skills in line with projected market demand. The rapid expansion of the offshore wind pipeline may outpace the availability of trained personnel in areas such as offshore installation, marine operations, specialised vessel logistics, and advanced operations and maintenance (O&M). At the same time, delays in permitting and project deployment may slow workforce mobilisation, creating uncertainty for training systems, industrial planning, and long-term skills development.

In Greece, the key challenge is lack of workforce readiness and skills gaps in offshore, as existing expertise is focused on onshore renewable energy. While strong academic and engineering capacities exist, specialised competencies in floating offshore wind technologies, marine engineering, offshore installation, subsea systems, and offshore O&M are still underdeveloped. Additional gaps are lack of port readiness, specialised logistics capacities, and the absence of operational offshore wind experience.

In Montenegro as well, there is currently no dedicated offshore wind workforce. Training programmes are still at an early stage, and the country relies significantly on international knowledge transfer and cooperations to build capacity in specialised areas.

BiH has many workers employed in coal and thermal power sectors, and although many skills are transferable, structured reskilling programmes tailored to offshore wind are still limited. In addition, offshore-specific expertise is absent.

Albania's employment challenges are limited awareness and training. While there is strong potential for local workforce participation, particularly in construction and maintenance, specialised skills in offshore wind energy are underdeveloped. Furthermore, gaps in public information and transparency around renewable energy projects may affect workforce engagement and long-term sector development.

Table 8 Comparative Overview of National Challenges and Gaps in Employment Capacities

Country	**Key Challenges & Gaps**	**Type of Gap**	**Level of Constraint**
Italy	Shortage of specialised offshore skills, mismatch between workforce growth and project pipeline, delayed workforce mobilisation due to permitting	Skills Scaling & Timing	Medium–High
Croatia	Lack of offshore-specific training programmes, uncertain deployment outlook, limited adaptation of maritime skills to offshore wind requirements	Training, Market Development & Skill Specialisation	Medium
Greece	Gaps in offshore technical expertise (marine operations, deep-water installation), workforce still focused on onshore renewables	Skills & Workforce Readiness	Medium
Montenegro	Limited workforce scale, absence of offshore expertise, reliance on international training and knowledge transfer	Capacity & Specialisation	Medium
Bosnia & Herzegovina	Need for large-scale reskilling from coal sector, lack of structured offshore training programmes	Workforce Transition & Reskilling	Medium–High
Albania	Limited specialised training, low awareness and information gaps, procedural issues affecting workforce engagement	Training & Awareness	Medium

3.2.3 National Challenges and Gaps on Energy Transition Investment Opportunities

Croatia's main investment challenges concern regulatory readiness, maritime planning, and infrastructure adaptation. Although investor interest in offshore wind exists and cross-border initiatives such as Adria Wind demonstrate strategic interest in the Adriatic basin, Croatia's spatial-planning restricts the planning of wind power plants on maritime domain and in marine areas, increasing uncertainty and limiting investment visibility. Consequently, no relevant infrastructure exists, making investment even more risky.

Italy, despite possessing the most advanced offshore wind market in the ADRION region, continues to face investment bottlenecks related to permitting complexity, governance fragmentation, and infrastructure adaptation. A large number of offshore wind projects remain under evaluation, while lengthy multi-level authorisation procedures involving environmental assessments, maritime spatial conflicts, fisheries, shipping, tourism, and regional governance structures continue to delay implementation. These delays increase investor uncertainty and financing risks.

Greece faces important investment challenges associated with the early-stage of its offshore wind market and the high costs of floating offshore technologies. Although the country has established strategic planning frameworks and international investor interest, support mechanisms and long-term market structures are still evolving. Permitting procedures remain complex and involve multiple authorities, contributing to investors' uncertainty. Environmental concerns and stakeholder acceptance represent additional constraints affecting investment confidence.

Montenegro faces investment challenges linked to limited market, the absence of an offshore project pipeline, and underdeveloped financing structures. Future offshore wind deployment will probably depend on blended finance structures, international financial institution support, and EU funding. The limited industrial absorption capacity further constrain short- to medium-term investment attractiveness.

Albania has successfully attracted investment into solar and onshore renewable energy projects through auctions and international financing, but offshore wind is not yet integrated into the national investment pipeline. The absence of offshore-specific regulatory frameworks, maritime planning, and dedicated infrastructure limits the country's readiness for offshore wind investment.

BiH faces investment constraints due to fragmented governance, lack of specific policy frameworks, and absence of offshore market. Complex institutional decision-making processes complicate the development of coherent national investment strategies and increase risk for investors.

Table 9 Comparative Overview of National Challenges and Gaps in Energy Transition Investment Opportunities

Country	Key Challenges & Gaps	Type of Gap	Level of Constraint
Italy	Permitting delays, governance fragmentation, grid reinforcement needs, high floating wind investment costs	Regulatory, Infrastructure & Market Coordination	High
Greece	High floating wind costs, evolving support mechanisms, port and grid upgrade needs, stakeholder acceptance issues	Cost, Infrastructure & Market Development	High
Croatia	Restrictive spatial-planning framework, incomplete offshore regulatory pathway,	Regulatory & Infrastructure Readiness	Medium–High

	limited offshore-ready infrastructure and grid adaptation		
Montenegro	Early-stage offshore market, absence of project pipeline, limited financing structures, small market scale	Market Maturity & Financing Capacity	Medium
Albania	Grid congestion, limited offshore strategic focus, absence of offshore-ready infrastructure and frameworks	Infrastructure & Strategic Prioritisation	Medium–High
Bosnia & Herzegovina	No offshore market, fragmented governance, lack of offshore investment frameworks, limited project bankability	Structural & Policy Coordination	High

3.2.4 National Challenges and Gaps on Internationalization Initiatives

Across the ADRION region, several common internationalization gaps can be identified. These include limited experience with cross-border offshore wind projects, insufficient alignment of national regulatory frameworks, and a strong dependence on external expertise and financing. While participation in EU programmes is common, it is still a challenge to integrate integrated into interregional and EU value chains.

While Croatian shipbuilding industry is already connected to global supply chains, offshore wind remains at a preparatory stage. The current restrictive spatial-planning framework and the absence of a clear deployment pathway reduce the country's ability to transition from a supporting industrial and logistics role toward a more central position in cross-border offshore energy projects. Croatia's internationalisation potential currently depends more on supply-chain participation, maritime services, and regional cooperation than on direct offshore deployment.

Italy, despite its strong position in international value chains, faces challenges in translating international engagement into operational offshore deployment. While the country attracts global investors and participates actively in EU initiatives, delays in permitting and project execution limit its ability to consolidate its role as a regional offshore wind leader. This creates a gap between international positioning and actual market delivery.

Greece encounters challenges related to coordination and implementation of cross-border initiatives. Although the country is highly active in EU initiatives and has strong interconnection potential with neighbouring countries, aligning regulatory, environmental, and spatial planning frameworks is still an ongoing process, which may delay regional integration.

Montenegro faces challenges related to limited capacity to actively participate in international value chains. Although well-positioned geographically and institutionally (EUSAIR, Energy Community, and EU programmes), the country's small market size and lack of offshore projects limit its ability to attract large-scale international partnerships, remaining in a limiting prospective role.

Albania's internationalization gaps are linked to sector focus and limited offshore wind interest. While the country benefits from strong engagement with international financial institutions and regional electricity markets, its current internationalization efforts are concentrated on solar and onshore renewables. Offshore wind is not yet integrated into these international initiatives, limiting opportunities for participation in interegional value chains.

In BiH participation in regional frameworks (Energy Community, Interreg ADRION, EUSAIR) is strong, but still the absence of a maritime sector and offshore deployment limits its direct involvement. In addition, coordination challenges at institutional level may hinder effective participation in international initiatives and reduce the country's visibility within regional cooperation platforms.

Table 10 Comparative Overview of National Challenges and Gaps in Internationalization Initiatives

Country	Key Challenges & Gaps	Type of Gap	Level of Constraint
Italy	Gap between strong international positioning and actual project implementation due to permitting delays	Implementation & Delivery	Medium–High
Greece	Limited realisation of cross-border projects, ongoing regulatory and spatial alignment with neighbouring countries	Coordination & Integration	Medium
Croatia	Limited scale of offshore market participation, constrained transition from supply-chain participation to operational offshore project development	Market Integration & Regulatory Readiness	Medium–High
Montenegro	Small market size, lack of projects, limited capacity to attract large-scale international partnerships	Capacity & Market Scale	Medium
Albania	Focus on solar/onshore renewables, limited integration of offshore wind into international initiatives	Sector Focus	Medium
Bosnia & Herzegovina	No direct offshore participation, institutional coordination challenges, limited visibility in value chains	Structural & Institutional	Medium–High

3.3. Joint National Basis

The comparative analysis of the ADRION countries demonstrates that, despite significant differences in market size, maturity, institutional capacity, and offshore deployment readiness, the region shares a common strategy towards energy transition and gradual integration of offshore wind into future energy mixes. This direction is dictated by the European climate and energy policies & the regions' participation in transnational cooperation initiatives. The analysis also demonstrates that offshore wind development remains at an early stage, due to gaps in implementation capacity, infrastructure readiness, workforce ability, and investment maturity. These common challenges simultaneously represent opportunities for coordinated regional cooperation and knowledge sharing.

3.3.1 Commonalities in Excellence, Challenges and Gaps

Across all ADRION countries, a similar pattern can be observed regarding R&I capacities. Academic institutions, research centres, and public authorities are increasingly engaged in renewable energy and energy transition activities, while participation in EU-funded programmes & frameworks such as Horizon Europe, Interreg ADRION, IPA III, and EUSAIR provides important access to knowledge networks and transnational cooperation. However, offshore wind-specific R&I ecosystems remain at relatively early stages of development throughout the region.

Italy and Greece demonstrate comparatively stronger technological and research capabilities, particularly in floating offshore wind, marine systems, environmental monitoring, and system integration. Croatia contributes important industrial and applied engineering expertise through its maritime and shipbuilding sectors. Montenegro, BiH, and Albania participate still face limitations in research infrastructure, industrial integration, and offshore-specific specialization. Across the region, a common gap concerns the weak connection between research activities and commercial deployment, combined with the absence of dedicated offshore testing environments, demonstration sites, and offshore-ready innovation infrastructures.

A similar convergence can be identified in employment capacities. All countries possess technically skilled workforces with relevant backgrounds in engineering, construction, energy systems, logistics, and industrial operations. Maritime and shipbuilding capabilities are particularly relevant in Croatia and Montenegro, while Italy and Greece benefit from more developed renewable energy labour markets and stronger links between academia, industry, and training systems. BiH possesses substantial workforce transition potential due to its large industrial and coal-sector labour base, while Albania demonstrates adaptable workforce capacity in construction and renewable energy services.

Nevertheless, offshore wind introduces highly specialised requirements, like including offshore safety procedures, subsea operations, marine logistics, floating wind technologies, and offshore O&M, that are not yet adequately covered by existing education and vocational training systems. As a result, a common challenge across the ADRION region is the limited availability of offshore-specific expertise and structured workforce development programmes.

In terms of investment opportunities, all ADRION countries are increasingly aligning national policies with EU climate and energy objectives and benefit from access to European funding instruments and international financial institutions. Italy demonstrates the highest level of market maturity and investor interest due to its advanced offshore project pipeline, while Greece is progressively developing a structured offshore wind framework and attracting increasing international investment interest. Croatia maintains important long-term investment potential due to its maritime position, industrial capacities, and participation in regional offshore initiatives, although the current spatial-planning framework significantly constrains near-term offshore deployment prospects. Montenegro, Albania, and BiH remain at earlier stages, where investment potential is linked more to enabling conditions, infrastructure positioning, and regional integration than to active offshore deployment.

Despite these differences, the region shares several common investment barriers, including regulatory complexity, lengthy permitting procedures, high upfront capital costs — particularly for floating offshore wind technologies — and the need for significant investments in transmission systems, ports, and offshore logistics infrastructure. In many cases, there remains a substantial gap between strategic policy ambition and operational project implementation.

Internationalization represents another important area of convergence. All countries participate in regional and European cooperation frameworks such as the Energy Community, EUSAIR, Interreg ADRION, Horizon Europe, and IPA III, which facilitate policy alignment, research collaboration, and access to financing opportunities. However, this international engagement remains focused primarily on policy dialogue, knowledge exchange, and programme participation, with relatively limited translation into concrete cross-border offshore wind projects, integrated supply chains, or joint industrial development initiatives.

3.3.2 Complementarities for Exploiting National Excellence

While the ADRION countries share several common challenges in offshore wind development, the region's greatest strategic advantage lies in the complementarity of national capacities and functional specialisations. No single country currently possesses all the technological, industrial, infrastructural, financial, and workforce components required to independently establish a fully integrated offshore wind value chain. Collectively, however, the ADRION area forms an emerging and highly complementary offshore wind ecosystem in which different countries contribute distinct but interconnected strengths across research and innovation, industrial production, logistics, workforce development, infrastructure, investment, and international cooperation.

In the field of **R&I**, complementarities emerge between countries with stronger technological and academic ecosystems and those with developing institutional and innovation capacities. Italy provides the region's strongest technological and industrial anchor through its progress in floating offshore wind technologies, offshore-oriented industrial hubs, pilot projects, and large-scale deployment planning. Greece contributes advanced scientific expertise in floating structures, mooring systems, subsea infrastructure, marine environmental monitoring, seismic resilience, and offshore system integration, supported by institutions such as NTUA, CRES, and HCMR. Croatia complements these capacities through applied maritime engineering, shipbuilding know-how, steel fabrication, and participation in international offshore supply chains, positioning itself as a potential regional fabrication, logistics, and marine engineering hub, even though current national spatial-planning restrictions limit near-term domestic offshore deployment. Montenegro contributes strategic maritime infrastructure, environmental expertise, and increasing participation in EU-funded research and regional cooperation initiatives, while Albania and BiH strengthen the regional ecosystem through growing integration into European research frameworks, renewable energy system modelling, industrial transition capacities, and participation in transnational cooperation programmes.

Significant complementarities are also evident in **workforce and employment capacities**. Croatia and Montenegro contribute maritime, logistics, shipbuilding, and industrial skills that are directly transferable to offshore construction, marine operations, and offshore maintenance activities. Italy and Greece provide more mature renewable energy labour markets, stronger links between academia and industry, and increasingly specialised training ecosystems related to offshore technologies and system integration. BiH contributes a substantial industrial and technical workforce with strong potential for large-scale reskilling through just transition processes, particularly in heavy industry, engineering, and energy operations. Albania complements the regional labour ecosystem through adaptable workforce capacity in construction, installation, and operational support services linked to renewable energy deployment. Together, these complementary workforce characteristics create opportunities for coordinated regional training systems, mobility mechanisms, shared offshore certification programmes, and cross-border skills development initiatives.

Complementarities are equally important in **investment and infrastructure capacities**. Italy currently represents the ADRION region's most mature offshore wind investment and deployment market, while Greece is emerging as a strategically important future market supported by strong research capacities, growing investor interest, and an evolving offshore planning frameworkCroatia contributes maritime-industrial capabilities, shipyard infrastructure, and participation in regional offshore initiatives, supporting offshore fabrication, logistics, and marine engineering services despite current regulatory limitations affecting offshore siting.Montenegro adds critical infrastructure assets, including the Port of Bar and the subsea electricity interconnector with Italy, which strengthen regional electricity integration and create future opportunities for offshore logistics, balancing services, and cross-border energy flows. Greece further contributes through existing and planned interconnection infrastructure with Italy and neighbouring countries, as well as strong capabilities in subsea cable systems and island-grid integration. Although Albania and BiH are not yet positioned for direct offshore deployment, they contribute through industrial supply-chain potential, regional market integration, renewable energy financing opportunities, and participation in regional infrastructure and cooperation frameworks.

Complementarities are also reflected in **internationalization and regional integration capacities**. Italy demonstrates the highest degree of integration into European offshore wind industrial and investment networks, while Greece is progressively strengthening its position through participation in EU research frameworks, offshore planning initiatives, and cross-border energy integration projects. Croatia contributes through maritime industries, Adriatic positioning, and participation in regional and European cooperation initiatives, particularly as a supply-chain and industrial partner. Montenegro provides strategic geographical connectivity through maritime infrastructure and regional energy interconnections, while Albania and BiH contribute through active participation in Energy Community mechanisms, EU-funded programmes, regional electricity market integration, and industrial cooperation processes linked to the broader energy transition.

Taken together, these complementary capacities demonstrate that the ADRION region's offshore wind potential does not depend on isolated national development pathways, but rather on the gradual emergence of a functionally integrated macro-regional ecosystem. Within this framework, different countries can specialise in complementary segments of the offshore wind value chain, such as R&I, floating wind technologies, fabrication, logistics, grid integration, workforce development, environmental monitoring, and industrial support activities, creating the basis for a coordinated Adriatic–Ionian offshore wind transition.

Table 11 Complementary National Specializations in Offshore Wind Value Chains

Country	Key Complementary Strength	Potential Regional Role
Italy	Floating wind deployment, pilot projects, industrial ports	Regional deployment & industrial anchor
Greece	Floating wind R&I, marine engineering, mooring systems, interconnections	Technology & system integration hub
Croatia	Shipbuilding, steel fabrication, maritime engineering, offshore supply-chain participation	Offshore fabrication, logistics & marine engineering support
Montenegro	Port of Bar, Italy interconnector, maritime logistics	Logistics & regional balancing node
BiH	Steel industry, electrical manufacturing, industrial workforce	Supply-chain manufacturing support
Albania	Renewable integration planning, regional electricity market participation	Regional electricity market integration & renewable system planning

Table 12 Complementary Infrastructure Assets

Country	Strategic Infrastructure	Offshore Wind Relevance
Italy	Taranto, Augusta ports	Floating wind assembly & logistics
Greece	Planned Greece–Italy interconnections and island grid systems	Cross-border balancing & export
Croatia	Adriatic shipyards and maritime industrial infrastructure	Floating platform fabrication & marine engineering support
Montenegro	Port of Bar, Italy interconnector	Maritime logistics & transmission
BiH	Grid interconnections, industrial zones	Manufacturing and grid integration support
Albania	ALPEX integration, regional transmission links	Regional market integration

Table 13 Complementary R&I and Technology Domains

Country	Specialized Knowledge Area	Regional Contribution
Italy	Floating platform industrialization	Technology commercialization
Greece	Seismic resilience, mooring systems, marine ecosystems	Mediterranean floating wind adaptation
Croatia	Applied marine engineering and offshore fabrication expertise	Offshore structural design & industrial support
Montenegro	Marine biology & coastal systems	Environmental monitoring

BiH	Grid integration & industrial transition	System integration support
Albania	Energy system modelling	Renewable integration planning

Table 14 Workforce and Industrial Complementarities

Country	Workforce Profile	Offshore Wind Role
Italy	Advanced offshore engineering workforce	High-value deployment activities
Croatia	Maritime construction and shipbuilding workforce	Fabrication, logistics & marine operations
Greece	Engineering and research workforce	Floating wind specialization
Montenegro	Port logistics & utility workforce	Logistics, utility operations & maritime support
BiH	Industrial and coal-transition workforce	Manufacturing and reskilling
Albania	Construction and installation labour	Deployment support services

These complementary strengths demonstrate that the ADRION region possesses the foundational capacities required for the gradual development of a transnational offshore wind ecosystem. The ADRION offshore wind ecosystem is unlikely to evolve through fully self-sufficient national value chains. Instead, regional competitiveness will depend on functional specialization and cross-border integration, whereby different countries contribute complementary industrial, infrastructural, technological, and workforce capacities.

3.4. Converting Joint National Basis into a Tangible Output

3.4.1 Open Innovation Approach Among R&I Institutions and Market Actors in The Target Regions

The comparative analysis of the ADRION countries demonstrates that offshore wind development in the region cannot be achieved through isolated national approaches. Consequently, the long-term competitiveness of the Adriatic–Ionian offshore wind sector will depend on a coordinated regional model based on functional specialization, open innovation, and cross-border integration of complementary national strengths. However, open innovation should not be conceived only as knowledge exchange, but as a structured regional cooperation model through which research institutions, industry actors, public authorities, infrastructure operators, financial stakeholders, and training organisations jointly develop offshore wind capacities across the area.

The analysis presented in Chapters 2 and 3 highlights the existence of complementary national expertise but also challenges. The principal challenge identified across the region is not the absence of capacities, but the lack of integration between them. Existing research, industrial, and institutional assets remain fragmented within national systems, while cross-border coordination is still insufficient. An open innovation approach can address this fragmentation through structured cooperation mechanisms connecting research, industry, infrastructure, policy, and investment actors at regional level. One key mechanism is the establishment of **transnational innovation and industrial cooperation networks** linking universities, research institutes, ports, shipyards, transmission system operators, energy companies, SMEs, industrial clusters, financial institutions, and public authorities. Existing EU cooperation frameworks already provide ground for collaboration. However, the region should increasingly focus on shared offshore wind initiatives, including floating offshore wind adaptation for Mediterranean conditions, regional supply-chain integration, environmental monitoring, workforce development, and cross-border electricity infrastructure planning.

A second critical component of the open innovation model is the **co-development of pilot and demonstration initiatives**, that can serve as shared regional learning platforms where technical, regulatory, environmental, financial, and operational solutions are tested collaboratively. Joint pilot initiatives involving multiple ADRION countries would allow infrastructure use, expertise, investment costs, and operational risks to be distributed across the region while simultaneously accelerating collective learning and technological readiness. Such pilot projects may also support the gradual harmonisation of permitting procedures, environmental assessment methodologies, and offshore operational standards.

Digitalisation represents another dimension of the open innovation approach. Shared digital platforms and interoperable data systems can facilitate knowledge exchange, stakeholder coordination and supply-chain integration across the area. Digital twins, marine spatial planning tools, offshore environmental databases, and collaborative monitoring systems can support more efficient project planning and regulatory coordination. In this context, the ADRIONWIND digital platform can evolve into a strategic regional coordination instrument capable of mapping regional competencies, identifying industrial and research capacities, facilitating B2B matchmaking, supporting SME visibility, and strengthening cooperation among offshore wind stakeholders throughout the Adriatic–Ionian region.

Strengthening the connection between research and **commercial deployment** also represents a central objective of the proposed open innovation model. Addressing this challenge requires stronger integration between research institutions and market actors through joint consortia, innovation clusters, public–private partnerships, and collaborative projects for demos and pilots. Such structures can accelerate the development of offshore wind solutions specifically adapted to Adriatic–Ionian conditions, including floating platforms suitable for deep-water Mediterranean environments, hybrid renewable energy systems, advanced mooring technologies, digital operations and maintenance tools, and environmentally sensitive deployment models.

Workforce development constitutes another strategic pillar of the regional cooperation model. Offshore wind requires highly specialised competencies that remain limited across most ADRION countries, particularly in areas such as offshore safety, marine operations, subsea systems, floating structures, offshore logistics, and operations and maintenance. The comparative analysis demonstrates that workforce capacities across the region are highly complementary, combining advanced renewable energy expertise, maritime skills, industrial labour, logistics capabilities, and workforce transition potential. Building on these complementarities, ADRION countries could jointly develop transnational educational programmes, mobility schemes, offshore certification systems, and collaborative vocational training initiatives. Universities, vocational centres, research institutions, and industrial actors can cooperate in designing curricula aligned with future offshore market needs, while programmes such as Erasmus+, Interreg ADRION, Horizon Europe, and EIT initiatives can support mobility and knowledge transfer among students, researchers, engineers, and technicians throughout the region.

Finally, the effectiveness of the open innovation approach depends heavily on **governance coordination and strategic policy alignment**. Public authorities at national and regional level play a fundamental role in creating enabling conditions for collaborative offshore wind development. This includes aligning regulatory frameworks, improving compatibility between maritime spatial planning systems, supporting cross-border pilot initiatives, simplifying administrative procedures for joint projects, and integrating offshore wind priorities into Smart Specialisation Strategies (S3), National Energy and Climate Plans (NECPs), regional operational programmes, and industrial transition strategies. Better coordination between national policies and macro-regional cooperation frameworks would allow ADRION countries to progressively move from fragmented participation in offshore-related activities toward the development of a coordinated Adriatic–Ionian offshore wind ecosystem based on shared infrastructure, integrated innovation systems, complementary industrial specialization, and long-term regional energy transition objectives.

3.4.2 Transforming Sectors Based on Shared Priorities

Building on the identification of common strengths, gaps, and complementarities across the ADRION countries, the transition from analysis to implementation requires a sectoral transformation approach grounded in **shared priorities**. As demonstrated throughout Chapters 2 and 3, while the countries of the Adriatic–Ionian region differ in terms of maturity, infrastructure, and institutional capacity, they have shared strategic needs. Based on the identification of common strengths, complementarities, challenges, and development gaps, six shared regional priorities emerge as the principal transformation pillars for the ADRION offshore wind ecosystem.

No.	Shared Regional Priority	Main Sectors Transformed
1	Floating Offshore Wind Adaptation for Mediterranean Conditions	Research & Innovation, Marine Engineering, Offshore Technologies, Environmental Systems
2	Regional Offshore Supply-Chain and Industrial Integration	Shipbuilding, Steel Fabrication, Manufacturing, Logistics, Industrial Services
3	Cross-Border Grid, Port, and Infrastructure transformation	Energy Infrastructure, Ports, Transmission Systems, Maritime Logistics ready for OWF development
4	Joint Pilot, Demonstration, and Applied Innovation Projects	Applied Research, Technology Transfer, Industrial Cooperation, Offshore Testing
5	Offshore Workforce Development and Skills Transition	Education, Vocational Training, Labour Markets, Industrial Reskilling
6	Coordinated Governance and Environmental Planning	Maritime Spatial Planning, Environmental Governance, Regulatory Coordination, Permitting Systems
7	Digital Cooperation and Smart Offshore Systems	Digital Platforms, Marine Data Systems, Digital Twins, Monitoring & Smart Energy Management

1. The first shared priority concerns the adaptation of floating offshore wind

technologies to Mediterranean conditions. Due to the deep-water characteristics of the Adriatic–Ionian basin, floating offshore wind is expected to become the dominant technological pathway for future offshore deployment. This priority therefore requires the transformation of sectors linked to marine engineering, offshore technologies, environmental monitoring, offshore digitalisation, and applied research. Italy and Greece currently demonstrate stronger capacities in floating offshore wind research, marine systems, mooring technologies, and offshore engineering, while Croatia contributes maritime engineering, shipbuilding, and offshore fabrication expertise through participation in international offshore supply chains. Through coordinated specialization and joint research activities, the region can progressively develop a Mediterranean-oriented offshore innovation ecosystem adapted to deep-water, seismic, and environmentally sensitive marine environments.

2. The second priority concerns the transformation of industrial and supply-chain sectors via enhanced regional integration. The comparative analysis demonstrates that ADRION countries possess highly complementary industrial assets relevant to offshore wind value chains, including shipbuilding, steel fabrication, electrical equipment manufacturing, heavy engineering, marine logistics, and industrial services. Croatia's shipyards and offshore fabrication capacities, Italy's industrial offshore ecosystem, Greece's engineering capabilities, and BiH's industrial manufacturing base provide important foundations for the development of an integrated regional offshore supply chain. Rather than duplicating industrial capacities across all countries, the regional model should support functional specialization where different countries contribute complementary manufacturing, logistics, fabrication, assembly, and support activities within a coordinated Adriatic–Ionian value chain.
3. The third shared priority focuses on the transformation of strategic infrastructure systems, particularly ports, electricity grids, interconnections, and maritime logistics infrastructure for offshore wind uses. Offshore wind deployment requires significant adaptation of port facilities to support heavy-lift operations, assembly areas, offshore logistics services, storage capacities, and maintenance activities. Italy already possesses emerging offshore-oriented port hubs, while Montenegro's Port of Bar and Croatia's maritime-industrial infrastructure provide complementary logistical, fabrication, and marine-service potential within regional offshore value chains. Simultaneously, the region requires stronger electricity interconnections, grid reinforcement, and more flexible transmission systems capable of integrating variable offshore renewable energy generation. Existing interconnectors between Italy and Montenegro, together with planned regional electricity integration initiatives (e.g. Greece – Italy), provide important foundations for cross-border infrastructure transformation supporting regional offshore deployment.
4. The fourth shared priority concerns the strengthening of applied research, pilot deployment, and innovation. Several ADRION countries possess strong academic and research institutions, but operational offshore deployment and industrial testing capacities remain limited throughout most of the region. To change that, stronger integration between universities, research centres, industrial actors, SMEs, ports, and energy companies is needed. That can be achieved through collaborative pilot projects, demonstration initiatives, offshore testing activities, and transnational innovation networks. In some countries, particularly Croatia, current legal and spatial-planning conditions mean that participation in pilot and demonstration activities may initially focus more on industrial cooperation,

offshore engineering support, environmental monitoring, digital systems, and cross-border governance learning rather than direct domestic offshore deployment.

5. The fifth shared priority concerns workforce and offshore skills development. Offshore wind deployment requires highly specialised competencies in offshore safety, marine operations, subsea systems, offshore logistics, floating structures, digital systems, and operations and maintenance. Although the ADRION countries collectively possess strong industrial, engineering, maritime, and renewable energy workforce potential, offshore-specific expertise remains limited throughout most of the region, making this transformation a shared priority. Italy and Greece contribute stronger renewable energy and research-driven training ecosystems, Croatia and Montenegro provide maritime and logistics skills, BiH contributes substantial industrial workforce and reskilling potential linked to just transition processes, while Albania offers adaptable labour capacity in construction and operational services.
6. The sixth shared priority concerns governance coordination and environmental planning. At present, ADRION countries face common governance challenges linked to administrative fragmentation, regulatory complexity, environmental protection, and limited coordination between sectors. Strengthening governance coordination at regional level can support the gradual harmonisation of procedures, permitting frameworks, and operational standards. Improved policy alignment between ADRION countries would also facilitate cross-border cooperation. increase investments, and strengthen the OWF positioning in regional and cross-regional strategies and policies. The evolving Croatian spatial-planning framework further illustrates the importance of regulatory clarity, long-term planning consistency, and coordination between energy, maritime, environmental, and territorial governance systems
7. The seventh shared priority concerns digital cooperation and smart offshore systems. Digitalisation is an enabling factor for offshore wind deployment (e.g. for environmental monitoring, predictive maintenance, offshore management, grid optimization). The development of interoperable digital systems and shared regional data platforms can significantly improve coordination between regional research institutions, industrial actors, infrastructure operators, public authorities, and investors across the Adriatic–Ionian region. Shared marine databases, digital twins, collaborative monitoring systems, offshore data platforms, and smart energy management tools can support more efficient project planning, operational management, and environmental supervision. In this context, the ADRIONWIND digital platform can evolve into a strategic regional coordination instrument supporting competence mapping, industrial matchmaking, stakeholder visibility, knowledge exchange, and cross-border cooperation throughout the emerging Adriatic–Ionian offshore wind ecosystem.

3.4.3 Transforming Activities Based on Shared Priorities

The identification of shared regional priorities requires the gradual transformation of activities across the Adriatic–Ionian offshore wind ecosystem. This section addresses the categories of activities that should evolve to support regional cooperation & the deployment of ADRION offshore wind:

1. The first shared priority — floating offshore wind adaptation for Mediterranean conditions — requires the transformation of research, engineering, and technological activities throughout the region. Existing offshore research activities in ADRION countries remain largely concentrated within academic and

institutional frameworks, while operational offshore deployment experience is still limited. Transforming these activities therefore requires stronger cross-border collaboration in floating platform design, mooring technologies, subsea systems, marine engineering, offshore environmental assessment, hybrid offshore renewable systems, and Mediterranean-specific environmental adaptation methodologies. Joint research programmes, collaborative testing activities, offshore monitoring campaigns, and shared demonstration initiatives can progressively support the development of offshore wind technologies specifically adapted to deep-water, seismic, and environmentally sensitive Adriatic–Ionian marine environments. In countries such as Croatia, where current spatial-planning conditions constrain near-term offshore deployment, activities may initially focus more strongly on offshore engineering support, fabrication technologies, environmental monitoring, digital systems, and participation in transnational R&I and demonstration networks.

2. The second shared priority — regional offshore supply-chain and industrial integration — requires the transformation of industrial and manufacturing activities toward greater macro-regional coordination. Offshore wind deployment creates demand for fabrication, steel processing, electrical equipment production, cable systems, offshore support services, assembly operations, maritime logistics, industrial maintenance activities, and offshore engineering services. Rather than attempting to replicate all industrial functions nationally, ADRION countries can progressively specialize in complementary operational roles according to their industrial strengths. Italy may increasingly concentrate on offshore deployment coordination and industrial integration, Croatia on maritime fabrication, shipbuilding, offshore structures, and engineering services linked to international supply chains, Greece on marine engineering and technological integration, Montenegro on logistics and infrastructure support services, while BiH and Albania can strengthen manufacturing support and industrial transition activities. Such functional specialization can support the emergence of an integrated Adriatic–Ionian offshore supply chain connected to wider European offshore markets.
3. The third shared priority — cross-border grid, port, and infrastructure transformation — requires significant transformation of operational infrastructure activities across the region. Offshore wind development increases demand for port modernisation, offshore assembly services, heavy-lift logistics operations, offshore maintenance coordination, transmission reinforcement, electricity balancing systems, and regional interconnection planning. Existing port infrastructures are not yet fully adapted to offshore wind requirements, creating the need for coordinated specialization between regional ports according to their geographic, industrial, and infrastructural characteristics. At the same time, cross-border activities related to grid studies, interconnector planning, offshore transmission coordination, marine logistics, electricity balancing, and smart energy management will become increasingly important for supporting future offshore renewable integration at regional scale. In the Croatian context, infrastructure-related activities are currently expected to focus primarily on maritime-industrial support functions, offshore logistics, fabrication capacities, and cross-border energy integration planning rather than direct offshore deployment infrastructure.
4. The fourth shared priority — joint pilot, demonstration, and applied innovation projects — requires the transformation of innovation and deployment activities throughout the ADRION area. At present, most countries possess research

potential but limited operational offshore deployment experience. Collaborative pilot initiatives therefore represent essential learning mechanisms for the region. Joint demonstrators, offshore testing environments, pilot-scale floating wind projects, applied industrial innovation initiatives, and collaborative environmental monitoring programmes can facilitate technology transfer, strengthen cooperation between research and industry actors, and accelerate collective technological readiness. Such activities can also support the gradual harmonisation of operational procedures, environmental methodologies, governance approaches, and offshore technical standards across the Adriatic–Ionian region. Participation in pilot activities may differ according to national conditions, with some countries focusing more on deployment-oriented testing and others contributing through industrial support, research, environmental assessment, digital systems, or regulatory-learning activities.

5. The fifth shared priority — offshore workforce development and skills transition — requires substantial transformation of educational, vocational, and labour market activities. Offshore wind deployment depends on highly specialised competencies in marine operations, offshore safety, subsea systems, offshore logistics, floating technologies, environmental monitoring, digital systems, and operations and maintenance. Current workforce development activities across the region remain insufficiently adapted to offshore requirements, despite the existence of strong industrial, maritime, engineering, and renewable energy workforce potential. Transforming these activities therefore requires the development of joint offshore curricula, transnational certification systems, vocational mobility schemes, collaborative training programmes, and coordinated reskilling initiatives linked to industrial transition processes. Such activities can support the emergence of a more integrated Adriatic–Ionian offshore labour market while strengthening regional workforce resilience and facilitating knowledge transfer between countries with complementary expertise.
6. The sixth shared priority — coordinated governance and environmental planning — requires stronger alignment of governance, planning, environmental, and regulatory activities across ADRION countries. Offshore wind development introduces increasing demands for maritime spatial planning coordination, environmental impact assessment, marine ecosystem monitoring, stakeholder engagement, permitting harmonisation, and long-term strategic planning. At present, governance-related activities remain highly fragmented, contributing to administrative complexity and uncertainty for investors and project developers. The evolving Croatian spatial-planning framework further demonstrates the importance of regulatory clarity, policy consistency, and coordination between energy, maritime, environmental, and territorial governance systems. Greater coordination of planning activities, environmental methodologies, public consultation processes, and regulatory cooperation mechanisms can therefore strengthen regional coherence while supporting more efficient offshore project development and improved environmental governance throughout the Adriatic–Ionian basin.
7. The seventh shared priority — digital cooperation and smart offshore systems — requires the transformation of digital, monitoring, and coordination activities across the regional offshore ecosystem. Offshore wind increasingly depends on advanced digital systems supporting environmental monitoring, predictive maintenance, offshore asset management, marine spatial planning, grid optimisation, and cross-border coordination. Transforming these activities requires the development of interoperable regional data systems, shared marine

databases, collaborative monitoring platforms, digital twins, offshore GIS systems, and smart energy management tools capable of supporting coordination between research institutions, industrial actors, infrastructure operators, public authorities, and investors. The use of European data infrastructures such as EMODnet and Copernicus, together with regional digital initiatives, can strengthen evidence-based planning and operational coordination. In this context, the ADRIONWIND digital platform can evolve into a strategic regional coordination instrument supporting competence mapping, industrial matchmaking, stakeholder visibility, knowledge exchange, and cross-border cooperation throughout the emerging Adriatic–Ionian offshore wind ecosystem..

3.4.4 Transnational Approach to R&D&I Initiatives

The development of offshore wind in the Adriatic–Ionian region requires a coordinated transnational approach to research, development, and innovation (R&D&I). Offshore wind technologies, particularly floating offshore wind, involve high technological complexity, infrastructure requirements, specialised expertise, and investment that exceed the capacities of most ADRION countries acting independently. Consequently, transnational cooperation is essential, σtructured around the shared regional priorities identified in Section 3.4.2. At the same time, participation in each priority area will differ according to national capacities, infrastructure readiness, industrial specialization, regulatory conditions, and strategic interests. In this context, the transnational approach does not aim to create identical national pathways, but rather to support functional specialization and coordinated regional integration.

A first category of transnational R&D&I initiatives concerns joint applied research activities focused on technological adaptation to Adriatic–Ionian conditions. Future collaborative research may focus on floating offshore wind technologies suitable for deep-water Mediterranean environments, advanced mooring systems, subsea infrastructure, seismic resilience, hybrid renewable energy systems, offshore environmental monitoring methodologies, and digital offshore management tools. Such initiatives can strengthen cooperation between universities, research institutes, industrial actors, and public authorities while accelerating the transfer of scientific knowledge into operational and commercial applications.

A second strategic area concerns the co-development of pilot and demonstration initiatives functioning as regional experimentation and learning platforms. Given the limited operational offshore wind experience across most ADRION countries, pilot and demonstration initiatives can support the collective testing of technological, environmental, regulatory, financial, industrial, and operational solutions under Mediterranean conditions, including through deployment-oriented pilots, environmental monitoring activities, offshore engineering demonstrators, digital systems testing, and regulatory-learning exercises. Shared pilot initiatives may involve joint use of research infrastructures, port facilities, digital systems, environmental monitoring networks, and industrial capacities distributed across multiple countries. Beyond technological validation, demonstration projects can contribute to the gradual harmonisation of environmental assessment methodologies, offshore operational standards, and permitting approaches at regional level.

Industrial cooperation and supply-chain integration also represent an important dimension of the transnational R&D&I. The ADRION region possesses industrial capacities in shipbuilding, steel fabrication, electrical equipment manufacturing, maritime logistics, offshore engineering, and energy infrastructure, which remain fragmented and insufficiently integrated into coordinated offshore value chains. The activities should support the creation of transnational industrial cooperation networks connecting ports, shipyards, SMEs, industrial clusters, utilities, transmission system operators, technology providers, and offshore service companies to facilitate technology transfer, supply-chain development, and stronger integration into wider European offshore wind markets, including participation by countries where offshore deployment may initially progress more slowly than industrial and technological integration activities.

Another important component is workforce and offshore skills development cooperatively. Offshore wind deployment requires specialised competencies that remain underdeveloped across most ADRION countries, mostly around marine operations, floating structures, offshore logistics, subsea systems, environmental monitoring, offshore safety, and operations and maintenance. Planned activities should therefore support the development of joint educational programmes, vocational training schemes, offshore certification systems, mobility programmes, and industrial internships or placements across the region. Strengthening labour mobility and knowledge circulation can help address workforce shortages while supporting long-term regional capacity building.

Shared digital infrastructures and interoperable data platforms can facilitate marine data exchange, environmental monitoring, stakeholder coordination, supply-chain integration, predictive maintenance, and offshore operational planning across the Adriatic–Ionian region. The development of collaborative digital tools (marine databases, digital twins, offshore monitoring systems, and smart planning platforms) can improve evidence-based decision-making and strengthen coordination between public authorities, research institutions, and market actors. In this context, the ADRIONWIND platform can progressively evolve into a regional coordination mechanism supporting stakeholder mapping, B2B matchmaking, knowledge exchange, project development, and visibility of regional offshore capacities.

The transnational R&D&I approach also requires stronger governance coordination, as mentioned, and targeted use of financing instruments. Existing European and regional frameworks already provide opportunities for supporting collaborative offshore wind initiatives but stronger alignment between national & regional cooperation mechanisms will be necessary to maximise the strategic impact of future investments and facilitate the development of transnational project pipelines.

3.4.5 Strategic Goals and KPIs

The strategic goals presented below are directly aligned with the shared regional priorities identified in Chapter 3.4 and reflect the collective needs of the Adriatic–Ionian offshore wind ecosystem. Rather than promoting identical development pathways for all countries, the framework supports differentiated national implementation within a coordinated regional strategy. In this context, the strategic goals provide a common direction for regional cooperation, while allowing each ADRION country to prioritize specific areas according to its own capacities, infrastructure, institutional readiness, and industrial specialization.

Table 15 Strategic Goals and Key Performance Indicators (KPIs)

Strategic Goal	Description	Indicative KPIs	Time Horizon
1. Strengthen	Promote joint	• Number of joint	Short–

Floating Offshore Wind R&D&I Cooperation	research, technological adaptation, and applied innovation for floating offshore wind systems suited to Adriatic–Ionian conditions.	offshore R&D&I projects • Number of collaborative research partnerships • Number of offshore technology demonstration initiatives	Medium (1–5 years)
2. Develop an Integrated Regional Offshore Supply Chain	Strengthen industrial cooperation and regional specialization across shipbuilding, steel fabrication, electrical equipment, logistics, and offshore services.	• Number of SMEs integrated into offshore supply chains • Number of cross-border industrial partnerships • Share of regional participation in offshore projects (%)	Medium–Long (3–10 years)
3. Upgrade Port, Grid, and Offshore Infrastructure	Support the transformation of ports, interconnections, logistics hubs, and transmission systems required for offshore wind deployment.	• Number of ports upgraded for offshore activities • Grid capacity reinforced or modernised (MW/km) • Number of upgraded or new interconnections	Medium–Long (5–15 years)
4. Develop Joint Pilot and Demonstration Projects	Facilitate collaborative pilot initiatives and regional testing environments for offshore technologies and operational models.	• Number of pilot or demonstration projects launched • Installed pilot offshore capacity (MW) • Number of countries participating in joint pilots	Medium (3–7 years)
5. Strengthen Offshore Workforce Development and Skills Transition	Build specialised offshore competencies through training systems, mobility schemes, certification programmes, and workforce reskilling initiatives.	• Number of trained professionals • Number of joint offshore training programmes • Participation in mobility and certification schemes	Short–Medium (1–5 years)
6. Improve Governance Coordination and Environmental Planning	Strengthen regulatory coordination, maritime spatial planning, environmental assessment methodologies, and	• Number of coordinated planning initiatives • Number of projects applying shared environmental methodologies • Stakeholder engagement	Short–Medium (1–5 years)

	stakeholder engagement mechanisms.	processes implemented	
7. Strengthen Digital Cooperation and Smart Offshore Systems	Promote digital platforms, interoperable marine data systems, monitoring tools, and smart offshore management solutions.	• Number of organisations using shared digital platforms • Number of interoperable marine/offshore databases • Digital monitoring systems deployed	Short–Medium (1–5 years)
8. Increase Investment Readiness and Access to Financing	Improve regulatory certainty, project maturity, and access to public and private financing mechanisms supporting offshore wind development.	• Volume of investments mobilised (€) • Number of projects reaching financial close • Use of blended financing instruments	Medium–Long (3–10 years)
9. Strengthen Transnational Cooperation and International Integration	Position the ADRION region within broader European offshore wind value chains, research networks, and energy cooperation frameworks.	• Number of international partnerships • Participation in EU offshore initiatives • Number of cross-border cooperation projects	Medium–Long (3–10 years)
10. Operationalise the ADRIONWIND Cooperation Ecosystem	Use ADRIONWIND as a long-term coordination mechanism supporting matchmaking, knowledge exchange, project development, and regional cooperation.	• Number of registered stakeholders • Number of B2B collaborations initiated • Number of regional actions facilitated through ADRIONWIND	Short–Medium (1–5 years)

These KPIs are designed to support comparability, progress monitoring, and EU alignment. They are indicative and flexible, allowing gradual adaptation according to national starting points and evolving offshore wind market conditions. ADRION countries can strengthen coordination, improve comparability of progress, and support evidence-based decision-making throughout the offshore wind transition process.

4. Strategic Design for the Offshore Wind Energy Sector and Joint Action Implementation

4.1. Cooperation Considerations

An important consideration of interregional cooperation is communication and productive dialog. The dialogue of all interested stakeholders must be planned and organized as prescribed by the foresight methodology [Martin, B. R. and Irvine, J., 1989][1]. To realize the dialogue, it is necessary to provide channels of communication, with pre-defined rules and standards of that communication. Communication is the first and key element of the foresight process, the process in which the strategic framework for the development of a sector of the economy is identified: goals, activities, plans, time horizon and stakeholders. This is the reason and motive for creating this report on Cooperation Considerations, as part of the formulation of the Transnational R&I Strategy

The partner countries involved in ADRIONWIND are at different stages of development. Some have already established regulatory frameworks, planning instruments, and research structures relevant to offshore wind, while others are still in the early phases of exploring their potential. This diversity creates opportunities and challenges and indicates that countries will participate in offshore wind development from different levels of readiness. This allows the transfer of knowledge and good practices but also makes alignment more difficult, especially when legal, institutional, and technical conditions differ significantly.

For this reason, the Cooperation Considerations Framework focuses on three key dimensions that are essential for enabling effective collaboration across countries:

- Regulatory and Policy Alignment,
- Data Sharing and Standardization, and
- Ethical and Social Considerations.

These dimensions reflect the main areas where coordination is required to move from isolated national efforts toward a more integrated regional approach to offshore wind development.

4.1.1 Regulatory & Policy Alignment

Regulatory and policy alignment is one of the most critical elements for cooperation in the offshore wind sector. Without some compatibility between national frameworks, it is difficult to develop joint initiatives, attract investment, or ensure that projects can be implemented across borders. Regulatory and Policy Alignment of Cooperation Consideration is considered within the following aspects:

- Status of offshore wind–related regulation (explicit framework / partial / none);
- Status of Maritime Spatial Planning (adopted / in preparation / not available);
- Main permitting or regulatory barriers (EIA/SEA, institutional fragmentation, grid access, etc.);
- Key challenges for transnational or cross-border cooperation – national and international aspects:
    - Responsible Research and Innovation,
    - Open Science,
    - Code-of-Conduct in Research and Innovation;

[1] Ben R. Martin and John Irvine: "Research foresight: Priority setting in science", 366 pages, London, Pinter Publishers, 1989

- Institutionally regulated conditions for the dialogue of all interested R&I stakeholders at the national and international level;
- Strategies, policies, instruments and measures which regulate research and innovation.
- Long-term and short-term planning of research and innovation activities: procedures, dialogue (foresight), decision-making.

The national inputs collected within ADRIONWIND (The ADRIONWIND Joint Transnational R&I Strategy provides a common strategic framework for supporting the gradual development of an offshore wind and offshore renewable-energy ecosystem within the Adriatic–Ionian region. Building on the national and comparative analyses, the Strategy identifies seven shared regional priorities that address the technological, industrial, environmental, governance, workforce, and digital dimensions of offshore wind development. Recognising the different levels of maturity, capacity, and readiness across participating countries, the Strategy promotes a model of complementary specialization, whereby each country contributes according to its strengths, development needs, and strategic potential while benefiting from transnational cooperation and knowledge exchange.

The Strategy is designed as an implementation-oriented framework rather than a purely analytical exercise. Through the Macroeconomic Foresight Model Framework, Capacity Building Framework, SME Support Framework, Knowledge Sharing Framework, and Offshore Wind Energy Excellence Collaboration Network, it establishes the foundations for future cooperation, innovation activities, investment mobilisation, workforce development, and stakeholder integration. The national specialization pathways and indicative investment priorities aim to translate the shared regional vision into practical actions that can support future projects, partnerships, and funding opportunities at regional, national, and European level.

The long-term success of offshore wind in the Adriatic–Ionian region will depend on the ability of stakeholders to strengthen cooperation, reduce fragmentation, accelerate innovation, and build the institutional and industrial capacities required for sustainable offshore deployment. While development pathways will differ across countries, coordinated action can enable the region to collectively increase its participation in the European offshore renewable-energy transition. Through complementary specialization, transnational cooperation, SME integration, environmental sustainability, and innovation-driven development, ADRIONWIND establishes a realistic and flexible foundation for a more resilient, competitive, and interconnected Adriatic–Ionian offshore renewable-energy ecosystem.

Annex I: National inputs for Regulatory & Policy Alignment) show that countries are currently at very different stages in terms of regulatory readiness:

- Italy and Greece are the most advanced in this respect. Both countries have moved beyond general renewable energy legislation and have introduced specific frameworks for offshore wind. Italy has established a centralised approach through recent legislative reforms and has adopted maritime spatial planning instruments that support offshore development. Greece has gone further in the designation of development areas and the preparation of a national programme for offshore wind deployment.
- Croatia represents an intermediate case. While it does not yet have a dedicated offshore wind regulatory framework, it has already adopted a Maritime Spatial Plan and has in place the main pieces of legislation that would apply to offshore projects, such as laws on energy, environmental protection, and construction. This creates a foundation for future development, although recent spatial-planning restrictions and the absence of an offshore-specific framework continue to create uncertainty regarding future offshore deployment pathways.
- Albania and Montenegro are still at an earlier stage. In both countries, offshore wind is recognised as a potential opportunity, but it has not yet been translated into concrete regulatory or planning frameworks. Maritime spatial planning is either under development or not yet fully operational, and offshore wind is not clearly integrated into existing systems. As a result, there is a high degree of uncertainty regarding permitting procedures, site allocation, and institutional responsibilities.
- BiH has a different position due to its limited access to the sea. As such, offshore wind is not part of its national regulatory framework. However, the country remains relevant through its role in electricity markets, grid infrastructure, and potential participation in supply chains.

From a cooperation perspective, several **desirable characteristics** can be identified. First, there is need for mor defined regulatory frameworks for offshore wind, including legislation and rules that clarify procedures and responsibilities. Second, maritime spatial planning should be fully developed and include offshore renewable energy as a use of marine space. Third, permitting processes should become more streamlined and predictable, while still maintaining high environmental standards. Equally important is the establishment of structured dialogue mechanisms. Regular and institutionalised interaction between government bodies, research institutions, industry, and local stakeholders can help address conflicts early, improve policy design, and build trust. In addition, stronger links between offshore wind development and national research and innovation strategies could ensure regulatory and tech capacities alignment. In more detail:

Table 16 Desirable national characteristics for Regulatory and Policy Alignment of Cooperation Consideration

Regulatory and Policy Alignment of Cooperation Consideration:	**Desirable national characteristics**	**Countries**
Status of offshore wind–related regulation	Developed legislation (laws and by-laws) regulating the development of the offshore wind energy sector, in accordance with	GR, IT

	recommendations and relevant legislation in the EU	
Status of Maritime Spatial Planning	Maritime Spatial Planning officially developed and adopted by the central government and local administration	GR, HR, IT
Main permitting or regulatory barriers	Constant work on removing barriers to the development of the offshore wind energy sector. Encourage dialogue with the local community.	GR, IT
Key challenges for transnational or cross-border cooperation	The main challenges are: obstacles in legal and regulatory frameworks; lack of action plans and resources for transnational or cross-border cooperation; environmental and spatial conflicts; insufficient political readiness and support for transnational or cross-border cooperation; absence or insufficient development of a dialogue with the local community about the need to develop the offshore wind energy sector.	GR, IT
Institutionally regulated conditions for the dialogue of all interested R&I stakeholders	Building a formal triple helix platform and recurring marine space dialogues with the aim of harmonizing with emerging European best practice.	GR, IT, HR
Strategies, policies, instruments and measures which regulate R&I	Building a national innovation system: improvement of existing and/or development of new legal frameworks, funding schemes, with constant benchmarking of national R&I performance to improve effectiveness and coordination across ministries.	GR, HR, IT
Long-term and short-term planning of R&I activities	Wide and comprehensive application of modern methodologies for planning of R&I activities (technology foresight, smart specialization, National Innovation System development), integrated with the national economy, with the identification of economic development priorities that will be realized by using national R&I resources.	GR, HR, IT

Based on these observations, several actions can be recommended:

- Countries where offshore wind regulation is still limited or absent should prioritise the development of relevant legal frameworks and procedures, drawing on EU/regional best practices and experience. The preparation and adoption of maritime spatial planning instruments should also be accelerated where this is still pending, with specific attention to offshore energy.
- At the regional level, efforts should focus on improving compatibility and interoperability between national systems. This can be achieved through the exchange of best practices, the development of common approaches to environmental assessment, and closer coordination on issues such as grid planning and cross-border infrastructure. Strengthening stakeholder dialogue,

both at national and transnational level, is also essential, particularly in countries where such processes are not yet well established.
In more detail:

Table 17 Recommendations for actions for Regulatory and Policy Alignment of Cooperation Consideration

Regulatory and Policy Alignment of Cooperation Consideration	Recommendations for actions	Countries
Status of offshore wind–related regulation	Drafting, clarification, and future adaptation of laws and by-laws regulating the development of the offshore wind energy sector, in accordance with recommendations and relevant legislation in the EU.	AL, BH, CG, HR
Status of Maritime Spatial Planning	Maritime Spatial Planning should be officially developed, completed, and/or further operationalised by the central government and local administration.	AL, BH, CG
Main permitting or regulatory barriers	It is necessary to remove barriers and/or mitigate the impact of unfavourable institutional, organizational, human, regulatory, and spatial-planning obstacles. It is necessary to build an environment that supports the development of the offshore wind energy sector, with constant dialogue with the local community.	AL, BH, CG, GR, HR
Key challenges for transnational or cross-border cooperation	Remove obstacles in legal and regulatory frameworks. Plan actions and allocate resources for transnational or cross-border cooperation. Prevent and/or eliminate environmental and spatial conflicts. Provide political conditions for transnational or cross-border cooperation. Develop a dialogue with the local community about the need to develop the offshore wind energy sector.	AL, BH, CG, GR, HR
Institutionally regulated conditions for the dialogue of all interested R&I stakeholders	It is necessary to overcome the lack of culture of dialogue, by developing stakeholder dialogue and sector-wide forums on offshore wind, institutionalised both at national and local community level.	AL, BH, CG, GR, IT
Strategies, policies, instruments and measures which regulate R&I	Development of National R&I policy: integrating the R&I sector with the national economy and society as a whole.	AL, BH, CG

Long-term and short-term planning of R&I activities	Application of foresight methodology in long-term planning of R&I activities and establishment of dialogue among all stakeholders interested in the development of the offshore wind energy sector. Develop smart specialisation strategies and integrate national R&I planning with EU and regional development programmes.	AL, BH, CG

Overall, regional cooperation within ADRIONWIND should be a flexible process, allowing countries to contribute according to their regulatory readiness, industrial capacities, infrastructure conditions, and strategic priorities.

4.1.2 Data Sharing & Standardization

Data availability and standardization are important factors for the development of offshore wind in a transnational context. Offshore wind projects rely on a range of data types, including metocean conditions, seabed characteristics, environmental constraints, spatial planning layers, and grid infrastructure. Without reliable, accessible, and interoperable data, planning and investment become more complex and risky. Data Sharing & Standardization of Cooperation Consideration is considered from the following aspects:

- Institutions holding key offshore-related data (metocean, MSP, environment, grid);
- Data accessibility (open / restricted / fragmented);
- Data protection (national and/or EU data protection policies);
- Use of EU data frameworks (INSPIRE, Copernicus, EMODnet);
- Potential national data custodians for offshore wind–related data;
- Internet, academic networks and IT support for research and innovation: national and international aspects (provide national and/or international best cases on websites, networks and AI tools):
    - Internet and networks: Capacity, speed, accessibility,
    - WoS, Scopus etc. – access to research projects and articles,
    - AI, in particular AI in wind/offshore projects.

The national inputs provided within ADRIONWIND (Annex II: National inputs for Data Sharing & Standardization) show that, across all participating countries, relevant data does exist, but it is often fragmented, unaccessible, and unorganised for offshore wind purposes. Due to offshore wind's multi-sectoral nature, data is held by multiple institutions (ministries, regulatory authorities, environmental agencies, transmission system operators, research organisations) which creates barriers to data use.

- In Italy and Greece, data systems are more advanced and increasingly aligned with European frameworks. Italy, for example, has a well-developed network of institutions responsible for marine, environmental, and energy data, with integration into platforms such as EMODnet and compliance with INSPIRE standards. Similarly, Greece has made significant progress in organising marine and environmental data through initiatives such as the Marine Spatial Data Infrastructure and the use of Copernicus and MSFD datasets.
- In Croatia a range of data is available through national institutions & EU platforms. Croatia also participates in European marine and spatial data initiatives linked to

MSP and environmental monitoring. However, there is no dedicated offshore wind data repository or standardised national framework for integrating datasets. In addition, the evolving spatial-planning for offshore wind creates uncertainty regarding the future use of offshore-related datasets.

- In Albania, Montenegro, and BiH data relevant to offshore wind is often incomplete, difficult to access, or available only in non-standard formats such as reports and static documents. In Montenegro, for example, data is distributed across institutions and is largely restricted. Albania and BiH, while not directly involved in offshore wind siting, face comparable challenges in terms of fragmented data systems and dependence on external data and tools, particularly for modelling and planning.

Across all countries, the use of EU data frameworks such as INSPIRE, Copernicus, and EMODnet is an important point. However, their implementation is uneven. While some countries have integrated these frameworks into national systems, others use them primarily within individual projects or research activities rather than as part of a coordinated national approach. This limits interoperability and reduces the potential for seamless data exchange at regional level. Another common issue is the balance between data accessibility and data protection. While environmental and spatial data are often publicly available, information related to energy infrastructure, grid capacity, and market operations is typically restricted due to security and commercial considerations. This creates a gap between the data needed for early-stage planning and the data required for project development. Digital infrastructure also varies, with Italy and Greece having stronger academic networks, access to international research databases, and use of advanced tools, while in Albania, Montenegro, and BiH, digital capacities are still developing.

From a cooperation perspective, several desirable characteristics emerge and are presented in the table:

Table 18 Desirable national characteristics for Data Sharing & Standardization of Cooperation Consideration

Data Sharing & Standardization of Cooperation Consideration:	**Desirable national characteristics**	**Countries**
Institutions holding key offshore-related data	Established agencies specialized in the offshore wind energy sector and/or environmental protection; Institutions (universities, institutes) of the science and innovation system that collect and research data and information relevant to the offshore wind energy sector.	BH, CG, GR, HR, IT
Data accessibility	Publicly available environmental, metocean and spatial data needed for offshore wind energy sector on national and EU portals.	GR, HR, IT
Data protection	GDPR based national law and emerging energy data governance frameworks strictly protect personal, commercial and critical infrastructure data, requiring privacy by design, cybersecurity safeguards and often controlled or aggregated access rather than	GR, HR, IT

	full openness.	
Use of EU data frameworks	A Mediterranean-wide MSFD SDI is a model of how multi-disciplinary data (physics, biology, human uses) can be integrated for ecosystem-based assessments that also support wind-energy decision. The development of Marine SDI should be explicitly designed to align with the EU INSPIRE Directive so that marine datasets (uses, habitats, pressures, infrastructure) are interoperable and shareable for SMEs and offshore energy planning.	GR, HR, IT
Potential national data custodians for offshore wind–related data	Established a number of institutions (statistical office, organizations of the science and innovation sector, relevant ministries, agencies, etc.) competent for the collection, processing, distribution and storage of data relevant to the offshore wind energy sector.	GR, HR, IT
Internet, academic networks and IT support for R&I	Across the Adriatic–Ionian region, offshore wind R&I is underpinned by academic modelling platforms, GIS infrastructures, ERA5 driven data services and ICT intensive living labs. Pan European work on IoT edge networks, digital twins and co-innovation platforms provides the IT blueprint that regional actors can adopt as offshore wind projects scale up.	GR, HR, IT

In terms of actions, the priority for several countries is to establish centralised access to data, for example through national data portals or integrated platforms. At the same time, efforts should be made to standardise data formats and ensure compatibility with European systems. Expanding the use of EU data frameworks beyond project-level applications into national practices is another key step. At regional level, sharing data, methodologies, and tools through joint platforms or project initiatives (like ADRIONWIND) can help. In addition, collaborative development of digital solutions could support a more coordinated approach.

In more detail:

Table 19 Recommendations for actions for Data Sharing & Standardization of Cooperation Consideration

Data Sharing & Standardization of Cooperation Consideration:	**Recommendations for actions**	**Countries**
Institutions holding key offshore-related data	Establishment of professional institutions responsible for monitoring and evaluating the state of the offshore wind energy sector; Integration with the relevant EU institutions responsible for monitoring and	AL, BH, CG, GR, IT

	evaluating the state of the offshore wind energy sector.	
Data accessibility	Establish and/or further integrate national portals for public access to data relevant to the offshore wind energy sector.	AL, BH, CG, HR
Data protection	Establish data management in the offshore wind energy sector, governed by national data protection regulations harmonized with EU rules through the accession process and obligations under the Energy Community framework. Relax access restrictions for data related to energy infrastructure and strategic assets.	AL, BH, CG
Use of EU data frameworks	Establish systematic and institutionalized use of EU data frameworks (INSPIRE, Copernicus, EMODnet) in offshore wind planning.	AL, BH, CG
Potential national data custodians for offshore wind–related data	Establishment and authorization of various institutions (statistical office, organizations of the science and innovation sector, relevant ministries, agencies, etc.) competent for the collection, processing, distribution and storage of data relevant to the offshore wind energy sector.	AL, BH, CG
Internet, academic networks and IT support for R&I	Establishing a functional digital infrastructure capable of supporting research and project activities, specialized and dedicated to offshore wind or large-scale offshore datasets.	AL, BH, CG

4.1.3 Ethical Aspects

The development of offshore wind has also social and environmental aspects. Ethical considerations should ensure that the energy transition is implemented in a way that is environmentally responsible, socially acceptable, and aligned with public interests.

National Ethical Aspects of Cooperation Consideration are considered from the following aspects:

- Main social or environmental concerns related to wind/offshore projects;
- Experience with public acceptance and stakeholder engagement;
- Practices related to biodiversity protection and cumulative impacts;
- Relevant good practices or lessons learned;
- Regulatory frameworks addressing ethical issues in research and innovation;
- Institutional structures responsible for ethical oversight.

The national inputs collected within ADRIONWIND (Annex III: National Input for Ethical Aspects) highlight that, while all countries recognise the importance of these aspects, their level of maturity and institutionalisation varies.

The integration of national ethical considerations into offshore wind research, innovation, and deployment represents a fundamental condition. Across the ADRIONWIND partner countries, varying levels of regulatory maturity, public engagement practices, and environmental governance frameworks require targeted actions to align national approaches within a common framework for cooperation on ethical aspects.

The development of the offshore wind energy sector must be carefully harmonised with the priorities of other maritime and coastal sectors, including fisheries, tourism, maritime transport, and marine conservation, and embedded within integrated maritime spatial planning processes supported by structured dialogue among all relevant stakeholders. Local communities, whose livelihoods and environment are directly affected by offshore installations should also be considered. Full transparency throughout project planning, licensing, and environmental impact assessment procedures is essential to prevent conflicts, avoid misinformation, and mitigate environmental risks. By institutionalising participatory mechanisms and ensuring access to relevant information, governments can strengthen social acceptance and enhance the credibility of offshore wind policies. In Albania, BiH, and Montenegro, public acceptance mechanisms and stakeholder engagement remain comparatively underdeveloped, with insufficient availability of information for decision-making. It is therefore necessary to formally establish institutional platforms for consultation that involve local authorities, civil society organisations, research institutions, and private sector actors.

Environmental protection and biodiversity conservation are also core ethical dimensions. Monitoring and evaluation systems should ensure continuous oversight of marine ecosystems, including impacts on seabed integrity, marine habitats, and migratory species. Given the semi-enclosed nature of the Adriatic basin and the increasing intensity of marine uses, cumulative impact assessment methodologies tailored to offshore wind and large-scale renewable deployment must be further developed. Integrating such approaches into national legislation will enhance alignment with European environmental standards and support cross-border ecological coherence.

A further critical component concerns the regulatory framework governing ethical issues in research and innovation. In Albania, BiH, Montenegro, and Greece, there is a need to define or strengthen national codes of conduct for research integrity alongside comprehensive research ethics frameworks. Establishing such instruments supports the development of dedicated regulatory approaches addressing the specific ethical challenges of offshore wind research and innovation. These include responsible data governance, environmental stewardship in experimental activities, transparency in public–private partnerships, and the inclusion of affected communities in research processes. Alignment with European standards will also facilitate participation in transnational research initiatives and funding programmes. Institutional arrangements for ethical oversight must complement these regulatory developments, to ensure coherence and sector-specific accountability. A potential specialised national body would enhance coordination among ministries, regulatory agencies, research institutions, and industry stakeholders, providing consistent oversight across planning, research, demonstration, and deployment phases.

From a cooperation perspective, the analysis of national inputs allows the identification of a set of desirable characteristics that can support the alignment of ethical frameworks across partner countries:

Table 20 Desirable national characteristics for Ethical Aspects of Cooperation

Consideration

National Ethical Aspects of Cooperation Consideration aspect:	Desirable national characteristics	Countries
Main social or environmental concerns related to wind/offshore projects	Offshore wind development raises concerns related to impacts on marine biodiversity, seabed disturbance, and cumulative environmental pressures, in particular ecological sensitivity, including protected habitats, biodiversity hotspots, and ecologically valuable marine ecosystems, as well as Visual impact on coastal aesthetics and tourism. Additional concern is caused by competition for the economic use of maritime space, especially with: tourism, fisheries, maritime transport, and coastal landscape protection.	BH, CG, GR, HR, IT
Experience with public acceptance and stakeholder engagement	Constant communication with all relevant stakeholders and the local community ensures the success of the realization of wind/offshore projects, with the acceptance of specific requests, such as: distance from shore and careful site selection to avoid "socially unsustainable" locations; concern about the visual effect, which is the main cause of concern for the local community (when turbines are sited so visual disturbance is minimal, local residents report little or no optical disturbance and mostly positive views of RES).	GR, HR, IT
Practices related to biodiversity protection and cumulative impacts	Offshore Wind Farm Development Programmes should embed biodiversity safeguards: Environmental Performance Value / EIA-based criteria: Hybrid offshore wind–wave siting should use an explicit environmental impact metric (EPV) that aggregates life cycle EIA results into the siting decision; Bird and megafauna protection; Ecological sensitivity layers (Mediterranean assessments emphasize avoiding marine biodiversity "hotspots," especially MPAs, wildlife corridors, priority habitats and seabed communities); Hard exclusion of protected areas.	GR, HR, IT
Relevant good practices or lessons learned	Best practice is to use broad exclusion layers (Natura 2000, key biodiversity zones, military areas, dense shipping, deep water limits) and then multi-criteria ranking of the remaining areas. Thrace and South Aegean case studies stress holistic, environmentally driven planning and micro-siting to minimise impacts on birds,	GR, HR, IT

	mammals, fisheries and seascapes.	
What regulation concerns ethical issues in R&I	National code of conduct for research integrity together with the code of research ethics is a prerequisite for establishing a national framework for research ethics and the basis for building a dedicated regulatory framework addressing ethical aspects of offshore wind research and innovation as a distinct field.	HR, IT
Which institutions are established for ethical issues in R&I	Initiatives have been taken in order to establish a national institutional framework for research ethics and research integrity for all disciplines whereby the EU plays an important (indirect) role: initiatives haven been undertaken partly in meeting the standards on research ethics and research integrity of the EU in obtaining funding for research.	GR, HR, IT

Recommendations for actions that partner countries in the ADRIONWIND project should undertake in order to integrate into the common framework for Cooperation Consideration within National Ethical Aspects are presented in fllowing table:

Table 21 Recommendations for actions for National Ethical Aspects

National Ethical Aspects of Cooperation Consideration aspect:	**Recommendations for actions**	**Countries**
Main social or environmental concerns related to wind/offshore projects	The development of the offshore wind energy sector should be harmonized with the development priorities of other sectors through the dialogue process of all interested stakeholders and taking into account the views of the local community. Avoid environmental problems and concerns of the local community by ensuring full transparency of all projects in the offshore wind energy sector.	AL, BH, CG, GR, HR, IT
Experience with public acceptance and stakeholder engagement	Underdeveloped culture of dialogue and insufficient transparency and availability of data and information for decision-making regarding wind/offshore projects. It is necessary to institutionally establish a dialogue process with the local community and all interested stakeholders and ensure public acceptance in the decision-making process regarding wind/offshore projects.	AL, BH, CG
Practices related to biodiversity	monitoring and evaluation system should be established institutionally through environmental impact assessment (EIA)	AL, BH, CG

protection and cumulative impacts	procedures and nature protection regulations. Build offshore wind–specific framework for assessing cumulative impacts of multiple marine uses or large-scale offshore renewable deployment.	
Relevant good practices or lessons learned	Regional cooperation and knowledge exchange within the Adriatic–Ionian region are identified as opportunities to transfer good practices related to environmental protection and stakeholder engagement from more advanced offshore wind contexts	AL, BH, CG
What regulation concerns ethical issues in R&I	It is necessary to define a national code of conduct for research integrity together with the code of research ethics, as a prerequisite for establishing a national framework for research ethics and the basis for building a dedicated regulatory framework addressing ethical aspects of offshore wind research and innovation as a distinct field.	AL, BH, CG, GR
Which institutions are established for ethical issues in R&I	Ethical oversight in research and innovation should be exercised through existing institutional mechanisms, including: Environmental authorities responsible for environmental protection and impact assessments; Academic and research institutions, which apply internal ethical standards and review procedures for research activities. Additionally, a specialized national body dedicated exclusively to ethical governance of offshore wind research and innovation should be established.	AL, BH, CG

Regional cooperation within the Adriatic–Ionian macro-region offers the opportunity to accelerate improvements in ethical governance. Through coordinated action within ADRIONWIND, good practices in environmental monitoring, stakeholder engagement, and regulatory oversight can be transferred and adapted to national contexts. This cooperation reduces fragmentation, facilitates policy convergence, and promotes the development of shared standards for ethical and sustainable offshore wind deployment.

4.2. National and EU Good Practices/Cases

Building on the analytical work presented in the previous chapters, this section shifts the focus from assessment to practical examples. The objective is to identify and present existing good practices and cases that can inform the development of joint actions within the ADRIONWIND framework, which is as already mentioned vital. These practices reflect concrete experiences in offshore wind development and the broader energy transition, including regulatory approaches, research and innovation initiatives, investment models, and stakeholder engagement mechanisms.

Given the diversity of the partner countries and their different levels of maturity in the offshore wind sector, this chapter is based primarily on contributions provided directly by the project partners. Each country has identified relevant national practices or cases that are considered representative, transferable, or instructive for the Adriatic–Ionian context. This ensures that the analysis reflects national realities and builds on first-hand knowledge of institutional, market, and technical conditions.

4.2.1 Qualitative Enquiries

The qualitative enquiry undertaken within the ADRIONWIND framework is designed to systematically identify, assess, and compare relevant good practices and cases across participating countries and selected EU benchmarks. Its primary objective is not only to document existing initiatives, but to extract transferable mechanisms that can inform the design and implementation of joint transnational actions in the offshore wind sector. To ensure consistency across countries, the enquiry is structured around the five transversal thematic areas derived from the SWOT analysis and validated through the Thematic Working Groups and Stakeholder Consultation Groups: Regulatory & Governance Frameworks; Infrastructure, Ports & Supply Chains; Financing & Investment Models; Innovation & Technology Development (with particular emphasis on floating wind); and Skills, Employment & Social Acceptance. This ensures continuity between the SWOT building phase, the stakeholder validation, and the strategic design, while enabling comparability between national cases and EU benchmarks. Within this structure, the qualitative enquiry further explores a set of operational dimensions that reflect the core building blocks of offshore wind ecosystem development:

- Policy and Regulatory Frameworks: This dimension focuses on governance mechanisms that reduce administrative complexity and investment uncertainty. Of importance are Contract-for-Difference (CfD) schemes and other revenue stabilization instruments, that may permit acceleration models such as one-stop-shop systems, and the integration of offshore wind into maritime spatial planning processes.
- Research, Innovation and Ecosystem Development: examines the role of research and innovation infrastructures in supporting offshore wind deployment, including offshore wind test centres, pilot and demonstration projects (especially in floating wind), university-industry consortia, and open innovation platforms. Emphasis is placed on the capacity of these ecosystems to bridge the gap between research and commercialization and to support emerging technologies relevant for deep-water contexts.
- SME Integration and Value Chain Development: Given the importance of local economic participation, this dimension investigates mechanisms that facilitate SME involvement in offshore wind value chains. Relevant practices include supplier development programmes, cluster-based industrial integration, and matchmaking or brokerage platforms that connect SMEs with larger market actors.
- Financing and Investment Models: considers financial structures that enable large-scale offshore wind deployment, particularly in early-stage markets. This includes public-private partnership (PPP) models, blended finance mechanisms combining EU and private funding, and risk mitigation instruments that reduce uncertainty in pre-investment and development phases.
- Skills Development and Workforce Transition: This dimension addresses human capital requirements, focusing on offshore wind academies, targeted training programmes, and reskilling initiatives (notably transitions from carbon-intensive sectors such as coal to renewables). It also considers the alignment between

education systems, industry needs, and long-term employment pathways in the offshore wind sector.
- Infrastructure and System Integration: The enquiry explores enabling physical and digital infrastructure, including port transformation for offshore wind activities, grid integration models (including offshore transmission planning), and digital monitoring and management systems. These elements are critical for ensuring operational efficiency and system-level integration of offshore wind into national and regional energy systems.

A practice or case is considered relevant for inclusion in Section 4.2 when it satisfies most of the following criteria.
- First, it addresses one or more of the above-mentioned structural barriers identified by ADRIONWIND.
- Second, it demonstrates at least partial evidence of implementation, effectiveness, or institutional uptake.
- Third, it contains a clearly identifiable and transferable mechanism, such as a permitting model, financing instrument, port solution, floating wind R&I initiative, skills programme, digital collaboration tool, or SME support workflow.
- Fourth, it shows relevance beyond a single local context, either through adaptability to multiple ADRION countries or by providing a high-value benchmark.
- Fifth, it generates actionable insights for joint implementation, rather than remaining a purely descriptive example.

So, each case presented in Sections 4.2.2–4.2.8 is documented using where possible a common analytical framework, including: the challenge addressed; institutional and territorial context; actors involved (reflecting the quadruple helix); governance and regulatory setting; investment and support mechanisms; R&I and technological components; relevance for SMEs and supply chains; evidence of results; transferability conditions; and specific lessons for ADRIONWIND.

4.2.2 Croatia

Croatia is currently at an early stage of offshore wind development, but it represents an important case within ADRIONWIND due to the combination of high technical potential, strong maritime-industrial capacities, and remaining structural gaps. Offshore wind potential in the Croatian Adriatic has been identified in several studies, particularly in the Northern Adriatic, although no operational offshore wind farms have yet been developed and the current spatial-planning framework constrains near-term deployment pathways. This makes Croatia a relevant example of an early-stage system where good practices are mainly linked to readiness-building, policy preparation, industrial adaptation, and cross-border cooperation. In this sense, Croatia's relevance within the ADRIONWIND strategy is the development of preparatory governance, industrial adaptation, and transnational coordination mechanisms that may support future offshore pathways.

A central emerging practice is the development of offshore wind readiness processes supported by national analytical work and international expertise. Studies such as *Offshore wind farm in the Adriatic Sea – opportunities for the Croatian economy* have contributed to identifying possible development zones, assessing economic impacts, and mapping domestic supply-chain potential. These activities are particularly important because Croatia still lacks a fully established offshore wind regulatory and permitting framework. Recent amendments to spatial planning legislation prohibits the planning and implementation of wind power plants on maritime domain, and provides that in marine areas no construction or placement of wind power plants may be planned. This means that offshore wind in Croatia should presently be treated as a medium- to long-term potential and a regulatory learning case, rather than a near-term deployment pathway, pending future legislative or planning changes. However, the current spatial-planning framework goes beyond additional compliance requirements and, at present, constitutes a legal-planning barrier to offshore wind siting in Croatian marine areas.

Croatia's maritime and shipbuilding industry represents another important good practice area. Existing capacities in shipyards, marine engineering, logistics, and large-scale fabrication—particularly in coastal industrial centres such as Pula, Rijeka, and Split—can provide a foundation for participation in offshore wind value chains. Rather than creating an entirely new industrial ecosystem, Croatia has the opportunity to adapt existing competencies toward offshore wind needs, including substructure production, assembly, maintenance, and logistics services. This is particularly relevant for SMEs, as national studies indicate that a considerable number of Croatian companies could potentially participate in offshore wind-related supply chains.

Another relevant best practice is the designed cross-border cooperation between Croatia and Italy in the Northern Adriatic. The new Croatian spatial-planning framework is highly relevant, since the current Act restricts the planning of wind power plants in both maritime domain and marine areas. As a result, the value of the Croatia–Italy case lies less in immediate project realisation on the Croatian side and more in its function as a cross-border governance, infrastructure-planning and regulatory-learning reference for the future. Although previously explored at the feasibility stage, the approximately 300 MW concept should presently be interpreted as an indicative cross-border reference rather than a concrete near-term implementation pipeline for Croatia.

Croatia also provides useful lessons in the early integration of skills development and stakeholder engagement. Since offshore wind has not yet been deployed, there is an opportunity to anticipate workforce and social acceptance challenges before they become barriers. Existing skills from onshore wind, shipbuilding, maritime industries, and offshore oil and gas can be adapted through targeted training, while early engagement with coastal communities, fisheries, tourism actors, and environmental stakeholders can reduce future opposition.

Finally, Croatia is relevant for the development of digital and platform-based collaboration mechanisms. Croatia can still be positioned within the ADRIONWIND framework as a relevant offshore-wind case, but primarily as a regulatory-learning and maritime-industry-preparedness case rather than a near-term deployment market. Its strategic role currently lies in three dimensions: first, as a testing ground for regulatory and governance adaptation; second, as a maritime-industrial hub with potential supply-chain relevance; and third, as a future research and innovation platform, especially for floating offshore wind and hybrid systems, should the legal framework evolve.

4.2.3 Italy

Within the Italian context, offshore wind is developing in parallel with the broader energy transition and the growing role of floating technologies in the Mediterranean. Although the sector is still far from the scale historically associated with oil and gas, offshore wind already represents a relevant and expanding field of industrial, infrastructural, and policy interest. Italy's only operational offshore wind farm, Beleolico in Taranto, has become a landmark case at Mediterranean level, while several additional projects are advancing through environmental and administrative procedures. At the same time, the national framework increasingly recognises floating offshore wind as a strategic component of both energy policy and industrial development, particularly in southern regions such as Puglia, Sicily, and Sardinia.

a. The Beleolico project is the first offshore wind farm in Italy and the Mediterranean. Developed by Renexia, the project is particularly significant because it combines pioneering renewable energy production with environmental compatibility, technological innovation, and strong territorial relevance in an area historically associated with heavy industry. The wind farm consists of 10 turbines of 3 MW each, for a total installed capacity of 30 MW, and is expected to generate more than 58,000 MWh annually. Beyond its technical performance, Beleolico is relevant as a good practice because it integrates circularity principles, environmental monitoring, and local development considerations from the outset. The project was assembled in the Port of Taranto, and part of the electricity generated is intended to support port operations and future green hydrogen production linked to local industrial activities. See also 0), Italy's Good Practices Adoption.

b. The Barium Bay project is second a large floating offshore wind project in the South Adriatic Sea, developed through the partnership between Galileo and Hope Group. Although not yet operational, the project has already reached an advanced stage in the authorisation pathway and is therefore a useful example of the next generation of offshore wind development in Italy.

The project is planned with a capacity of approximately 1,100 MW, based on 74 turbines of 15 MW each, and is expected to generate more than 3 billion kWh per year. It is located more than 45 kilometres from the coast, reflecting an effort to reduce visual impacts and improve environmental compatibility. A major milestone has already been achieved through the positive Environmental Impact Assessment decree issued in 2025, making Barium Bay the largest offshore wind farm in Italy and the Mediterranean to reach this stage.

Barium Bay is particularly relevant as a good practice because it combines large-scale floating wind ambition with a design approach that integrates environmental monitoring and mitigation measures from the outset. The project includes real-time marine monitoring systems based on Internet of Underwater Things technologies, aimed at tracking water quality, underwater noise, biodiversity, and currents. Landscape mitigation measures and bird collision reduction solutions are also incorporated into the design. In this sense, the project illustrates how environmental and territorial considerations can be embedded early in project planning rather than treated only as compliance requirements.

The project is also significant from an industrial and employment perspective, with expected impacts in terms of construction, long-term operations, and supply-chain development. As such, it reflects not only the technological evolution of floating wind in Italy, but also its potential to generate wider economic benefits.

c. The Messapia project represents a third relevant case and offers a particularly interesting perspective because of its floating technology and transboundary dimension. Promoted by Messapia Floating Wind S.r.l. within the partnership between Plenitude and Simply Blue Group, the project is planned in the Ionian Sea off the Apulian coast, with a maximum capacity of around 1.3 GW.

Messapia is still under technical review, but it already stands out as a good practice because of the way it combines renewable energy ambition with environmental sensitivity and cross-border governance. The project includes 73 floating turbines of 18 MW each, installed on semi-submersible platforms with low-impact mooring systems, and is expected to generate up to 3.4 TWh annually.

Its relevance lies not only in its scale, but also in the fact that it has been subject to a comprehensive Environmental Impact Assessment involving both Italian and Greek authorities, reflecting the transboundary character of the marine ecosystem in the Strait of Otranto. This makes Messapia particularly valuable for the ADRIONWIND context, as it shows how offshore wind planning in shared sea basins requires continuous coordination between countries, authorities, and environmental bodies.

The project also places strong emphasis on biodiversity protection, marine monitoring, and adaptive management. Particular attention has been given to impacts on migratory birds, marine mammals, fishing activities, and maritime traffic. The studies carried out so far indicate that the most significant impacts are expected during installation, while operational impacts are considered limited if mitigation and monitoring measures are properly applied. In this sense, Messapia illustrates a more advanced model of offshore wind planning in which environmental assessment, scientific knowledge, and transnational coordination are closely intertwined.

Overall, the Italian experience shows that good practices in offshore wind are emerging along different but complementary lines. Beleolico demonstrates the value of an operational pilot with strong environmental integration; Barium Bay reflects progress toward large-scale floating wind under advanced permitting and monitoring frameworks; and Messapia highlights the importance of transboundary coordination and ecosystem-sensitive planning in shared marine spaces. Together, these cases make Italy—particularly Puglia—a highly relevant reference point for the Adriatic–Ionian region and for the development of joint action within ADRIONWIND.

4.2.4 Greece

Although Greece is at an early stage in offshore wind deployment, it has made rapid progress in establishing a comprehensive regulatory and institutional framework. This structured approach is widely recognized as a good practice in emerging offshore wind markets, combining policy clarity, spatial planning and R&I alignment. Some good examples of this framework are presented below:

One of the most important developments is the adoption of Law 4964/2022, which introduces a comprehensive and centralised framework, including state-led spatial planning, designated development zones and competitive tendering procedures. The framework clarifies institutional roles and introduces a coordinated approach that reduces uncertainty for investors and streamlines permitting processes. This law provides the Greek State with exclusive competence for offshore wind planning and introduces a coordinated development model.

The key features are:

- Centralized state-led spatial planning
- Designation of Offshore Wind Farm Organized Development Areas (OWF-ODA)
- Clear allocation of responsibilities to national authorities, including HEREMA
- Structured licensing and tendering procedures

More recently, the Greek government has identified the further adaptation of this law as a priority within its broader policy agenda. Planned revisions aim to improve procedural efficiency and accelerate implementation, reflecting a flexible and adaptive governance approach that responds to early-stage challenges.

Building on this foundation, the Greek government has recently identified the adaptation of Law 4964/2022 as a key reform priority within its "*Unified Government Policy Plan*", aiming to address implementation delays and accelerate offshore wind deployment. Specifically, the planned reform—targeted for implementation within 2026—includes amendments to improve procedural efficiency, enable faster initiation of studies and tenders, and strengthen the overall investment framework for offshore wind projects. This iterative improvement of the regulatory framework represents a good practice in adaptive governance, ensuring that the legal and institutional setup evolves in response to early-stage implementation challenges..

A further good practice is the two-stage licensing system, which separates exploration and survey rights from full project development. This approach allows for early data collection and feasibility assessment, while ensuring that projects entering the development phase meet both technical and environmental requirements. It also contributes to reducing investment risks and improving overall project quality.

Given the specific conditions of the Greek seas, the country has placed a strong emphasis on floating offshore wind technologies. This early prioritisation reflects a form of smart specialisation, aligning technological choices with regional characteristics and integrating floating wind into both spatial planning and research agendas.

Offshore wind is also embedded within Greece's NECP, which sets a target of at least 2 GW by 2030. This demonstrates a clear long-term commitment and ensures alignment with EU energy and climate objectives.

Finally, Greece's governance model is supported by a well-defined institutional structure, involving HEREMA for planning, the Regulatory Authority for Energy for tendering, and the transmission system operator for grid integration. This coordinated approach helps ensure consistency across planning, licensing, and infrastructure development.

Early pilot projects, including designated development areas such as Alexandroupolis, are already moving into exploration and feasibility phases. These initiatives function as pre-commercial testbeds, generating valuable technical, environmental, and financial data, while also supporting stakeholder engagement and market confidence.

4.2.5 Albania

Albania remains at a very early stage of offshore wind development, where the sector is still largely conceptual and embedded within broader renewable energy and energy security priorities. Its relevance within ADRIONWIND does not lie in existing offshore wind deployment, but in the way it illustrates the conditions required for initiating an offshore wind ecosystem from a low baseline. The Albanian case highlights the importance of regulatory preparation, international technical assistance, investment structuring, capacity building, and cross-border cooperation.

A key feature of Albania's energy system is its strong dependence on hydropower. While this provides a largely renewable electricity base, it also creates vulnerability to hydrological variability and climate change. Offshore wind is therefore increasingly viewed as a potential long-term option for diversifying the energy mix, strengthening energy security, and supporting integration into regional electricity markets.

An emerging good practice is the gradual development of offshore wind readiness through international support and preliminary feasibility work. Institutions such as the European Bank for Reconstruction and Development have contributed to early-stage assessments, including resource mapping, potential zone identification, and grid integration considerations. These activities are useful because they show how technical studies can begin to structure future offshore wind opportunities.

Albania also illustrates the importance of building human capital and social acceptance from the beginning. The country does not yet have a specialised offshore wind workforce, but it can build on existing competencies from hydropower, construction, electrical engineering, and infrastructure development. Targeted upskilling can therefore support gradual workforce preparation.

4.2.6 Montenegro

Although offshore wind development in Montenegro is still at an early stage, several emerging practices can be identified that are relevant for future development and for regional cooperation. These practices are mainly related to regulatory alignment, institutional structures, and environmental governance, and they provide a useful foundation for further progress.

A key element is Montenegro's alignment with EU energy frameworks through the Energy Community. This process supports the gradual adoption of EU rules on renewable energy, electricity markets, and regulatory standards. While offshore wind is not yet fully developed, this alignment creates a stable institutional environment and facilitates compatibility with neighbouring markets, which is particularly important for cross-border cooperation.

Offshore wind is also recognised within national strategic documents, including the National Adaptation Plan (2023) and the Energy Development Strategy. In these documents, it is framed as a future opportunity for strengthening energy security, supporting decarbonisation, and improving resilience. Although still at a conceptual level, this early integration into policy frameworks reflects a forward-looking approach and provides a basis for long-term planning.

In terms of data and knowledge, Montenegro already relies on a multi-institutional system, involving environmental agencies, energy authorities, and public utilities. More specifically, relevant institutions include:

- Agency for Environmental Protection
- Ministry of Capital Investments
- Regulatory Energy Agency (REGAGEN)
- Electric Power Company of Montenegro (EPCG)

While data management remains fragmented, the existence of these institutions demonstrates that the basic elements required for offshore wind planning are already in place. This can be seen as a starting point for developing more integrated data-sharing systems in the future.

Environmental governance represents another important area. Montenegro applies Environmental Impact Assessment (EIA) procedures for large infrastructure projects, ensuring that biodiversity, marine ecosystems, and protected areas are taken into account. Although these frameworks are not yet tailored specifically to offshore wind, they provide a solid basis that can be further developed as the sector evolves.

Stakeholder engagement is currently at an early stage, but initial consultations involving ministries, academia, private sector actors, and civil society organisations indicate a growing awareness of offshore wind opportunities.

4.2.7 Bosnia & Herzegovina

In BiH, good practices relevant to offshore wind development are primarily derived from broader energy transition policies, institutional frameworks, and increasing alignment with EU climate and energy objectives. Although direct offshore wind deployment is constrained by geographical and regulatory factors, the country demonstrates several enabling practices that support its participation in the wider Adriatic–Ionian offshore wind ecosystem.

A key element is the integration of renewable energy targets within national strategic frameworks, particularly through the NECP. These frameworks define decarbonisation pathways and provide a policy basis for expanding renewable energy capacity, including wind energy, while ensuring alignment with EU priorities.

Another important aspect is the gradual development of regulatory and investment frameworks for renewable energy. This includes support schemes, improvements in permitting procedures, and ongoing market reforms. While these measures are primarily focused on onshore renewables, they contribute to strengthening the overall investment environment and institutional readiness, which are essential preconditions for future participation in offshore wind initiatives at regional level.

BiH also demonstrates good practice in regional energy integration and cross-border cooperation. Alignment with European energy markets and participation in regional initiatives support electricity trade, grid interconnection, and knowledge exchange. This is particularly relevant in the context of offshore wind, which is expected to develop through transnational projects and shared infrastructure across the Adriatic–Ionian basin.

Within this framework, Elektroprivreda BiH (EPBiH) plays an important role as a national energy actor and ADRIONWIND project partner. Its operational and planning capacities contribute to strengthening renewable energy integration, supporting grid stability and flexibility, and enabling participation in regional electricity systems.

In addition, BiH's just transition policies in coal-dependent regions represent a relevant practice. Efforts to diversify the energy mix and support workforce transition create the conditions for reallocating skills and industrial capacities toward renewable energy sectors, including potential roles within offshore wind value chains.

From a research and innovation perspective, existing academic and technical capacities contribute to areas such as energy system modelling, grid integration, and digitalisation. While not directly linked to offshore wind deployment, these capabilities are relevant for supporting system-level integration and regional cooperation.

Overall, BiH's good practices are primarily enabling and policy-oriented. While offshore wind development is not expected to take place domestically in the short term, the country is well positioned to contribute to the regional offshore wind ecosystem through regulatory alignment, system integration, and active participation in transnational initiatives such as ADRIONWIND.

4.2.8 Rest of EU

Strategic context

This subsection focuses on transferable offshore-wind mechanisms from other EU Member States, rather than compiling a descriptive list of projects. For ADRIONWIND, the value of these cases lies in how mature and emerging EU markets have reduced uncertainty before large-scale deployment: through coordinated sea-basin planning, state-led site preparation, integrated grid planning, port specialisation, adaptive support schemes, and early attention to skills and public legitimacy. At EU level, the European Commission reports that Member States have updated offshore-renewable ambitions across the EU's five sea basins, while the revised TEN-E framework links those ambitions to integrated offshore network development plans to improve visibility for investors, grid promoters and supply chains. This shift from isolated authorisations to coordinated planning is especially relevant for the Adriatic-Ionian macro-region, where offshore wind remains comparatively early-stage and institutional capacity is still being assembled.

For ADRIONWIND EU cases are most valuable when they demonstrate mechanisms that can be adapted to the institutional, infrastructural, and market realities of the Adriatic–Ionian region. The objective is not to replicate the scale or maturity of North Sea offshore wind markets, but to identify transferable approaches that support the gradual development of a coordinated macro-regional offshore wind ecosystem. In this context, the most relevant lessons concern the public and institutional functions that must be established before large-scale deployment can occur, including maritime spatial planning, baseline environmental and technical studies, transparent permitting and tender procedures, coordinated port and grid planning, industrial and supply-chain integration, workforce preparation, stakeholder engagement, and digital data-sharing systems. These elements directly support the shared regional priorities identified in the ADRIONWIND strategy, particularly floating offshore wind adaptation for Mediterranean conditions, cross-border infrastructure coordination, joint pilot and innovation activities, workforce and skills transition, coordinated governance and environmental planning, and the development of interoperable digital cooperation platforms. Rather than pursuing isolated national pathways, the EU cases demonstrate how offshore wind development becomes more effective when supported by functional specialization, transnational coordination, and long-term integration between research, industry, infrastructure, governance, and regional communities.

Table 22 Selected EU good-practice mechanisms and their transferability to ADRIONWIND

Shared ADRIONWIND priority	EU good-practice mechanism	EU case(s)	ADRIONWIND use
Floating Offshore Wind Adaptation for Mediterranean Conditions	Floating wind pilots, testbeds, deep-water demonstration and environmental monitoring	France, Spain, Portugal	Floating-wind R&I track and demonstrator partnerships
Regional Offshore Supply-Chain and Industrial Integration	Supplier clustering, local-content coordination, SME integration and industrial compacts	Poland, Esbjerg	SME capability mapping and regional value-chain integration
Cross-Border Grid, Port, and Infrastructure Transformation	Port specialisation, offshore grid planning, interconnector coordination and public system-risk allocation	Netherlands, Belgium, Esbjerg, Poland	Port role allocation, grid-risk principles and infrastructure planning templates

Joint Pilot, Demonstration, and Applied Innovation Projects	State-supported pilots, test centres, open-ocean validation and pre-commercial learning platforms	France, Spain, Portugal	Shared demonstration logic for ADRION floating wind and applied innovation
Offshore Workforce Development and Skills Transition	Skills action plans, training pathways, community-benefit structures and labour-market preparation	Ireland, Poland, France	Modular training pathways and stakeholder engagement toolkit
Coordinated Governance and Environmental Planning	State-led site preparation, one-stop coordination, MSP, public debate and pre-development protocols	Denmark, Netherlands, France	Permit-pathway mapping, baseline-study checklists and consultation templates
Digital Cooperation and Smart Offshore Systems	Data hubs, GIS layers, national offshore portals, SME brokerage and marine data platforms	Germany, EMODnet, EEN, Denmark, Netherlands	ADRIONWIND observatory, GIS repository and matchmaking platform

Governance and regulatory good practices

Denmark

A central Danish lesson is that early administrative clarity matters as much as market ambition. The Danish Energy Agency (DEA) acts as the main public coordinator for offshore wind procedures. Official DEA guidance states that preliminary investigations and environmental assessments are conducted and published for ongoing offshore wind tenders, with results targeted at potential bidders through a data platform maintained by Energinet. Denmark's new tender framework also demonstrates how public authorities can adjust tender design when market conditions change, including state support and greater flexibility for developers in the 2025 offshore wind tender round.

The challenge addressed here is familiar to ADRIONWIND partners: fragmented permitting, weak baseline knowledge and late-stage environmental conflict. Denmark's governance mechanism reduces these risks by sequencing public and private responsibilities. The state undertakes strategic environmental assessment and preliminary site investigation first; the winning developer then undertakes project-specific development within a clearer evidence base. This is transferable because it does not depend on a very large market. It depends on institutional discipline and a shared rule that public authorities should narrow uncertainty before private capital is asked to price it.

Actionable lesson for ADRIONWIND: Promote a macro-regional pre-development protocol in which participating authorities jointly define minimum baseline studies, common data standards, and a single administrative coordination contact for offshore wind pilots and demonstrators.

The Netherlands

The Dutch model is one of the clearest European examples of centralised offshore wind de-risking. The Netherlands Enterprise Agency (RVO) states that government preparation of new offshore wind farms includes area designation, permits, site studies and tender organisation, while the legally appointed TSO, TenneT, develops and operates the offshore grid. The 2026 Development Framework further documents the Dutch approach to coordinated roadmap implementation, site decisions, standardised offshore-grid specifications and delivery responsibilities.

What makes this particularly relevant for ADRIONWIND is not only the maturity of the Dutch system but its adaptability under stress. In January 2026, after weaker market conditions and previous tender difficulties, the Dutch government announced a 1 GW subsidised tender for IJmuiden Ver Gamma-A. In other words, the Dutch good practice is not 'subsidy-free auctions' as such; it is policy credibility through transparent correction when markets change.

Actionable lesson for ADRIONWIND: Advocate a joint action template in which public authorities prepare sites and grid assumptions centrally, publish a rolling tender and study pipeline, and retain the option of adaptive support instruments when financing conditions deteriorate.

Infrastructure, ports and supply chain good practices

Port-led clustering in Esbjerg

The most transferable port case is not simply a successful harbour, but a port that became a logistics-and-supply-chain platform. Port of Esbjerg states that it has specialised facilities and flexible areas for transporting, pre-assembling, shipping out and servicing offshore wind turbines. It also reports that 23.6 GW of offshore wind turbines have been shipped from the port since 2001 and that the port has been involved in numerous Danish and foreign wind farms. The transferable mechanism is the concentration of complementary functions - marshalling, heavy logistics, O&M and supplier co-location - rather than attempting to make every port do everything.

For ADRIONWIND, the Esbjerg lesson is highly relevant because Adriatic-Ionian ports are diverse in scale, hinterland connections and industrial legacy. The strategic implication is that macro-regional efficiency will come from role differentiation: one port may specialise in assembly and marshaling, another in O&M, another in cable or service-vessel support. That approach is friendlier to SMEs, because it creates visible, durable niches for local firms instead of forcing them to compete across the entire value chain from the outset.

Actionable lesson for ADRIONWIND: Identify a small number of candidate offshore wind function ports and define their future roles early, including land availability, heavy-load quays, laydown areas, vessel access, training facilities and supplier-campus potential.

Poland's coordinated port and industrial build-out

For a region that is entering offshore wind later, Poland is especially relevant because it is building port and supply-chain capacity in parallel with market creation. The Polish Offshore Wind Sector Deal commits ministries, investors, suppliers, financial institutions, local authorities, educational bodies and sector organisations to aligned actions on local content, installation and service ports, training centres, internships, vocational education, fisheries coexistence and SME support. Sector-deal commitments explicitly link investors to cooperation with domestic suppliers and port/logistics development.

Separate government announcements confirm public support for service-terminal development, including the adaptation of the Port of Leba and the planned development of additional service terminals in Darlowo and Ustka. The strength of the Polish case is that port policy is not treated as a standalone infrastructure issue. It is embedded in industrial policy, education policy and local economic development.

That is highly transferable to ADRIONWIND, because the Adriatic-Ionian challenge is not only where offshore wind will connect, but how coastal industries, shipyards, logistics firms and engineering SMEs can position themselves before first commercial deployment.

> **Actionable lesson for ADRIONWIND:** Develop a transnational port-and-supply-chain compact that combines port role allocation, SME capability mapping, fisheries coexistence protocols, and a visible training pipeline for local labour and service providers.

Financing and investment model good practices

Dutch public de-risking and adaptive support

The Dutch financing lesson begins before the subsidy question. By preparing site studies centrally, coordinating permits and assigning offshore-grid delivery to the TSO, the Netherlands removes a substantial portion of development risk from bidders. Official Dutch material is explicit that the state prepares the framework for new offshore wind farms and that the TSO has responsibility for offshore grid development. In practical financing terms, this lowers contingency costs, reduces information asymmetry and supports more competitive bids.

The second Dutch lesson is flexibility. In 2026 the government moved to a subsidised 1 GW tender for IJmuiden Ver Gamma-A in order to preserve progress under changed market conditions. For ADRIONWIND countries, the transferable part is not the scale of the Dutch subsidy envelope; it is the principle that transparent adjustment of support design can be preferable to stop-go deployment.

> **Actionable lesson for ADRIONWIND:** Frame investment pathways around staged public de-risking first, and support instruments second, with the latter explicitly designed as adjustable if macroeconomic conditions worsen.

Belgium's two-way CfD and grid-risk allocation

Belgium offers a strong financing case because it addresses two distinct investor risks: market-price volatility and offshore-grid availability. In September 2024, the European Commission approved a Belgian scheme for the first project in the Princess Elisabeth Zone based on a transparent competitive process and a 20-year variable premium under a two-way Contract for Difference. The measure is designed to support a 700 MW offshore wind farm and to provide a clearer long-term revenue framework than merchant exposure alone.

Belgium goes further by allocating part of the grid-performance risk to the system operator. The 2024 Royal Decree on liabilities for the Princess Elisabeth Zone specifies compensation to concession holders in cases of delayed commissioning or unavailability of the Modular Offshore Grid, with compensation linked to the strike price or reference electricity price depending on the circumstance. That mechanism is highly relevant for new offshore wind regions, where grid uncertainty can be as important as market-price uncertainty.

Actionable lesson for ADRIONWIND: When discussing future tenders or pilot support, distinguish clearly between generation-price risk and public-system-delivery risk, and consider a formal compensation framework for delays in public grid or offshore connection infrastructure.

Innovation and technology development good practices

France's floating-wind pilots as a bridge to commercial scale

France is one of the most relevant floating-wind references for ADRIONWIND because it has used pilot projects as a bridge towards commercial-scale Mediterranean deployment. The official French offshore-wind portal records that public debate in 2021 identified the Narbonnaise Sud-Herault and Golfe de Fos zones for four floating wind parks with a cumulative capacity of approximately 1.4 to 1.6 GW. The French public debate process and Mediterranean planning documentation link offshore wind to biodiversity, maritime uses and long-term planning choices. [14][15]

Pilot deployment reinforces this planning pathway. EDF describes Provence Grand Large as the first French floating offshore wind farm, with three floating turbines installed off Port-Saint-Louis-du-Rhone and fully commissioned in 2025. The more important mechanism is how France blends technology demonstration with public governance: pilots generate technical and environmental learning, which then informs spatial planning, port preparation and later auctions.

Actionable lesson for ADRIONWIND: Treat any Adriatic-Ionian floating pilot not as an end in itself, but as a structured learning platform for environmental protocols, deeper-water design, port procedures, fisheries dialogue and future commercial zoning.

Iberian testbeds and open-ocean experimentation

The Iberian Atlantic adds a second transferable model: test infrastructure linked to deeper-water industrialisation. Spain's roadmap for offshore wind and marine energy prioritises research, innovation and floating technologies, while PLOCAN is identified as a key infrastructure for the development and testing of marine energy and offshore-wind technologies. The H2020 PivotBuoy project, tested in the Canary Islands ecosystem, illustrates how open-ocean validation can be used to reduce floating wind costs and validate mooring and platform concepts.

Portugal's WindFloat Atlantic complements that model with first-of-a-kind operational evidence. Official project information states that the 25 MW semi-submersible floating project off Viana do Castelo was connected to the grid by the end of 2019, commissioned in 2020, and operates around 100 metres water depth. Together, the Spanish and Portuguese cases show that floating wind development benefits from an ecosystem approach: test sites, demonstration projects, digital monitoring, EU-funded research consortia, and institutions capable of linking universities, innovators, equipment suppliers and public authorities.

Actionable lesson for ADRIONWIND: Prioritise a transnational floating-wind R&I track for deeper Adriatic-Ionian waters, built around shared test access, monitoring protocols, and demonstrator partnerships rather than fragmented local pilots.

Skills, social acceptance and digital collaboration good practices

Ireland's early skills and community-benefit architecture

Ireland is a particularly useful case for ADRIONWIND because it shows how a newer offshore wind market can institutionalise human-capital and community measures before full build-out. The Irish government's ORESS Community Benefit Fund Rulebook requires each fund to be representative of the local community and wholly inclusive in its decision-making. Separate official guidance states that generator contributions begin in the early project stages, before operation, and may continue for up to 25 years.

On the skills side, the Offshore Wind Skills Action Plan identifies existing training provision and the gaps that could hinder sector development. This approach addresses two risks that are very relevant in the Adriatic-Ionian context: first, community perceptions that benefits arrive too late or too vaguely; second, the tendency to discuss jobs abstractly without a funded training route.

Actionable lesson for ADRIONWIND: Embed early-stage community-benefit principles and modular offshore-wind training pathways into joint action from the start, rather than leaving both issues to individual developers after project siting.

France's consultation architecture

France provides one of the clearest European examples of formalised public participation in offshore wind planning. Official French sources show that the public debate for Mediterranean floating offshore wind ran from July to October 2021 and helped identify zones for floating projects. The CNDP maritime-planning debate also addressed biodiversity, maritime uses and offshore wind as part of integrated sea-basin planning. This does not eliminate conflict, but it institutionalises dialogue as part of planning rather than as a late-stage corrective exercise.

For ADRIONWIND, the transferable point is procedural rather than cultural: stakeholder engagement works better when it is predictable, documented and tied to real planning choices. A region that is still forming its offshore wind narrative should therefore normalise structured dialogue with fisheries, tourism actors, port users, municipalities, universities and environmental NGOs before projects reach a confrontational stage.

Actionable lesson for ADRIONWIND: Design a common consultation toolkit for pilot areas, including stakeholder mapping, fisheries-specific engagement, and public-facing summaries of baseline studies and option areas.

Digital and ecosystem collaboration tools

A short but important set of good practices concerns digital visibility and collaboration infrastructure. National offshore portals in France, Denmark and the Netherlands already perform functions that ADRIONWIND's future platform should emulate: they centralise project documentation, consultation records, study outputs, tender information and baseline data in one place for public authorities, developers, researchers and communities. Germany's PINTA portal is especially instructive because it openly structures preliminary investigation data for marine environment, subsoil, wind and oceanographic conditions, and shipping hazards on the sites to be tendered.

At EU level, the Enterprise Europe Network provides advisory and brokerage support for SMEs on sustainability, Single Market issues and digitalisation, while EMODnet Human Activities and the European Atlas of the Seas provide shared geographic information and map layers that can support basin-wide visibility and planning intelligence. The direct relevance for ADRIONWIND is strong: actor visibility, SME matchmaking, policy intelligence and technical knowledge exchange all improve when data are searchable, georeferenced and updated through one trusted interface.

> **Actionable lesson for ADRIONWIND:** Build the Network of Excellence platform as a practical offshore-wind observatory with supplier profiles, GIS layers, study repositories, event brokerage, and a structured library of transferable regulatory and technical documents.

Strategic synthesis

Taken together, the selected EU cases demonstrate that successful offshore wind development depends on the gradual coordination of governance, infrastructure, research and innovation, industrial ecosystems, workforce development, environmental planning, and digital cooperation. While the institutional and market conditions of the Adriatic–Ionian region differ significantly from those of the North Sea and Atlantic basins, the analysed practices provide valuable reference mechanisms that can be adapted to the Mediterranean context and to the shared regional priorities identified within ADRIONWIND.

The EU examples confirm the importance of early public coordination in areas such as maritime spatial planning, environmental assessment, offshore grid preparation, port specialization, and investment de-risking. They also demonstrate that floating offshore wind development benefits from integrated research, pilot deployment, environmental monitoring, and industrial cooperation frameworks rather than isolated projects. At the same time, the analysed cases underline the importance of early workforce preparation, stakeholder engagement, and structured dialogue with coastal communities and maritime sectors.

For ADRIONWIND, the main strategic lesson is not the replication of large-scale offshore wind models developed in mature European markets, but the adaptation of transferable governance, innovation, infrastructure, and cooperation mechanisms to the realities of the Adriatic–Ionian macro-region. In this context, offshore wind development is expected to evolve progressively through functional specialization, transnational coordination, shared infrastructure planning, collaborative R&I activities, and stronger integration between public authorities, research institutions, industrial actors, ports, SMEs, and regional communities.

The EU good practices therefore reinforce the strategic orientation of ADRIONWIND toward:

- floating offshore wind adaptation for Mediterranean conditions;
- coordinated infrastructure and port transformation;
- integrated regional supply chains and industrial cooperation;
- joint pilot and demonstration activities;
- offshore workforce and skills transition;
- harmonised governance and environmental planning; and
- interoperable digital cooperation systems supporting regional coordination and knowledge exchange.

4.3. Macroeconomic Foresight Model Framework

This chapter aims to define the analytical structure upon which the foresight model to be developed under Activity 2.6 (Deliverable D.2.6.1) will be based. Its purpose is to establish the key dimensions, variables, and methodological logic that will guide the model, rather than to present the results of a macroeconomic assessment within the Strategy itself. The model will act as a forward-looking, decision-support tool, designed to explore potential development pathways for the offshore wind energy sector in the ADRION region. By examining how market conditions, policy frameworks, technological developments, and investment dynamics may evolve, the model will support the Strategy in remaining adaptable and responsive to changing external circumstances.

Attention will be given to the seven shared regional priorities identified in Chapter 3, including floating offshore wind adaptation, regional supply-chain integration, infrastructure transformation, pilot and demonstration activities, workforce development, coordinated governance, and digital cooperation. In this way, the foresight framework aims to support the transition from strategic analysis toward implementation-oriented planning, while allowing the Strategy to remain adaptable to evolving market, technological, and policy conditions.

4.3.1 Market and Sectoral Trends Analysis

Market and sectoral trends analysis constitutes a core dimension of the Macroeconomic Foresight Model Framework, as it defines the external environment within which future offshore wind development pathways in the ADRION region will evolve. At this stage, the objective is not to provide a detailed market assessment, but rather to identify the principal dynamics and structural trends that will shape the foresight model.

A primary trend concerns the acceleration of the European energy transition and the increasing strategic role of renewable energy sources, including offshore wind, within broader decarbonisation and energy security policies. These developments are expected to influence long-term investment priorities, infrastructure planning, and regional energy-market integration.

The framework also considers the gradual emergence of offshore wind markets in the Adriatic–Ionian region. Although the ADRION area remains largely at a pre-commercial stage, ongoing resource assessments, spatial-planning initiatives, feasibility studies, and regulatory developments indicate a progressive movement toward market formation. The foresight model will therefore assess how differences in regulatory readiness, institutional capacity, infrastructure availability, and investment conditions may influence the pace and geography of offshore wind deployment across the region.

Technological evolution represents another central dimension of the framework, particularly regarding floating offshore wind technologies, hybrid renewable systems, energy-storage integration, digital offshore systems, and sector-coupling applications such as hydrogen production. These technologies are especially relevant in the Adriatic–Ionian basin due to deep-water conditions, environmental sensitivities, and spatial constraints.

The framework further incorporates trends related to investment dynamics and industrial development. Particular attention will be given to factors influencing project bankability, public and private investment mobilisation, supply-chain development, SME participation, and the integration of offshore wind activities into regional industrial ecosystems, including maritime industries, logistics, engineering, manufacturing, and digital services.

Finally, the foresight model will consider broader systemic trends linked to grid modernisation, cross-border electricity integration, port transformation, environmental governance, and macro-regional cooperation. These dimensions reflect the interconnected nature of offshore wind development and its dependence on wider economic, infrastructural, and institutional transformation processes across the ADRION region.

4.3.2 Economic Impact Assessment

Economic impact assessment represents a central dimension of the Macroeconomic Foresight Model Framework, as it defines how the foresight model will evaluate the potential macroeconomic implications of offshore wind development in the ADRION region. At this stage, the objective is not to quantify impacts, but to establish the principal categories, variables, and relationships through which the model will assess how offshore wind development may influence regional economic performance over time.

The foresight model will assess the potential contribution of offshore wind to economic growth, with particular attention to effects on gross domestic product (GDP), value added, industrial output, and investment flows. This includes consideration of both direct impacts generated through offshore wind activities—such as planning, construction, operation, and maintenance—and indirect and induced impacts arising through supply chains, supporting services, infrastructure development, and wider economic activity.

Particular attention will be given to the extent to which offshore wind may contribute to the diversification and transformation of regional economies. In line with the shared regional priorities identified in Chapter 3, the model will examine how offshore wind development may stimulate industrial upgrading, maritime and logistics activities, engineering services, manufacturing, digital applications, and cross-border value-chain integration across the Adriatic–Ionian region.

Employment and labour-market dynamics constitute another key dimension of the framework. The foresight model will consider potential employment generation across different stages of offshore wind development, including project preparation, infrastructure construction, manufacturing, marine operations, and long-term operation and maintenance activities. In parallel, the model will assess workforce adaptation requirements, including reskilling, upskilling, offshore-specialised training needs, and labour mobility linked to regional workforce integration.

The framework further recognises the importance of differentiated economic impacts across the ADRION area. Economic outcomes are expected to vary depending on national and regional conditions, including industrial capacity, infrastructure readiness, institutional maturity, investment attractiveness, and integration into European offshore wind and energy value chains. The foresight model will therefore assess how varying levels of preparedness and cooperation may influence development trajectories and economic distribution across participating countries.

In addition, the model will examine the broader structural implications of offshore wind deployment, including its potential contribution to innovation ecosystems, SME development, technological modernisation, and regional competitiveness. Particular consideration will be given to the role of transnational cooperation in strengthening economic integration and enabling complementary specialisation across regional supply chains and industrial activities.

Finally, the foresight model will consider longer-term macroeconomic implications associated with offshore wind deployment, including contributions to energy security, energy-system resilience, infrastructure modernisation, and reduced exposure to energy-price volatility. These dimensions are particularly relevant within the context of the European energy transition, evolving geopolitical conditions, and the increasing strategic importance of renewable and domestically integrated energy systems.

4.3.3 Policy and Regulatory Environment Analysis

Policy and regulatory environment analysis constitutes a critical dimension of the Macroeconomic Foresight Model Framework, as it defines the institutional and governance conditions that may influence the feasibility, pace, and scale of offshore wind development in the ADRION region. Within this framework, the objective is to identify the principal policy-related variables and regulatory factors that shape market formation, investment conditions, infrastructure development, and transnational cooperation.

The foresight model will assess the extent to which policy frameworks at European, national, and regional levels support or constrain offshore wind development. This includes consideration of European climate, energy, industrial, maritime, and environmental policies, as well as their translation into national strategies, regulatory instruments, and implementation mechanisms. Particular attention will be given to the degree of alignment between policy levels and the extent to which policy coherence contributes to enabling conditions for offshore wind deployment.

A central aspect of this dimension concerns the development and maturity of offshore wind regulatory frameworks, including licensing systems, permitting procedures, environmental assessment requirements, maritime spatial planning, grid access conditions, and infrastructure planning. The foresight model will assess how differences in regulatory readiness and administrative capacity across ADRION countries may influence project development timelines, investment attractiveness, and market evolution.

The framework will also consider the effectiveness of governance structures and institutional coordination mechanisms. Offshore wind development requires interaction between multiple policy domains, particularly energy, maritime affairs, environmental protection, industrial development, infrastructure planning, and research and innovation. The model will therefore examine how integrated or fragmented governance approaches may affect the efficiency and predictability of offshore wind development processes.

In addition, the foresight model will assess the importance of cross-border and macro-regional regulatory coordination. Given the transnational nature of the Adriatic–Ionian basin, differences in legal frameworks, planning procedures, technical standards, and permitting approaches may significantly influence opportunities for cooperation, shared infrastructure development, joint pilot activities, and regional market integration. The model will therefore examine how greater regulatory convergence and coordinated governance may reduce uncertainty and strengthen the development of a more integrated ADRION offshore wind ecosystem.

Particular consideration will also be given to policy support mechanisms and investment-enabling frameworks, including renewable energy support schemes, public de-risking instruments, innovation funding, and infrastructure financing mechanisms. These elements are expected to play a decisive role in shaping investment flows and project bankability, particularly in emerging offshore wind markets.

Finally, the framework recognises the importance of policy stability, predictability, and long-term strategic visibility as key determinants of investor confidence and sectoral development. Frequent regulatory changes, administrative delays, unclear institutional responsibilities, or inconsistent implementation may create significant barriers to offshore wind deployment, while stable and well-coordinated policy frameworks can support long-term planning, investment mobilisation, and regional cooperation.

4.3.4 Risk and Opportunity Mapping

Risk and opportunity mapping represents a key dimension of the Macroeconomic Foresight Model Framework, defining how the foresight model will identify and assess the principal uncertainties, constraints, and enabling factors influencing the development of the offshore wind sector in the ADRION region. This component builds directly on the analytical findings generated through the SWOT analysis, national context assessments, and comparative evaluations presented in previous chapters, translating them into forward-looking considerations that will support scenario development and strategic decision-making.

Within this framework, the foresight model will systematically examine both risks that may constrain sectoral development and opportunities that may accelerate market formation, investment mobilisation, industrial transformation, and regional integration. These factors will be treated as dynamic and interrelated variables shaped by evolving market conditions, policy environments, technological developments, infrastructure readiness, and geopolitical trends.

A first category of risks concerns regulatory and institutional uncertainty. The foresight model will assess how delays in permitting procedures, fragmented governance structures, incomplete offshore wind frameworks, inconsistent implementation of maritime spatial planning, or regulatory instability may affect investor confidence and project development timelines. Differences in regulatory maturity and administrative capacity across ADRION countries will be considered an important source of variability in future development trajectories.

The framework will also examine infrastructure-related risks, particularly those associated with electricity grids, port capacity, offshore logistics systems, interconnections, and supporting industrial infrastructure. Limited grid integration capacity, insufficient offshore-ready ports, or weak maritime logistics systems may significantly constrain deployment scalability and increase development costs, especially in emerging offshore wind markets.

Financial and investment-related risks will constitute another important analytical dimension. The foresight model will assess the implications of high upfront capital requirements, evolving financing conditions, limited access to private capital, inflationary pressures, and uncertainty surrounding support schemes and revenue mechanisms. In early-stage markets, these factors may significantly influence project bankability and the pace of investment mobilisation.

In addition, the model will consider technological and operational risks linked to floating offshore wind deployment, particularly in deep-water Mediterranean conditions. These include uncertainties related to technological maturity, cost reduction trajectories, offshore maintenance requirements, environmental performance, and integration with existing energy systems.

Environmental and social risks will also form part of the analysis. The foresight model will examine how biodiversity concerns, marine ecosystem impacts, fisheries interactions, spatial conflicts, stakeholder opposition, and insufficient public engagement may affect project implementation and long-term sectoral acceptance. Particular attention will be given to the importance of environmental governance and inclusive stakeholder dialogue in reducing conflict and improving social legitimacy.

At the same time, the framework recognises a range of significant opportunities associated with offshore wind development in the ADRION region. These include the possibility to leverage favourable geographic and maritime conditions for floating offshore wind deployment, particularly in deep-water areas where conventional bottom-fixed solutions are less feasible.

The foresight model will also assess opportunities linked to industrial diversification and regional value-chain development. Offshore wind may stimulate economic activity across shipbuilding, steel fabrication, maritime services, engineering, logistics, environmental services, and digital applications, while simultaneously strengthening SME participation and industrial upgrading throughout the Adriatic–Ionian region.

Another major opportunity dimension concerns transnational cooperation and macro-regional integration. The model will examine how coordinated approaches to infrastructure planning, research and innovation, environmental monitoring, workforce development, and industrial cooperation may reduce development risks, generate economies of scale, and improve regional competitiveness within the broader European offshore wind ecosystem.

The framework will further consider opportunities associated with technological innovation, particularly in floating offshore wind technologies, hybrid renewable systems, digital offshore management tools, energy storage, and sector coupling applications such as offshore hydrogen production. These emerging domains may provide strategic entry points for ADRION countries into higher-value segments of European offshore wind value chains.

In addition, the foresight model will assess opportunities arising from alignment with European policy priorities and funding mechanisms, including EU climate and energy objectives, industrial transition instruments, and transnational cooperation programmes. Access to European financing and innovation support may play a decisive role in accelerating market readiness and reducing barriers to offshore wind deployment in the ADRION region.

By structuring these categories of risks and opportunities within the framework, the Strategy ensures that the foresight model will incorporate both constraints and enabling factors into its analysis of future development pathways. This approach supports a more balanced and realistic understanding of offshore wind development in the ADRION region, highlighting not only potential barriers, but also the strategic opportunities that may support long-term regional transformation and integration.

4.3.5 Scenario Building and Forecasting

Scenario building and forecasting constitute the central analytical component of the Macroeconomic Foresight Model Framework, as they define how the foresight model will explore possible future development pathways for the offshore wind energy sector in the ADRION region. Within this framework, scenarios are used as structured, forward-looking tools to examine how different combinations of drivers, constraints, policy choices, and enabling conditions may influence the evolution of the sector and its broader economic, industrial, and territorial implications.

The foresight model will adopt a scenario-based and exploratory approach, focusing on the analysis of plausible trajectories rather than attempting to produce deterministic forecasts. This approach allows for the systematic examination of uncertainty while supporting the identification of the key variables and interdependencies likely to shape future outcomes. In this context, scenario building serves as a mechanism for linking policy ambition, investment dynamics, technological progress, governance capacity, infrastructure readiness, and regional cooperation with potential macroeconomic and sectoral developments.

Within the framework, the foresight model will develop a set of alternative development scenarios reflecting different levels of offshore wind market maturity and strategic implementation across the ADRION region. These scenarios are expected to represent varying degrees of regulatory readiness, investment mobilisation, infrastructure development, technological adoption, industrial integration, workforce preparedness, and cross-border coordination. By comparing these alternative pathways, the model will provide insights into how different conditions may accelerate, delay, or reshape offshore wind deployment and its associated economic impacts.

A baseline scenario will represent the continuation of existing trends and currently observable policy and market dynamics. Under this pathway, offshore wind development in the ADRION region would progress gradually, with uneven implementation across countries, limited transnational coordination, and slower infrastructure adaptation. Existing barriers related to permitting complexity, fragmented governance, infrastructure limitations, and investment uncertainty would continue to constrain deployment speed and market integration.

Intermediate scenarios will examine the effects of partial acceleration driven by improvements in selected enabling conditions, such as enhanced regulatory coordination, increased investment support, stronger workforce development, or more systematic integration of research and innovation activities. These scenarios will allow the model to assess how targeted interventions may improve market readiness and reduce structural bottlenecks without requiring full regional integration.

More advanced or strategic-cooperation scenarios will explore the implications of stronger macro-regional coordination and implementation of the shared regional priorities identified within the ADRIONWIND Strategy. These scenarios may include accelerated development of floating offshore wind technologies, coordinated infrastructure planning, integrated supply-chain development, expanded transnational R&I cooperation, harmonised environmental and permitting approaches, and the emergence of shared digital and industrial ecosystems across the Adriatic–Ionian region.

The foresight model will also examine how interactions between key variables may influence the trajectory and resilience of each scenario. This includes assessing how limitations in one domain — such as grid capacity, port readiness, financing conditions, or workforce availability — may constrain overall development even under otherwise favourable market conditions. At the same time, the model will consider how positive developments, such as regulatory simplification, technological breakthroughs, or successful pilot projects, may generate multiplier effects and accelerate broader regional transformation.

In addition, the foresight model will analyse the macroeconomic implications associated with each scenario, including potential effects on economic growth, employment creation, industrial diversification, investment flows, infrastructure development, and SME participation. Particular attention will be given to how offshore wind deployment may contribute to the gradual formation of regional value chains and the strengthening of industrial and innovation ecosystems within the ADRION region.

The framework also recognises the importance of transnational dynamics in shaping future development pathways. The foresight model will therefore examine not only national trajectories, but also the role of cross-border cooperation, shared infrastructure systems, coordinated policy approaches, and regional integration mechanisms in influencing overall macro-regional performance. This perspective is particularly relevant in the ADRION context, where many structural limitations may be addressed more effectively through cooperation than through isolated national action.

Furthermore, scenario building will support the identification of strategic leverage points and priority intervention areas. By examining the conditions under which more favourable outcomes become achievable, the foresight model will provide guidance for policymakers, research institutions, industrial actors, and project partners in prioritising investments, coordinating actions, and strengthening implementation capacity.

The scenario-building process will also support the future operationalisation of the Macroeconomic Foresight Model to be developed under Activity 2.6 (Deliverable D.2.6.1). In this context, the framework establishes the analytical logic upon which future quantitative and semi-quantitative modelling exercises may be structured, including the integration of economic, technological, regulatory, environmental, and social variables into coherent forward-looking pathways.

By defining this structured approach to scenario building and forecasting, the Macroeconomic Foresight Model Framework ensures that the foresight model will be capable of capturing the complexity, uncertainty, and multi-dimensional nature of offshore wind development in the ADRION region, while also providing a practical and policy-relevant basis for strategic planning, cooperation, and long-term decision-making.

4.3.6 Cross-Sectoral Interdependencies

Cross-sectoral interdependencies constitute an important dimension of the Macroeconomic Foresight Model Framework, as they define how the foresight model will capture the interactions between offshore wind development and the wider economic, industrial, infrastructural, environmental, and technological systems of the ADRION region. These interdependencies are critical for understanding the broader systemic effects of offshore wind deployment and for identifying opportunities for integrated and coordinated regional transformation.

Within this framework, the foresight model will examine how offshore wind development is linked to a broad range of interconnected sectors, including energy systems, maritime industries, shipbuilding, manufacturing, logistics, ports, digital technologies, environmental services, tourism, fisheries, and research and innovation ecosystems. The model will assess how developments within these sectors may influence — and be influenced by — the expansion of offshore wind activities, highlighting both structural dependencies and potential synergies.

A central area of analysis concerns the relationship between offshore wind and wider energy systems. The foresight model will examine interactions between offshore renewable generation, electricity transmission infrastructure, storage systems, interconnectors, and emerging sector-coupling applications such as hydrogen production and smart energy management. Particular attention will be given to the role of grid flexibility, cross-border electricity integration, and coordinated infrastructure planning in enabling large-scale offshore wind deployment within the Adriatic–Ionian region.

The framework will also explore interdependencies with maritime and coastal economic activities. Offshore wind development requires coordinated spatial planning and coexistence mechanisms involving shipping routes, port operations, fisheries, aquaculture, tourism, marine conservation, and coastal development. The foresight model will therefore assess how competing or complementary uses of marine space may influence deployment scenarios, stakeholder acceptance, environmental governance, and long-term operational sustainability.

Industrial and manufacturing interdependencies will represent another major analytical dimension. The foresight model will examine how existing industrial capacities within the ADRION region — including shipbuilding, steel fabrication, electrical equipment manufacturing, heavy engineering, cable systems, offshore logistics, and maintenance services — may be leveraged, adapted, or upgraded to support offshore wind value chains. In this context, the model will also assess the role of SMEs and industrial clustering processes in supporting supply-chain diversification and regional economic integration.

The framework will further consider workforce and labour-market interdependencies. Offshore wind development is closely connected to broader labour-market transitions, particularly in regions undergoing industrial restructuring or just transition processes linked to fossil-fuel phase-out policies. The foresight model will therefore analyse interactions between offshore wind deployment, workforce reskilling, vocational education systems, maritime professions, engineering specialisations, and labour mobility across the ADRION region.

Another important dimension concerns research, innovation, and digitalisation. The foresight model will assess how digital technologies — including advanced monitoring systems, predictive maintenance tools, GIS platforms, digital twins, marine data systems, and smart infrastructure solutions — may improve the operational efficiency, reliability, and integration of offshore wind systems. At the same time, the model will examine how offshore wind development may stimulate broader innovation ecosystems, foster university–industry collaboration, and support the growth of knowledge-intensive economic activities.

Environmental interdependencies will also be incorporated into the framework. Offshore wind deployment interacts directly with marine ecosystems, biodiversity protection objectives, climate adaptation policies, and environmental monitoring systems. The foresight model will therefore assess how environmental governance structures, monitoring capacities, and ecosystem-management approaches may influence both the sustainability and the social legitimacy of offshore wind development pathways.

The model will additionally consider cross-sectoral interdependencies related to infrastructure and territorial development. Port modernisation, transport connectivity, coastal industrial zones, offshore logistics corridors, and digital infrastructure upgrades may generate spillover effects extending beyond the offshore wind sector itself. In this context, offshore wind may act as a catalyst for broader territorial transformation and macro-regional infrastructure integration.

Finally, the foresight model will analyse how these interdependencies may contribute to broader structural economic transformation within the ADRION region.

By identifying linkages between offshore wind and multiple interconnected sectors, the model will support a more systemic understanding of offshore wind not merely as an energy technology, but as a multi-sectoral development driver capable of supporting industrial upgrading, innovation, regional integration, and sustainable economic diversification.

By incorporating these cross-sectoral interdependencies into the framework, the Strategy ensures that the foresight model moves beyond a sector-specific perspective and instead reflects the complex and interconnected nature of offshore wind development. This approach supports more integrated policy design, strengthens coordination between strategic sectors, and helps identify opportunities for synergies across countries, industries, and regional development pathways within the Adriatic–Ionian area.

4.3.7 Innovation and Technology Foresight

Innovation and technology foresight constitutes a key dimension of the Macroeconomic Foresight Model Framework, as it defines how the foresight model will assess the role of technological development, innovation capacity, and research cooperation in shaping the future evolution of the offshore wind sector in the ADRION region. This component is closely aligned with the shared regional priorities, complementarities, and strategic transformation pathways identified in Chapters 3 and 4 of the ADRIONWIND Strategy, particularly those related to floating offshore wind adaptation, applied innovation, digital cooperation, industrial integration, and transnational R&I collaboration.

Within this framework, the foresight model will examine how emerging technologies, innovation ecosystems, and knowledge-transfer processes may influence the competitiveness, scalability, resilience, and long-term sustainability of offshore wind deployment in the Adriatic–Ionian region. Particular attention will be given to technologies and innovation domains that are especially relevant to the geographical, environmental, industrial, and infrastructural characteristics of the Adriatic–Ionian basin.

A central focus of the analysis concerns the evolution and deployment potential of floating offshore wind technologies, which are expected to constitute the dominant technological pathway for offshore wind development in large parts of the ADRION region due to deep-water conditions and Mediterranean spatial constraints. The foresight model will assess how technological maturity, cost-reduction trajectories, industrial readiness, demonstration activities, and infrastructure adaptation related to floating systems may influence future market development pathways and regional positioning within European offshore wind value chains.

In addition, the model will examine technological innovation related to hybrid renewable systems, offshore energy integration, and sector coupling applications, including the integration of offshore wind with energy storage systems, hydrogen production, smart grids, and cross-border electricity balancing mechanisms. These innovation domains are increasingly recognised as important for enhancing energy-system flexibility, improving grid stability, and creating new industrial and investment opportunities in emerging offshore wind markets.

The framework will also assess the role and maturity of regional research and innovation ecosystems. Building on the comparative analyses presented in previous chapters, the foresight model will consider differences in research capacity, technological specialisation, institutional readiness, and industry–academia collaboration across ADRION countries. This includes evaluating the role of universities, research institutes, innovation clusters, pilot infrastructures, demonstration facilities, and transnational cooperation networks in supporting technology development and market uptake.

Particular emphasis will be placed on the role of transnational R&I cooperation and functional specialisation within the ADRION region. The foresight model will assess how complementarities between countries — such as Italy's progress in floating offshore wind deployment, Greece's expertise in marine systems and floating technologies, Croatia's maritime engineering and fabrication capacities, Montenegro's maritime infrastructure, and the industrial transition potential of BiH and Albania — may contribute to the emergence of a more integrated macro-regional offshore wind innovation ecosystem.

The model will further examine the importance of pilot projects, offshore testing environments, demonstration initiatives, and applied innovation platforms as mechanisms for accelerating technological learning and reducing deployment risks. In this context, the foresight model will assess how collaborative pilot activities may support the validation of Mediterranean-adapted floating technologies, environmental monitoring methodologies, offshore operational standards, and digital management systems.

Another important analytical dimension concerns digitalisation and smart offshore systems, reflecting the strategic importance assigned to digital cooperation within the ADRIONWIND framework. The foresight model will evaluate how digital technologies — including predictive maintenance systems, digital twins, advanced monitoring platforms, GIS-based marine planning systems, offshore sensor networks, AI-supported analytics, and shared marine-data infrastructures — may improve operational efficiency, environmental supervision, infrastructure coordination, and system integration across the region.

The framework also recognises that innovation extends beyond technological advancement alone and includes organisational, institutional, financial, and business-model innovation. The foresight model will therefore examine how new governance approaches, collaborative industrial models, regional cluster structures, financing mechanisms, and public–private cooperation frameworks may influence the deployment and long-term viability of offshore wind activities in the ADRION region.

In addition, the model will assess the role of knowledge circulation, skills development, and innovation diffusion in strengthening regional technological capacity. Given the uneven distribution of expertise and infrastructure across participating countries, transnational knowledge exchange, workforce mobility, and collaborative training activities will be treated as important enabling factors for technological uptake and innovation-driven growth.

The foresight model will also examine how technological and innovation dynamics interact with broader macroeconomic variables, including investment attraction, industrial competitiveness, SME integration, value-chain formation, and infrastructure development. This integrated perspective will allow the model to capture innovation not as an isolated R&I process, but as a systemic driver of broader economic transformation and regional integration.

By structuring these dimensions within the framework, the Strategy ensures that the foresight model will systematically incorporate technological and innovation-related dynamics into its analysis of future development pathways. This approach supports a more comprehensive understanding of offshore wind as a technologically advanced, innovation-driven, and cooperation-intensive sector, while reinforcing the strategic importance of transnational R&I integration, digital cooperation, and macro-regional specialisation within the ADRION region.

4.3.8 Investment and Funding Analysis

Investment and funding analysis represents a fundamental dimension of the Macroeconomic Foresight Model Framework, as it defines how the foresight model will assess the financial conditions, investment dynamics, and funding structures required to support the development of the offshore wind sector in the ADRION region. This component focuses on identifying the principal investment drivers, financing mechanisms, economic incentives, and financial constraints that may influence the scale, timing, viability, and long-term sustainability of offshore wind deployment.

Within this framework, the foresight model will examine the overall investment requirements associated with offshore wind development, taking into account the capital-intensive nature of offshore infrastructure, floating technologies, grid integration systems, port adaptation, logistics services, and supporting industrial activities. The model will consider how investment needs evolve across different phases of offshore wind deployment, including early-stage market preparation, pilot and demonstration activities, infrastructure upgrading, commercial-scale deployment, and long-term operations and maintenance.

A central analytical dimension concerns the mobilisation and interaction of public and private financial resources. The foresight model will assess the role of European funding instruments, national support schemes, international financial institutions, regional cooperation mechanisms, and private-sector investment in enabling offshore wind market formation within the ADRION region. Particular attention will be given to how public financing may support risk reduction and market preparation in early-stage offshore wind environments.

The framework will also examine the diversity of financing instruments and investment structures relevant to offshore wind development. This includes grants, loans, blended-finance mechanisms, guarantees, public–private partnerships, equity investments, green financing instruments, innovation funding schemes, and industrial transition support mechanisms. The foresight model will assess how combinations of these instruments may influence project feasibility, infrastructure readiness, and value-chain development across different national contexts.

Particular emphasis will be placed on project bankability and investor confidence, which are especially important in emerging offshore wind markets such as the ADRION region. The foresight model will analyse how factors such as regulatory stability, permitting efficiency, grid availability, revenue predictability, support mechanisms, risk allocation, infrastructure preparedness, and long-term policy visibility may influence investment attractiveness and financing conditions.

The framework will further consider the specific investment implications associated with floating offshore wind technologies, which are expected to dominate future offshore deployment pathways in the Adriatic–Ionian basin. The foresight model will therefore assess how technological maturity, demonstration activities, supply-chain readiness, infrastructure adaptation, and economies of scale may influence investment costs, financing structures, and commercial viability over time.

Another important analytical dimension concerns investment distribution and regional asymmetries. The foresight model will examine how differences in industrial capacity, infrastructure readiness, regulatory maturity, institutional effectiveness, and market size across ADRION countries may influence the geographical concentration of investments and the uneven distribution of economic benefits. In this context, the model will assess how targeted policy support and transnational cooperation mechanisms may help reduce disparities and facilitate broader regional participation in offshore wind value chains.

The model will also assess the role of infrastructure investment as a precondition for offshore wind market development. This includes investments related to ports, electricity transmission systems, interconnectors, offshore logistics infrastructure, digital systems, and environmental monitoring capacities. Particular attention will be given to the strategic importance of coordinated infrastructure planning and shared regional assets in reducing development costs and improving investment efficiency.

In addition, the foresight model will analyse the potential multiplier effects and economic spillovers associated with offshore wind investment. Investments in offshore wind are expected to stimulate economic activity across shipbuilding, manufacturing, engineering, maritime services, logistics, environmental consulting, digital applications, and research and innovation sectors. The model will therefore examine how offshore wind investment may contribute to industrial diversification, SME growth, innovation capacity, and broader macro-regional competitiveness.

The framework also recognises the strategic importance of transnational cooperation in investment planning and financing mobilisation. The foresight model will assess how coordinated approaches between ADRION countries — including joint projects, shared infrastructure investments, integrated value chains, collaborative R&I initiatives, and macro-regional funding strategies — may improve investment efficiency, reduce perceived risks, and strengthen access to European and international financing opportunities.

Particular attention will also be given to the interaction between investment dynamics and the shared regional priorities identified within the ADRIONWIND Strategy. The foresight model will assess how investments related to floating offshore wind adaptation, industrial integration, infrastructure transformation, workforce development, digital cooperation, and environmental governance may reinforce one another and contribute to cumulative regional development effects.

Finally, the framework will consider the long-term sustainability and resilience of offshore wind financing models in the context of evolving market conditions, energy-price dynamics, geopolitical uncertainty, technological change, and climate-transition policies. This includes examining how adaptive support frameworks, diversified financing structures, and stronger macro-regional coordination may improve the resilience and long-term attractiveness of offshore wind investment in the ADRION region.

By defining these dimensions within the framework, the Strategy ensures that the foresight model will incorporate a comprehensive understanding of investment and funding dynamics into its analysis of future offshore wind development pathways. This approach supports a more realistic and policy-relevant assessment of the financial conditions required for offshore wind deployment while helping identify the principal enabling factors and constraints shaping investment in the Adriatic–Ionian region.

4.3.9 Environmental and Social Sustainability Metrics

Environmental and social sustainability metrics constitute a key dimension of the Macroeconomic Foresight Model Framework, as they define how the foresight model will assess the broader sustainability implications of offshore wind development in the ADRION region. This component reflects the understanding that offshore wind deployment is not solely an economic, technological, or infrastructural process, but also a transformation with significant environmental, territorial, and social dimensions that must be systematically integrated into long-term planning and decision-making.

Within this framework, the foresight model will examine how offshore wind development aligns with environmental protection objectives, climate-transition priorities, and sustainable maritime governance principles. Particular attention will be given to biodiversity preservation, marine ecosystem integrity, cumulative environmental impacts, climate resilience, and the sustainable use of maritime space. The model will assess how environmental considerations may influence both the feasibility and the long-term sustainability of offshore wind deployment pathways within the Adriatic–Ionian basin.

A central analytical dimension concerns the role of environmental governance and assessment mechanisms, including Environmental Impact Assessments (EIA), Strategic Environmental Assessments (SEA), marine ecosystem monitoring systems, and maritime spatial planning procedures. The foresight model will examine how the effectiveness, consistency, and integration of these instruments may influence project implementation, regulatory predictability, stakeholder trust, and environmental compatibility across different national contexts.

The framework will also assess the environmental implications associated with floating offshore wind technologies, which are expected to become the dominant deployment pathway in much of the ADRION region. Particular consideration will be given to environmental interactions related to mooring systems, subsea infrastructure, marine biodiversity, fisheries coexistence, underwater noise, seabed disturbance, and cumulative ecosystem pressures in environmentally sensitive Mediterranean marine environments.

At the same time, the foresight model will examine social sustainability dimensions, including stakeholder acceptance, public participation, territorial inclusion, workforce transition, and the distribution of economic benefits. Offshore wind development involves a wide range of stakeholders — including coastal communities, fisheries, maritime industries, tourism actors, environmental organisations, research institutions, and public authorities — and its long-term success depends significantly on the ability to ensure inclusive governance processes and balanced socio-economic outcomes.

The model will therefore assess how stakeholder-engagement mechanisms, public consultation procedures, and governance practices may influence social legitimacy, conflict mitigation, and implementation effectiveness. Particular attention will be given to the importance of early dialogue, transparent communication, and participatory planning approaches in strengthening public acceptance and reducing socio-environmental tensions.

Building on the findings of the comparative analyses and the shared regional priorities identified within the ADRIONWIND Strategy, the foresight model will also consider how offshore wind development may contribute to broader socio-economic sustainability objectives. These include employment generation, workforce reskilling, just transition processes, regional cohesion, industrial diversification, and the strengthening of coastal and maritime economies. In this context, sustainability is understood not only in environmental terms, but also as the capacity of offshore wind development to support inclusive, resilient, and territorially balanced economic transformation across the ADRION region.

The framework additionally recognises the importance of measurability, monitoring, and indicator-based assessment. The foresight model will therefore consider how environmental and social sustainability dimensions may be translated into measurable variables and performance indicators. These may include environmental compliance metrics, biodiversity monitoring indicators, stakeholder-engagement processes, workforce-development indicators, regional value-chain participation, SME involvement, and measures related to governance quality and social inclusion.

Particular emphasis will also be placed on alignment with European environmental legislation, climate targets, sustainability taxonomies, and macro-regional policy frameworks. The foresight model will examine how consistency with EU priorities — including the European Green Deal, biodiversity strategies, marine policies, and sustainable-finance frameworks — may influence both environmental performance and access to investment and financing opportunities.

The model will further assess how environmental and social sustainability considerations interact with other strategic dimensions of offshore wind development, including investment attractiveness, infrastructure planning, technological innovation, industrial integration, and regional cooperation. Sustainability factors may therefore function both as enabling conditions — when effectively integrated into planning and governance processes — and as constraints when environmental risks, stakeholder concerns, or governance deficiencies are insufficiently addressed.

In addition, the foresight model will examine the role of transnational cooperation in strengthening environmental and social sustainability across the ADRION region. Shared marine ecosystems, interconnected maritime activities, and cross-border environmental pressures require coordinated monitoring methodologies, harmonised assessment approaches, and collaborative governance mechanisms. The model will therefore consider how regional cooperation may improve environmental supervision, knowledge exchange, and social-policy coordination related to offshore wind deployment.

Finally, the framework recognises that environmental and social sustainability metrics are closely connected to the long-term resilience and legitimacy of offshore wind development pathways. The foresight model will therefore assess how sustainability performance may influence the durability, adaptability, and public acceptance of different offshore wind scenarios over time.

By incorporating these environmental and social dimensions into the framework, the Strategy ensures that the foresight model will provide a balanced and comprehensive assessment of offshore wind development, integrating economic, technological, environmental, and societal considerations into a coherent analytical structure. This approach strengthens the connection between strategic priorities, measurable outcomes, sustainable development objectives, and long-term regional transformation within the ADRION region.

4.3.10 Expected Impact

Expected impact represents the concluding dimension of the Macroeconomic Foresight Model Framework, as it defines how the foresight model will synthesise the analytical findings generated throughout the previous dimensions into a coherent interpretation of the potential outcomes of offshore wind development in the ADRION region. This component does not provide quantified projections at this stage; rather, it establishes the conceptual structure through which the foresight model will evaluate and interpret the economic, industrial, technological, environmental, social, and strategic implications of different offshore wind development pathways.

Within this framework, the foresight model will assess the overall contribution of offshore wind development to macro-regional economic transformation and long-term regional competitiveness. Building on the dimensions examined in previous sections, the model will analyse how different scenarios may influence economic growth, value creation, industrial diversification, employment generation, investment mobilisation, and the strengthening of regional value chains. Both direct and indirect effects will be considered, capturing the broader systemic footprint of offshore wind across interconnected sectors and territorial systems.

A central dimension of the expected impact analysis concerns industrial transformation and regional value-chain development. The foresight model will examine how offshore wind deployment may contribute to the upgrading of maritime industries, shipbuilding activities, engineering services, manufacturing systems, logistics operations, and digital infrastructures across the Adriatic–Ionian region. Particular attention will be given to the role of SMEs, industrial clustering, and functional specialisation in supporting a more integrated macro-regional offshore wind ecosystem.

The framework will also assess expected impacts related to research, innovation, and technological advancement. This includes evaluating how offshore wind development may stimulate transnational R&I cooperation, accelerate technological learning, support pilot and demonstration activities, strengthen research infrastructures, and improve regional positioning within European and global offshore wind value chains. Particular emphasis will be placed on the strategic relevance of floating offshore wind technologies, digital offshore systems, and hybrid renewable-energy applications for the ADRION region.

In parallel, the foresight model will examine expected impacts associated with infrastructure development and territorial integration. Offshore wind deployment is expected to generate increased investment in ports, electricity grids, interconnectors, logistics systems, environmental-monitoring infrastructure, and digital coordination platforms. The model will therefore assess how these infrastructure developments may contribute not only to offshore wind deployment itself, but also to broader territorial cohesion, macro-regional connectivity, and economic resilience.

A further important dimension concerns workforce development and labour-market transformation. The foresight model will assess how offshore wind development may contribute to job creation, workforce reskilling, vocational specialisation, and the emergence of new professional domains linked to offshore engineering, marine operations, digital systems, environmental monitoring, and renewable-energy services. In this context, the model will also consider the role of offshore wind in supporting just transition processes and broader socio-economic adaptation within the ADRION region.

The framework additionally incorporates the assessment of environmental and social impacts, reflecting the importance of sustainable and inclusive development pathways. The foresight model will evaluate how offshore wind deployment may contribute to climate-transition objectives, emissions reduction, energy diversification, and sustainable use of maritime resources, while simultaneously considering ecosystem protection, stakeholder acceptance, governance quality, and social inclusion.

Another major analytical dimension concerns regional integration and transnational cooperation, which constitute central elements of the ADRIONWIND strategic approach. The foresight model will therefore assess how coordinated action across ADRION countries may strengthen policy alignment, facilitate shared infrastructure planning, support knowledge exchange, improve investment efficiency, and generate synergies that would be difficult to achieve through isolated national pathways. In this context, the model will capture the added value of macro-regional cooperation as a driver of offshore wind readiness and long-term competitiveness.

The framework also recognises that expected impacts are likely to vary significantly across countries and regions depending on their initial conditions, industrial structures, institutional capacities, infrastructure readiness, and levels of market maturity. The foresight model will therefore assess differentiated impacts while simultaneously identifying areas where convergence, complementarities, and mutual reinforcement may emerge through targeted cooperation and strategic coordination.

In addition, the foresight model will consider the temporal dimension of expected impacts, distinguishing between short-term enabling effects, medium-term deployment and industrialisation impacts, and longer-term structural transformation outcomes. This phased perspective is particularly relevant in the ADRION context, where offshore wind development is expected to evolve progressively from early-stage preparation toward more integrated regional deployment systems.

Particular attention will also be given to the relationship between expected impacts and the seven shared regional priorities identified within the ADRIONWIND Strategy. The foresight model will assess how progress in areas such as floating offshore wind adaptation, industrial integration, infrastructure transformation, applied innovation, workforce development, governance coordination, and digital cooperation may generate cumulative and mutually reinforcing development effects across the region.

Finally, the foresight model will link expected impacts to the strategic objectives, implementation pathways, and Key Performance Indicators (KPIs) defined within the ADRIONWIND Strategy. This will ensure that future model outputs may support monitoring, evaluation, strategic adjustment, and evidence-based policy development over time.

By structuring expected impacts in this manner, the Macroeconomic Foresight Model Framework ensures that the foresight model will provide a comprehensive, integrated, and policy-relevant interpretation of future offshore wind development pathways in the ADRION region. This approach supports the transition from strategic analysis to implementation by helping policymakers, industrial actors, research institutions, and regional stakeholders better understand the potential benefits, trade-offs, priorities, and transformation dynamics associated with the development of a coordinated Adriatic–Ionian offshore wind ecosystem.

4.3.11 Timeframe

The foresight model will consider short-, medium-, and long-term development horizons, reflecting the progressive maturation of offshore wind ecosystems across the Adriatic–Ionian region.

- In the short term, the foresight model will focus primarily on enabling conditions and market formation processes. This includes the evolution of regulatory and policy frameworks, maritime spatial planning activities, institutional coordination mechanisms, early-stage investment preparation, stakeholder engagement processes, resource assessments, feasibility studies, pilot-project preparation, and the gradual development of offshore wind governance capacity. The implementation of the shared regional priorities are especially important.
- The medium-term perspective will examine the transition from preparation to deployment and industrial consolidation. During this phase, the foresight model will analyse the scaling-up of pilot and demonstration activities, the emergence of offshore wind supply chains, increased investment flows, port and grid adaptation, industrial specialisation, SME integration, and the expansion of transnational cooperation mechanisms. The medium-term horizon will also assess the progressive integration of floating offshore wind technologies and the

strengthening of regional research, innovation, and industrial ecosystems linked to offshore renewable energy development.

- The long-term horizon will the maturation of the offshore wind sector within the ADRION region. This includes the integration of offshore wind into regional energy systems, industrial ecosystems, innovation networks, labour markets, and macro-regional infrastructure systems. The foresight model will analyse how offshore wind may contribute to long-term economic diversification, energy security, technological upgrading, climate-transition objectives, and the formation of a more integrated Adriatic–Ionian offshore renewable-energy ecosystem.

The foresight model is expected to provide a forward-looking assessment covering primarily medium- and long-term horizons, while remaining sufficiently flexible to incorporate updates as market conditions, technologies, investment environments, and policy frameworks evolve, with a phased implementation logic.

The framework additionally recognises that different strategic dimensions may evolve at different speeds: technological innovation, digitalisation, and market adaptation may progress relatively rapidly, while infrastructure deployment, regulatory harmonisation, environmental permitting, workforce transformation, and industrial restructuring may require significantly longer timeframes. The foresight model will therefore incorporate asynchronous and non-linear development dynamics across sectors, countries, and policy domains in order to provide a more realistic representation of offshore wind transition processes within the ADRION region.

4.4. Capacity Building Framework

The Capacity Building Framework establishes the strategic basis for strengthening the knowledge, skills, institutional readiness, and cooperation capacities required to support the implementation of the ADRIONWIND Joint Transnational R&I Strategy. The framework is designed to support the development of a more integrated Adriatic–Ionian offshore wind ecosystem by enhancing the capabilities of public SMEs, authorities, research institutions, industrial actors, educational organisations, and other stakeholders involved in offshore wind development and related value chains.

The framework directly supports the seven shared regional priorities identified in Section 3.4.2. It contributes to strengthening capacities related to floating offshore wind adaptation for Mediterranean conditions, regional industrial and supply-chain integration, offshore infrastructure transformation, applied research and pilot development, workforce transition, coordinated governance and environmental planning, and digital cooperation and smart offshore systems. Capacity building is treated not as an isolated training activity, but as an enabling mechanism supporting broader economic, technological, institutional, and social transformation processes within the ADRION region, with attention to the transnational dimension of capacity building. All participating countries contribute complementary competencies and experiences that can support the emergence of a more resilient and interconnected macro-regional ecosystem.

4.4.1 National Employment Categories of Focus

For the Capacity Building Framework important are SMEs and SME-related employment categories, recognising that those are expected to play a central role in the development of the Adriatic–Ionian offshore wind ecosystem. Within this context, the framework focuses on employment categories and professional profiles that can support SME participation in emerging offshore wind value chains and related offshore renewable-energy activities. The objective is not only to strengthen technical competencies, but also to improve the operational readiness, innovation capacity, business adaptability, and cross-border cooperation capabilities of SMEs operating in sectors connected to offshore wind development.

A first group of employment categories are technical and engineering profiles relevant to offshore wind supply chains. This includes engineers, technicians, designers, fabricators, assembly specialists, maintenance personnel, marine and electrical technicians, and professionals involved in offshore infrastructure, maritime operations, and industrial manufacturing. Many SMEs within the ADRION region already possess competencies in related sectors such as shipbuilding, metal processing, energy services, maritime logistics, construction, and industrial maintenance, which can potentially be adapted to offshore wind applications.

A second category includes SME professionals operating in logistics, transport, port services, and operational support activities. Offshore wind deployment requires specialised logistics coordination, vessel operations, storage management, offshore servicing, and maintenance support, creating opportunities for SMEs involved in maritime and industrial services throughout the Adriatic–Ionian region.

The framework also targets SMEs and employment categories linked to digital technologies and innovation services. Increasing digitalisation within offshore wind systems creates growing demand for GIS specialists, data analysts, software developers, monitoring-system operators, cybersecurity experts, and digital-platform managers. SMEs active in ICT, smart systems, environmental monitoring, and digital engineering may therefore become increasingly important participants within the offshore wind ecosystem.

Research and innovation-related employment categories are also included within the framework, particularly those connected to applied research, environmental assessment, marine sciences, technology testing, and innovation transfer. SMEs cooperating with universities, research centres, innovation clusters, and technology providers may play an important role in supporting pilot projects, offshore testing activities, and the development of Mediterranean-adapted offshore solutions.

In addition, the framework recognises the importance of business-development and managerial profiles within SMEs. Offshore wind markets involve complex regulatory, financial, and operational conditions that require new competencies in strategic planning, project development, international cooperation, certification procedures, sustainability compliance, and participation in transnational value chains. Capacity-building activities will therefore also target SME managers, entrepreneurs, cluster representatives, innovation intermediaries, and business-support organisations.

Another important focus concerns governance and institutional stakeholders that directly support SME participation within offshore wind ecosystems. This includes local and regional authorities, chambers of commerce, development agencies, vocational education providers, innovation-support organisations, and sectoral associations. Strengthening cooperation between SMEs and these institutional actors is considered essential for improving access to knowledge, financing opportunities, partnerships, and transnational networks.

The employment categories most relevant for SME participation may differ between ADRION countries according to their economic structures and industrial specialisations. Some countries may prioritise maritime industries and fabrication activities, while others may focus more heavily on environmental services, digital applications, logistics, energy-system integration, or innovation support. So the framework adopts a flexible and adaptive approach that allows national specificities to be integrated within a shared transnational cooperation structure.

4.4.2 Nature of the Action

The actions within the Capacity Building Framework are designed as strategic support mechanisms aimed at strengthening the readiness, adaptability, and cooperation capacity of SMEs and relevant stakeholders participating in the emerging Adriatic–Ionian offshore wind ecosystem, in line with the broader objectives of ADRIONWIND and the seven shared regional priorities identified in Chapter 3. Supporting SMEs in understanding offshore wind market conditions, identifying future business opportunities, strengthening innovation and operational capacities, and improving preparedness for participation in emerging offshore renewable-energy value chains, is crucial.

The nature of the Capacity Building extends beyond conventional training activities and focuses on the gradual development of practical competencies required for offshore wind development in the region. Rather than relying exclusively on theoretical approaches, the framework promotes applied and interactive learning methods aimed at strengthening the operational capacities of participants within complex and evolving offshore wind environments.

The actions are designed not only to support the implementation period of ADRIONWIND, but also to contribute to the longer-term sustainability of regional offshore wind cooperation.

4.4.3 Relevance to the Project

The Capacity Building Framework supports the project's objective of strengthening transnational cooperation, SME participation, and long-term ecosystem development for offshore wind in the Adriatic–Ionian region. While offshore wind development is often associated primarily with technological innovation and infrastructure investment, the analyses conducted throughout the project demonstrate that human capital, institutional capabilities, stakeholder coordination, and operational readiness are also critical enabling conditions for sectoral growth.

Within the ADRION context, the relevance of capacity building is particularly significant due to the uneven levels of offshore wind maturity, institutional readiness, industrial integration, and technical expertise observed across participating countries. The Capacity Building Framework therefore functions as a strategic mechanism for reducing fragmentation and strengthening the collective ability of regional actors to participate in offshore wind development processes.

Strengthening the ability of SMEs and offshore-relevant stakeholder groups to cooperate across sectors and borders is essential for supporting innovation, improving governance coordination, facilitating supply-chain integration, and increasing regional competitiveness. In this respect, the framework contributes directly to the development of a more connected and resilient Adriatic–Ionian offshore wind ecosystem.

The framework is also highly relevant to the implementation of the seven shared regional priorities identified in Chapter 3. Capacity-building actions support the development of competencies linked to floating offshore wind adaptation, offshore infrastructure and logistics, industrial transformation, digital cooperation, environmental governance, applied research, workforce transition, and transnational project development. By strengthening the operational and organisational capacities required in these areas, the framework contributes to translating strategic priorities into practical implementation capabilities.

The framework additionally responds to the increasing importance of digitalisation, innovation management, and adaptive organisational capabilities within the offshore wind sector. As offshore renewable-energy systems become increasingly data-driven, technologically complex, and interconnected, stakeholders require stronger competencies related to digital tools, innovation processes, collaborative decision-making, and strategic adaptability. Capacity-building activities can therefore support not only immediate project implementation needs, but also longer-term resilience and competitiveness within a rapidly evolving offshore energy landscape.

From an operational perspective, the framework contributes directly to the objectives of Work Package 3 by supporting Activities 3.1–3.6 related to stakeholder training, SME guidance, business planning, B2B cooperation, network sustainability, and dissemination of project results and good practices. At the same time, its relevance extends beyond the formal duration of the project itself

4.4.4 Description of the Capacity Building Scheme

The Capacity Building Scheme adopts an ecosystem-oriented approach to capacity building, strengthening the interaction capacities of quadruple-helix actors to support more integrated and resilient regional cooperation. Within this context, the capacity-building scheme is structured around several complementary learning dimensions aligned with the seven shared regional priorities identified in Chapter 3.

A first dimension concerns interpersonal communication, stakeholder interaction, and cooperation capacities. Offshore wind development in the Adriatic–Ionian region requires extensive collaboration between public authorities, SMEs, industrial actors, research organisations, and civil society stakeholders operating within different institutional and cultural contexts. The actions therefore support the development of communication skills, stakeholder engagement capacities, collaborative working approaches, negotiation abilities, conflict-management techniques, and trust-building mechanisms necessary for effective transnational cooperation and quadruple-helix interaction.

A second dimension focuses on leadership, innovation management, and organisational adaptability within an increasingly digitalised offshore energy environment. Offshore wind ecosystems are characterised by rapid technological evolution, growing data integration, and increasing operational complexity. Capacity-building actions therefore aim to strengthen leadership competencies linked to innovation processes, digital transformation, adaptive management, organisational resilience, and the integration of emerging technologies and digital tools. Attention is also given to the balanced use of data-driven approaches and human-centred decision-making within collaborative and innovation-oriented environments.

A third dimension concerns analytical thinking, operational problem-solving, and structured decision-making capacities. Offshore wind development involves technical, logistical, regulatory, environmental, and financial challenges that require systematic approaches to diagnosis, planning, implementation, and evaluation. The framework therefore promotes practical methodologies for identifying operational constraints, evaluating alternatives, assessing risks, monitoring implementation outcomes, and supporting continuous organisational learning. These capacities are considered important for SMEs seeking to operate within emerging offshore renewable-energy markets characterised by uncertainty and rapid change.

In operational terms, the actions include a combination of:

- workshops and thematic training sessions;
- transnational seminars and peer-learning activities;
- stakeholder dialogue and cooperation forums;
- mentoring and advisory support;
- case-study analysis and good-practice exchange;
- collaborative exercises and simulation-based learning;
- networking and B2B-oriented interaction formats;
- online learning tools and digital collaboration environments;
- and awareness-raising activities linked to offshore wind opportunities, innovation processes, and regional cooperation.

The framework also emphasises flexibility and adaptability. Given the different levels of offshore wind maturity across ADRION countries, actions must remain sufficiently adaptable to respond to varying national conditions, sectoral structures, institutional capacities, and stakeholder needs. Capacity-building activities may utilise digital platforms, online collaboration tools, shared knowledge repositories, webinars, and hybrid learning formats in order to facilitate wider participation. In this context, the ADRIONWIND platform can function as a supporting coordination and visibility tool for training materials, stakeholder interaction, and long-term network development.

The Capacity Building Scheme is not intended solely as a short-term project activity, but as a mechanism for strengthening the long-term resilience, innovation capacity, and cooperation culture of the Adriatic–Ionian offshore wind ecosystem. By improving stakeholder readiness, supporting SME integration, strengthening institutional cooperation, and facilitating knowledge circulation across borders, the scheme contributes to creating the human and organisational foundations necessary for future offshore wind development and broader regional transformation processes.

4.4.5 Capacity Building Scheme Template

The Capacity Building Scheme implemented within ADRIONWIND is structured around a modular and flexible training architecture designed to support the varying needs of SMEs and stakeholders across the Adriatic–Ionian region. The scheme combines soft skills, organisational competencies, innovation-management capacities, and operational decision-making capabilities that are considered essential for participation in emerging offshore wind ecosystems and transnational cooperation environments.

The structure of the scheme is organised into thematic learning modules that can be adapted according to stakeholder profiles, national contexts, and sectoral priorities. While the detailed operational implementation may vary between activities and target groups, the overall template is designed to provide a coherent and transferable framework for capacity-building delivery across the project.

The proposed template includes three interconnected training pillars:

1. Problem-Solving and Decision-Making

This pillar focuses on strengthening analytical thinking, operational problem-solving, and strategic decision-making capacities relevant to complex offshore wind environments. Offshore renewable-energy projects involve technical, financial, environmental, organisational, and regulatory uncertainties that require structured approaches to diagnosis, evaluation, implementation, and monitoring.

- Indicative modules may include:

- identification and analysis of operational challenges;
- root-cause analysis methodologies;
- decision-making frameworks and risk assessment;
- implementation planning and monitoring;
- evaluation methodologies and performance indicators;
- adaptive management and continuous improvement processes.

Particular emphasis is placed on developing practical methodologies that support SMEs and stakeholders in managing uncertainty, improving organisational resilience, and responding effectively to rapidly evolving offshore wind market conditions.

2. Interpersonal Skills and Effective Communication

This pillar addresses the importance of communication, stakeholder interaction, and collaborative working capacities within transnational offshore wind ecosystems. Since offshore wind development depends heavily on cooperation between public authorities, research institutions, industrial actors, SMEs, and local communities, effective communication is considered a critical enabling competency.

- Indicative modules may include:
- communication styles and collaborative interaction;
- stakeholder dialogue and negotiation;
- interpersonal influence and relationship-building;
- conflict prevention and conflict-management approaches;
- constructive feedback and team communication;
- cooperation within multicultural and multidisciplinary environments.

The objective is to strengthen the ability of stakeholders to cooperate effectively within complex transnational networks, support trust-building processes, and facilitate more coordinated interaction between quadruple-helix actors across the ADRION region.

3. Leadership in the Digital and Innovation Landscape

The third pillar focuses on leadership, innovation management, and organisational adaptability within an increasingly digitalised offshore energy environment. Offshore wind systems are becoming progressively more data-driven, technologically complex, and interconnected, requiring stakeholders to develop stronger capacities related to innovation processes, digital transformation, and strategic coordination.

- Indicative modules may include:
- strategic leadership and adaptive management;
- digital transformation and innovation readiness;
- introduction to AI-supported organisational processes;
- change management and organisational resilience;
- stakeholder engagement within digital environments;
- balancing technological efficiency with ethical and social considerations.

This pillar aims to strengthen the capacity of SMEs and stakeholders to manage technological change, support innovation adoption, and maintain effective organisational leadership within rapidly evolving offshore renewable-energy ecosystems.

- Operational Characteristics of the Scheme
- The Capacity Building Scheme is designed to remain:
- modular, allowing adaptation to different stakeholder categories;
- transnational, supporting cross-border learning and cooperation;
- SME-oriented, focusing on operational applicability and market readiness;

- practice-based, combining theoretical knowledge with real-world case analysis;
- digitally supported, through online tools, hybrid learning formats, and collaborative platforms;

and scalable, allowing future expansion beyond the lifetime of ADRIONWIND.

Evaluation mechanisms, including feedback collection, participation monitoring, and learning assessment tools, may also be integrated in order to support continuous improvement of the scheme and ensure alignment with the evolving needs of the Adriatic–Ionian offshore wind ecosystem.

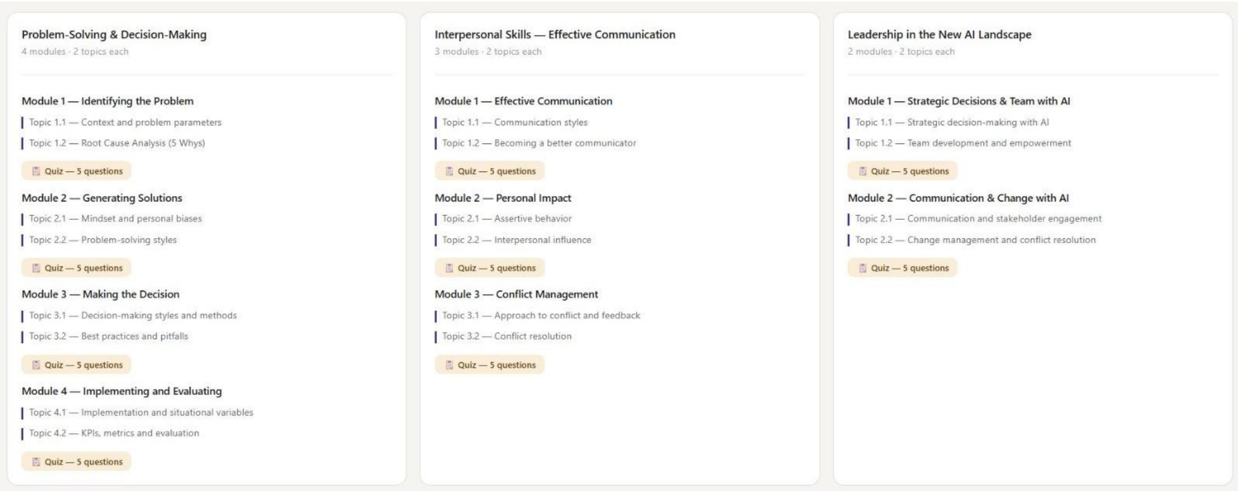


Figure 4 Capacity Building Scheme Template

4.5. Training and Guidance for SMEs Framework

The Training and Guidance for SMEs Framework constitutes a complementary implementation component of the ADRIONWIND Joint Transnational R&I Strategy, focusing specifically on strengthening the strategic, operational, and business-development capacities of SMEs participating in the emerging Adriatic–Ionian offshore wind ecosystem. While the Capacity Building Framework presented in Section 4.4 addresses broader stakeholder competencies and ecosystem cooperation capacities, the present framework is more directly oriented toward improving SME preparedness for participation in offshore wind markets, value chains, innovation activities, and transnational cooperation initiatives.

The framework is closely linked to the implementation of Work Package 3, particularly Activities 3.2 and 3.3, which aim to support SMEs in developing effective business plans, strengthening market understanding, and participating more actively in knowledge-sharing and B2B cooperation processes. In this context, the framework contributes to translating the strategic priorities and analytical findings of ADRIONWIND — including the outputs of the Joint Transnational R&I Strategy and the Macroeconomic Foresight Model — into practical guidance and operational support mechanisms for SMEs.

Given the early-stage character of offshore wind development in most ADRION countries, many SMEs currently possess only limited direct experience with offshore renewable-energy markets. However, the region already includes a broad range of enterprises operating in sectors that may potentially contribute to offshore wind ecosystems, including maritime industries, engineering services, manufacturing, logistics, construction, environmental consultancy, digital technologies, energy services, and research and innovation support. The framework therefore adopts an adaptive and opportunity-oriented approach, helping SMEs identify potential market niches, understand future sectoral trends, and strengthen their ability to participate in emerging offshore wind value chains.

Particular emphasis is placed on strategic business planning and long-term organisational readiness. The framework supports SMEs not only in understanding immediate market opportunities, but also in aligning their business development strategies with broader macroeconomic, technological, regulatory, environmental, and investment trends shaping the future offshore wind sector in the Adriatic–Ionian region. In this respect, the framework is directly connected to the macroeconomic foresight logic developed under Section 4.3 and aims to support more informed, resilient, and future-oriented SME decision-making.

The framework also reflects the transnational and cooperative nature of offshore wind development within the ADRION region. Since future offshore wind ecosystems are expected to evolve through increasing cross-border cooperation, functional specialisation, and integrated value chains, SMEs require stronger capacities related to international cooperation, strategic networking, consortium-building, innovation partnerships, and participation in regional and European funding opportunities. The framework therefore supports not only business planning capacities, but also broader ecosystem integration and collaboration readiness.

Training and guidance activities are expected to combine strategic awareness, practical methodologies, peer-learning, business-oriented mentoring, and applied case analysis. Workshops organised in participating countries will function as practical learning environments where SMEs can strengthen their understanding of offshore wind ecosystems, innovation dynamics, investment conditions, regulatory frameworks, sustainability requirements, and cooperation opportunities relevant to the Adriatic–Ionian region. The recording and dissemination of training materials through the ADRIONWIND ICT platform further supports continuity of learning, wider accessibility, and long-term knowledge-sharing within the regional network.

Ultimately, the Training and Guidance for SMEs Framework contributes to strengthening the resilience, competitiveness, and innovation capacity of SMEs across the Adriatic–Ionian region, supporting their gradual integration into offshore wind and offshore renewable-energy ecosystems while reinforcing the broader strategic objectives of ADRIONWIND related to regional cooperation, economic diversification, and sustainable macro-regional development.

4.5.1 Stakeholder Categories of Focus

The Training and Guidance for SMEs Framework primarily targets SMEs and SME-supporting stakeholders with existing or potential relevance to offshore wind development and related offshore renewable-energy value chains in the Adriatic–Ionian region. Given the early-stage maturity of offshore wind markets across most ADRION countries, the framework adopts a broad and inclusive understanding of SME participation, recognising that future offshore wind ecosystems will depend on the gradual mobilisation and adaptation of competencies from multiple economic sectors.

Although SMEs constitute the primary beneficiaries of the framework, the successful development of the Adriatic–Ionian offshore wind ecosystem requires the coordinated contribution of a broader set of stakeholder categories, each playing a distinct and complementary role. Industry actors operate as market drivers, generating demand and structuring supply chains; academia and research organisations provide knowledge, training, and R&I capacity; the public sector enables the regulatory, financial, and policy conditions necessary for market emergence; and civil society contributes to social acceptance, workforce mobilisation, and sustainability. The table below summarises the role of each category within the framework and the added value it generates for SME participation:

Table 23 Stakeholder Focus Categories

Stakeholder Category	Role in Framework	Added Value for SMEs
SMEs	Primary beneficiaries	Market entry, skills development, partnerships
Industry	Market drivers	Demand creation, supply chain integration
Academia	Knowledge providers	Training, innovation, R&I
Public sector	Enabling environment	Regulation, funding, policy alignment
Civil society	Social dimension	Acceptance, workforce, sustainability

4.5.2 Nature of the Action

The actions implemented within the Training and Guidance for SMEs Framework are designed as practical support mechanisms aimed at strengthening the strategic planning, business-development, and market-readiness capacities of SMEs operating within, or seeking to enter, the emerging offshore wind and offshore renewable-energy ecosystem of the Adriatic–Ionian region.

In contrast to broader awareness-raising or general capacity-building activities, the nature of these actions is strongly business-oriented and implementation-focused. Their primary objective is to support SMEs in understanding how offshore wind market development, technological evolution, regulatory conditions, and macroeconomic trends may influence future business opportunities, organisational strategies, investment decisions, and cooperation models. Particular emphasis is therefore placed on helping SMEs translate strategic knowledge into concrete operational and business-planning capacities.

The framework is directly linked to the macroeconomic foresight logic developed under Section 4.3 and aims to ensure that SMEs are able to align their strategic planning processes with anticipated developments in offshore wind markets, value chains, investment conditions, and innovation ecosystems. In this context, the actions support SMEs in moving beyond short-term market positioning toward more resilient, forward-looking, and adaptive business-development approaches.

The actions are designed around a combination of strategic training, practical guidance, applied workshops, mentoring-oriented support, and collaborative learning activities. Particular importance is given to experiential and problem-oriented learning approaches that allow SMEs to examine realistic offshore wind market scenarios, identify potential business niches, assess risks and opportunities, and strengthen organisational preparedness for participation in offshore renewable-energy ecosystems.

A central dimension of the actions concerns business-plan development and strategic business modelling. SMEs participating in the framework are expected to strengthen their capacities related to:

- identification of offshore wind market opportunities;
- analysis of future sectoral trends and investment conditions;

- understanding of offshore wind value chains and supply-chain dynamics;
- strategic positioning within emerging offshore renewable-energy ecosystems;
- assessment of organisational strengths, risks, and development needs;
- integration of innovation and digitalisation strategies;
- and development of realistic, adaptable, and sustainability-oriented business plans.

The framework also supports the development of cooperation and internationalisation capacities. Offshore wind development in the ADRION region is expected to evolve through increasing cross-border cooperation, functional specialisation, and participation in transnational value chains. The actions therefore encourage SMEs to strengthen competencies related to networking, consortium-building, partnership development, participation in European projects and funding mechanisms, and engagement with regional offshore wind ecosystems.

Particular attention is given to SMEs operating in sectors with transferable competencies relevant to offshore wind development, including maritime industries, manufacturing, engineering, logistics, digital technologies, environmental services, energy consulting, and innovation support activities. The framework recognises that many SMEs may not currently operate directly within offshore renewable-energy markets, but may nevertheless possess capabilities that can be adapted to future offshore wind supply chains and supporting services.

Operationally, the actions may include:

- national workshops and practical training sessions;
- business-planning guidance activities;
- mentoring and advisory support;
- case-study analysis and applied market exercises;
- peer-learning and experience-sharing sessions;
- B2B networking and matchmaking activities;
- strategic discussions linked to macroeconomic and technological foresight;
- and digital dissemination of training materials and guidance resources through the ADRIONWIND ICT platform.

The framework also promotes flexibility and adaptability in implementation. Since the levels of offshore wind maturity, industrial capacity, and SME readiness differ considerably across ADRION countries, training activities may be adapted to national and sectoral conditions while maintaining alignment with the common strategic priorities and transnational objectives of ADRIONWIND.

Finally, the actions are designed not only to support immediate project implementation, but also to contribute to the longer-term strengthening of regional SME ecosystems connected to offshore renewable energy. By improving strategic planning capacities, innovation readiness, cooperation capabilities, and understanding of future offshore wind market dynamics, the framework aims to support the gradual emergence of more resilient, competitive, and internationally connected SMEs across the Adriatic–Ionian region.

4.5.3 Relevance to the Project

The Training and Guidance for SMEs Framework is directly linked to the core objectives and long-term implementation logic of ADRIONWIND. Its relevance to the project derives from the recognition that the successful development of an Adriatic–Ionian offshore wind ecosystem depends not only on regulatory frameworks, technological progress, and infrastructure development, but also on the ability of SMEs to understand, anticipate, and strategically position themselves within emerging offshore renewable-energy markets.

Across most ADRION countries, offshore wind remains at an early stage of market development. As identified in the national analyses, SWOT assessment, and stakeholder consultations, many SMEs currently face significant barriers related to limited market knowledge, low awareness of offshore wind value chains, insufficient strategic planning capacities, fragmented cooperation structures, and uncertainty regarding future investment and regulatory conditions. At the same time, the region already possesses important industrial, maritime, engineering, environmental, and digital competencies that could potentially support future offshore wind ecosystems if appropriate guidance, strategic orientation, and cooperation mechanisms are established.

Within this context, the framework contributes directly to several of the shared regional priorities identified in Chapter 3, particularly those related to:

- strengthening offshore wind innovation and R&I ecosystems;
- supporting SME integration into regional value chains;
- enhancing transnational cooperation capacities;
- promoting digitalisation and knowledge-sharing mechanisms;
- supporting workforce adaptation and business resilience;
- and improving long-term regional competitiveness within offshore renewable-energy sectors.

The framework is also strongly connected to the Macroeconomic Foresight Model Framework presented in Section 4.3. One of the central objectives of the training and guidance activities is to help SMEs interpret and operationalise the strategic insights generated through macroeconomic foresight analysis. Rather than treating the foresight model as a purely analytical exercise, ADRIONWIND aims to translate future-oriented knowledge into practical business-development capacities that can support SME preparedness, investment planning, and long-term strategic positioning.

This relevance is particularly important in the context of emerging offshore wind markets, where uncertainty regarding technology evolution, infrastructure development, financing conditions, and regulatory maturity can discourage SME participation. By improving understanding of future market trends, investment dynamics, innovation pathways, and transnational cooperation opportunities, the framework helps reduce informational and strategic barriers that often limit SME engagement in new sectors.

The framework also supports one of the broader strategic ambitions of ADRIONWIND: transforming the Adriatic–Ionian region from a fragmented and largely pre-commercial offshore wind area into a more connected, innovation-oriented, and cooperation-based macro-regional ecosystem. SMEs are expected to play a central role in this transition, not only as suppliers and service providers, but also as innovation actors, local economic multipliers, and participants in transnational industrial networks.

Another important aspect of the framework's relevance concerns the strengthening of long-term organisational resilience and adaptability. Offshore wind ecosystems are characterised by rapid technological change, evolving regulatory conditions, digital transformation, and increasing integration between energy, maritime, industrial, and environmental systems. SMEs therefore require stronger capacities related to strategic planning, innovation management, risk assessment, partnership development, and adaptive business modelling. The framework addresses these needs by promoting future-oriented and implementation-focused learning approaches rather than purely theoretical training activities.

The relevance of the framework also extends to the project's transnational cooperation objectives. Since offshore wind development in the ADRION region is unlikely to evolve through isolated national markets alone, SMEs must increasingly operate within cross-border cooperation environments involving international partnerships, shared value chains, European funding mechanisms, and macro-regional coordination processes. The framework therefore contributes to strengthening internationalisation capacities and improving SME readiness for participation in transnational offshore renewable-energy ecosystems.

Finally, the framework contributes to the sustainability and continuity of ADRIONWIND beyond the formal implementation period of the project. By strengthening SME competencies, business-planning capacities, networking capabilities, and strategic awareness, the framework helps establish the human, organisational, and entrepreneurial foundations necessary for the longer-term continuation and expansion of regional offshore wind cooperation networks. In this respect, the training and guidance activities function not only as project outputs, but also as enabling mechanisms for the gradual emergence of a resilient Adriatic–Ionian offshore renewable-energy ecosystem integrated into wider European industrial and innovation networks.

4.5.4 Description of the Knowledge-sharing events and B2B opportunities

Within the Training and Guidance for SMEs Framework, the knowledge-sharing and B2B dimension functions primarily as a supporting mechanism for the practical implementation of training activities and SME learning processes. In this context, the activities are designed to complement the business-planning and capacity-building components of ADRIONWIND by creating opportunities for SMEs to interact directly with relevant stakeholders, exchange practical experience, and strengthen understanding of offshore renewable-energy market dynamics.

The activities support the transition from theoretical training to practical engagement by exposing participating SMEs to real business environments, sectoral developments, cooperation opportunities, and operational challenges linked to offshore wind and related offshore renewable-energy sectors. The knowledge-sharing dimension also supports the exchange of practical know-how, good practices, lessons learned, and implementation experiences between stakeholders operating in different national and sectoral contexts. The B2B component is intended to strengthen SMEs' ability to establish contacts with industrial actors, research organisations, public authorities, clusters, and potential project partners relevant to future offshore renewable-energy activities. These interactions support the development of business perspectives, cooperation pathways, and future participation in regional and European initiatives.

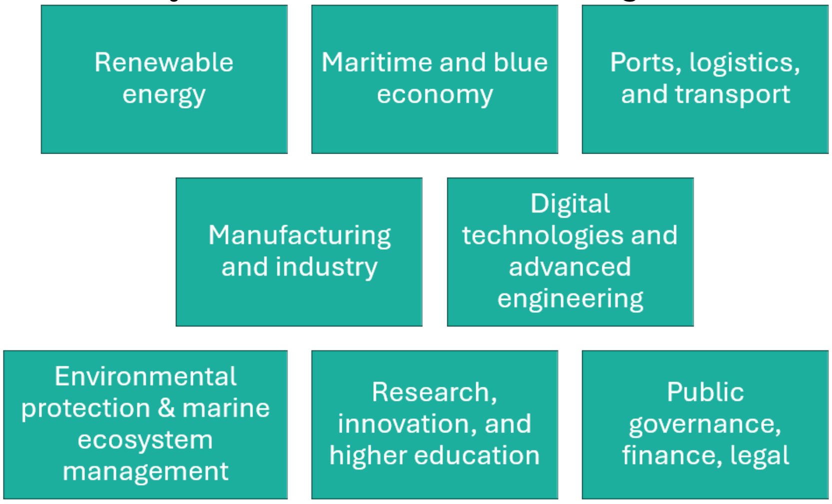
the knowledge-sharing and B2B dimension within the Training and Guidance for SMEs Framework functions primarily as a practical extension of the training process, supporting SME preparedness, market awareness, stakeholder interaction, and future participation in offshore renewable-energy ecosystems, while the broader regional networking and ecosystem-building dimension is addressed separately within the ADRIONWIND Knowledge Sharing Events Framework (Section 4.7).

4.6. Offshore Wind Energy Excellence Collaboration Network Framework

The Network Framework is closely linked to the strategic priorities identified throughout the ADRIONWIND Strategy. It supports transnational R&I cooperation, the development of offshore wind value chains, the integration of SMEs into the market, the promotion of digital collaboration tools, and the enhancement of stakeholder coordination across governance levels and sectors.

4.6.1 Sectors of Interest

The ADRIONWIND Network is structured around the key economic, industrial, technological, environmental, and institutional sectors relevant to the development of the offshore wind ecosystem in the Adriatic–Ionian region.



A central sector of interest is the **renewable energy sector**, particularly activities related to offshore wind, floating renewable technologies, hybrid energy systems, hydrogen applications, energy storage, and grid integration. These activities form the technological core of the future offshore wind ecosystem within the ADRION region.

The **maritime and blue economy sector**. ADRION has maritime traditions and existing industrial capacities linked to shipbuilding, marine engineering, vessel operations, fisheries, coastal infrastructure, and offshore services. Existing shipyards and maritime infrastructure may support future offshore wind activities through fabrication, assembly, logistics, maintenance, and specialised marine operations, particularly in relation to floating offshore wind systems.

Ports, logistics, and transport infrastructure also constitute key sectors. Ports are expected to play a critical role in offshore wind value chains through assembly operations, storage, maintenance, and transport services, while logistics systems and maritime corridors are essential for supporting future offshore deployment and regional industrial integration.

The **manufacturing and industry (**metal processing, mechanical engineering, electrical systems, automation technologies, industrial fabrication, specialised technical services, and component production) are activities relevant to offshore renewable energy systems. Emphasis is placed on SMEs, which can contribute through specialised services, innovation, engineering, and digital applications.

Digital technologies and advanced engineering solutions are increasingly important in offshore wind ecosystem. The Network includes activities related to GIS systems, monitoring platforms, artificial intelligence applications, predictive maintenance systems, digital twins, remote sensing, cybersecurity, smart-energy management, and offshore operational digitalisation. These technologies support improved operational efficiency, environmental monitoring, infrastructure management, and data-driven decision-making.

Environmental and marine ecosystem protection is a major sector within the framework, and includes biodiversity monitoring, marine spatial planning, environmental assessment, climate adaptation, ecosystem-based governance approaches, and sustainable maritime management practices. These are all considered essential conditions for offshore wind.

Research, innovation, and higher education contribute scientific expertise, applied research, pilot testing, workforce development, and innovation support relevant to offshore energy and value chains. Especially important are cross-border scientific cooperation, joint pilot initiatives, applied R&I activities, and technology validation.

Finally, the Network incorporates **public governance, finance, legal frameworks, and regional development sectors**. These include public authorities, regulatory bodies, development agencies, financial institutions, investment-support structures, and advisory organisations involved in permitting procedures, maritime governance, investment facilitation, risk management, and policy coordination. These actors are essential for supporting institutional readiness, long-term investment conditions, and coordinated offshore ecosystem development across the ADRION region.

4.6.2 Network Description

The network operates via a model supported by the ADRIONWIND ICT Platform. Membership is structured across three tiers: Core Partners (Project members), Associated Industrial Members (SMEs), and Institutional Observers (Ministries, NGOs, etc). Communication flows through technical workshops, thematic working groups (TWGs), and business-to-business (B2B) matchmaking tools embedded within the digital platform. The network is designed for long-term sustainability through:

- Institutional partnerships
- Expansion toward additional EU initiatives
- Business model development
- Integration into RIS3 frameworks

Specifically, the Network operates through several functions. First, it serves as a stakeholder mapping and visibility mechanism, providing information on organisations, expertise areas, industrial capacities, research competences, and cooperation opportunities across the region. This function supports matchmaking, partnership formation, SME integration, and the identification of cross-border synergies.

Second, the Network functions as a knowledge-sharing and cooperation platform supporting the exchange of knowledge, research outputs, market developments, regulatory information, environmental practices, investment opportunities, and technological solutions related to offshore renewable energy.

Third, the Network supports the integration of SMEs into offshore wind value chains and innovation ecosystems. Through aforementioned activities, SMEs are supported in improving visibility, developing partnerships, and participating in future offshore energy projects and transnational initiatives.

4.6.3 Relevance to the Project

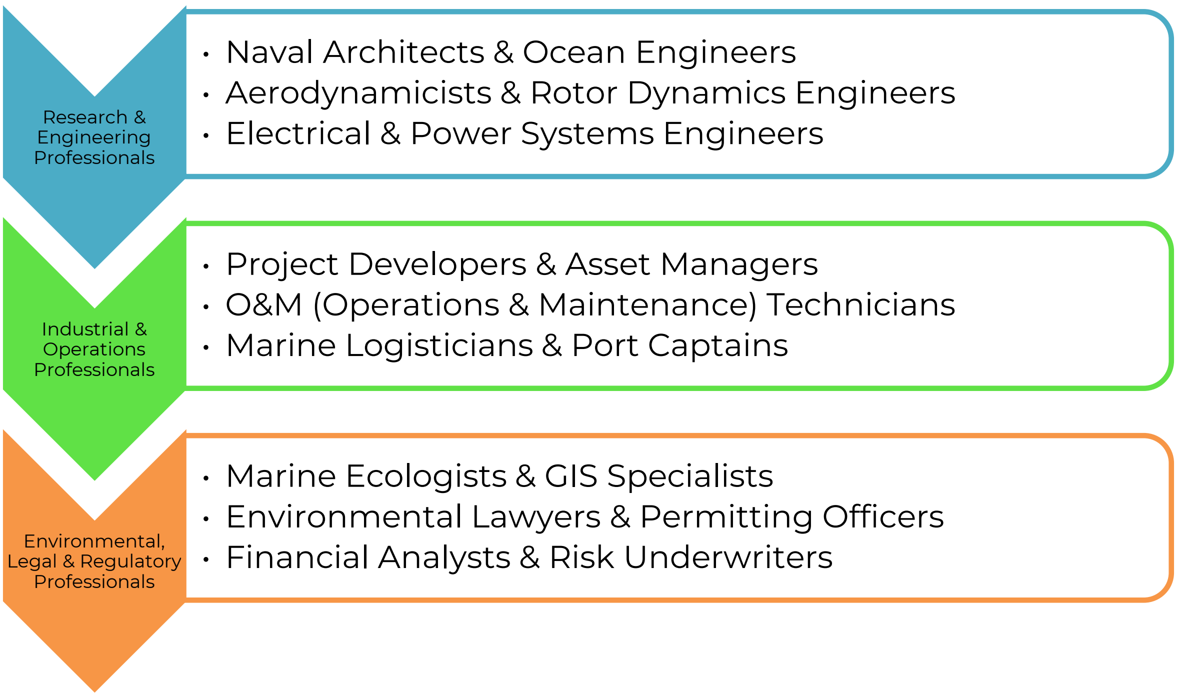
The Network directly supports several core objectives of ADRIONWIND, including the enhancement of transnational R&I cooperation, the integration of SMEs into offshore wind value chains, the strengthening of stakeholder dialogue, the development of digital collaboration mechanisms, and the promotion of long-term ecosystem-building activities. It contributes to improving stakeholder visibility, facilitating matchmaking and cooperation opportunities, and enabling continuous access to knowledge, resources, research activities, and partnership opportunities across the region.

It also contributes to addressing key regional challenges identified throughout the Strategy, including fragmented innovation ecosystems, uneven technological readiness, limited industrial integration, and insufficient cross-border coordination within offshore renewable energy activities.

The framework further acts as a connecting structure between the main ADRIONWIND work packages. It builds upon the stakeholder mapping and digital infrastructure developed within WP1, supports the implementation of the strategic priorities and specialization pathways defined in WP2, and provides an operational environment for the capacity-building, SME support, training, and business cooperation activities developed under WP3. In this regard, the Network functions not only as a stakeholder platform, but also as a mechanism for ensuring continuity and practical implementation of project results beyond the project duration.

4.6.4 Professionals Involved

For SMEs to successfully integrate into the offshore wind sector and participate in increasingly complex international markets, the involvement of specialized business-development professionals is necessary. Those are:



At the technical core of the network, Research and Engineering Professionals drive the foundational design and technical validation required for semi-enclosed sea basins. Within this category, Naval Architects and Ocean Engineers provide critical expertise in floating mooring systems, hull geometry design, hydrodynamic stability, and wave-structure interactions, which are vital for adapting floating wind structures to the deep bathymetry of the southern Adriatic and Ionian seas. Working in tandem with them, Aerodynamicists and Rotor Dynamics Engineers evaluate wind turbine blade performance and structural fatigue, with a localized focus on analyzing complex wake effects within enclosed marine basins. Simultaneously, Electrical and Power Systems Engineers architect the vital grid infrastructure, designing offshore substations and subsea grid topologies while managing the power quality and grid integration challenges associated with variable offshore generation entering coastal transmission networks.

This engineering foundation feeds directly into the commercial sphere, managed by Industrial and Operations Professionals who translate technical designs into bankable, operational assets. Project Developers and Asset Managers spearhead the macroscopic execution of these deployments, handling multi-million euro capital allocations, strategic procurement pipelines, and international contract management under rigid legal frameworks. On the water, the physical lifecycle of the asset is sustained by Operations and Maintenance (O&M) Technicians, a highly specialized workforce certified for high-risk offshore interventions. This sub-sector encompasses autonomous robotics operators, including ROV and AUV pilots for subsea hull inspections, alongside industrial data scientists who utilize IoT sensor inputs to build predictive maintenance algorithms. Facilitating this entire onshore-to-offshore pipeline are Marine Logisticians and Port Captains, who manage the complex movements of heavy-lift installation vessels, orchestrate supply harbor staging areas, and optimize maritime supply chains to overcome port infrastructure constraints within the macroregion.

Ensuring that these industrial activities align with regulatory boundaries and societal expectations is the responsibility of Environmental, Legal, and Regulatory Professionals. Marine Ecologists and GIS Specialists lead the spatial planning process by mapping sensitive marine habitats, processing underwater bio-acoustics data, and building spatial optimization models to ensure co-location synergy with marine protected areas and local fisheries. Concurrently, Environmental Lawyers and Permitting Officers navigate the complex, fragmented regulatory landscape of the Adriatic-Ionian area. They apply deep expertise in international maritime law, to resolve border maritime boundary disputes and accelerate environmental compliance permitting pipelines. Finally, the financial viability of these trans-national initiatives is secured by Financial Analysts and Risk Underwriters assess maritime climate and meteorological risks, and design innovative, blended finance mechanisms that leverage both private equity and EU structural funds. Through this synchronized integration of diverse professional roles, the framework builds a complete and resilient workforce for the regional energy transition.

These professionals provide strategic support in areas such as entrepreneurship development, market analysis, investment planning, innovation commercialization, internationalization strategies, and financial modelling, all of which are fundamental for strengthening the competitiveness and long-term sustainability of SMEs operating within the renewable energy ecosystem. Through their expertise, these professionals facilitate access to new markets, strengthen innovation capacities, support the commercialization of emerging technologies, and improve the investment readiness of SMEs entering offshore wind supply chains. Their contribution is particularly important for increasing regional economic participation and enabling local businesses to become active stakeholders within the broader Adriatic-Ionian renewable offshore ecosystem.

4.6.5 Products & Services inventory

The inventory serves as a strategic mapping tool for identifying regional capacities, industrial competencies, innovation potential, and opportunities for cross-border collaboration. The inventory includes both tangible products and intangible services provided by research institutions, SMEs, public organizations, industrial operators, and innovation intermediaries participating in the ADRIONWIND initiative.

Table 24 Products & Services Purpose

Category	Products / Services	Purpose within the Network
Engineering & Manufacturing	Turbine components, floating platforms, subsea cables, energy storage systems	Support offshore wind infrastructure development and grid integration
Digital & Smart Technologies	Predictive maintenance software, smart-grid systems	Improve operational efficiency, monitoring, and digital management
Research & Innovation	Feasibility studies, energy modelling, technology testing, innovation consulting	Strengthen R&D activities and support technology transfer
Training & Capacity Building	Technical training, SME mentoring, business-plan support, workshops	Develop workforce skills and improve SME participation
Environmental Services	Environmental impact assessments, marine monitoring, sustainability analysis	Ensure environmental compliance and sustainable development
Business & Investment Support	Investment consulting, cluster development, B2B networking, internationalization support	Strengthen market access, partnerships, and investment readiness

4.6.6 Innovation and Scalability

Several innovation domains are particularly relevant within the framework, including floating offshore wind technologies adapted to Mediterranean conditions, offshore monitoring systems, smart-energy management solutions, digital collaboration tools, predictive maintenance systems, environmental intelligence platforms, maritime robotics, and data-driven operational applications. These areas are close to European priorities related to energy transition, digitalisation, sustainable industrial transformation, and climate neutrality.

Scalability is supported through the structure of the ADRIONWIND digital platform, which allows the continuous addition of new stakeholders, products, services, projects, research activities, and cooperation opportunities beyond the initial project partnership. The framework is intentionally designed as a modular and expandable cooperation structure capable of supporting future regional growth, integration of additional institutional and industrial partners, and participation in wider European cooperation initiatives.

The framework also supports scalability through:

- supply-chain development and industrial integration;
- SME participation in offshore renewable energy value chains;
- replication and transfer of good practices;
- expansion of B2B, R&I, and institutional partnerships;
- development of future joint project initiatives;
- dissemination of innovative technologies, digital tools, and operational solutions.

Digitalisation is a key enabling factor for both innovation and scalability. The implementation of shared digital infrastructure supports remote cooperation, digital knowledge exchange, stakeholder mapping, environmental monitoring, virtual training activities, and cross-border communication between Network members. Thus the ADRIONWIND digital platform functions also as a communication tool, and a mechanism capable of supporting the long-term operational sustainability and expansion of the Network.

4.6.7 Expected Impact

The comprehensive impact profile of the network is categorized across four main strategic impacts:

- Economic
- Environmental
- Social
- Innovation

Economic Impact

The network is designed to function as a powerful driver of regional macroeconomic modernization, providing the necessary infrastructure to attract large-scale capital investments to the Adriatic-Ionian sea basins. Specifically, the network is expected to contribute directly to:

- **SME Growth and Global Value-Chain Integration:** By providing SMEs with targeted technical auditing, up-skilling, and dedicated B2B platforms, the framework lowers the entry barriers to the highly competitive offshore wind market, making local suppliers from isolated domestic vendors into certified suppliers capable of international contracting
- **Job Creation and Regional Industrial Diversification:** The deployment of fixed and floating offshore wind assets demands a massive influx of specialized maritime labor. The network revitalizes declining coastal economies, traditional manufacturing centers, and underutilized shipyards by pivoting their production capacities toward offshore wind component assembly, high-

tech steel fabrication, and marine engineering services

- **Investment Attraction and Supply-Chain Strengthening:** By offering transparent wind asset mapping, standardized risk-allocation models, and verified local supplier registries, the framework de-risks the region for institutional infrastructure funds, private equity, and commercial project developers

Environmental Impact

On an environmental scale, the framework establishes the scientific, spatial, and technical pathways required to decouple macroregional economic growth from carbon-intensive energy production. The expected environmental impacts include:

- **Reduction of Greenhouse-Gas Emissions and Accelerated Renewable Deployment:** By removing administrative delays, optimizing grid injection layouts, and clarifying subsea maritime sovereignty boundaries, the network shortens the development cycle for commercial offshore wind farms. This directly displaces legacy fossil-fuel thermal generation plants along the coastal zones
- **Support for Climate-Neutrality Objectives and EU Decarbonization Goals:** The network operates as a direct execution tool for achieving the binding targets of the European Green Deal and national Energy and Climate Plans (NECPs). It provides a concrete path toward the EU's goal of reaching climate neutrality by 2050

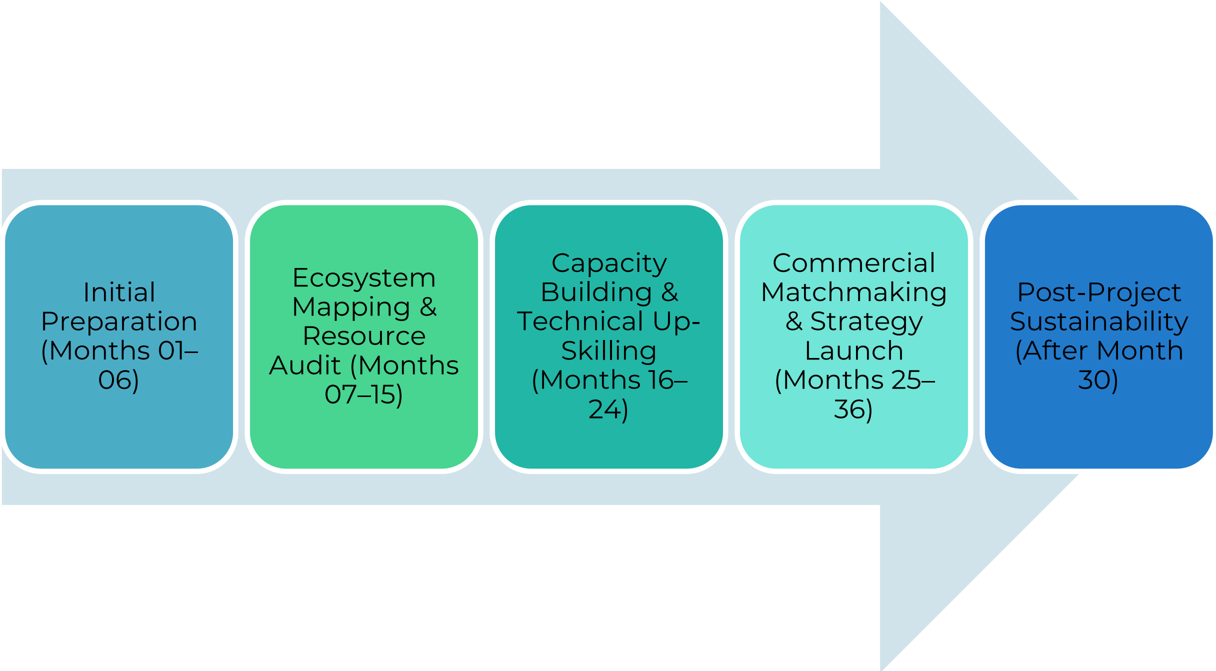
Social Impact

The social dimension of the framework centers on human development, community empowerment, and the prevention of economic marginalization in regions undergoing rapid energy transitions. The network actively promotes:

- **Knowledge Accessibility and Cross-Border Cooperation:** The network systematically breaks down technical and informational asymmetries between EU member states and IPA partner countries. By ensuring open access to cutting-edge resource data, legal compliance toolkits, and academic methodologies via the ICT platform, knowledge becomes a shared macroregional asset
- **Advanced Skills Development and Technical Up-skilling:** Through its structured capacity-building programs, the network delivers continuous professional training in tech domains such as robotic subsea asset inspection, predictive maintenance analytics, and specialized offshore maritime safety
- **Youth Employment Opportunities and Brain-Drain Mitigation**: By fostering a high-growth sector within the Adriatic-Ionian region, the network creates long-term career pathways for young engineers, researchers, and maritime professionals. This provides an effective countermeasure to the regional challenge of youth emigration
- **Community Engagement and Social Cohesion:** By incorporating civil society organizations directly into its Quadruple Helix model, the network establishes transparent local consultation loops. This proactive community engagement creates equitable local wealth-sharing models and strengthens social cohesion, thereby ensuring the long-term sustainability of regional green energy policies

4.6.8 Timeframe

The Offshore Wind Energy Excellence Collaboration Network is designed as a long-term and continuously evolving framework. The proposed timeframe includes five stages:



Phase 1: Initial Preparation (Months 01–06)

- Formally establish the Steering Committee and the Quality Control Board
- Define the inner communication rules and membership criteria for the network

Phase 2: Ecosystem Mapping & Resource Audit (Months 07–15)

- Complete the National Context and SWOT analyses across the six target nations
- Launch the first version of the ADRIONWIND ICT Platform

Phase 3: Capacity Building & Technical Up-Skilling (Months 16–24)

- Roll out specialized training curricula and business development programs for local SMEs
- Set up the Thematic Working Groups to focus on key technical challenges

Phase 4: Commercial Matchmaking & Strategy Launch (Months 25–36)

- Organize cross-border B2B events to connect local suppliers with international developers
- Finalize and publish the Joint Transnational R&I Strategy and the network's long-term business plan

Phase 5: Post-Project Sustainability (After Month 30)

- Transition to the self-sustained financing model outlined in the business plan
- Maintain free access to the ICT platform and ensure continued cross-border collaboration for at least two years after funding ends

In the long term, the Network is intended to remain operational beyond the duration of the ADRIONWIND project itself. Through the continued use and further development of the digital platform and collaboration mechanisms, the framework aims to support sustainable regional cooperation, future project development, and the gradual expansion of the Adriatic–Ionian offshore wind ecosystem.

4.7. Knowledge Sharing Events Framework

The knowledge-sharing events and B2B opportunities foreseen within ADRIONWIND are a practical cooperation and networking mechanism designed to strengthen interaction, visibility, and collaboration among SMEs, research organisations, public authorities, industrial actors, and other stakeholders relevant to the offshore wind ecosystem in the Adriatic–Ionian region.

4.7.1 Stakeholder Categories of Focus

The Knowledge Sharing Events Framework focuses on stakeholders involved in, or potentially contributing to, the development of the offshore wind ecosystem in the Adriatic–Ionian region. The focus is on SMEs, as key actors for innovation, supply-chain development, and regional economic integration.

The main stakeholder categories include:

- SMEs active in renewable energy, maritime industries, engineering, logistics, digital technologies, environmental services, and related sectors;
- Offshore wind developers and industrial companies;
- Ports, shipyards, and maritime service providers;
- Research institutions, universities, and innovation centres;
- Public authorities and regulatory bodies;
- Financial and investment-support organisations;
- Business support organisations, clusters, and chambers of commerce;
- Environmental organisations and civil society representatives;
- Vocational education and training providers;
- Technology providers and digital solution developers.

The framework also encourages participation from emerging actors and organisations with transferable expertise from related sectors, such as offshore oil and gas, shipbuilding, blue economy industries, and smart energy systems. This approach supports cross-sectoral collaboration and facilitates the gradual expansion of the regional offshore wind value chain.

4.7.2 Nature of the Action

The action is primarily characterised by its transnational and multi-stakeholder nature. It brings together actors from different countries, sectors, and institutional environments in order to support communication, cooperation, and the gradual development of functional relationships across the offshore renewable-energy ecosystem. The framework supports interaction not only between businesses, but also between industry, research institutions, public authorities, financial actors, training providers, and civil society organisations.

Rather than functioning exclusively as a dissemination or conference activity, the framework aims to create structured environments for stakeholder engagement, mostly SMEs, partnership-building, exchange of practical experience, and identification of future cooperation opportunities.

The framework is also characterised by its hybrid and scalable implementation model. Activities combine physical events with digital accessibility through the ADRIONWIND platform, allowing broader stakeholder participation, continuity of interaction, and long-term accessibility of knowledge and networking outputs. This approach supports the gradual expansion of cooperation activities beyond individual events and contributes to the development of more stable and interconnected regional cooperation structures.

4.7.3 Relevance to the Project

The Knowledge Sharing Events Framework directly supports the broader objectives of ADRIONWIND by strengthening cooperation, visibility, and knowledge exchange across the Adriatic–Ionian offshore wind ecosystem. As identified throughout the Strategy, one of the main barriers to offshore wind development in the region is the fragmentation of stakeholders, limited cross-border cooperation, and the relatively low integration of SMEs into emerging offshore wind value chains.

Within this context, the organisation of knowledge-sharing events and B2B activities provides a practical mechanism for connecting actors from different countries, sectors, and institutional environments. The framework contributes to several strategic priorities of ADRIONWIND, particularly those related to SME integration, innovation and technology transfer, capacity building, digital collaboration, and transnational networking.

The action is also closely linked to the development of the ADRIONWIND Collaboration Network and digital platform, as the events generate new contacts, cooperation opportunities, and knowledge resources that can be further integrated into the Network of Excellence. In this way, the framework supports not only short-term networking activities, but also the gradual consolidation of a more connected and resilient regional offshore wind community.

Finally, the framework contributes to improving the long-term readiness of the ADRION region for offshore wind development by encouraging stakeholder interaction, strengthening business relationships, and facilitating the exchange of practical experience and good practices between more mature and emerging offshore wind markets.

4.7.4 Description of the Knowledge-sharing events and B2B opportunities

he ADRIONWIND knowledge-sharing events and B2B opportunitiesare intended to function as more than dissemination activities, including operational collaboration platforms capable of supporting long-term ecosystem formation. Within this context, the activities promote the exchange of experiences, practical know-how, good practices, market intelligence, technological insights, and business-development perspectives relevant to offshore wind and related offshore renewable-energy sectors.

A strong focus is SME participation and visibility. The events provide SMEs with opportunities to:

- present products, services, competencies, and innovation capacities;
- strengthen understanding of offshore wind market dynamics and future trends;
- identify potential market niches and supply-chain opportunities;
- establish direct contacts with industrial actors, public institutions, research organisations, and potential partners;
- explore participation in transnational projects and European funding mechanisms;
- and improve integration into emerging offshore renewable-energy ecosystems.

The B2B dimension of the activities is especially important within the ADRION context, where future offshore wind development is expected to rely on transnational cooperation, functional specialisation, and cross-border value-chain integration. The framework encourages structured networking and matchmaking activities aimed at facilitating cooperation between SMEs and larger industry actors, as well as between enterprises operating in complementary sectors such as maritime services, engineering, manufacturing, logistics, environmental consulting, digital technologies, and innovation support services.

The knowledge-sharing events are also designed to reinforce the strategic priorities and analytical findings developed throughout the ADRIONWIND Strategy. In this context, discussions and networking activities may address topics such as:

- offshore wind market trends and macroeconomic foresight;
- regulatory and policy developments;
- floating offshore wind technologies and innovation pathways;
- investment and financing conditions;
- environmental sustainability and stakeholder engagement;
- digitalisation and smart offshore systems;
- maritime infrastructure and port adaptation;
- SME integration into offshore renewable-energy value chains;
- and opportunities for transnational cooperation within the Adriatic–Ionian region.

Operationally, the activities will be implemented through a series of national and transnational events organised by project partners across participating countries. Croatia, Italy, and Greece will each host two events, while Albania, Bosnia and Herzegovina, and Montenegro will each host one event. The implementation process will involve coordination and methodological support to ensure consistency with the broader strategic objectives of ADRIONWIND while allowing sufficient flexibility to reflect national priorities and stakeholder structures.

The events may include a combination of:

- thematic conferences and networking sessions;
- SME matchmaking and brokerage meetings;
- roundtables and stakeholder dialogue forums;
- practical workshops and demonstration activities;
- expert presentations and market briefings;
- innovation showcases and business pitching sessions;
- collaborative discussions on funding and partnership opportunities;
- and digital or hybrid participation formats supporting wider regional accessibility.

Digital dissemination and long-term accessibility represent an additional operational dimension of the framework. Relevant parts of the events will be recorded and published through the ADRIONWIND ICT platform in order to support continuity of knowledge exchange, wider stakeholder participation, and long-term visibility of project outputs and cooperation opportunities. In this context, the ICT platform functions not only as a dissemination channel, but also as a supporting infrastructure for regional networking, stakeholder mapping, and ecosystem development.

Beyond immediate networking outcomes, the events are intended to contribute to the gradual emergence of a more structured and resilient Adriatic–Ionian offshore wind ecosystem. By strengthening relationships between SMEs, institutions, research actors, and industry stakeholders, the framework supports the development of trust, cooperation culture, and transnational connectivity that are necessary for future offshore renewable-energy development in the region.

Finally, the knowledge-sharing and B2B activities contribute directly to the long-term sustainability objectives of ADRIONWIND by helping establish the foundations for continued cooperation beyond the formal project duration. Through repeated interaction, visibility enhancement, and partnership development, these actions support the creation of a more integrated regional offshore renewable-energy community capable of participating more effectively within wider European offshore wind and innovation ecosystems.

4.7.5 Knowledge-sharing events Organisation Template

To ensure consistency and comparability across participating countries, ADRIONWIND knowledge-sharing events and B2B activities should follow a common organisational structure while remaining adaptable to national contexts and stakeholder needs. The template is intended to support the planning, implementation, documentation, and follow-up of events organised within the framework of the project.

Each event should include the following core elements:

Organisational Element	Description
Event Title	Name of the event, workshop, networking session, or B2B activity
Organising Partner	Responsible ADRIONWIND project partner and supporting organisations
Country and Location	Host country, city, and venue or digital platform
Date and Duration	Planned implementation date and event duration
Type of Event	Workshop, B2B meeting, conference session, networking event, thematic seminar, hybrid event, etc.
Main Theme	Main offshore wind topic(s) addressed
Strategic Priority Addressed	Link to relevant ADRIONWIND strategic priority/priorities
Target Stakeholders	SMEs, industry, academia, public authorities, investors, NGOs, clusters, etc.
Expected Number of Participants	Estimated attendance and stakeholder representation
Objectives of the Event	Main expected outcomes and purpose
Planned Activities	Presentations, matchmaking sessions, panel discussions, workshops, pitching sessions, networking activities, etc.
SME Participation Dimension	Description of how SMEs will be integrated and supported
B2B / Matchmaking Component	Planned networking or partnership-building activities
Knowledge-sharing Outputs	Reports, presentations, recordings, policy recommendations, contact lists, etc.
Digital Integration	Materials to be uploaded to the ADRIONWIND platform
Dissemination Activities	Communication and visibility actions before and after the event
Follow-up Actions	Potential partnerships, future meetings, project proposals, or cooperation initiatives

The template is intended to support a coherent regional approach while allowing flexibility for different national contexts, stakeholder structures, and thematic priorities. It also ensures that knowledge-sharing activities contribute directly to the ADRIONWIND Collaboration Network and digital platform by generating reusable materials, stakeholder connections, and long-term cooperation opportunities.

5. National Specialization of Joint Transnational R&I Strategy

This chapter translates the regional analytical findings and strategic priorities into indicative national implementation pathways. It identifies how participating countries can contribute to the emerging transnational ecosystem according to their capacities & strengths, development needs, and institutional readiness. Given these differences, the strategy promotes complementary national priorities. Not all countries are expected to contribute equally across all thematic areas; instead, each national framework focuses on those regional priorities where the country can generate the highest strategic added value while simultaneously strengthening regional cooperation and interdependence.

The national priorities and indicative actions presented in this chapter are derived from:

- the national context analyses in Chapter 2;
- stakeholder consultations and regional exchanges conducted during the project;
- the shared regional priorities identified in Chapter 4;
- existing national strategic orientations and offshore energy ambitions;
- and the objective of strengthening macro-regional cooperation and long-term investment readiness.

The proposed actions are indicative. Their purpose is to provide a strategic orientation for future cooperation initiatives, project pipelines, investment mobilisation, and institutional coordination at both national and transnational level.

5.1. Croatia

5.1.1 Croatian R&I Vision & Priorities

Croatia's strategic role within the ADRION offshore wind ecosystem is linked to maritime-industrial capacities, port infrastructure potential, engineering knowledge, and future cross-border infrastructure cooperation in the Adriatic basin, because the country has regulatory and spatial-planning constraints. However, Croatia has potential to contribute to the regional offshore wind value chain through industrial adaptation, logistics, digital systems, and maritime services. The R&I actions therefore are based on the preparation of a future offshore wind ecosystem capable of supporting regional deployment through R&I activities & infrastructure readiness, and strengthening the role of Croatian maritime industries, ports, engineering services, research institutions, and SMEs within future Adriatic–Ionian offshore wind supply chains. The following shared regional priorities are identified as the most relevant for Croatia:

Shared Regional Priority	**Croatian Strategic Relevance**
Priority 2 – Regional Offshore Supply-Chain and Industrial Integration	Croatia possesses important maritime-industrial and shipbuilding capacities that can gradually support offshore wind manufacturing, assembly, logistics, maintenance, and engineering services.
Priority 3 – Cross-Border Grid, Port, and Infrastructure Transformation	Croatian ports and coastal infrastructure may play an important future role within Adriatic offshore logistics and cross-border energy cooperation frameworks.

Priority 4 – Joint Pilot, Demonstration, and Applied Innovation Projects	Croatia can contribute through pilot cooperation, maritime research activities, environmental monitoring, and future floating offshore wind innovation initiatives.
Priority 5 – Offshore Workforce Development and Skills Transition	Existing competencies from shipbuilding, maritime industries, onshore wind, and offshore energy sectors provide a basis for workforce adaptation and SME capacity building.
Priority 7 – Digital Cooperation and Smart Offshore Systems	Croatia can support the development of digital collaboration mechanisms, stakeholder platforms, offshore data systems, and smart monitoring solutions within the ADRION region.

5.1.2 Croatian Indicative Proposed Actions

The proposed actions for Croatia are focused on strengthening long-term offshore wind readiness, supporting maritime-industrial transition, and improving integration into emerging Adriatic–Ionian offshore wind value chains. The actions are aligned with Croatia's identified strategic priorities and reflect the country's current regulatory context, industrial capacities, and future cooperation potential.

Regional Priority	Indicative Proposed Actions
Priority 2 – Regional Offshore Supply-Chain and Industrial Integration	Support the mapping and integration of Croatian maritime industries, shipyards, engineering companies, and SMEs into regional offshore wind supply chains. Promote industrial adaptation projects focused on offshore structures, logistics, maintenance services, and specialised maritime operations. Encourage cooperation between industrial actors and research institutions for the development of offshore-related technical solutions.
Priority 3 – Cross-Border Grid, Port, and Infrastructure Transformation	Develop preliminary assessments of Croatian port readiness for offshore wind logistics and maintenance activities. Support participation in cross-border infrastructure development related to Adriatic energy connectivity, offshore logistics corridors, and future grid integration initiatives. Encourage technical cooperation with regional and EU partners on offshore infrastructure planning and environmental compatibility.
Priority 4 – Joint Pilot, Demonstration, and Applied Innovation Projects	Support Croatian participation in transnational pilot and demonstration initiatives related to floating offshore wind, marine monitoring systems, offshore digital technologies, and environmental research. Strengthen cooperation between universities, institutes, and industrial actors in applied offshore innovation projects. Support involvement in EU-funded offshore energy research consortia.

Priority 5 – Offshore Workforce Development and Skills Transition	Develop targeted training and reskilling activities for SMEs and workers from maritime industries, shipbuilding, engineering, and related technical sectors. Promote cooperation between educational institutions, vocational centres, and industry actors to strengthen offshore-related technical and digital competencies. Support the inclusion of offshore wind topics within existing maritime and engineering education frameworks.
Priority 7 – Digital Cooperation and Smart Offshore Systems	Support the development of digital cooperation tools, offshore stakeholder databases, GIS-supported planning systems, and smart monitoring applications linked to offshore activities. Promote Croatian participation in regional offshore data-sharing initiatives and digital collaboration platforms developed within ADRIONWIND. Encourage SME involvement in digital offshore services and monitoring technologies.

5.1.3 Croatian Indicative Supporting Investments

The following indicative investment areas are proposed to support Croatia's gradual integration into the Adriatic–Ionian offshore wind ecosystem. The objective is to strengthen enabling conditions, industrial readiness, research capacity, and regional cooperation mechanisms required for future participation in offshore wind value chains and innovation activities.

Priority	Indicative Action	Indicative Supporting Investments	Potential Supporting Institutions / Mechanisms
Priority 2 – Regional Offshore Supply-Chain and Industrial Integration	Support the mapping and integration of Croatian maritime industries, shipyards, engineering companies, and SMEs into regional offshore wind supply chains	Supply-chain mapping tools, SME internationalisation support, certification programmes, cluster development initiatives	Interreg IPA ADRION, Enterprise Europe Network (EEN), Croatian Chamber of Economy, HAMAG-BICRO
	Promote industrial adaptation programmes focused on offshore structures,	Industrial modernisation schemes, technical upgrading, engineering software, fabrication	European Regional Development Fund (ERDF), Croatian Ministry of Economy, EIB

	logistics, maintenance services, and specialised maritime operations	equipment	
	Encourage cooperation between industrial actors and research institutions for the development of offshore-related technical solutions	Applied R&I funding, innovation vouchers, collaborative research programmes	Horizon Europe, universities, research institutes, innovation agencies
Priority 3 – Cross-Border Grid, Port, and Infrastructure Transformation	Develop preliminary assessments of Croatian port readiness for offshore wind logistics and maintenance activities	Port feasibility studies, logistics assessments, infrastructure planning support	CEF, Croatian port authorities, Ministry of Maritime Affairs
	Support participation in cross-border infrastructure development related to Adriatic energy connectivity, offshore logistics corridors, and future grid integration initiatives	Cross-border technical studies, regional infrastructure cooperation mechanisms	Interreg, CEF Energy, Energy Community Secretariat
	Encourage technical cooperation with regional and EU partners on offshore infrastructure planning and environmental compatibility	Technical exchange programmes, environmental planning studies, institutional cooperation initiatives	Horizon Europe, EUSAIR initiatives, regional cooperation platforms
Priority 4 – Joint Pilot, Demonstration,	Promote Croatian participation in	Pilot project funding, testing infrastructure,	Horizon Europe, Innovation Fund,

and Applied Innovation Projects	transnational pilot and demonstration initiatives related to floating offshore wind, marine monitoring systems, offshore digital technologies, and environmental research	offshore monitoring technologies	research consortia
	Strengthen cooperation between universities, institutes, and industrial actors in applied offshore innovation projects	Joint research programmes, university-industry partnerships, innovation platforms	Universities, R&I institutes, Interreg, national science foundations
	Support involvement in EU-funded offshore energy research consortia	Consortium-building support, proposal development assistance, networking activities	Horizon Europe, ADRIONWIND Network, European clusters
Priority 5 – Offshore Workforce Development and Skills Transition	Develop targeted training and reskilling activities for SMEs and workers from maritime industries, shipbuilding, engineering, and related technical sectors	Vocational training programmes, digital learning systems, certification schemes	Erasmus+, ESF+, vocational training centres
	Promote cooperation between educational institutions, vocational centres, and industry actors to strengthen offshore-related technical and digital competencies	Educational partnerships, curriculum development, technical workshops	Universities, chambers of commerce, ministries of education
	Support the inclusion of	Educational modules, teaching	Higher education

	offshore wind topics within existing maritime and engineering education frameworks	materials, academic cooperation programmes	institutions, Erasmus+, national education authorities
Priority 7 – Digital Cooperation and Smart Offshore Systems	Support the development of digital cooperation tools, offshore stakeholder databases, GIS-supported planning systems, and smart monitoring applications linked to offshore activities	GIS infrastructure, digital platforms, stakeholder databases	Digital Europe Programme, Interreg, ADRIONWIND platform
	Promote Croatian participation in regional offshore data-sharing initiatives and digital collaboration platforms developed within ADRIONWIND	Data-sharing systems, interoperability tools, regional ICT cooperation	EMODnet, Copernicus, Interreg
	Encourage SME involvement in digital offshore services and monitoring technologies	SME digitalisation support, smart monitoring tools, AI and data analytics applications	

Potential supporting financing sources may include Interreg programmes, Horizon Europe, the Innovation Fund, Connecting Europe Facility (CEF), EIB instruments, national recovery and resilience mechanisms, and future public-private investment initiatives linked to energy transition and maritime industrial modernization.

5.2. Italy

5.2.1 Italian R&I Vision & Priorities

Italy is the most advanced offshore wind ecosystem within ADRIONWIND, particularly in large-scale project development. Therefore, the Italian R&I vision is focused on positioning the country as a regional driver and strengthening transnational cooperation in offshore technologies, environmental monitoring, and digital systems, while supporting the integration of SMEs into the value chain. The following shared regional priorities are identified as the most relevant for Italy:

Shared Regional Priority	Italian Strategic Relevance
Priority 1 – Floating Offshore Wind Adaptation for Mediterranean Conditions	Italy is emerging as one of the leading Mediterranean markets for floating offshore wind, supported by large-scale projects, industrial expertise, and growing technological maturity.
Priority 2 – Regional Offshore Supply-Chain and Industrial Integration	Italian ports, engineering companies, maritime industries, and energy operators already possess significant capacities relevant to offshore wind development and regional supply-chain integration.
Priority 3 – Cross-Border Grid, Port, and Infrastructure Transformation	Italy plays an important role in Adriatic–Ionian maritime infrastructure, offshore logistics, and future regional energy connectivity initiatives.
Priority 4 – Joint Pilot, Demonstration, and Applied Innovation Projects	Italy provides important pilot and demonstration opportunities through floating offshore wind projects, marine monitoring systems, and applied innovation activities.
Priority 6 – Coordinated Governance and Environmental Planning	Italy has accumulated important experience in offshore permitting, environmental assessment, and offshore planning.
Priority 7 – Digital Cooperation and Smart Offshore Systems	Italy has strong potential to support offshore digitalisation, environmental monitoring technologies, smart maritime systems, and regional offshore data-sharing mechanisms.

5.2.2 Italian Indicative Proposed Actions

The proposed actions for Italy focus on strengthening its role as a regional innovation and implementation leader within the Adriatic–Ionian offshore wind ecosystem:

Regional Priority	Indicative Proposed Actions
Priority 1 – Floating Offshore Wind Adaptation for Mediterranean Conditions	Support the development and demonstration of floating offshore wind solutions adapted to Mediterranean environmental and spatial conditions. Promote applied research activities focused on floating platforms, anchoring systems, marine operations, and offshore system optimisation. Encourage cooperation between industrial actors, ports, and research institutions in the development of floating offshore technologies.
Priority 2 – Regional Offshore Supply-Chain and Industrial Integration	Strengthen the integration of Italian maritime industries, engineering companies, ports, and SMEs into Adriatic–Ionian offshore wind value chains. Promote industrial cooperation initiatives focused on offshore manufacturing, logistics,

	maintenance services, and specialised marine operations. Support SME participation in transnational offshore supply-chain and innovation networks.
Priority 3 – Cross-Border Grid, Port, and Infrastructure Transformation	Support the development of offshore-ready port infrastructure and logistics systems connected to floating offshore wind activities. Encourage technical cooperation related to offshore grid integration, maritime infrastructure planning, and Adriatic–Ionian energy connectivity initiatives. Promote cross-border infrastructure dialogue and cooperation mechanisms involving ports, TSOs, and regional authorities.
Priority 4 – Joint Pilot, Demonstration, and Applied Innovation Projects	Promote participation in pilot and demonstration projects related to floating offshore wind, environmental monitoring systems, offshore digital technologies, and hybrid renewable solutions. Strengthen cooperation between universities, research centres, industrial actors, and regional authorities in applied offshore innovation initiatives. Support Italian involvement in transnational offshore R&I consortia and testing activities.
Priority 6 – Coordinated Governance and Environmental Planning	Encourage the exchange of good practices related to offshore permitting, maritime spatial planning, environmental assessment, and transboundary consultation processes. Support cooperation initiatives focused on ecosystem-sensitive offshore development and marine biodiversity monitoring. Promote dialogue between public authorities, research institutions, industry actors, and local communities regarding sustainable offshore planning approaches.
Priority 7 – Digital Cooperation and Smart Offshore Systems	Support the development of offshore digital monitoring systems, smart maritime applications, GIS-supported planning tools, and regional offshore data-sharing mechanisms. Promote cooperation on digital offshore platforms and environmental monitoring technologies. Encourage SME participation in digital offshore services, marine data applications, and smart operational systems.

5.2.3 Italian Indicative Supporting Investments

The following suggested investment mechanisms can support the implementation of the aforementioned actions.

Priority	Indicative Action	Indicative Supporting Investments	Potential Supporting Institutions / Mechanisms
Priority 1 – Floating Offshore Wind Adaptation for Mediterranean Conditions	Support the development and demonstration of floating offshore wind solutions adapted to Mediterranean environmental and spatial conditions	Pilot infrastructure, floating platform testing systems, offshore engineering equipment, marine testing facilities	Horizon Europe, Innovation Fund, CDP, Italian Ministry of Environment and Energy Security
	Promote applied research activities focused on floating platforms, anchoring systems, marine operations, and offshore system optimisation	Applied R&I funding, engineering laboratories, simulation systems, collaborative research programmes	Universities, research centres, Horizon Europe, national innovation programmes
	Encourage cooperation between industrial actors, ports, and research institutions in the development of floating offshore technologies	Industrial partnerships, offshore technology clusters, demonstration partnerships	Regional innovation clusters, port authorities, industrial associations
Priority 2 – Regional Offshore Supply-Chain and Industrial Integration	Strengthen the integration of Italian maritime industries, engineering companies, ports, and SMEs into Adriatic–Ionian offshore wind value chains	SME internationalisation support, industrial upgrading, supplier certification programmes	Enterprise Europe Network (EEN), regional development agencies, chambers of commerce
	Promote industrial cooperation initiatives focused on offshore manufacturing, logistics,	Industrial modernisation schemes, logistics infrastructure, specialised offshore equipment	ERDF, EIB, regional industrial support programmes

	maintenance services, and specialised marine operations		
	Support SME participation in transnational offshore supply-chain and innovation networks	Cluster participation support, matchmaking tools, networking activities	Interreg IPA ADRION, ADRIONWIND Network, innovation hubs
Priority 3 – Cross-Border Grid, Port, and Infrastructure Transformation	Support the development of offshore-ready port infrastructure and logistics systems connected to floating offshore wind activities	Port adaptation studies, heavy-load infrastructure upgrades, logistics planning systems	CEF, port authorities, Ministry of Infrastructure and Transport
	Encourage technical cooperation related to offshore grid integration, maritime infrastructure planning, and Adriatic–Ionian energy connectivity initiatives	Technical studies, grid planning cooperation mechanisms, infrastructure coordination platforms	CEF Energy, TSOs, Energy Community Secretariat
	Promote cross-border infrastructure dialogue and cooperation mechanisms involving ports, TSOs, and regional authorities	Institutional cooperation platforms, regional infrastructure working groups	Interreg, EUSAIR, regional cooperation initiatives
Priority 4 – Joint Pilot, Demonstration, and Applied Innovation Projects	Promote participation in pilot and demonstration projects related to floating offshore wind, environmental monitoring systems, offshore	Pilot project funding, monitoring systems, offshore digital tools	Horizon Europe, Innovation Fund, research consortia

	digital technologies, and hybrid renewable solutions		
	Strengthen cooperation between universities, research centres, industrial actors, and regional authorities in applied offshore innovation initiatives	Collaborative R&I programmes, innovation partnerships, technology transfer activities	Universities, regional innovation ecosystems, national R&I agencies
	Support Italian involvement in transnational offshore R&I consortia and testing activities	Consortium-building support, networking activities, offshore testing infrastructure	Horizon Europe, European offshore clusters
Priority 6 – Coordinated Governance and Environmental Planning	Encourage the exchange of good practices related to offshore permitting, maritime spatial planning, environmental assessment, and transboundary consultation processes	Policy cooperation mechanisms, environmental planning studies, institutional exchanges	European Commission programmes, MSP initiatives, regional authorities
	Support cooperation initiatives focused on ecosystem-sensitive offshore development and marine biodiversity monitoring	Biodiversity monitoring systems, marine research infrastructure, environmental data tools	EMODnet, Copernicus, environmental agencies
	Promote dialogue between public authorities, research institutions, industry actors, and local communities regarding	Stakeholder engagement platforms, consultation processes, awareness activities	Regional authorities, NGOs, Interreg initiatives

	sustainable offshore planning approaches		
Priority 7 – Digital Cooperation and Smart Offshore Systems	Support the development of offshore digital monitoring systems, smart maritime applications, GIS-supported planning tools, and regional offshore data-sharing mechanisms	GIS infrastructure, smart monitoring technologies, offshore digital platforms	Digital Europe Programme, Interreg, ADRIONWIND platform
	Promote cooperation on digital offshore platforms and environmental monitoring technologies	Interoperability tools, marine data-sharing systems, digital cooperation initiatives	EMODnet, Copernicus, research institutes
	Encourage SME participation in digital offshore services, marine data applications, and smart operational systems	SME digitalisation support, AI and data analytics tools, innovation vouchers	Digital innovation hubs, SME agencies, regional innovation programmes

5.3. Greece

5.3.1 Greek R&I Vision & Priorities

Greece is positioned as a leading emerging offshore wind market in the Adriatic–Ionian and Eastern Mediterranean region. The Greek R&I vision is focused on establishing a technologically advanced and environmentally sustainable offshore wind ecosystem capable of supporting large-scale deployment in deep-water Mediterranean conditions. Floating offshore wind technologies are in focus, as well as integrated maritime planning, offshore infrastructure coordination, and the development of innovation ecosystems linking research institutions, industry actors, ports, and energy operators. Greece is also expected to play an important regional role in strengthening cross-border.

Shared Regional Priority	Greek Strategic Relevance
Priority 1 – Floating Offshore Wind Adaptation for Mediterranean Conditions	Greece has prioritised floating offshore wind as a strategic technology due to deep-water conditions and strong offshore wind potential in the Mediterranean basin.
Priority 3 – Cross-Border	Greece has important energy connectivity

Grid, Port, and Infrastructure Transformation	infrastructure, port systems, and technical expertise relevant to offshore grid integration and regional energy cooperation.
Priority 4 – Joint Pilot, Demonstration, and Applied Innovation Projects	Greece is developing pilot and demonstration activities linked to floating offshore wind, marine research, environmental monitoring, and offshore innovation systems.
Priority 5 – Offshore Workforce Development and Skills Transition	Greece can support specialised offshore workforce development through maritime expertise, engineering capacities, and cooperation between academia and industry.
Priority 6 – Coordinated Governance and Environmental Planning	Greece has established one of the most advanced offshore wind governance frameworks in the ADRION region, including state-led planning, licensing structures, and marine spatial coordination mechanisms.
Priority 7 – Digital Cooperation and Smart Offshore Systems	Greece has growing capacities in offshore digital monitoring, marine spatial data systems, environmental intelligence, and smart energy infrastructure applications.

5.3.2 Greek Indicative Proposed Actions

The proposed actions are aligned with Greece's strategic priorities and aim to support technological innovation, environmental sustainability, infrastructure integration, and regional knowledge transfer within the Adriatic–Ionian offshore wind ecosystem.

Regional Priority	Indicative Proposed Actions
Priority 1 – Floating Offshore Wind Adaptation for Mediterranean Conditions	Support the development and testing of floating offshore wind technologies adapted to deep-water Mediterranean environments. Promote cooperation between research institutions, industrial actors, and energy companies on floating platforms, offshore engineering solutions, and marine operational systems. Encourage participation in Mediterranean floating offshore wind pilot and demonstration initiatives.
Priority 3 – Cross-Border Grid, Port, and Infrastructure Transformation	Strengthen cooperation on offshore grid integration, submarine cable systems, and regional energy connectivity initiatives. Support the development of offshore-ready port infrastructure and logistics capacities linked to floating offshore wind deployment. Promote cross-border technical cooperation related to offshore energy infrastructure planning and maritime transport coordination.
Priority 4 – Joint Pilot, Demonstration, and Applied Innovation Projects	Promote pilot and demonstration projects focused on floating offshore wind, offshore monitoring systems, hybrid renewable systems,

	and marine digital technologies. Strengthen cooperation between universities, research centres, public authorities, and industrial actors in applied offshore innovation activities. Support Greek participation in transnational offshore R&I and demonstration consortia.
Priority 5 – Offshore Workforce Development and Skills Transition	Develop specialised offshore training and reskilling programmes targeting maritime industries, engineering sectors, technical professionals, and SMEs. Promote cooperation between educational institutions, research centres, and industry actors for the development of offshore technical, environmental, and digital competencies. Encourage the integration of offshore wind topics into maritime and engineering education programmes.
Priority 6 – Coordinated Governance and Environmental Planning	Promote the exchange of governance practices related to offshore permitting, marine spatial planning, environmental assessment, and transboundary consultation mechanisms. Support cooperation initiatives focused on ecosystem-sensitive offshore planning, biodiversity protection, and integrated maritime governance. Encourage regional dialogue between public authorities, regulators, industry actors, and local stakeholders regarding sustainable offshore development.
Priority 7 – Digital Cooperation and Smart Offshore Systems	Support the development of offshore digital monitoring systems, marine spatial intelligence tools, GIS-supported planning platforms, and smart offshore infrastructure applications. Promote participation in regional offshore data-sharing initiatives and environmental monitoring networks. Encourage SME involvement in digital offshore services, marine analytics, and smart operational technologies.

These actions aim to strengthen Greece's contribution to the development of a technologically advanced, environmentally sustainable, and regionally integrated offshore wind ecosystem within the Adriatic–Ionian region.

5.3.3 Greek Indicative Supporting Investments

The following indicative supporting investments are proposed to facilitate the implementation of the identified Greek priority areas and strengthen the country's contribution to the Adriatic–Ionian offshore wind ecosystem. The investments are intended to support technological development, infrastructure readiness, environmental sustainability, workforce development, and cross-border cooperation, while improving long-term investment readiness and regional integration.

Priority	Indicative Action	Indicative Supporting Investments	Potential Supporting Institutions / Mechanisms
Priority 1 – Floating Offshore Wind Adaptation for Mediterranean Conditions	Support the development and testing of floating offshore wind technologies adapted to deep-water Mediterranean environments	Floating platform demonstrators, offshore testing facilities, marine engineering systems, anchoring and mooring technologies, offshore simulation infrastructure	Horizon Europe, Innovation Fund, Hellenic Ministry of Environment and Energy, EIB
	Promote cooperation between research institutions, industrial actors, and energy companies on floating platforms, offshore engineering solutions, and marine operational systems	Applied R&I programmes, university–industry partnerships, offshore technology laboratories, digital modelling tools	Universities and research institutes, national R&I programmes, Horizon Europe
	Encourage participation in Mediterranean floating offshore wind pilot and demonstration initiatives	Pilot project financing, offshore monitoring infrastructure, demonstration partnerships, technical feasibility studies	Innovation Fund, Interreg, European offshore wind partnerships
Priority 3 – Cross-Border Grid, Port, and Infrastructure Transformation	Strengthen cooperation on offshore grid integration, submarine cable systems, and regional energy connectivity initiatives	Offshore transmission studies, submarine cable infrastructure planning, smart grid systems, technical coordination platforms	CEF Energy, ADMIE, Energy Community Secretariat, EIB
	Support the development of offshore-ready port	Port modernisation, heavy-load quays, logistics planning	Port authorities, ERDF, national infrastructure programmes

	infrastructure and logistics capacities linked to floating offshore wind deployment	systems, storage and assembly facilities	
	Promote cross-border technical cooperation related to offshore energy infrastructure planning and maritime transport coordination	Cross-border infrastructure studies, regional planning initiatives, institutional cooperation platforms	Interreg IPA ADRION, EUSAIR, regional transport and energy initiatives
Priority 4 – Joint Pilot, Demonstration, and Applied Innovation Projects	Promote pilot and demonstration projects focused on floating offshore wind, offshore monitoring systems, hybrid renewable systems, and marine digital technologies	Demonstration funding, offshore digital systems, hybrid energy pilot infrastructure, marine sensors and monitoring tools	Horizon Europe, Innovation Fund, research consortia
	Strengthen cooperation between universities, research centres, public authorities, and industrial actors in applied offshore innovation activities	Innovation clusters, collaborative research platforms, technology transfer mechanisms	Universities, research centres, regional innovation ecosystems
	Support Greek participation in transnational offshore R&I and demonstration consortia	Consortium-building support, networking activities, proposal development assistance	Horizon Europe, European Technology Platforms, ADRIONWIND Network
Priority 5 – Offshore	Develop specialised	Vocational training systems,	Erasmus+, ESF+, vocational

Workforce Development and Skills Transition	offshore training and reskilling programmes targeting maritime industries, engineering sectors, technical professionals, and SMEs	offshore safety certification, simulation-based learning, digital training platforms	training centres, universities
	Promote cooperation between educational institutions, research centres, and industry actors for the development of offshore technical, environmental, and digital competencies	Curriculum development, university–industry partnerships, specialised workshops and laboratories	Ministry of Education, universities, industry associations
	Encourage the integration of offshore wind topics into maritime and engineering education programmes	Academic modules, educational materials, offshore engineering programmes	Higher education institutions, Erasmus+, maritime academies
Priority 6 – Coordinated Governance and Environmental Planning	Promote the exchange of governance practices related to offshore permitting, marine spatial planning, environmental assessment, and transboundary consultation mechanisms	Governance cooperation platforms, regulatory studies, institutional coordination activities	HEREMA, MSP initiatives, European Commission programmes
	Support cooperation initiatives focused on ecosystem-sensitive offshore	Marine biodiversity monitoring systems, environmental data platforms, ecological	Environmental agencies, EMODnet, Copernicus

	planning, biodiversity protection, and integrated maritime governance	assessment tools	
	Encourage regional dialogue between public authorities, regulators, industry actors, and local stakeholders regarding sustainable offshore development	Stakeholder consultation mechanisms, public engagement platforms, regional cooperation forums	Interreg programmes, regional authorities, NGOs
Priority 7 – Digital Cooperation and Smart Offshore Systems	Support the development of offshore digital monitoring systems, marine spatial intelligence tools, GIS-supported planning platforms, and smart offshore infrastructure applications	GIS infrastructure, marine data systems, smart monitoring technologies, offshore digital platforms	Digital Europe Programme, Interreg, national digitalisation initiatives
	Promote participation in regional offshore data-sharing initiatives and environmental monitoring networks	Interoperable data systems, marine observation networks, digital collaboration tools	EMODnet, Copernicus, research institutes
	Encourage SME involvement in digital offshore services, marine analytics, and smart operational technologies	SME digitalisation support, AI and analytics tools, innovation vouchers, digital incubators	Digital innovation hubs, SME agencies, regional innovation programmes

These investments are indicative and intended to guide future cooperation, project development, and funding mobilisation efforts. Their implementation will depend on national priorities, regional partnerships, investment readiness, and the availability of European and national financing instruments. Collectively, these investments aim to strengthen Greece's role within the regional offshore wind ecosystem while contributing to the broader objectives of ADRIONWIND related to innovation, sustainability, infrastructure integration, and transnational cooperation.

5.4. Albania

5.4.1 Albanian R&I Vision & Priorities

Albania represents an emerging offshore wind market within the ADRION region, where offshore wind development is still at a preparatory and exploratory stage. Within ADRIONWIND, Albania's strategic role is linked to institutional readiness building, renewable energy diversification, regional cooperation, and the gradual development of technical, regulatory, and innovation capacities necessary for future offshore wind participation.

The Albanian R&I vision focuses on establishing the foundational conditions required for long-term offshore wind development, while strengthening integration into the wider Adriatic–Ionian offshore wind ecosystem. This includes improving regulatory preparedness, supporting research and technical cooperation, enhancing workforce and SME capacities, and facilitating access to regional knowledge, innovation networks, and investment mechanisms.

Given Albania's current level of market maturity, the emphasis is placed less on immediate deployment and more on capacity-building, pilot participation, governance adaptation, and gradual infrastructure and innovation preparation. In this context, transnational cooperation and knowledge transfer from more mature offshore wind markets are considered essential elements of the Albanian strategic pathway.

The following shared regional priorities are identified as the most relevant for Albania:

Shared Regional Priority	Albanian Strategic Relevance
Priority 4 – Joint Pilot, Demonstration, and Applied Innovation Projects	Albania can strengthen its offshore preparedness through participation in regional pilot initiatives, technical cooperation projects, and applied offshore innovation activities.
Priority 5 – Offshore Workforce Development and Skills Transition	Albania requires targeted workforce development, technical training, and SME capacity-building to support future offshore wind participation and energy transition activities.
Priority 6 – Coordinated Governance and Environmental Planning	Institutional strengthening, regulatory adaptation, maritime planning, and environmental governance are essential prerequisites for future offshore wind development in Albania.
Priority 7 – Digital Cooperation and Smart Offshore Systems	Albania can benefit from regional digital cooperation mechanisms, offshore data-sharing systems, GIS-supported planning tools, and smart monitoring applications.

5.4.2 Albanian Indicative Proposed Actions

The proposed actions for Albania focus on strengthening institutional preparedness, technical capacity, workforce development, and participation in regional offshore wind cooperation initiatives. The actions are aligned with Albania's current level of offshore wind maturity and are intended to support the gradual development of enabling conditions for future offshore wind activities within the

Adriatic–Ionian region.

Regional Priority	Indicative Proposed Actions
Priority 4 – Joint Pilot, Demonstration, and Applied Innovation Projects	Promote Albanian participation in regional pilot and demonstration initiatives related to offshore wind, marine monitoring systems, environmental research, and offshore digital technologies. Encourage cooperation between universities, public institutions, and international partners in applied offshore energy research activities. Support involvement in transnational offshore R&I and knowledge-sharing consortia.
Priority 5 – Offshore Workforce Development and Skills Transition	Develop targeted training and capacity-building programmes for SMEs, technical professionals, public authorities, and educational institutions related to offshore wind and renewable energy systems. Promote cooperation between vocational centres, universities, and industry actors for the development of offshore-related technical and digital competencies. Encourage the inclusion of offshore energy topics within engineering, environmental, and maritime education programmes.
Priority 6 – Coordinated Governance and Environmental Planning	Support the gradual development of offshore-related governance capacities, including maritime spatial planning, environmental assessment procedures, and institutional coordination mechanisms. Promote technical exchanges and cooperation with ADRION and EU partners regarding offshore permitting, environmental governance, and sustainable marine planning approaches. Encourage stakeholder dialogue related to offshore energy development and coastal sustainability.
Priority 7 – Digital Cooperation and Smart Offshore Systems	Support the development of offshore-related digital cooperation tools, GIS-supported planning systems, marine data-sharing mechanisms, and environmental monitoring applications. Promote Albanian participation in regional digital offshore platforms and smart monitoring initiatives developed within ADRIONWIND. Encourage SME involvement in digital services, environmental data applications, and smart operational systems linked to offshore and renewable energy activities.

The proposed actions are intended to strengthen Albania's long-term offshore wind readiness while improving integration into regional cooperation structures, innovation ecosystems, and future Adriatic–Ionian offshore energy initiatives.

5.4.3 Albanian Indicative Supporting Investments

The following indicative supporting investments are proposed to facilitate the gradual development of offshore wind readiness and innovation capacities in Albania. The investments are primarily focused on institutional strengthening, technical preparedness, workforce development, digital systems, and regional cooperation mechanisms, reflecting Albania's current stage of offshore wind market development.

Priority	Indicative Action	Indicative Supporting Investments	Potential Supporting Institutions / Mechanisms
Priority 4 – Joint Pilot, Demonstration, and Applied Innovation Projects	Promote Albanian participation in regional pilot and demonstration initiatives related to offshore wind, marine monitoring systems, environmental research, and offshore digital technologies	Pilot project participation support, marine monitoring equipment, applied research infrastructure, offshore digital tools	Horizon Europe, Interreg IPA ADRION, Innovation Fund
	Encourage cooperation between universities, public institutions, and international partners in applied offshore energy research activities	Research cooperation programmes, technical exchange schemes, university–industry collaboration initiatives	Universities, research institutes, national innovation programmes
	Support involvement in transnational offshore R&I and knowledge-sharing consortia	Consortium-building support, networking activities, proposal development assistance	Horizon Europe, ADRIONWIND Network, regional cooperation platforms
Priority 5 – Offshore Workforce Development and Skills Transition	Develop targeted training and capacity-building programmes for SMEs, technical professionals, public authorities, and educational institutions related to offshore wind and renewable energy systems	Vocational training programmes, technical certification systems, digital learning platforms, reskilling activities	Erasmus+, ESF+, vocational centres, universities
	Promote cooperation	Curriculum development,	Ministry of Education,

	between vocational centres, universities, and industry actors for the development of offshore-related technical and digital competencies	technical workshops, university–industry partnerships	chambers of commerce, industry associations
	Encourage the inclusion of offshore energy topics within engineering, environmental, and maritime education programmes	Educational materials, academic modules, offshore engineering and environmental training programmes	Higher education institutions, Erasmus+, national education authorities
Priority 6 – Coordinated Governance and Environmental Planning	Support the gradual development of offshore-related governance capacities, including maritime spatial planning, environmental assessment procedures, and institutional coordination mechanisms	Governance studies, institutional strengthening activities, MSP tools, environmental planning systems	European Commission programmes, MSP initiatives, national ministries
	Promote technical exchanges and cooperation with ADRION and EU partners regarding offshore permitting, environmental governance, and sustainable marine planning approaches	Technical cooperation platforms, institutional exchange programmes, regulatory advisory support	Interreg IPA ADRION, EUSAIR, Energy Community Secretariat
	Encourage stakeholder dialogue related to offshore energy development and coastal sustainability	Stakeholder consultation mechanisms, awareness activities, regional dialogue platforms	NGOs, regional authorities, coastal development programmes
Priority 7 – Digital	Support the development of	GIS infrastructure,	Digital Europe

Cooperation and Smart Offshore Systems	offshore-related digital cooperation tools, GIS-supported planning systems, marine data-sharing mechanisms, and environmental monitoring applications	digital platforms, marine observation systems, environmental databases	Programme, Interreg, national digitalisation initiatives
	Promote Albanian participation in regional digital offshore platforms and smart monitoring initiatives developed within ADRIONWIND	Interoperable data systems, regional ICT cooperation tools, smart monitoring applications	EMODnet, Copernicus, ADRIONWIND platform
	Encourage SME involvement in digital services, environmental data applications, and smart operational systems linked to offshore and renewable energy activities	SME digitalisation support, innovation vouchers, AI and analytics tools	SME support agencies, digital innovation hubs, regional innovation programmes

The proposed investments are indicative and intended to support Albania's gradual integration into the Adriatic–Ionian offshore wind ecosystem.

5.5. Montenegro

5.5.1 Montenegrin R&I Vision & Priorities

Within ADRIONWIND, Montenegro's strategic role is primarily linked to institutional capacity-building, environmental governance, SME participation, and gradual integration into Adriatic–Ionian offshore wind cooperation structures. The Montenegrin R&I vision focuses on strengthening the country's preparedness for participation in future offshore wind and offshore renewable energy activities through targeted capacity development, regulatory adaptation, research cooperation, and workforce strengthening.

Given Montenegro's current stage of offshore wind development, the strategic approach prioritises cooperation, technical readiness, and integration into regional innovation and planning frameworks rather than immediate large-scale deployment. In this context, participation in pilot initiatives, governance exchanges, digital cooperation systems, and offshore skills development activities is considered essential for long-term market preparation.

Shared Regional Priority	Montenegrin Strategic Relevance

Priority 4 – Joint Pilot, Demonstration, and Applied Innovation Projects	Montenegro can strengthen offshore preparedness through participation in regional pilot initiatives, marine research cooperation, and applied offshore innovation activities.
Priority 5 – Offshore Workforce Development and Skills Transition	Workforce development and SME capacity-building are necessary to support future offshore renewable energy participation and maritime economic diversification.
Priority 6 – Coordinated Governance and Environmental Planning	Institutional coordination, marine planning, environmental governance, and sustainable coastal development are key prerequisites for future offshore activities.
Priority 7 – Digital Cooperation and Smart Offshore Systems	Montenegro can benefit from regional digital cooperation tools, offshore monitoring systems, GIS-supported planning, and marine data-sharing mechanisms.

5.5.2 Montenegrin Indicative Proposed Actions

The proposed actions for Montenegro focus on strengthening institutional preparedness, workforce capacities, environmental governance, and participation in regional offshore wind cooperation and innovation activities. The actions are aligned with Montenegro's current stage of offshore wind market development and support the gradual creation of right conditions for future offshore renewable energy participation.

Regional Priority	Indicative Proposed Actions
Priority 4 – Joint Pilot, Demonstration, and Applied Innovation Projects	Promote Montenegrin participation in regional pilot and demonstration initiatives related to offshore renewable energy, marine environmental monitoring, and offshore digital systems. Encourage cooperation between universities, research institutions, public authorities, and international partners in applied offshore innovation activities. Support participation in transnational offshore R&I, testing, and knowledge-sharing consortia.
Priority 5 – Offshore Workforce Development and Skills Transition	Develop targeted training and reskilling programmes for SMEs, maritime professionals, technical workers, and public authorities related to offshore renewable energy and blue economy activities. Promote cooperation between educational institutions, vocational centres, and industry actors to strengthen technical, environmental, and digital competencies relevant to offshore sectors. Encourage the integration of offshore renewable energy topics into existing maritime, engineering, and environmental education programmes.
Priority 6 – Coordinated Governance and Environmental Planning	Support the strengthening of governance capacities related to maritime spatial planning, environmental assessment procedures, coastal

	management, and offshore permitting preparation. Promote technical cooperation and exchange of practices with ADRION and EU partners regarding sustainable offshore planning and marine governance. Encourage stakeholder dialogue on offshore renewable energy development, environmental sustainability, and coastal community participation.
Priority 7 – Digital Cooperation and Smart Offshore Systems	Support the development of offshore-related digital cooperation tools, GIS-supported marine planning systems, environmental monitoring applications, and regional offshore data-sharing mechanisms. Promote Montenegrin participation in regional digital offshore initiatives and smart monitoring platforms developed within ADRIONWIND. Encourage SME involvement in digital marine services, environmental analytics, and smart operational applications linked to offshore and maritime activities.

5.5.3 Montenegrin Indicative Supporting Investments

The following indicative investments are proposed to support Montenegro's gradual integration into the Adriatic–Ionian offshore renewable energy ecosystem via the selected actions.

Priority	Indicative Action	Indicative Supporting Investments	Potential Supporting Institutions / Mechanisms
Priority 4 – Joint Pilot, Demonstration, and Applied Innovation Projects	Promote Montenegrin participation in regional pilot and demonstration initiatives related to offshore renewable energy, marine environmental monitoring, and offshore digital systems	Pilot project participation support, marine monitoring technologies, offshore digital infrastructure, applied research equipment	Horizon Europe, Interreg IPA ADRION, Innovation Fund
	Encourage cooperation between universities, research institutions, public authorities, and international partners in applied	Research cooperation programmes, university–industry partnerships, technical exchange initiatives	Universities, research institutes, national innovation programmes

	offshore innovation activities		
	Support participation in transnational offshore R&I, testing, and knowledge-sharing consortia	Consortium-building support, networking activities, proposal development assistance	Horizon Europe, ADRIONWIND Network, regional cooperation platforms
Priority 5 – Offshore Workforce Development and Skills Transition	Develop targeted training and reskilling programmes for SMEs, maritime professionals, technical workers, and public authorities related to offshore renewable energy and blue economy activities	Vocational training programmes, technical certification systems, digital learning platforms, reskilling activities	Erasmus+, ESF+, vocational centres, universities
	Promote cooperation between educational institutions, vocational centres, and industry actors to strengthen technical, environmental, and digital competencies relevant to offshore sectors	Curriculum development, technical workshops, university–industry cooperation programmes	Ministry of Education, chambers of commerce, industry associations
	Encourage the integration of offshore renewable energy topics into existing maritime, engineering, and environmental education programmes	Academic modules, educational materials, offshore energy training programmes	Higher education institutions, Erasmus+, maritime academies
Priority 6 – Coordinated Governance and Environmental Planning	Support the strengthening of governance capacities related to maritime spatial	Governance studies, MSP systems, institutional strengthening	European Commission programmes, MSP initiatives, national

	planning, environmental assessment procedures, coastal management, and offshore permitting preparation	programmes, environmental planning tools	ministries
	Promote technical cooperation and exchange of practices with ADRION and EU partners regarding sustainable offshore planning and marine governance	Technical cooperation platforms, institutional exchange programmes, advisory support mechanisms	Interreg IPA ADRION, EUSAIR, Energy Community Secretariat
	Encourage stakeholder dialogue on offshore renewable energy development, environmental sustainability, and coastal community participation	Stakeholder engagement mechanisms, public consultation platforms, awareness activities	NGOs, regional authorities, coastal development initiatives
Priority 7 – Digital Cooperation and Smart Offshore Systems	Support the development of offshore-related digital cooperation tools, GIS-supported marine planning systems, environmental monitoring applications, and regional offshore data-sharing mechanisms	GIS infrastructure, marine observation systems, digital cooperation platforms, environmental databases	Digital Europe Programme, Interreg, national digitalisation initiatives
	Promote Montenegrin participation in regional digital offshore initiatives and smart monitoring platforms developed within ADRIONWIND	Interoperable marine data systems, regional ICT cooperation tools, smart monitoring technologies	EMODnet, Copernicus, ADRIONWIND platform

	Encourage SME involvement in digital marine services, environmental analytics, and smart operational applications linked to offshore and maritime activities	SME digitalisation support, AI and analytics tools, innovation vouchers	SME support agencies, digital innovation hubs, regional innovation programmes

The proposed investments are indicative and intended to support Montenegro's long-term offshore renewable energy preparedness and regional integration. Their implementation will depend on institutional development, regional cooperation opportunities, and access to European and international funding mechanisms supporting energy transition, maritime sustainability, innovation, and digital transformation.

5.6. Bosnia & Herzegovina

5.6.1 Bosnian R&I Vision & Priorities

BiH represents an emerging participant within the Adriatic–Ionian offshore renewable energy ecosystem, with strategic interest in energy transition, regional cooperation, industrial diversification, and capacity-building related to offshore and maritime innovation. Within ADRIONWIND, their role is to strengthening institutional preparedness, SME integration, workforce development, and participation in regional offshore cooperation and innovation networks. The following shared regional priorities are identified as the most relevant for Bosnia and Herzegovina:

Shared Regional Priority	Bosnian Strategic Relevance
Priority 2 – Regional Offshore Supply-Chain and Industrial Integration	BiH can contribute through engineering services, manufacturing support activities, technical expertise, and SME participation in regional offshore supply chains.
Priority 5 – Offshore Workforce Development and Skills Transition	Capacity-building, technical training, and workforce development are essential for enabling future participation in offshore and renewable energy value chains.
Priority 6 – Coordinated Governance and Environmental Planning	Institutional cooperation, environmental governance, and policy coordination are important for aligning with regional offshore energy and sustainability frameworks.
Priority 7 – Digital Cooperation and Smart Offshore Systems	BiH can benefit from regional digital cooperation tools, offshore data-sharing mechanisms, smart monitoring systems, and digital innovation activities.

Given the country's current level of offshore wind market maturity and its limited direct maritime infrastructure, the strategic approach prioritises integration into regional supply chains, technical services, digital cooperation systems, environmental governance activities, and workforce development rather than direct offshore deployment. BiH's specialization within ADRIONWIND is therefore centred on strengthening technical capacities, SME integration, workforce preparedness, and regional cooperation mechanisms, while supporting gradual participation in the wider Adriatic–Ionian offshore renewable energy ecosystem.

5.6.2 Bosnian Indicative Proposed Actions

The proposed actions for BiH are aligned with the country's current level of offshore market development and aim to support gradual integration into the Adriatic–Ionian offshore energy ecosystem through innovation, technical services, and institutional cooperation.

Regional Priority	Indicative Proposed Actions
Priority 2 – Regional Offshore Supply-Chain and Industrial Integration	Support the integration of Bosnian SMEs, engineering companies, and technical service providers into regional offshore renewable energy supply chains. Promote cooperation between industrial actors, chambers of commerce, and regional offshore stakeholders in areas such as manufacturing support, engineering services, digital applications, and logistics. Encourage participation in regional supplier mapping, business networking, and industrial cooperation initiatives.
Priority 5 – Offshore Workforce Development and Skills Transition	Develop targeted training and reskilling programmes for SMEs, technical professionals, engineers, and educational institutions related to offshore renewable energy technologies and services. Promote cooperation between universities, vocational centres, and industry actors to strengthen technical, environmental, and digital competencies relevant to offshore and energy-transition sectors. Encourage the integration of renewable energy and offshore-related topics into existing technical and engineering education programmes.
Priority 6 – Coordinated Governance and Environmental Planning	Support institutional cooperation and knowledge exchange related to renewable energy governance, environmental planning, and sustainable development practices. Promote technical cooperation with ADRION and EU partners regarding environmental assessment procedures, policy alignment, and regional sustainability frameworks. Encourage stakeholder dialogue involving public authorities, SMEs, academia, and civil society related to energy transition and regional cooperation opportunities.
Priority 7 – Digital Cooperation and Smart Offshore Systems	Support the development of digital cooperation tools, offshore-related databases, GIS-supported planning systems, and smart monitoring applications linked to renewable energy and environmental management activities. Promote participation in regional offshore data-sharing and digital collaboration initiatives developed

	within ADRIONWIND. Encourage SME involvement in digital services, smart monitoring technologies, environmental analytics, and data-driven operational solutions.

The proposed actions aim to strengthen Bosnia and Herzegovina's long-term participation in regional offshore renewable energy cooperation while supporting SME development, technical capacity-building, innovation, and integration into Adriatic–Ionian energy transition initiatives.

5.6.3 Bosnian Indicative Supporting Investments

The following indicative investments focus on SME integration, workforce development, digitalisation, technical cooperation, and institutional strengthening, reflecting the country's current role within regional offshore value chains and energy-transition activities.

Priority	Indicative Action	Indicative Supporting Investments	Potential Supporting Institutions / Mechanisms
Priority 2 – Regional Offshore Supply-Chain and Industrial Integration	Support the integration of Bosnian SMEs, engineering companies, and technical service providers into regional offshore renewable energy supply chains	SME internationalisation support, supplier certification programmes, industrial digitalisation tools, business networking platforms	Interreg IPA ADRION, chambers of commerce, SME support agencies
	Promote cooperation between industrial actors, chambers of commerce, and regional offshore stakeholders in areas such as manufacturing support, engineering services, digital applications, and logistics	Industrial cooperation initiatives, technical upgrading schemes, logistics and engineering support systems	ERDF-related regional programmes, EEN, regional development agencies
	Encourage participation in regional supplier mapping, business networking, and industrial cooperation initiatives	Supplier databases, matchmaking events, regional cluster participation support	ADRIONWIND Network, chambers of commerce, innovation hubs

Priority 5 – Offshore Workforce Development and Skills Transition	Develop targeted training and reskilling programmes for SMEs, technical professionals, engineers, and educational institutions related to offshore renewable energy technologies and services	Vocational training systems, technical certification programmes, reskilling initiatives, digital learning platforms	Erasmus+, ESF+, vocational training centres, universities
	Promote cooperation between universities, vocational centres, and industry actors to strengthen technical, environmental, and digital competencies relevant to offshore and energy-transition sectors	Curriculum development, university–industry cooperation programmes, technical workshops	Ministry of Education, universities, industry associations
	Encourage the integration of renewable energy and offshore-related topics into existing technical and engineering education programmes	Academic modules, educational materials, engineering and renewable energy programmes	Higher education institutions, Erasmus+, technical faculties
Priority 6 – Coordinated Governance and Environmental Planning	Support institutional cooperation and knowledge exchange related to renewable energy governance, environmental planning, and sustainable development	Governance studies, institutional strengthening programmes, environmental planning systems	European Commission programmes, Energy Community Secretariat

	practices		
	Promote technical cooperation with ADRION and EU partners regarding environmental assessment procedures, policy alignment, and regional sustainability frameworks	Technical exchange programmes, policy advisory support, institutional cooperation platforms	Interreg IPA ADRION, EUSAIR, regional cooperation initiatives
	Encourage stakeholder dialogue involving public authorities, SMEs, academia, and civil society related to energy transition and regional cooperation opportunities	Stakeholder consultation mechanisms, awareness activities, regional dialogue platforms	NGOs, regional authorities, development agencies
Priority 7 – Digital Cooperation and Smart Offshore Systems	Support the development of digital cooperation tools, offshore-related databases, GIS-supported planning systems, and smart monitoring applications linked to renewable energy and environmental management activities	GIS infrastructure, environmental databases, digital cooperation platforms, monitoring systems	Digital Europe Programme, Interreg, national digitalisation initiatives
	Promote participation in regional offshore data-sharing and digital collaboration initiatives developed within ADRIONWIND	Interoperable data systems, regional ICT cooperation tools, digital networking platforms	EMODnet, Copernicus, ADRIONWIND platform
	Encourage SME involvement	SME digitalisation	Digital innovation hubs,

	in digital services, smart monitoring technologies, environmental analytics, and data-driven operational solutions	support, AI and analytics tools, innovation vouchers, smart technology applications	SME agencies, regional innovation programmes

BiH suggested investments might support its progressive participation in regional offshore renewable energy cooperation and related economic activities. Their implementation will depend on institutional capacities, regional partnerships, and access to European and international funding mechanisms supporting innovation, digitalisation, sustainability, and energy transition.

6. Conclusion and Strategic Outlook

The ADRIONWIND Joint Transnational R&I Strategy provides a common strategic framework for supporting the gradual development of an offshore wind and offshore renewable-energy ecosystem within the Adriatic–Ionian region. Building on the national and comparative analyses, the Strategy identifies seven shared regional priorities that address the technological, industrial, environmental, governance, workforce, and digital dimensions of offshore wind development. Recognising the different levels of maturity, capacity, and readiness across participating countries, the Strategy promotes a model of complementary specialization, whereby each country contributes according to its strengths, development needs, and strategic potential while benefiting from transnational cooperation and knowledge exchange.

The Strategy is designed as an implementation-oriented framework rather than a purely analytical exercise. Through the Macroeconomic Foresight Model Framework, Capacity Building Framework, SME Support Framework, Knowledge Sharing Framework, and Offshore Wind Energy Excellence Collaboration Network, it establishes the foundations for future cooperation, innovation activities, investment mobilisation, workforce development, and stakeholder integration. The national specialization pathways and indicative investment priorities aim to translate the shared regional vision into practical actions that can support future projects, partnerships, and funding opportunities at regional, national, and European level.

The long-term success of offshore wind in the Adriatic–Ionian region will depend on the ability of stakeholders to strengthen cooperation, reduce fragmentation, accelerate innovation, and build the institutional and industrial capacities required for sustainable offshore deployment. While development pathways will differ across countries, coordinated action can enable the region to collectively increase its participation in the European offshore renewable-energy transition. Through complementary specialization, transnational cooperation, SME integration, environmental sustainability, and innovation-driven development, ADRIONWIND establishes a realistic and flexible foundation for a more resilient, competitive, and interconnected Adriatic–Ionian offshore renewable-energy ecosystem.

Annex I: National inputs for Regulatory & Policy Alignment

All project partners submitted input data related to *Regulatory and Policy Alignment of Cooperation Consideration*. These data are arranged in the following tables.

Table 25National input data related to Regulatory and Policy Alignment of Cooperation Consideration – Albania and BiH

Regulatory and Policy Alignment of Cooperation Consideration:	Albania (AL)	BiH (BH)
Status of offshore wind–related regulation	The offshore wind energy sector in Albania remains in its infancy. The country possesses a strategic advantage for developing offshore wind infrastructure due to a coastline of over 400 km along the Adriatic and Ionian seas. The regulatory framework was established by Law No. 107/2014 on territorial planning and Law No. 7/2017 on the promotion of renewable energy. The framework aligns with broader goals of sustainable development and EU integration. A clear national commitment exists to increase the share of renewable energy sources. Specific experience and a defined planning strategy for the offshore wind sector are currently lacking in Albania.	None. BiH (BiH) is a landlocked country with neglectable marine territory and therefore has no offshore wind–specific legal or policy framework. Renewable energy regulation focuses exclusively on onshore resources (hydropower, onshore wind, solar, biomass). Legal and institutional framework (relevant by analogy): Energy governance is fragmented between state level, entity level (Federation of BiH, Republika Srpska), and Brčko District. Renewable energy laws and incentives are adopted at entity level, leading to non-harmonised procedures, support schemes, and permitting rules. No legislation addresses maritime energy, offshore infrastructure, or marine spatial planning. Planning instruments and recent initiatives: National Energy and Climate Plan (NECP) is prepared, driven by Energy Community obligations; offshore wind is not included, but regional cooperation on RES is

Regulatory and Policy Alignment of Cooperation Consideration:	Albania (AL)	BiH (BH)
		acknowledged. Strategic documents increasingly reference regional electricity market integration and cross-border infrastructure.
Status of Maritime Spatial Planning	Albania has initiated several steps toward establishing a comprehensive MSP system. The country is actively developing its Maritime Spatial Planning (MSP) framework to sustainably manage coastal and marine resources. The MSP development process is aligned with European Union (EU) standards. Offshore wind potential is currently not reflected in spatial or permitting frameworks.	Not applicable (no coastline / marine jurisdiction).
Main permitting or regulatory barriers	Albania does not yet have a dedicated legal or regulatory framework specifically for offshore wind. The absence of such a framework can delay project development. Legal uncertainties can deter investor confidence. The legal framework for marine spatial planning and offshore wind licensing is inadequate or still evolving.	Institutional fragmentation and complex multilevel governance slow decision-making and alignment with EU acquis. Limited administrative capacity in energy planning, environmental assessment, and innovation policy. Grid constraints and aging infrastructure, limiting absorption of variable renewable energy, including imports from offshore wind in neighbouring countries. Absence of experience with large-scale, capital-intensive RES projects comparable to offshore wind.
Key challenges for	Albania's cross-border cooperation opportunities are	Alignment of national energy regulation with EU market and

Regulatory and Policy Alignment of Cooperation Consideration:	Albania (AL)	BiH (BH)
transnational or cross-border cooperation	mainly considered within the ADRION framework. The focus is placed on knowledge sharing, capacity building, and infrastructure planning as key enablers for joint initiatives. Coordination across borders is challenged by competition for coastal space, including tourism, fisheries, and maritime transport. High environmental sensitivity of marine and coastal ecosystems complicates siting and permitting processes. Albania's membership in the Energy Community supports gradual alignment of its regulatory framework with EU rules. This alignment facilitates cooperation with neighbouring markets and strengthens regional integration.	network codes. Cross-border grid planning, congestion management, and balancing. Governance coordination between state and entity authorities in international projects. Limited national expertise in offshore technologies, requiring reliance on external partners.
Institutionally regulated conditions for the dialogue of all interested R&I stakeholders	The National Agency for Higher Education Financing (NAHEF) is a public institution under the authority of the Ministry of Education, Sports and Youth. The institution is responsible for allocating public funds. Public funds are allocated to support the activities of public higher education institutions.	No permanent offshore wind–specific R&I dialogue platforms exist. Stakeholder engagement in energy R&I is mainly project-based, donor-driven (EU, EBRD, World Bank), and focused on conventional RES. Universities, transmission system operators, and ministries participate sporadically in regional initiatives rather than structured national forums.

Regulatory and Policy Alignment of Cooperation Consideration:	Albania (AL)	BiH (BH)
	Public funds are allocated to provide scholarship support for excellent students with high grades in secondary and tertiary education. Public funds are allocated to support students enrolled in study programmes designated as priority areas. Public funds are allocated to support students from disadvantaged social groups.	
Strategies, policies, instruments and measures which regulate R&I	Albania's energy policies aim to align with broader environmental goals, fostering a sustainable future through involving several key elements: The plan addresses Climate Change Mitigation considering the reduce of the greenhouse gas emissions to combat climate change pursuant to international agreements such as Paris Agreement. Sustainable Energy Security through the development of renewable energy sources, such as solar, wind, and hydropower, in order to minimize environmental impact and enhance energy security. Enhancing energy efficiency across sectors is crucial to reduce overall energy demand and lower emissions, contributing to both economic savings and environmental protection. The plan considers the	Policy / instrument type: Examples relevant to offshore wind R&I. National energy policy: Framework Energy Strategy of BiH; entity-level RES action plans (no offshore component). R&I policy: Fragmented national R&I governance; limited dedicated funding for energy innovation International programmes: Horizon Europe, IPA III, Energy Community projects supporting regional cooperation. Grid & market reforms: Electricity market liberalisation and regional market coupling initiatives

Regulatory and Policy Alignment of Cooperation Consideration:	Albania (AL)	BiH (BH)
	impact of energy projects on ecosystems and biodiversity, promoting practices that are more friendly with natural habitats while developing energy infrastructure. Public Engagement through involving communities and stakeholders in the planning process ensures that local environmental concerns are addressed and that the diversification of energy in sustainable way is socially accepted.	
Long-term and short-term planning of R&I activities	Wind energy is at a crossroads in Albania. Research and Innovation (R&I) can help address many existing challenges. Renewable energy plays a crucial role in Albania in the context of climate targets and energy security needs. Wind energy will be central to accelerating the roll-out of renewables and the green transition. Research and Innovation (R&I) in offshore wind parks in Albania will provide a clean and renewable source of electricity. Such development can help reduce greenhouse gas emissions and mitigate the impacts of climate change. These efforts support the attainment of 2030 energy	Long-term strategic orientation BiH's R&I system prioritises technology transfer and capacity building rather than frontier technology development. Offshore wind appears indirectly through regional decarbonisation scenarios, grid adequacy studies, and South-East Europe (SEE) power system modelling. Long-term relevance lies in system integration, flexibility, storage, and cross-border balancing, rather than siting or permitting. Short-term and project-level planning Pilot studies and feasibility analyses focus on grid upgrades, RES forecasting, and market integration. Participation in regional research consortia provides

Regulatory and Policy Alignment of Cooperation Consideration:	Albania (AL)	BiH (BH)
	goals.	exposure to offshore wind knowledge without domestic deployment.

Table 26National input data related to Regulatory and Policy Alignment of Cooperation Consideration – Croatia and Greece

Regulatory and Policy Alignment of Cooperation Consideration:	Croatia (HR)	Greece (GR)
Status of offshore wind–related regulation	No explicit offshore wind regulatory framework currently in place. Offshore renewable energy not specifically regulated in dedicated legislation. General energy legislation (Electricity Market Act), maritime domain legislation, environmental protection law, and construction law would apply. National Energy and Climate Plan (NECP) recognizes renewable energy expansion but does not define concrete offshore wind deployment measures, only the plan for spatial planning improvements. *Strategic discussions on offshore and floating wind potential exist at policy and expert level, but no formal programme or auction scheme has been launched.* No offshore wind projects currently permitted or under	Legal and institutional framework: The first legal permission for OWFs dates to Law 3468/2006, followed by the 2008 Special Spatial Planning Framework for RES and Law 3851/2010, which set siting criteria (depth ≤ ~50–60 m, ≥6 nm from shore, environmental/visual constraints). A dedicated offshore wind law (L. 4964/2022) created Offshore Wind Farm Organized Development Areas (OWFODA) and gave the state exclusive responsibility for site identification and rights allocation via HEREMA (Hellenic Hydrocarbons & Energy Resources Management Company). Article 174 of L. 4964/2022 caps capacity in specific areas (e.g., Thrace sea region at 600 MW) and encodes detailed exclusion criteria, now implemented in GIS-based siting studies. Planning instruments and

Regulatory and Policy Alignment of Cooperation Consideration:	Croatia (HR)	Greece (GR)
	construction.	recent initiatives: HEREMA's draft National Offshore Wind Farm Development Programme (NDP OWF, 2023) defines potential OWFODA and underpins a Strategic Environmental Impact Assessment; it awaits approval by Joint Ministerial Decision. A 2023 law (5037/2023, Art. 164) designates a pilot offshore wind area south of Evros/north of Samothraki (up to 600 MW, min. 200 MW per project), aligned with EU "go to areas" for rapid RES deployment
Status of Maritime Spatial Planning	Maritime Spatial Plan of the Republic of Croatia adopted (2023). MSP does not designate specific zones for offshore wind development. Competing uses (tourism, fisheries, shipping, Natura 2000 areas, military zones) significantly constrain available maritime space.	Adopted.
Main permitting or regulatory barriers	Complex and multi-layered permitting procedures (maritime domain concession, location permit, EIA, construction permit). Strong environmental protection regime, including extensive Natura 2000 coverage in the Adriatic. Institutional fragmentation across multiple ministries and agencies (energy, environment, maritime affairs, spatial	**1. Complex, evolving legal framework** Until Law 4964/2022, offshore wind relied on fragmented RES and spatial-planning rules; this history of frequent legal changes and unclear responsibilities is cited as a core barrier for wind deployment in Greece. Even now, the new framework (HEREMA led OWFODAs, competitive tenders) is not fully operational and depends on approval and detailed implementation of the

Regulatory and Policy Alignment of Cooperation Consideration:	Croatia (HR)	Greece (GR)
	planning). Absence of predefined concession model for offshore wind. Grid connection uncertainties and limited transmission capacity in coastal and island areas.	National Offshore Wind Development Programme and Strategic EIA. **2. Restrictive spatial and environmental constraints** The Specific Framework for Spatial Planning and Sustainable Development for RES imposes multiple hard exclusion rules (6 nm buffer from shore, depth limits, Natura 2000, military/port zones, shipping lanes) that sharply reduce eligible area and complicate siting. New offshore law adds capacity caps per marine region (e.g., 600 MW in Thrace), further constraining development and forcing complex optimization within legal limits. **3. Administrative and licensing bottlenecks** Broader Greek wind experience highlights slow, multi-step licensing, overlapping authorities, and heavy environmental assessment requirements as major obstacles; these same institutional weaknesses are expected to affect offshore projects. Lack of standardized environmental licensing guidance for offshore wind (compared with best practice "one stop shop" models) is identified as a risk for new markets like Greece. **4. Grid and infrastructure constraints** Insufficient transmission capacity and delayed grid reinforcements are repeatedly

Regulatory and Policy Alignment of Cooperation Consideration:	Croatia (HR)	Greece (GR)
		cited as key barriers for Greek wind deployment in general. For offshore, deep waters imply floating projects and new offshore transmission infrastructure, which the current system operator must still plan and permit at scale.
Key challenges for transnational or cross-border cooperation	Different regulatory maturity levels among Adriatic–Ionian countries. No harmonized approach to offshore wind zoning in the Adriatic basin. Limited cross-border grid interconnection capacity for large-scale offshore integration.	Misaligned legal and regulatory frameworks. Grid planning, cost allocation and a TSO role. Environmental and spatial conflicts. Geopolitical and governance sensitivities (security concerns)
Institutionally regulated conditions for the dialogue of all interested R&I stakeholders	National research and innovation policy is coordinated by the Ministry of Science, Education and Youth, with stakeholder dialogue ensured through public consultations and participation in EU research platforms and macro-regional initiatives (e.g. EUSAIR).	Greece has only partial, project-based mechanisms for R&I stakeholder dialogue on offshore wind; no permanent, sector-wide forum yet exists. National level stakeholder dialogue on offshore wind R&I in Greece is mainly organised through planning studies and one-off consultations, rather than through institutionalised forum. Building a formal triple helix platform and recurring marine space dialogues would align Greece with emerging European best practice.
Strategies, policies, instruments and measures which regulate R&I	R&I activities are guided by key strategic documents, including the Smart Specialisation Strategy (S3), National Development Strategy 2030, and the National Energy and Climate Plan (NECP), and supported through funding instruments of the Croatian Science	Strategic OWF law & programme: Law 4964/2022 on offshore wind; National Offshore Wind Farm Development Programme (OWFODA areas, HEREMA role, SEA). Spatial planning tools: GIS based, multi criteria frameworks for national/regional OWF site

Regulatory and Policy Alignment of Cooperation Consideration:	Croatia (HR)	Greece (GR)
	Foundation and EU Structural Funds.	selection (AHP, TOPSIS, VIKOR). RES investment&risk policy:Broader policy mix (feed in/support schemes), with policy design risk shown to strongly affect capital costs and investor appetite. National R&I policy: Horizontal reforms: new legal frameworks, funding schemes, and benchmarking of Greek R&I performance to improve effectiveness and coordination across ministries.
Long-term and short-term planning of R&I activities	Long- and short-term R&I planning is conducted within national and sectoral strategies, with foresight elements integrated into S3 and energy transition planning, and decision-making centralized at ministerial level, complemented by stakeholder consultations. • Responsible Research and Innovation: – Governed under national Science and Higher Education Act and strategic R&I documents, done through EU funded projects • Open Science: – National Open Science policies aligned with EU frameworks. – Institutional repositories established at	**Long term strategic planning:** National scale GIS–MCDM frameworks define a strategic portfolio of OWF projects with staged implementation, aligning with 2050 decarbonisation and high RES targets. Climate resilient siting studies integrate future wind regimes and sea level rise (to 2040–2070), embedding long term climate scenarios in marine spatial planning and thus in R&I agendas. Scenario based suitability analyses (e.g., alternative policy orientations, environmental vs techno economic weighting) guide flexible long-term pathways for OWF deployment . Work on floating wind and circular economy stresses the need for long term technology specific institutions, standards and lifecycle strategies (design, decommissioning, recycling)

Regulatory and Policy Alignment of Cooperation Consideration:	Croatia (HR)	Greece (GR)
	major universities and research institutes. • Code-of-Conduct in Research and Innovation – Ethical codes adopted at university and research institution level. – National Committee for Ethics in Science and Higher Education oversees compliance.	that should inform Greece's R&I roadmap. **Short term and project level planning:** Regional and local studies (South Aegean, Thrace, specific island clusters) use detailed site screening, micro siting and techno economic evaluation to prioritise near term pilot and first wave projects. Case designs for OWFs (e.g., Karpathos–Kassos, energy island concepts in Crete) provide concrete 2020s–2030s deployment and operation plans, including storage, grid connection and phased roles before/after interconnection. Emerging national scale GIS MCDM work (2025) ranks 35 candidate sites incorporating multiple decision maker perspectives, directly supporting short to medium term siting and licensing choices

Table 27National input data related to Regulatory and Policy Alignment of Cooperation Consideration – Italy and Montenegro

Regulatory and Policy Alignment of Cooperation Consideration:	Italia (IT)	Montenegro (CG)
Status of offshore wind–related regulation	Explicit framework. Italy has transitioned from a fragmented approach to a centralized regime through the Renewable Energy Code (Legislative Decree 190/2024).	Montenegro has no offshore wind installations and offshore wind remains at a conceptual/policy level, with no defined offshore development zones and no pilot projects initiated. From a legal standpoint, the Law on Energy (2022) provides a general RES

Regulatory and Policy Alignment of Cooperation Consideration:	Italia (IT)	Montenegro (CG)
		framework (licensing/support schemes, market rules), but it does not distinguish onshore vs. offshore wind and does not include provisions for maritime energy zoning. The Law on Maritime Property (2011) governs marine/coastal use and protection, but it was not designed for offshore renewables and the current setup lacks clearly defined procedures for offshore-specific planning and assessments (incl. the absence of exclusive sea zones for energy infrastructure).
Status of Maritime Spatial Planning	Adopted. The first Maritime Space Management Plans were officially adopted on September 25, 2024, thanks to Ministerial Decree No. 237.	Delays and the absence of a finalized maritime spatial plan are explicitly highlighted, noting that this delay prevents strategic site allocation for offshore infrastructure and increases project risk and timeline uncertainty. Offshore wind potential is not reflected in spatial or permitting frameworks at present.
Main permitting or regulatory barriers	Complex Environmental Impact Assessments (EIA/VIA) and Strategic Environmental Assessments (SEA) under Legislative Decree 152/2006. Rigorous visual impact analyses and landscape reports required by Legislative Decree 42/2004. The requirement for a definitively accepted grid connection estimate from Terna.	The SWOT analysis that was done for the offshore wind energy sector in Montenegro identifies regulatory and permitting uncertainty as a core weakness: despite existing laws, practical permitting procedures-especially for maritime zones and environmental impact assessments-remain unclear and fragmented, creating high investment risk. A second critical barrier is grid access/infrastructure readiness: there are no high-capacity offshore transmission lines or substations along the coast, limiting the feasibility of

Regulatory and Policy Alignment of Cooperation Consideration:	Italia (IT)	Montenegro (CG)
		connecting offshore wind farms to the national grid. Finally, the SWOT flags low public awareness and limited stakeholder coordination mechanisms, which undermines structured engagement and can affect planning and acceptance.
Key challenges for transnational or cross-border cooperation	**Governance**: Friction due to misaligned planning (strategic Italian MSP vs. binding Slovenian plans). **Success Metric**: The 2024 EEZ Agreement between Italy and Croatia has ended the "high seas" status of the Adriatic, strengthening sovereign rights over marine resources. **R&I Standards**: Adherence to MUR guidelines (August 2025) on research security and Open Science via CARE-CRUI.	Montenegro's cross-border opportunity through regional cooperation is considered mainly under the ADRION framework, emphasizing knowledge exchange, capacity building, and infrastructure planning as enabling conditions for joint ventures. At the same time, there are cross-border-relevant constraints that complicate coordinated siting and permitting, especially competition for coastal space (tourism, fisheries, maritime transport) and high ecological sensitivity of the marine/coastal ecosystem. Montenegro's membership in the Energy Community supports gradual regulatory convergence with EU rules, which is relevant for alignment with EU-adjacent markets and regional cooperation.
Institutionally regulated conditions for the dialogue of all interested R&I stakeholders	The National Technology Cluster "Blue Italian Growth" (BIG) serves as the primary pillar for connecting research and industry.	Structured engagement processes for communities, local governments, and private sector stakeholders are not yet well developed, reflecting limited national coordination mechanisms around offshore wind.
Strategies, policies, instruments and measures which	**FER 2 Decree** (Aug 2024): The primary national instrument for offshore wind development, providing	The main policy anchors referenced for the offshore wind enabling environment are:

Regulatory and Policy Alignment of Cooperation Consideration:	Italia (IT)	Montenegro (CG)
regulate R&I	financial stability through a 25-year Contract for Difference (CfD). **Financial Allocation**: Supported by an annual budget of €1.85 billion to cover the gap between market prices and the base tariff of €185/MWh. **Efficiency Measures**: Includes an annual $3% tariff digression to promote technological cost reduction over time.	Energy Development Strategy of Montenegro until 2030 (2014): mentions offshore wind potential but does not define clear actions, policies, or investment frameworks for offshore wind. National Adaptation Plan (NPP/NAP, 2023): highlights energy system resilience and frames offshore wind as a future opportunity for energy security and reduced exposure to fossil fuel markets. Energy Community alignment: supports gradual harmonization with EU directives and market rules, relevant for the enabling ecosystem for offshore wind.
Long-term and short-term planning of R&I activities	**Short-term**: Development of 3,800 MW of offshore wind capacity by 2028 under the FER 2 Decree. Projects must reach commercial operation within 60 months of allocation. **Long-term**: Achieving 19.3 GW of total wind capacity by 2030 as outlined in the PNIEC.	There is evidence of long-term policy direction through national strategies and targets (e.g., energy transition commitments by 2030 and national strategic documents up to 2030), but it does not describe formal national foresight / decision-making procedures for offshore wind R&I specifically. It is important, however, that offshore wind remains conceptual and not integrated into spatial or permitting frameworks, which in practice limits short-term planning readiness for offshore deployment and related R&I activities.

Annex II: National inputs for Data Sharing & Standardization

All project partners submitted input data related to *Data Sharing & Standardization of Cooperation Consideration*. These data are arranged in the following tables.

Table 28 National input data related to Data Sharing & Standardization of Cooperation Consideration – Albania and BiH

Data Sharing & Standardization of Cooperation Consideration:	Albania (AL)	BiH (BH)
Institutions holding key offshore-related data	Albanian institutions that provide data related to offshore wind energy are: National Agency of Natural Resources (AKBN), Albania Institute of Statistic INSTAT, Ministry of Infrastructure and Energy (MIE), the Energy Regulatory Authority (ERE), Electricity Distribution Operator (OSHEE), the Albanian Energy Corporation (KESH), the Transmission System Operator (OST), Institute of Geosciences, State Authority for Geospatial Information (ASIG), Albanian Hydrographic Service and Ministry of Tourism and Environment / Environmental Agencies	NOSBiH / Elektroprenos BiH – transmission grid data, cross-border interconnections. Entity-level statistical offices – energy production and consumption data. Universities and research institutes – energy system modelling, climate and meteorological data.
Data accessibility	Generally, wind measurement data from national stations are not openly published in centralized, easy-to-use formats (e.g., CSV, GIS shapefiles). Some available wind resource information (e.g., maps, preliminary data) exists in reports or research publications, often in PDF or static form rather than structured open data. Global datasets (e.g., World Bank, NASA, IRENA estimates) can be accessed but are not specifically tailored to Albania's local conditions without	Energy and grid data are partially accessible and often fragmented across institutions. Commercially sensitive and critical infrastructure data are restricted. Data-sharing practices improve mainly through EU-funded projects.

Data Sharing & Standardization of Cooperation Consideration:	Albania (AL)	BiH (BH)
	further processing. A lack of open renewable energy datasets, including wind speed time series and spatial wind resource maps is recognized as a common challenge in Albania's green transition policy planning.	
Data protection	Law No. 124/2024 "On the Protection of Personal Data" is the primary law governing the protection of personal data (information relating to an identified or identifiable person) in Albania. Sector-specific regulations may also include provisions for confidential information and data security, especially regarding network and market information that must not be disclosed publicly. In institutions energy sectors, secondary legislation, for example, there are rules on the protection of confidential information alongside consumer protections.	
Use of EU data frameworks	With a focus on Albania and the energy / environment context use of EU data frameworks (INSPIRE, Copernicus, EMODnet), Albania, as an EU candidate country, is in the process of aligning with INSPIRE requirements rather than being fully compliant with EU legal framework that standardises spatial and geospatial data (e.g. land use, elevation, transport networks, energy infrastructure) to support environmental and sectoral policies. Copernicus for Earth	Copernicus climate and meteorological data are widely used in academic and planning studies.

Data Sharing & Standardization of Cooperation Consideration:	Albania (AL)	BiH (BH)
	observation programme, providing free and open satellite data (Sentinel missions) for land, atmosphere, climate, marine, and emergency monitoring. EMODnet for harmonize marine and coastal data (bathymetry, seabed habitats, wind, waves, currents, human activities).	
Potential national data custodians for offshore wind–related data	The potential national data custodians in Albania for offshore wind-related data i.e. the key government agencies and institutions that collect, manage or could host datasets relevant to offshore wind planning, marine conditions, spatial data, maritime infrastructure, and environmental monitoring: • Ministry of Infrastructure and Energy (MIE) • Energy Regulatory Authority • State Authority for Geospatial Information (ASIG) • Albanian Hydrographic Service • National Institute of Statistics (INSTAT) • Ministry of Tourism and Environment / Environmental Agencies	Data type: Potential custodian: Grid & interconnections: Elektroprenos BiH/NOS BiH Energy statistics: State / entity statistical offices Climate & meteo: Universities, hydrometeorological institutes Market & trade: Energy regulators on state and entity level
Internet, academic networks and IT support for R&I	**Internet and networks: Capacity, speed, accessibility** Albania referred the country-level snapshot of internet and networks covering capacity, speeds, accessibility, penetration, infrastructure trends, and digital divides.	Limited use of advanced digital tools (AI, digital twins) in the energy sector, mostly within externally funded projects. Strong dependence on international research networks for high-performance computing and

Data Sharing & Standardization of Cooperation Consideration:	Albania (AL)	BiH (BH)
	WoS, Scopus etc. – access to research projects and articles: Albania has a clear overview of access to research literature and project information in Albania, specifically regarding major international bibliographic databases like Web of Science (WoS) and Scopus, plus local systems and practical alternatives. Some Albanian higher-education institutions have institutional subscriptions that provide campus access to Scopus and/or WoS. For example, Albanian University explicitly states it has an annual partnership with Elsevier/Scopus, allowing academic staff, researchers, and PhD students. **AI, in particular AI in wind/offshore projects** The status and use of Artificial Intelligence (AI) in wind energy and offshore projects in Albania cover current adoption, practical applications, research trends, challenges, and opportunities. AI use within Albania's energy industry, particularly wind and offshore wind is still emerging and not yet widespread. Most AI adoption today is in pilot stages or limited to academic research and consulting projects rather than full-scale commercial deployments.	data-intensive modelling.

Table 29 National input data related to Data Sharing & Standardization of

Cooperation Consideration – Croatia and Greece

Data Sharing & Standardization of Cooperation Consideration:	Croatia (HR)	Greece (GR)
Institutions holding key offshore-related data	Offshore-related data in Croatia are held by multiple public institutions, resulting in fragmented data ownership and access conditions. While parts of the data are publicly available through national geoportals and EU platforms, there is no centralized offshore wind data repository, and access to detailed technical datasets is often restricted or subject to specific conditions. Data governance follows EU and national data protection frameworks, including GDPR and environmental information access rules. Key institutions holding offshore-related data include: • Croatian Meteorological and Hydrological Service (DHMZ): metocean data • Hydrographic Institute of the Republic of Croatia: seabed, nautical and marine spatial data • Ministry responsible for spatial planning: Maritime Spatial Planning data • Ministry responsible for environmental protection: environmental and Natura 2000 data • HOPS (TSO): electricity	Hellenic Centre for Marine Research (HCMR) – main provider of offshore wind/wave data and reanalysis validation (POSEIDON buoy network; wind and wave climatologies; ERA5/CERRA evaluations) European Centre for Medium Range Weather Forecasts (ECMWF) – ERA Interim/ERA5 reanalysis used extensively for Greek offshore wind/wave assessment Satellite/oceanographic portals (AVISO etc.) also supply wave data used around Greek islands A national Marine Spatial Data Infrastructure (Marine SDI) for MSP is being developed, aggregating official marine layers under INSPIRE/MSP needs The MSFD open access database (Greek implementation of the Marine Strategy Framework Directive) provides state/pressure descriptors, monitoring stations and spatial environmental layers to support MSP. Official cartographic/data sources used in offshore wind MSP include: - Hellenic Navy Hydrographic Service – bathymetry, military zones - EMODnet – submarine cables and other marine infrastructure - EUROSTAT / EU marine datasets – EEZ and

Data Sharing & Standardization of Cooperation Consideration:	Croatia (HR)	Greece (GR)
	transmission and grid capacity data • Research institutes: marine and environmental datasets	administrative base-maps – National "GEODATA" geoportal for protected areas, wetlands, coastal bathing waters, etc. – MSFD monitoring network (305 stations) and Natura 2000 / marine parks data, coordinated under the Ministry of Environment & Energy and research institutes. – IPTO/ADMIE (Independent Power Transmission Operator) – high voltage substations, submarine power cables and grid infrastructure maps used in offshore wind siting – Offshore wind specific planning (OWFODA areas) is coordinated by HEREMA, which compiles wind and siting datasets at national scale
Data accessibility	Partial openness; significant institutional fragmentation Grid and high-resolution metocean data often restricted Environmental data generally accessible under EU transparency rules No national standardisation framework specific to offshore wind	Environmental, metocean and spatial data needed for offshore wind in Greece are largely accessible through EU and national portals, supporting transparent site selection and OWFODA planning. At the same time, GDPR based Greek law and emerging energy data governance frameworks strictly protect personal, commercial and critical infrastructure data, requiring privacy by design, cybersecurity safeguards and often controlled or aggregated access rather than full openness.
Data protection	Data governance follows EU and national data protection frameworks, including GDPR and environmental	

Data Sharing & Standardization of Cooperation Consideration:	Croatia (HR)	Greece (GR)
	information access rules.	
Use of EU data frameworks	INSPIRE implemented via national geoportal systems Copernicus and EMODnet used for environmental monitoring and marine data Strong academic and research network support (CARNet, EU research infrastructures)	Greece's developing Marine SDI is explicitly designed to align with the EU INSPIRE Directive so that marine datasets (uses, habitats, pressures, infrastructure) are interoperable and shareable for MSP and offshore energy planning. EU work on MSFD implementation shows how INSPIRE data models and services underpin marine monitoring, reporting and spatial analysis, providing a blueprint that Greece is following for its own MSFD/MSP data system. MSFD delivers in-depth environmental data (state, pressures, monitoring stations, descriptors) which is treated as "best available knowledge" and an open database feeding directly into MSP and offshore wind siting in Greece. A Mediterranean-wide MSFD SDI demonstrates how multi-disciplinary data (physics, biology, human uses) can be integrated for ecosystem-based assessments that also support wind-energy decision. Critical literature on Greek MSP highlights that EU MSPD/MSFD obligations frame the data and indicators that should balance offshore energy with marine protection, even if implementation is politically contested
Potential national	Offshore-related data	Bathymetry, sea charts:

Data Sharing & Standardization of Cooperation Consideration:	Croatia (HR)	Greece (GR)
data custodians for offshore wind–related data	in Croatia are held by multiple public institutions, resulting in fragmented data ownership and access conditions. While parts of the data are publicly available through national geoportals and EU platforms, there is no centralized offshore wind data repository, and access to detailed technical datasets is often restricted or subject to specific conditions.	HNHS In situ wind & waves, metocean: HCMR / POSEIDON Reanalysis based wind atlases: HCMR, universities EEZ, admin boundaries: ELSTAT / national GIS portals Environmental protected areas, land use: GEODATA portal, ministries
Internet, academic networks and IT support for R&I	Digitalisation and emerging tools: Access to international scientific databases (WoS, Scopus) through academic institutions Initial use of AI-based tools in research (modelling, forecasting), with no dedicated offshore wind AI programme	Across Greece and the Adriatic–Ionian region, offshore wind R&I is underpinned by academic modelling platforms, GIS infrastructures, ERA5 driven data services and ICT intensive living labs (notably in Crete). Pan European work on IoT edge networks, digital twins and co-innovation platforms provides the IT blueprint that regional actors can adopt as offshore wind projects scale up.

Table 30National input data related to Data Sharing & Standardization of Cooperation Consideration – Italia and Montenegro

Data Sharing & Standardization of Cooperation Consideration:	Italia (IT)	Montenegro (CG)
Institutions holding key offshore-related data	OGS (Chemistry/Biology), ISMAR-CNR (Bathymetry), ISPRA (Geology/Habitats), INGV, ENEA, and Terna.	Agency for Environmental Protection of Montenegro – data on protected areas, ecological zones, marine and coastal habitats, biodiversity, and potential environmental constraints. Ministry of Capital Investments (energy and

Data Sharing & Standardization of Cooperation Consideration:	Italia (IT)	Montenegro (CG)
		maritime competences) – data related to the energy sector, renewable energy investment planning, and infrastructure development. REGAGEN (Energy Regulatory Agency) – regulatory and sectoral data on the electricity system and energy market. Electric Power Company of Montenegro (EPCG) – technical and operational data relevant to electricity generation and integration of renewable energy sources. Coastal Zone Management Authority / maritime authorities – data related to the use of marine space and the coastal zone (where available). Academic and research institutions (e.g. University of Donja Gorica) – research data, resource potential studies, and analytical work related to offshore wind.
Data accessibility	Open. Italian data services are integrated into the EMODnet Central Portal and adhere to OGC standards.	Data relevant to offshore wind are fragmented across multiple institutions, with no single national access point. Environmental and spatial data are partially available but often subject to administrative access procedures. Energy and grid-related data are largely restricted or non-public, particularly technical and operational datasets. There is no integrated digital platform combining metocean,

Data Sharing & Standardization of Cooperation Consideration:	Italia (IT)	Montenegro (CG)
		spatial, environmental, and energy data relevant to offshore wind projects.
Data protection	Managed under MUR guidelines (2025) regarding data protection and cybersecurity training within research institutions	Data management is governed by national data protection regulations, with gradual alignment to EU rules through the accession process and obligations under the Energy Community framework. Access restrictions are particularly pronounced for data related to energy infrastructure and strategic assets.
Use of EU data frameworks	Systematic use of the Copernicus Marine Service (via the MED MFC center) and full compliance with the INSPIRE Directive.	There is no identified systematic or institutionalized use of EU data frameworks (INSPIRE, Copernicus, EMODnet) in offshore wind planning. Where used, these frameworks appear in the context of individual research or project-based activities rather than as part of a national standardized system.
Potential national data custodians for offshore wind–related data	OGS serves as the coordinator for EMODnet Chemistry, while ISPRA manages environmental state and sediment data.	Agency for Environmental Protection – environmental monitoring, protected areas, and biodiversity data. REGAGEN – regulatory and energy market data. EPCG and energy-sector institutions – electricity generation and renewable energy integration data. Ministry of Capital Investments – coordination of energy and infrastructure-related data relevant to offshore wind projects.

Data Sharing & Standardization of Cooperation Consideration:	Italia (IT)	Montenegro (CG)
		Academic institutions – research outputs, analytical datasets, and offshore wind resource studies.
Internet, academic networks and IT support for R&I	Internet and networks: The GARR-T (Terabit) network provides a backbone capacity of 23 Tbps with access speeds up to 400 Gbps. WoS, Scopus: Full access to citation databases is maintained through the CARE-CRUI consortium. AI in wind/offshore projects: Autonomous drones for blade inspections, reducing costs by up to 70%.	Internet and networks: Capacity, speed, accessibility: Montenegro has functional digital infrastructure capable of supporting research and project activities, but no specialized digital infrastructure dedicated to offshore wind or large-scale offshore datasets. WoS, Scopus etc. – access to research projects and articles: Universities and research institutions have institutional access to international scientific databases and research projects, enabling participation in international R&I networks and access to state-of-the-art research. AI, in particular AI in wind/offshore projects: There is no identified operational use of AI tools in offshore wind projects in Montenegro. Advanced digital tools and AI-based approaches are recognized as a development opportunity, but no national examples of applied use are currently documented.

Annex III: National Input for Ethical Aspects

All project partners submitted input data related to *National Ethical Aspects of Cooperation Consideration*. These data are arranged in the tables that follow.

Table 31National input data related to National Ethical Aspects of Cooperation

Consideration – Albania and BiH

National Ethical Aspects of Cooperation Consideration aspect:	Albania (AL)	BiH (BH)
Main social or environmental concerns related to wind/offshore projects	Environmental Concerns: Wildlife Impacts, Land and Habitat Alteration, Noise and Shadow Flicker, Landscape and Visual Impacts, Water & Soil Effects Social Concerns: Public Acceptance, Land Use Conflicts, Health Perceptions, Equity and Community Benefits	Environmental and social concerns in BiH focus on hydropower impacts, land use, and community participation. Offshore wind raises no direct local environmental conflicts, but indirect concerns include cost distribution, energy prices, and fairness of cross-border investments.
Experience with public acceptance and stakeholder engagement	Public engagement in energy projects is often reactive and conflict-driven. Limited awareness of offshore wind, but generally positive attitudes toward renewables when linked to energy security and economic benefits. Civil society increasingly demands transparency and participation in large infrastructure decisions.	Public engagement in energy projects is often reactive and conflict-driven. Limited awareness of offshore wind, but generally positive attitudes toward renewables when linked to energy security and economic benefits. Civil society increasingly demands transparency and participation in large infrastructure decisions.
Practices related to biodiversity protection and cumulative impacts	In Albania, biodiversity protection for wind energy projects is guided by a combination of EIA processes, pre- and post-construction monitoring, species-specific mitigation measures, and alignment with EU biodiversity frameworks. Early planning, careful siting, and adaptive management are central to minimizing impacts on wildlife and habitats.	Environmental assessment practices are established for terrestrial projects but vary in quality. Experience with cumulative impact assessment is required by Federal Law on Environment Protection. However, it would require adoption for participation in offshore wind value chains.
Relevant good practices or lessons learned	Albania's experiences show that early planning, environmental and social integration, robust data collection, and regulatory	Importance of early stakeholder involvement to avoid opposition and delays. Need for capacity building

National Ethical Aspects of Cooperation Consideration aspect:	Albania (AL)	BiH (BH)
	alignment are critical for successful wind energy projects. Lessons from past projects emphasize that neglecting biodiversity, community concerns, or technical integration can lead to costly delays or reduced project performance. Regional cooperation can help transfer best practices from offshore-experienced countries.	in SEA/EIA methodologies aligned with EU standards. Regional cooperation can help transfer best practices from offshore-experienced countries.
What regulation concerns ethical issues in R&I	In Albania, ethical issues in research and innovation are currently regulated through a combination of formal regulations, institutional policies, and emerging governance frameworks, though the landscape is still evolving. Here are the key regulations and frameworks that concern research ethics.	No unified national framework for research ethics; governance is fragmented across entities and institutions. Universities have ethics committees and internal codes of research conduct. Ethical standards are largely shaped by EU funding requirements (Horizon Europe, IPA), which act as de facto harmonisation mechanisms. Continued alignment with EU research integrity norms is necessary for effective transnational R&I cooperation.
Which institutions are established for ethical issues in R&I	The key institutions in Albania that are responsible for or involved in ethical issues in research and innovation — including official bodies with mandates, institutional committees, and relevant authorities that influence ethical oversight and governance are: Ministry of Education and Science (MES), University Ethics Committees (Institutional Research Ethics Committees), National Agency	

National Ethical Aspects of Cooperation Consideration aspect:	Albania (AL)	BiH (BH)
	for Scientific Research and Innovation (ARIS) and Academy of Sciences of Albania.	

Table 32National input data related to National Ethical Aspects of Cooperation Consideration – Croatia and Greece

National Ethical Aspects of Cooperation Consideration aspect:	Croatia (HR)	Greece (GR)
Main social or environmental concerns related to wind/offshore projects	Potential impacts on tourism and landscape/visual identity of the Adriatic coast. Biodiversity protection (marine habitats, birds, marine mammals). Fisheries interactions. Cumulative impacts in semi-enclosed Adriatic Sea. Cultural heritage and underwater archaeology.	Biodiversity & habitats: Birds, Natura 2000 areas, sensitive wetlands (Evros, Nestos, islands) Landscape / seascape: Visual impacts on iconic islands and coasts Socio economic: Impacts on tourism, fisheries, rural livelihoods; local jobs vs. external profit Governance & justice: Monopolistic projects, inadequate SEA/EIA, lack of local benefit sharing Concerns over dual use (fishing, military but mostly in the Aegean)
Experience with public acceptance and stakeholder engagement	Public sensitivity to coastal and maritime development projects. Formal public consultation procedures required under EIA/SEA legislation. Mixed public perception of onshore wind; offshore wind not yet tested in practice.	A large national survey (1,802 respondents) found high social acceptability of offshore wind projects (80.6% support) but clear conditions: citizens prefer minimum 5 km distance from shore and careful site selection to avoid "socially unsustainable" locations. A GIS–AHP study that directly integrated citizen preferences into offshore wind site selection showed that including a "social acceptance" criterion shifts preferred sites offshore (e.g., southwest of Rhodes) and

National Ethical Aspects of Cooperation Consideration aspect:	Croatia (HR)	Greece (GR)
		demonstrates that public input can materially shape siting outcomes. Visual impact is a key concern: Greek case studies show that when turbines are sited so visual disturbance is minimal, local residents report little or no optical disturbance and mostly positive views of RES
Practices related to biodiversity protection and cumulative impacts	Extensive Natura 2000 marine coverage. Mandatory Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA). Strict environmental permitting regime. Application of EU Birds and Habitats Directives.	Although no offshore wind farms operate yet in Greece, several GIS–MCDA siting studies and the national Offshore Wind Farm Development Programme embed biodiversity safeguards: Hard exclusion of protected areas: Most Greek siting frameworks exclude Natura 2000 sites, national parks, SPAs/SACs and other legally protected areas from eligibility, or use distance-from-MPA as a high weight criterion. Ecological sensitivity layers: Mediterranean assessments emphasize avoiding marine biodiversity "hotspots," especially MPAs, wildlife corridors, priority habitats and seabed communities; they argue OWFs should be kept out of high biodiversity areas altogether (a "NIMPA" approach: Not in Marine Protected Areas). Bird and megafauna protection: In the Thrace pilot area, routing of migratory birds, importance of Evros/Nestos deltas, and risks to vulnerable and endangered birds and marine mammals are explicitly

National Ethical Aspects of Cooperation Consideration aspect:	Croatia (HR)	Greece (GR)
		considered; authors call for detailed ecological studies before licensing. Environmental Performance Value / EIA-based criteria: Hybrid offshore wind–wave siting in Greece uses an explicit environmental impact metric (EPV) that aggregates life cycle EIA results into the siting decision.
Relevant good practices or lessons learned	Strong environmental baseline data in the Adriatic. Established public consultation mechanisms. Experience in managing competing maritime uses through MSP framework.	Strategic planning and siting National and regional GIS–MCDM frameworks systematically combine technical, economic, environmental and social criteria to rank sites, avoiding ad hoc, project-by-project siting. Best practice is to use broad exclusion layers (Natura 2000, key biodiversity zones, military areas, dense shipping, deep water limits) and then multi-criteria ranking of the remaining areas. Thrace and South Aegean case studies stress holistic, environmentally driven planning and micro-siting to minimise impacts on birds, mammals, fisheries and seascapes
What regulation concerns ethical issues in R&I	Science and Higher Education Act. Ethical codes of universities and research institutions. National and EU research integrity standards.	Greece does not have a national code of conduct for research integrity but most universities have developed their codes, together with the code of research ethics. Initiatives have been taken in order to establish a national institutional framework for research ethics and research integrity for all disciplines whereby the EU plays an important (indirect) role:
Which institutions are	National Committee for Ethics in Science and Higher	

National Ethical Aspects of Cooperation Consideration aspect:	Croatia (HR)	Greece (GR)
established for ethical issues in R&I	Education. Institutional ethics committees at universities and research institutes.	initiatives haven been undertaken partly in meeting the standards on research ethics and research integrity of the EU in obtaining funding for research. The first initiative was taken by a network in 2008. In that year, EARTHnet, A leading network for research ethics and research integrity, was voluntarily established. A second initiative was taken in 2014, again by a network. In that year, RCR-Greece, Network of Responsible Conduct of Research in Greece, was voluntarily established and legally based as a non-profit organisation. A third initiative was taken by the Greek government. A law was released in 2017, according to which a Deontology Committee (DC) should be created in each Higher Education Institute. This committee must be composed of the Deans and the Vice-Rector responsible for Academic Affairs, Student Care and Lifelong Education (N.4485/2017, Article 47). A fourth initiative was again taken by the Greek government when it took an important step towards a more concrete national institutional structure for research integrity. Starting in September 2017, the Minister of Education assigned a panel of six experts to draft a document as basis for a national law that would apply to all research ethics committees at

National Ethical Aspects of Cooperation Consideration aspect:	Croatia (HR)	Greece (GR)
		the institutional level in which both research ethics and research integrity would be addressed.

Table 33National input data related to National Ethical Aspects of Cooperation Consideration – Italia and Montenegro

National Ethical Aspects of Cooperation Consideration aspect:	Italia (IT)	Montenegro (CG)
Main social or environmental concerns related to wind/offshore projects	Visual impact on coastal aesthetics and tourism, protection of marine biodiversity (Natura 2000 sites), and underwater noise disturbance.	The coastal and marine area of Montenegro is characterized by high ecological sensitivity, including protected habitats, biodiversity hotspots, and ecologically valuable marine ecosystems. Potential offshore wind development raises concerns related to impacts on marine biodiversity, seabed disturbance, and cumulative environmental pressures in the Adriatic Sea. Competition for maritime space is a significant concern, particularly with tourism, fisheries, maritime transport, and coastal landscape protection, all of which are economically and socially important sectors. Visual impacts and potential effects on tourism are identified as socially sensitive issues, especially in coastal communities with high dependence on tourism.
Experience with public acceptance and stakeholder engagement	The "Beleolico" project in Taranto highlights the importance of "local-content" business models. Public support is	Public awareness of offshore wind energy in Montenegro is limited, as offshore wind remains at an early, conceptual stage.

National Ethical Aspects of Cooperation Consideration aspect:	Italia (IT)	Montenegro (CG)
	generally high (over 80%) but conditional on turbines being sited far from shore (typically > 12 nautical miles).	Stakeholder engagement related to offshore wind has so far been sporadic and informal, primarily conducted through consultations with ministries, academia, energy companies, and environmental organizations. There is no established, institutionalized framework for systematic public consultation or early stakeholder involvement specifically tailored to offshore wind projects. Limited public familiarity with offshore wind technology is identified as a risk factor for future social acceptance.
Practices related to biodiversity protection and cumulative impacts	Strict exclusion of Natura 2000 sites and Marine Protected Areas (MPAs) from development zones, utilizing a "precautionary approach".	Environmental protection practices are primarily governed through environmental impact assessment (EIA) procedures and nature protection regulations applicable to all large infrastructure projects. Special attention is given to protected areas, sensitive marine habitats, and biodiversity conservation, particularly in coastal and offshore zones. However, there is no offshore wind–specific framework for assessing cumulative impacts of multiple marine uses or large-scale offshore renewable deployment. Existing practices focus on project-level environmental assessments, rather than integrated, basin-wide

National Ethical Aspects of Cooperation Consideration aspect:	Italia (IT)	Montenegro (CG)
		cumulative impact approaches.
Relevant good practices or lessons learned	Integrating "social acceptance" criteria into GIS-based siting studies to identify socially sustainable locations.	The SWOT analysis highlights the importance of early environmental screening and precautionary approaches as key lessons for any future offshore wind development. Engagement of academic and research institutions in environmental assessments is recognized as a positive practice, supporting evidence-based decision-making. Regional cooperation and knowledge exchange within the Adriatic–Ionian region are identified as opportunities to transfer good practices related to environmental protection and stakeholder engagement from more advanced offshore wind contexts.
What regulation concerns ethical issues in R&I	MUR Guidelines on Research Security (2025) and the European Code of Conduct.	Ethical considerations in research and innovation are addressed through general national legislation on research, environmental protection, and data protection, rather than offshore wind–specific ethical frameworks. Environmental laws and permitting procedures implicitly incorporate ethical principles related to environmental protection, public interest, and sustainability. There is no dedicated regulatory framework addressing ethical aspects of offshore wind research and innovation as a distinct field.

National Ethical Aspects of Cooperation Consideration aspect:	Italia (IT)	Montenegro (CG)
Which institutions are established for ethical issues in R&I	CNR: Research Ethics and Bioethics Committee. MUR: Working Group on Research Security. Universities: Local Ethics Committees for Research (e.g., CERA at the University of Brescia).	Ethical oversight in research and innovation is exercised through existing institutional mechanisms, including: Environmental authorities responsible for environmental protection and impact assessments. Academic and research institutions, which apply internal ethical standards and review procedures for research activities. No specialized national body dedicated exclusively to ethical governance of offshore wind research and innovation is identified.

Annex IV: Knowledge-sharing Events Organisation Template

To ensure consistency and replicability, the framework proposes a general template for organising knowledge-sharing and B2B events:

1. Objective Definition

- *Clear identification of the purpose (e.g. training, matchmaking, business plan support)*

2. Target Group Identification

- *Selection of SME categories and relevant stakeholders*

3. Content Design

- *Definition of thematic focus and expected outputs (e.g. draft business plans, partnerships)*

4. Expert Involvement

- *Engagement of industry experts, researchers, and financial advisors*

5. Format Selection

- *Workshops, webinars, hybrid events, or on-site sessions*

6. Interaction Mechanisms

- *Structured networking, breakout sessions, B2B meetings*

7. Output and Follow-up

- *Documentation of results (e.g. business plan drafts, partnership agreements)*

- *Identification of next steps for participating SMEs*