Offshore Wind Energy:

Knowledge Transfer and Strategic Partnerships for Industrial Development

ABEEólica COSRO NL Netherlands

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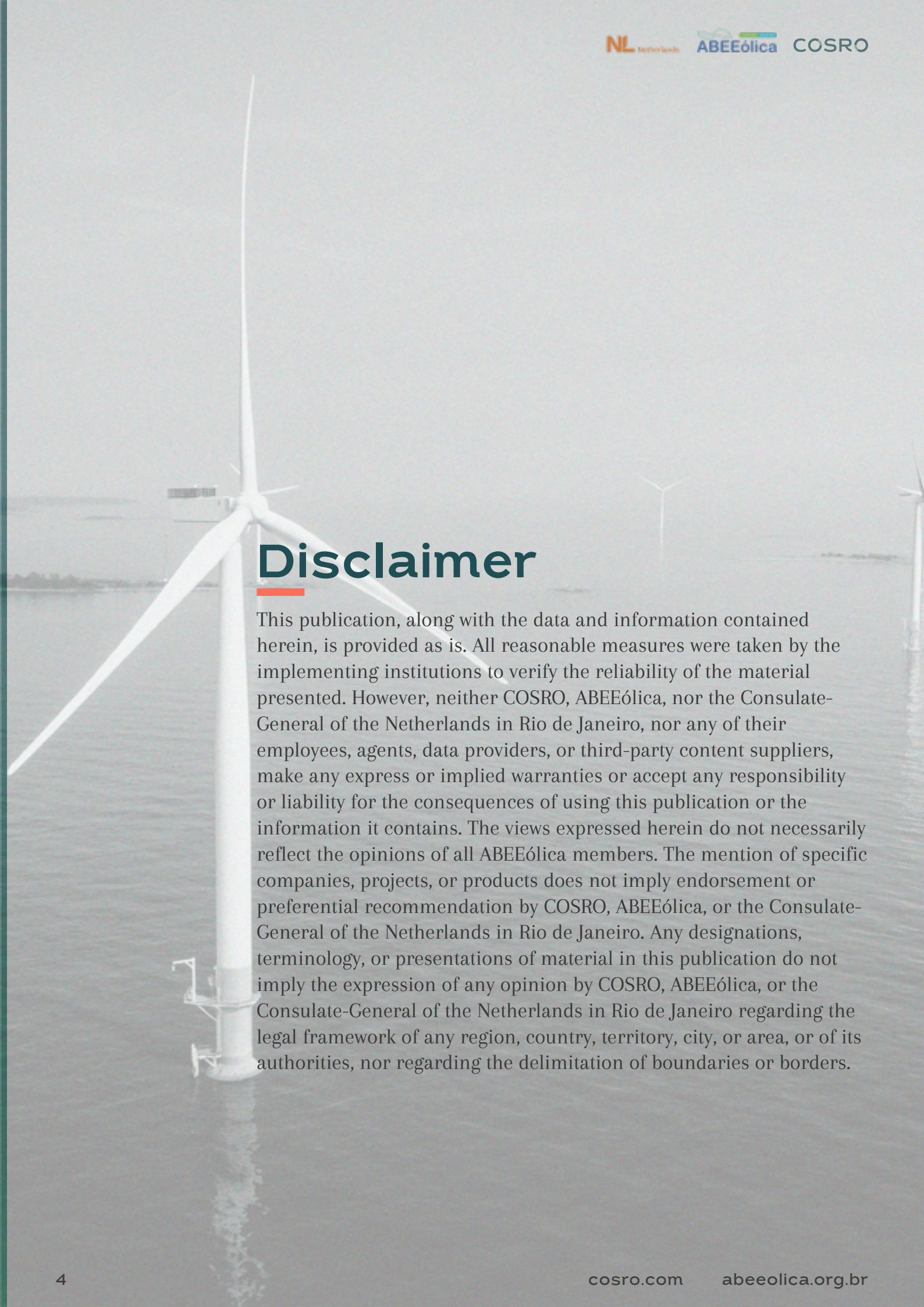
COSRO is a multisectoral, multidisciplinary law firm with over 50 professionals experienced at leading full-service firms in Brazil and globally. With offices in Rio de Janeiro, São Paulo, Brasília, New York, Rome, Madrid, and Singapore, we value diversity and combine legal and economic insights to deliver comprehensive solutions to our clients. Our practice focuses on 15 key sectors, including Energy, Decarbonization, Shipping, Technology, and Infrastructure. We provide full legal support across all critical practice areas such as Commercial Contracts, EGVC, Environmental, Government Affairs, Litigation and Arbitration, Project Finance, Regulatory, Sustainability, and Tax.

About ABEEólica

Founded in 2002, the Brazilian Wind Energy Association – ABEEólica is a non-profit organization that represents the national wind energy industry, bringing together over 150 companies from the entire value chain and aims to promote the growth, consolidation, and sustainability of the sector in Brazil.

About the Consulate-General of the Netherlands in Rio de Janeiro

The Consulate-General of the Netherlands in Rio de Janeiro plays a strategic role in promoting bilateral relations between the two countries, facilitating trade, cultural cooperation, and exchanges in various areas such as the environment and education. Its activities within the Dutch diplomatic network reinforce the significance of the relationship between the Netherlands and Brazil, reflecting a mutual commitment to sustainable development and international cooperation. Among the Consulate's main functions is the promotion of shared priorities, such as advancing sustainable development, innovation, and the energy transition, thereby strengthening partnerships between Brazilian and Dutch stakeholders across strategic sectors.



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Summary

01 Presentation of the Report

COSRO, in partnership with the Brazilian Wind Energy Association – ABEEólica and the Consulate-general of the Netherlands in Rio de Janeiro, is pleased to present this report, which highlights key outcomes and insights from the event "Offshore Wind Energy – Knowledge Transfer and Strategic Partnerships for Industrial Development", which held on 6 May 2025 at the Fairmont Rio Hotel in Rio de Janeiro, Brazil, and was divided into three panels:

- Section 01: Offshore Wind Energy and the Regulatory Horizon, with Elbia Gannoum (ABEEólica) as moderator, and Gustavo Ponte (Energy Research Office – EPE), Karina Araújo (Ministry of Mines and Energy – MME) and Roberta Cox (Global Wind Energy Council – GWEC) as panelists.
- Section 02: Market Routes and Area Auctions: Pathways to Technology, with Matheus Noronha (ABEEólica) as moderator, and Adriano Gouvea (Neoenergia), Mauro de Andrade (Porto do Açu), Rafael Palhares (Ocean Winds) and Sylvain Jouhanneau (EDF) as panelists.
- Section 03: Financing and Planning: Ocean Economy and Energy Transition, with Roberta Cox (Global Wind Energy Council – GWEC) as moderator, and David Casimiro (World Bank Group), Marcelo Frazão (COSRO), Renato Santos (Brazilian Development Bank – BNDES) and Sérgio Coelho (State Secretariat of Rio de Janeiro) as panelists.

The event was organized by ABEEólica and the Consulate-general of the Netherlands in Rio de Janeiro and brought together a range of sectoral institutions actively engaged in advancing the offshore wind energy agenda. Notable participants included the Brazilian Development Bank – BNDES, the Global Wind Energy Council – GWEC, and the Energy Research Office – EPE, each of them offering valuable insights and strategic perspectives throughout the panel discussions.

Drawing on the discussions held during the event, the authors have prepared this report, aiming to spread knowledge and foster dialogue on the development of offshore wind energy in Brazil.

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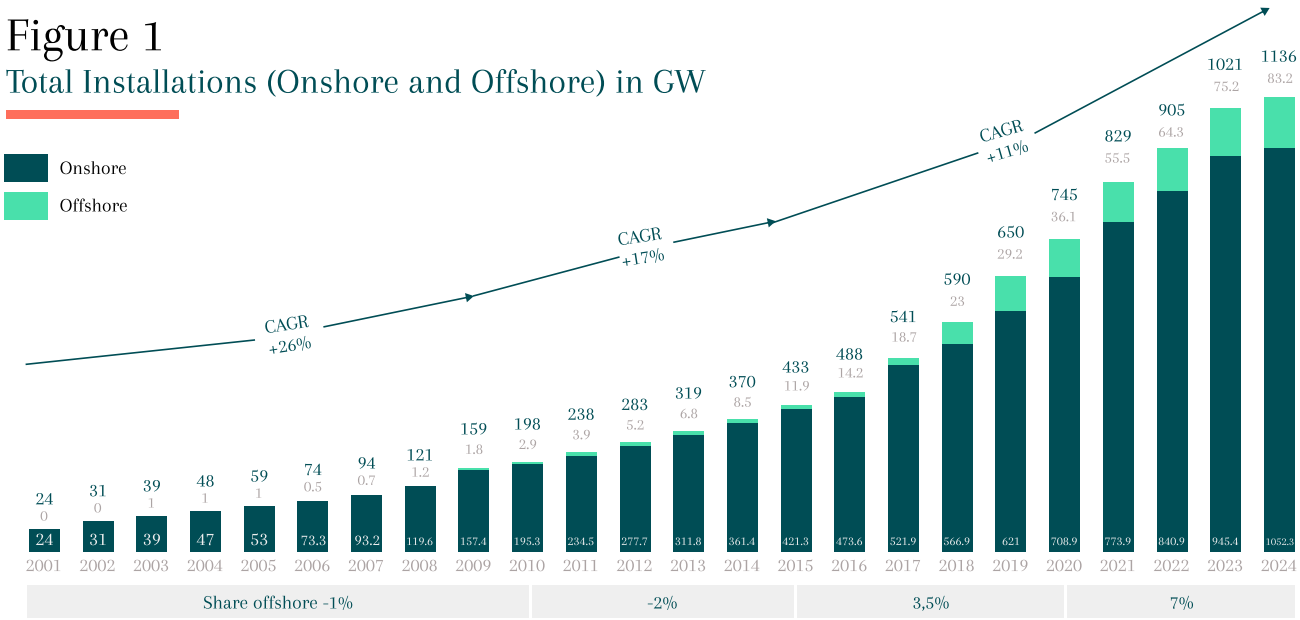
02 Introduction

According to ABEEólica's 2024 Annual Report, 76 new wind farms were installed in Brazil in 2024, adding 3.3 GW of new installed capacity and 23 MW of repowered capacity. Although this figure was lower than in the previous three years, reflecting the challenging scenario currently faced by the industry, the year still ranked as the fourth highest in the country's history for wind power capacity expansion. The Brazilian wind industry accounts for a total of 33,7 GW of installed onshore wind energy capacity. In the global context, onshore and offshore wind energy has already surpassed the milestone of 1 TW of installed capacity — specifically, 1,136 GW in operation across various countries worldwide. Offshore wind energy, in particular, has been consolidating and currently totals 83.2 GW of installed capacity (Graph 1).

Figure 1
Total Installations (Onshore and Offshore) in GW

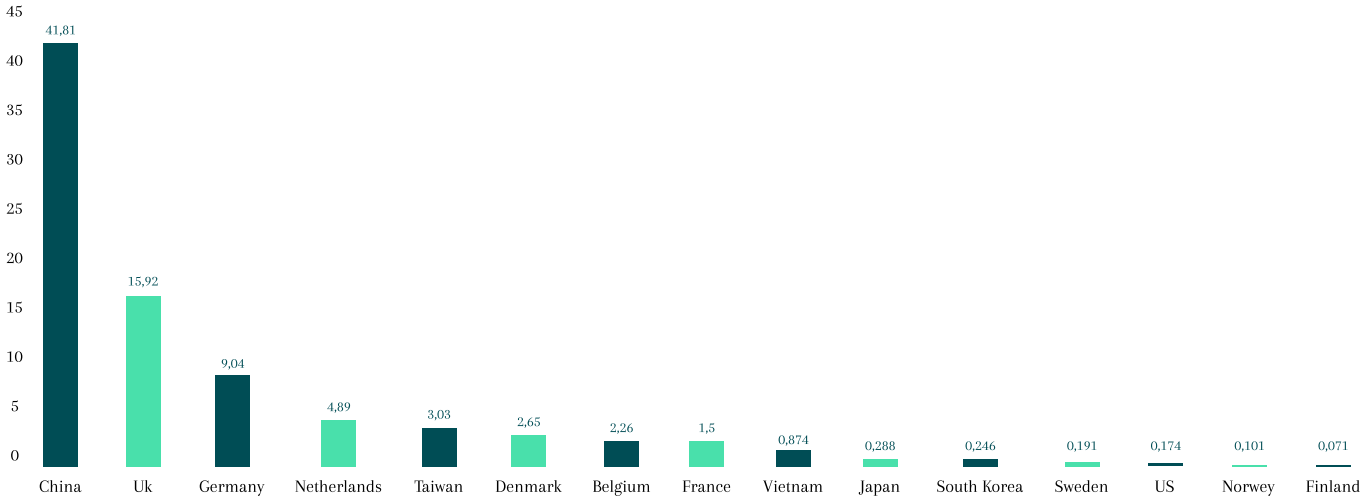


Source: Adapted from GWEC (2025)

With regards to the offshore wind power capacity mix, several countries stand out for having already developed the necessary technology, supported by a regulatory environment and supply chains that have been consolidating over the past years to meet industry demands. Among these countries are China, the United Kingdom, Germany, the Netherlands, Taiwan, and Denmark. Below is a chart showing the 15 countries with the highest installed offshore wind capacity.

Figure 2

Cumulative capacity of all countries with offshore wind (GW) – 15th Ranking



Source: GWEC (2025)

The Netherlands has been a continuous reference in the growth of its installed capacity, totaling 4.89 GW according to data from the Global Wind Energy Council. The country has developed an offshore wind auction model that enables the scaling of the technology, considering the pursuit of energy security and the balance between climate goals to be addressed in the coming years. Countries such as the Netherlands and others in the ranking presented in Figure 2 can serve as benchmarks in their regulatory and productive models, sharing knowledge to help developing economies deepen their offshore wind technology production.

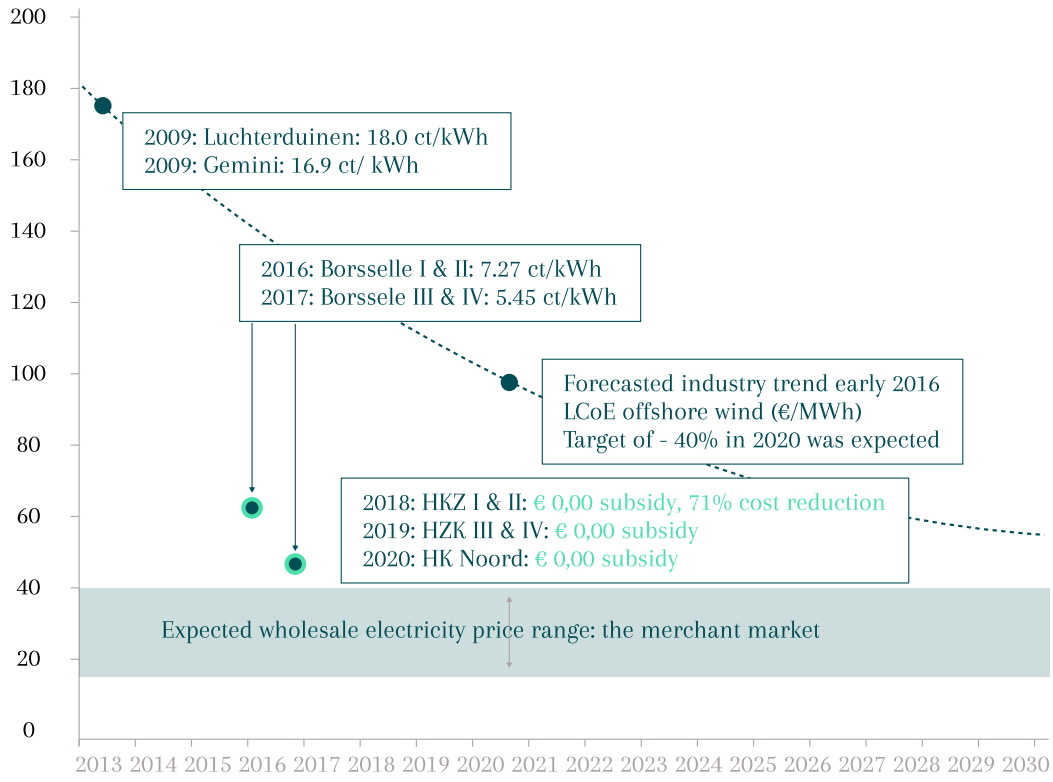
Figure 3

Netherlands 1st Offshore Wind Roadmap (2023) – Conclusion

4.7 GW OW capacity by end 2023
- 5 successful tenders, 3,7 GW in total
- Equal to 15.8% current NL electr. demand
- To remind: was 1 GW in 2013

71% LCoE reduction 2013-2018
- Rulling by NL Legal Court of Audit
- Cost price 15 cents/kWh in 2013 (reference price)
- Cost price 4.4 cents/kWh in 2018 (HKZ)

Reduced lead times (tender to operation)
- 3-4 years (to remind: was 7-10 years)



Source: RVO - Netherlands Enterprise Agency

The Netherlands began offshore wind energy development with early projects in 2006 and 2008, but a fragmented, risky, and costly approach slowed progress. In 2013, a broad coalition including government, industry, and environmental groups launched the Energy Agreement for Sustainable Growth, setting ambitious renewable energy and net-zero targets.

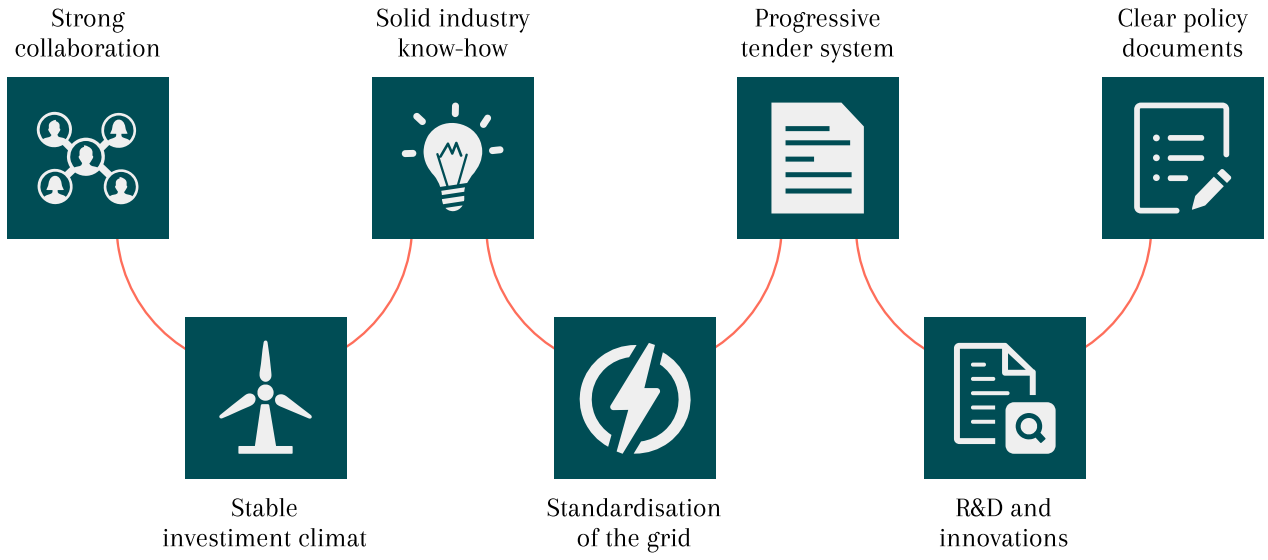
This led to a new, centralized policy framework with predesignated wind farm zones, multi-year tender schemes, and a “one-stop shop” for permitting and grid connections managed by TenneT. The approach encouraged competition, lowered risks, and made participation easier for developers.

As a result, offshore wind capacity surged from under 1 GW before 2013 to 4.7 GW by 2023, surpassing targets. Costs dropped by 70%, well beyond the initial 40% goal, cutting expected subsidies from €18 billion to €5-6 billion. Development times shortened from 7-10 years to 3-4 years.

This success highlights the impact of coordinated public-private partnerships and effective government policy in accelerating sustainable offshore wind growth.

Figure 4

Key Drivers in the Netherlands Experience



Source: RVO - Netherlands Enterprise Agency

In the onshore wind segment, Brazil ranks fifth in the world in terms of total installed capacity. With regards to offshore wind, a significant milestone was reached with the enactment of Law No. 15,097 on January 10, 2025, which introduced the Legal Framework for the sector. The new law has laid the groundwork for regulating the use of federal assets for power generation in offshore projects, authorizing the development and operation of offshore wind farms within Brazil's territorial waters, exclusive economic zone, and continental shelf.

Additionally, different publications and regulatory advancements were conducted by the government and competent bodies to achieve a safe institutional environment to develop offshore wind energy in the last years and months. Below is a list of some of the main regulatory publications about technology that will allow to develop the source in the next coming years:

- Law No. 15,097/2025
- Decree No. 10.946/2022
- Ordinance No. 52/GM/MME/2022
- Interministerial Ordinance MME/MMA No. 3/2022
- EPE Technical Note: Proposed methodology for selection of areas for offshore wind power generation
- EPE Technical Note: Considerations on the amount due to the Union for the transfer of an area
- EPE Technical Note: Considerations on the limitation of the area to be transferred
- Interministerial Committee of Offshore Wind Energy guided by MME

The promotion of offshore wind power generation in Brazil is guided by objectives that align with the country's broader sustainable development goals. These include generating employment and income, ensuring the responsible use of natural resources to enhance energy security, and promoting research and development in renewable energy technologies, with a particular focus on offshore wind and the hydrogen production derived from it.

Offshore projects are expected to be developed in harmony with the environment and local cultures, safeguarding marine ecosystems and oceanic heritage. Special attention must be given to preserving and enhancing the natural and cultural landscape, especially in tourism-sensitive areas. Core principles also include transparency, public access to information, and the right to free, prior, and informed consultation with affected communities and populations.

Brazil has a regulatory framework for offshore wind energy power

In this context, Law No. 15,097/2025 represents a landmark achievement for the development of Brazil's first offshore wind projects in Brazil. The new law establishes the legal framework for the assignment of offshore areas, providing two mechanisms by which the Executive Branch may grant the usage rights: concession or authorization, as outlined below.

Permanent offer — the granting authority assigns areas for exploration based on requests from interested parties, under the authorization regime;

Planned offer — the authority designates pre-defined areas for development, identified through spatial planning by the competent body, and grants usage rights via concession awarded through a bidding process.

Other relevant aspects are still pending definition, including the technical, economic-financial, and qualification criteria for the sea leasing auctions, as well as requirements for promoting domestic industry, to be met by the parties interested in obtaining offshore development zones, whether through permanent or planned offers. The successful implementation of offshore wind projects depends on establishing robust, well-defined complement regulations to address existing gaps in the legal framework.

Acknowledging the relevance of this challenge, COSRO, in partnership with ABEEólica and the Consulate – General of the Netherlands in Rio de Janeiro, has prepared this report to promote dialogue on legal and regulatory developments, strengthen engagement with influential market stakeholders, and support the coordinated advancement of offshore wind power in Brazil.

03 Context

Executives and professionals in the offshore wind industry have been working to transfer knowledge and create business opportunities to support the consolidation of offshore wind technology. Offshore wind represents an important opportunity for the energy transition and for meeting climate targets. Brazil views this technology as a complementary option to drive industrialization and decarbonize its industry — strategic issues that will be discussed during COP30 and in the coming years in the country.

“A key milestone in Brazil’s offshore wind journey occurred in 2016, when ABEEólica organized its first dedicated offshore wind panel during the Brazil Windpower event in Rio de Janeiro. The event was traditionally focused on onshore wind energy, making the inclusion of a panel on offshore wind—scheduled for the final session on the last day—a bold and forward-looking move. Although the topic was relatively new within Brazilian discussions in 2016, the panel drew strong participation from both speakers and attendees, reflecting a growing interest in the sector. This moment is widely seen as ABEEólica’s first significant step into the national dialogue on offshore wind energy.”

Elbia Gannoum
(CEO of ABEEólica)

The Dutch experience illustrates that developing a viable offshore wind and green hydrogen market requires a structured approach, proper incentives, and a well-established track record in developing offshore wind deployment and sustainable hydrogen solutions. It demonstrates that accelerating the energy transition is possible through effective public policies, strategic incentives, and strong public-private collaboration."

Job Runhaar
(Consul-General of the Netherlands in Rio de Janeiro)

The Netherlands is prioritizing five economic areas in its bilateral relationship with Brazil:

- Sustainable agriculture and bioeconomy, which are essential for environmental preservation and food security.

- Water management and related technologies, a field where Dutch expertise is globally recognized and highly relevant, especially given the extreme climate events occurring worldwide, including in Brazil.

- Sustainable port development, covering infrastructure and green logistics.

- High-tech systems and materials, with innovative solutions focused on efficiency and low environmental impact.

- Energy transition, with special emphasis on green hydrogen and offshore wind energy.

Brazil has all the elements to become a global leader in renewable energy. To realize this potential, it is vital to maintain a business-friendly environment for foreign companies, striking the right balance between supporting the domestic industry and leveraging global expertise.

04 Sections

4.1 Offshore Wind Energy and the Regulatory Horizon

This panel opened the event's discussions by addressing one of the most urgent topics on Brazil's offshore wind agenda: developing the regulatory framework required for the assignment of areas for development of the country's first offshore wind projects. Moderated by Elbia Gannoum (CEO of ABEEólica), the panel brought together Gustavo Ponte (Energy Research Office – EPE), Karina Araújo (Ministry of Mines and Energy – MME), and Roberta Cox (Global Wind Energy Council – GWEC)—to explore the current regulatory landscape, outline next steps toward implementation, and examine the planning strategies that will shape the design of the regulatory framework.

Notable insights from this panel include the perception that Brazil stands at a decisive moment in the development of its offshore wind sector, in particular with the recent enactment of the legal framework, Law No. 15,097/2025, which represents a major step forward, placing the country ahead of many others still debating the foundations of their offshore regimes. The focus now turns to establishing a clear, predictable, and technically viable infralegal framework that meets the market needs while addressing social and environmental priorities. In this process, strategic partnerships, transparent governance, and long-term planning are fundamental to operationalize the effective regulatory horizon.

> The future is being decided. If we don't make the decisions now, if we don't prepare now, we won't have the effective opportunity. In the long term, with all the changes we've made and the opportunities available to Brazil in the green industry sector, demand will not be an issue."
>
> Elbia Gannoum
> (CEO of ABEEólica)

4.1.1 The Brazilian Legal Framework

Karina Araújo (Ministry of Mines and Energy – MME) began by outlining the steps that led to the publication of Law No. 15,097/2025, which forms the foundation for offshore wind development in Brazil.

Significant progress has been made in recent years, with extensive legislative debate followed by the publication of Decree No. 10,946 in 2022 and Law No. 15,097 in January 2025. These developments provide Brazil with a robust legal basis, placing the country ahead of many others still debating their offshore frameworks. Brazil can now benefit from the experience of mature markets while adapting regulations to its unique socio-environmental context.

However, the new law is not self-executing; a detailed regulatory framework is still required to make its provisions operational, particularly concerning the assignment of areas. The focus now lies in finalizing this secondary layer of regulation to operationalize the procedures established by law.

4.1.2 Strategic Partnerships for Regulation

Drawing on international experience is a key element in shaping Brazil's offshore wind regulatory approach, with countries like the Netherlands offering valuable lessons in long-term planning and institutional learning.

Rather than adopting rigid, static rules, the Dutch model allowed for continuous improvement across successive bidding rounds since the first offshore wind roadmap in 2013. The regulatory flexibility enabled stakeholders to refine procedures, payment structures, and area allocations based on lessons learned in previous phases.

International experience highlights the importance of stakeholder and market engagement, requiring coordination not only among government agencies but also with civil society and the private sector. In line with this, an interministerial working group led by the Ministry of Mines and Energy – MME has been established, bringing together representatives from over twenty federal institutions to ensure a comprehensive, multidisciplinary regulatory design. The next step will be to open public consultations and engage directly with investors and other offshore wind stakeholders. The interministerial group includes the following institutions:

Ministries and Government Offices

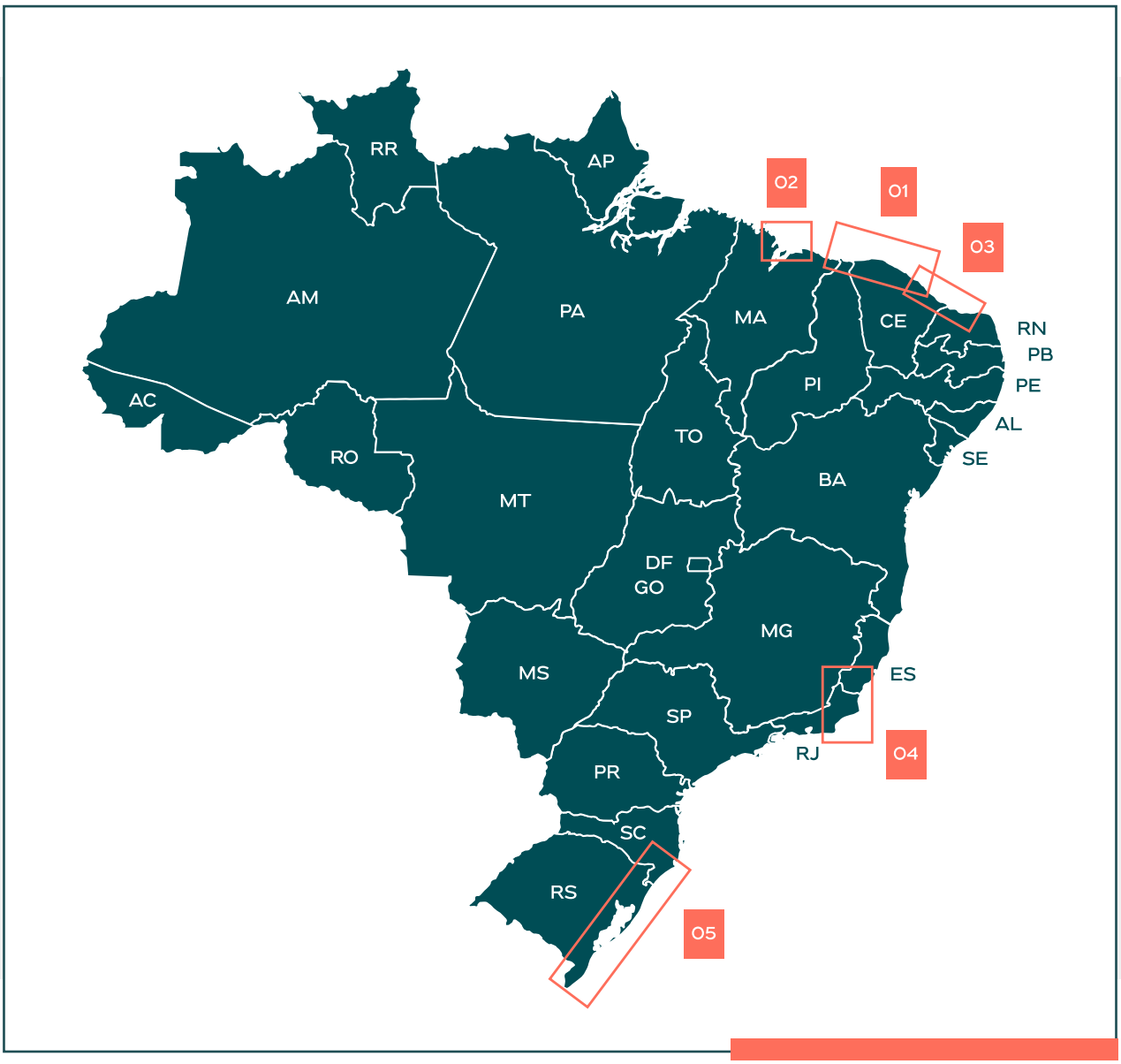
- Ministry of Mines and Energy (MME)
- Office of the Chief of Staff of the Presidency of the Republic
- Ministry of Science, Technology and Innovation
- Ministry of Finance
- Ministry of Management and Innovation in Public Service
- Ministry of Fisheries and Aquaculture
- Ministry of Ports and Airports
- Ministry of Development, Industry, Trade and Services
- Ministry of the Environment and Climate Change
- Ministry of Tourism
- Air Force Command
- Navy Command
- Secretariat of the Federal Heritag

Regulatory Agencies and Technical Entities

- Brazilian Institute of Environment and Renewable Natural Resources (IBAMA)
- Chico Mendes Institute for Biodiversity Conservation (ICMBio)
- National Telecommunications Agency (ANATEL)
- National Agency for Waterway Transportation (ANTAQ)
- National Electric Energy Agency (ANEEL)
- National Agency of Petroleum, Natural Gas and Biofuels (ANP)
- National System Operator (ONS)
- Energy Research Office (EPE)

Along with the solid governance structure created by this interministerial coordination, government bodies experienced in offshore oil and gas have also engaged. IBAMA, for example, has developed a specific reference framework for offshore wind licensing, indicating that while environmental approvals will be rigorous, they should not be obstacles in case there are quality studies and early developer engagement. IBAMA has already received expressions of interest for over 100 projects seeking environmental licensing. These projects are currently awaiting the next steps in the regulation of offshore wind development in order to participate in the competitive process and future deployment (Figure 2).

Figure 5
IBAMA's Map



Source: IBAMA (2025)

Both international and domestic strategic partnerships are essential for developing a robust, efficient, and globally aligned offshore wind sector. International collaborations provide technical expertise, best practices, and financial models from mature markets, helping to mitigate early-stage risks and accelerate implementation, while domestic cooperation ensures the regulatory framework is comprehensive and responsive to practical deployment challenges.

With Law No. 15,097/2025 now in place, the focus has shifted to building a clear and reliable regulatory path, already underway through strategic planning and multi-stakeholder dialogue. As a long-term investment, offshore wind requires several preparatory phases before projects become operational.

Thanks to its natural advantages and coordinated public policy efforts, Brazil has the opportunity not only to establish a successful offshore wind market but also to lead a broader green industrial transformation. With strategic partnerships and transparent governance, the country is positioning itself as both a key offshore wind player and a global leader in renewable industry development

> “We need a well-built, robust regulatory framework, which includes risk management, market interaction and responsiveness, and is fundamental to providing security for investments as well. Because if investors are going to invest billions of dollars in their projects, they need clear rules that provide them with legal certainty and transparence.” (Gustavo Ponte, from the Energy Research Office – EPE)

Gustavo Ponte
from the Energy
Research Office – EPE

4.1.3 Potential and Timeframe of Offshore Wind Projects

Offshore wind development is a long-term process involving multiple sequential phases before the first turbines generate power. Energy planning decisions must consider a five to ten-year horizon, especially for capital-intensive and complex technologies as offshore wind. A relevant aspect is aligning expectations between the government and investors regarding the regulatory timeline and development procedures. This requires transparent communication about the regulatory milestones and the expected timeframe.

There are three priority pillars for enabling the development of offshore wind activities in Brazil:

Brazil has approximately 3,000,000 km² of exclusive economic zone, but not all this area is suitable for offshore wind project deployment. The key challenge is identifying zones with greater technical viability, lower risk for both the government and developers, and higher market interest—the so-called “hotspots”.

The Ministry of Mines and Energy – MME is developing a sectoral planning methodology that will allow the market to indicate areas of interest and acceptable levels of risk. The proceeding begins with broad regional screenings and narrows to specific sites, and includes market dialogue, signaling areas of interests and analysis of acceptable risk levels. This methodology is currently in its refinement phase and will soon be submitted for public consultation, enabling dialogue and experience sharing between the government and investors.

Another central aspect is strategic planning in maritime environments, where multiple activities coexist—such as navigation, fishing, and the livelihoods of coastal communities. The objective is not to impose technologies on specific regions, but to identify, through a participatory process, where there is both viability and interest from the private sector, in alignment with national strategies and market dynamics.

Finally, the third priority pillar is the development of regulation. The Ministry of Mines and Energy – MME is working closely with ANEEL, the central agency responsible for operationalizing the offshore wind regulatory processes. The Ministry is committed to advancing infralegal regulation, spatial planning, and regulatory structuring with maximum transparency and agility, fostering legal certainty and predictability for all stakeholders involved.

The publication of a presidential decree—the first anticipated infralegal regulation—will not immediately trigger the first area auctions, but will instead initiate a complex, data-driven process to operationalize the auctions, which dates cannot yet be foreseen. However, a full roadmap outlining the next regulatory steps and a timeline is expected for the end of the first semester of 2025. This roadmap will detail the procedures for transition from early-phase activities, such as data collection and maritime surveys, to formal area access and, ultimately, the first auctions.

On the other hand, environmental licensing is a major global bottleneck, often causing significant project delays. Thus, regulatory stability is essential for investor confidence, as frequent legal or institutional shifts can undermine long-term investment credibility.

> “Brazil is currently among the top five countries in terms of total installed wind power capacity and is strongly positioned to maintain its leadership in the sector, with significant potential for further expansion through offshore wind developments. We present this strong positioning of Brazil as a wind energy leader, as well as the encouraging offshore wind progress demonstrated each year, in GWEC’s reports. Brazil is well equipped to develop a robust domestic offshore wind supply chain as soon as the first auctions are launched.”
>
> Roberta Cox,
> Global Wind Energy Council – GWEC

Brazil stands out with a vast coastline, high-quality wind resources, a strong interconnected grid, and a large, diversified internal market. As such, policy should go beyond the energy matrix and adopt a whole-economy perspective, linking offshore wind to broader opportunities in green hydrogen, sustainable fertilizers, and low-carbon manufacturing.

> “Our goal is to have the infralegal framework revised and improved by the end of this year, based on the new Offshore Wind Law. This technical and silent effort was initiated by the Ministry of Mines and Energy – MME in July 2024. Regarding the areas suitable for offshore wind development, the methodology for their identification is currently in its refinement stage and will soon be submitted for public consultation to enable the exchange of insights with investors.”
>
> Karina Araújo
> Ministry of Mines and Energy – MME

4.2 Market Routes and Area Auctions: Pathways to Technology

This panel was moderated by Matheus Noronha (ABEEólica), and featured Adriano Gouvea (Neoenergia), Mauro de Andrade (Porto do Açu), Rafael Palhares (Ocean Winds), and Sylvain Jouhanneau (EDF). It discussed the global and Brazilian outlook for the offshore wind sector, emphasizing essential enablers for advancing technology and project development, such as knowledge transfer, competitiveness, and auction design.

The companies working in the offshore wind sector in Brazil agreed that regulatory clarity, infrastructure readiness, and investor confidence are fundamental to unlocking Brazil's offshore wind potential.

Despite global economic pressures, the sector continues to grow, and Brazil is well positioned, provided it swiftly finalizes regulations and strategically aligns public and private efforts. The importance of aligning regulatory actions with the capabilities and infrastructure of domestic players was also emphasized.

Clear qualification criteria, well-structured auctions, and early access to development areas were highlighted as important steps to ensure transparent governance and attract credible developers.

> "At this stage of development and infrastructure planning for the first offshore wind projects, it is crucial not only to address technical aspects but also to provide clear and effective signals to foster technological innovation and ensure developers remain committed and actively engaged in the process."
>
> Matheus Noronha
> ABEEólica

4.2.1 Global Outlook

According to the Global Offshore Wind Energy Report, we have surpassed 1 TW of globally installed wind energy capacity. In 2024, the offshore wind sector added 8 GW globally — 4 GW in Asia and the rest predominantly in Europe. Annual investments in the sector now reach $200 billion, roughly half the amount spent on upstream oil and gas activities.

A value chain of this scale demands significant commitment, complex coordination, and highly structured execution. Despite this momentum, the current macroeconomic environment has created uncertainty for investors, considering the rising interest rates, higher capital costs, inflation, geopolitical tensions, trade barriers, and supply chain pressures.

Industry representatives view these challenges as cyclical rather than structural. Given their capital-intensive and long-term nature, offshore wind projects require extended timelines, far exceeding those of onshore wind, and demand comprehensive planning guided by confidence and long-term vision. Still, markets such as China, South Korea and Japan continue to move forward with new offshore wind initiatives, demonstrating that the sector remains dynamic and firmly on a growth trajectory.

> “The world has not stopped investing in offshore wind. There are many projects in China, other markets are opening, South Africa is looking into it, South Korea continues developing its projects, and Japan keeps installing wind turbines at sea. So, the world hasn’t stopped. This perception that the entire sector has come to a halt is a view held by those who are not following closely or who are focusing too much only on Brazil and the United States.”
>
> Mauro de Andrade from Porto do Açu

4.2.2 Brazilian Wind Power Context: Transmission Challenge

Brazil's offshore wind sector is still in its early stages and requires further regulatory clarity and infrastructure development to advance. The country is well positioned, with a vast coastline, high-quality wind resources, and a large domestic market.

To move forward, Brazil must go beyond simply defining project areas and focus on creating a supportive ecosystem—modern ports, strategic hubs, and especially a reliable, upgraded energy grid. With 60% of its transmission lines already over 25 years old and nearing the end of their expected 30–40-year lifespan, both grid expansion and modernization are urgent. Without an efficient transmission system, increased generation capacity will not translate into meaningful progress.

Brazil's offshore wind potential is substantial. Regarding infrastructure, ports alone will not ensure project success if the surrounding infrastructure — particularly the grid — is not well developed. Strong logistical networks and a modern transmission system are essential. Effective planning must extend beyond technical zoning to include business-friendly policies and the development of strategic industrial hubs that support interconnected supply chains.

Offshore wind, in this context, offers broad economic spillover effects (e.g. job creation and improvement in infrastructure) that can drive long-term industrial transformation in the country.

4.2.3 Offshore Wind Regulation

The next and most urgent step for Brazil is to provide clarity on upcoming regulatory and market actions. Offshore wind development depends on long-term planning, and companies typically structure their investments five to ten years in advance. Without clear signals towards the development of Brazil's offshore wind regulation, the country risks being overlooked in global investment strategies. Including offshore wind in financial planning is fundamental to unlocking project activity, drive service demand, create jobs, and ensure steady progress

Although the approval of Law No. 15,097/2025 was a major milestone, the real challenge now lies in its regulation. The law offers a broad framework, but core details still need to be defined, such as qualification criteria, whether auctions should prioritize revenue generation or credible developers, and how to ensure a level playing field. Regulation must also clarify the selection processes, contractual obligations, and project timelines.

Legal gaps must be addressed carefully to avoid excessive complexity that could undermine competitiveness. In this process, priority should be placed on gathering comprehensive data to guide informed decisions and identify the most suitable zones for offshore wind development.

Points of attention and recommendations for the first offshore wind projects in Brazil ⚠

Early assessment of project feasibility must consider factors such as proximity to consumption centers and integration with green hydrogen hubs, which may intensify competition. Legal certainty is vital to define rights and shared responsibilities, forming a foundation for sustainable sector growth. Market pathways, institutional signals, contracting models, hub structures, and local supply chain support are critical elements discussed to advance the industry.

4.2.4 Knowledge Transfer and Strategic Partnerships

Drawing on lessons from 17 global markets—including two major UK projects totaling 2 GW—industry representatives emphasized that Brazil has the structural conditions to become a global offshore wind leader. The country offers abundant natural resources, high wind capacity factors, and favorable generation timing.

> “From an investor’s perspective, it is very reassuring to know that there is a clear timeline in place and that the regulatory work is being carried out. At the same time, we have a clear horizon of best practices through the extensive research the sector has been conducting, to learn from what has succeeded and what needs improvement. Offshore wind is a long-term commitment, which requires careful planning, and we are on the right path.”
>
> Rafael Palhares
> Ocean Winds

Although it's unrealistic to expect area auction to follow immediately after the approval of the new law, having a clear plan and timeline is essential. This structured approach enables companies to align their strategies. While investor impatience is natural, there is strong confidence in the work being carried out by Ministry of Mines and Energy – MME and the Energy Research Office – EPE. Brazilian companies are already investing in research and development, and the conversation has shifted from "if" to "when and how" offshore wind projects will be implemented.

Despite ongoing challenges, such as high CAPEX and competitiveness, global shifts present new opportunities. For instance, cyclical issues in other markets may redirect investment to Brazil. In this context, well-defined planning frameworks are crucial for providing companies with the confidence to allocate capital within defined timeframes. Success in offshore wind depends not only on economic criteria but also on robust planning and public-private collaboration. Markets that overlooked these elements often produced less successful outcomes.

Although building a full supply chain demands substantial investment, granting early access to development areas can immediately mobilize underused industrial capacity—particularly segments idle due to limited onshore activity. This generates short-term economic impact while laying the foundation for long-term benefits. Policymakers must look beyond energy pricing and recognize offshore wind's broader role in supporting local industry, creating jobs, diversifying Brazil's energy matrix, and developing a future-oriented national supply chain

Brazil has significant potential to lead the global transition toward a low-carbon future and net-zero emissions. While countries take different approaches, Brazil's strong onshore wind experience provides a solid foundation for developing a full offshore wind industry. This development goes beyond building a single farm; it requires establishing an entire industry, value chain, and infrastructure such as Porto do Açu.

4.2.5 Another International Market Examples and Emerging Technologies

France offers a valuable example: its structured approach has built confidence among investors, the value chain, public authorities, and society. Initially, French grid connection responsibilities ended at the onshore substation—investors managed offshore substations and export cables before handing over to the transmission operator. Today, the French transmission system operator manages connections up to the offshore substation. Industry representatives reinforce that this approach carefully planned enabled sustainable industry growth.

Between 2025 and 2032, Brazil has the time and resources to develop a robust, competitive offshore wind sector that encourages innovation and drives down costs. Emerging sectors such as green hydrogen, data centers, and other energy-intensive industries can anchor Brazil's clean energy future and attract investment.

The rise of generative artificial intelligence will further boost energy demand, making ports strategic hubs for foreign investment and offshore wind development. The path ahead is a long-term, collaborative effort, with stakeholders committed to creating a thriving offshore wind industry in Brazil.

4.2.6 Qualification Criteria

Establishing appropriate qualification criteria for companies seeking to develop offshore wind projects is essential to effectively identify well-prepared developers, reduce project uncertainty, and avoid unnecessary cost escalations. The criteria proposed during the panel included: **(i) financial capacity, favoring companies with stronger credit ratings; (ii) relevant prior experience, such as in offshore oil and gas, infrastructure, or transmission projects; and (iii) the advancement of project studies.** These criteria could be applied either as minimum eligibility requirements or as weighted scoring factors in auction processes.

International experience offers relevant lessons in the matter. Australia's offshore wind auctions were based solely on qualitative assessments and faced challenges due to subjectivity. The challenge for Brazil is to develop objective qualitative criteria that are rigorous yet achievable. A good reference is the Dutch experience, as the government has successfully applied non-price criteria without imposing excessive financial burdens that could hinder industry growth.

Important Concerns for the Future

Other important concerns are the risks of market concentration and speculation. Allowing a single company to secure an entire auction capacity often leads to stalled projects. Brazil might consider limiting any one company to 20–30% of total capacity to encourage diversification.

To mitigate speculation risk, one option is to require performance guarantees for developers conducting studies to ensure only serious players advance.

Additionally, representatives highlight that bid winners could be obligated to commit to minimum exploration programs, as is likewise mandated under Brazilian oil and gas regulations, to ensure active project developmen

4.3 Financing and Planning: Ocean Economy and Energy Transition

The third and final panel was moderated by Roberta Cox (Global Wind Energy Council - GWEC), and brought together David Casimiro (World Bank Group), Marcelo Frazão (COSRO), Renato Santos (Brazilian Development Bank – BNDES) and Sérgio Coelho (State Secretariat of Rio de Janeiro). The debate covered the technical, environmental, and financial dimensions of the infralegal regulation for offshore wind development in Brazil.

The main takeaways of this panel were that Brazil is strategically aligning regulatory, financial, and technical instruments to enable the sustainable development of offshore wind energy. A central theme was the importance of Marine Spatial Planning (PEM) as a regulatory and coordination tool, currently under development, but already serving as a guiding framework to organize maritime activities and reduce long-term environmental and economic conflicts.

The panel also discussed the local content policies and emphasized that while local content policies are important tools for national development, they must be applied strategically and gradually to avoid cost inflation and investment delays.

4.3.1 Marine Spatial Planning (PEM)

A crucial and emerging element in Brazil's offshore wind development is the role of Marine Spatial Planning (PEM) as both a regulatory instrument and a strategic enabler for maritime activities. PEM is a public process that analyzes and allocates human activities in marine areas through integrated planning across government levels and economic sectors, with active participation from society.

Its main goals are to reduce long-term risks and conflicts related to maritime economic activities, support sectoral planning, and streamline environmental licensing. Rather than replacing sector-specific frameworks, PEM guides and coordinates these processes. It is a dynamic system relying on continuous data collection, activity mapping, and classification of marine zones into priority, permissible, or restricted areas.

Despite being widely implemented in other countries to coordinate maritime activities, PEM is still under development in Brazil. Similar goals are often achieved elsewhere through tools such as Strategic Environmental Assessment (SEA) and other marine

planning instruments. Various marine activities, including oil and gas exploration and coastal operations, are currently carried out in Brazil without PEM.

This raises a common question: *if other industries operate without PEM, why should offshore wind be dependent on it?* Representatives explained that, while PEM can be complex and time-consuming, its establishment is vital for a more strategic, sustainable, and coordinated use of maritime space, supporting not only offshore wind but also the broader blue economy and Brazil's energy transition.

> The development of Marine Spatial Planning (PEM) is a long and multi-stage process, but it is already progressing, with some regions further ahead and contracts awarded. Meanwhile, the legal framework wisely allows initial areas designations before the PEM is fully completed or published. This enables early market development, which can even contribute to and inform the ongoing PEM process."
>
> Renato Santos
> from Brazilian Development Bank – BNDES

4.3.2 Equivalent Instruments for Environmental Analysis

Initial legislative drafts raised concerns that the first offshore wind auctions could be delayed until PEM was fully completed. However, Law No. 15,097/2025 introduced flexibility by requiring that area designations be guided by PEM or equivalent studies. This approach allows the industry to advance while formal planning continues and balances the urgency of enabling offshore wind development with the need for coherent marine planning.

The World Bank's sensitivity mapping guidance offers a valuable methodology to support initial offshore wind areas definition while contributing to the ongoing PEM process.
On the operational front, PEM contracts are progressing in Brazil's South and Southeast regions. Meanwhile, in the North region, the tender process for PEM services is still in progress but is expected to be concluded by mid-2025.

This integrated approach emphasizes Brazil's commitment not just to regulatory compliance, but to building a sustainable, competitive blue economy through coordinated marine governance and offshore wind development.

4.3.3 Offshore Wind Development Program of ESMAP

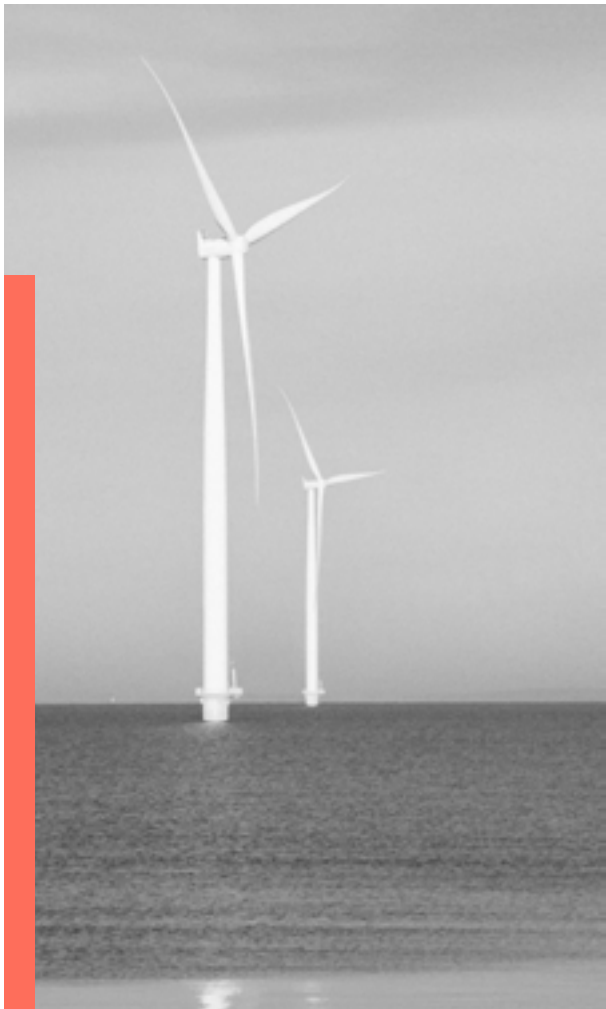
The World Bank Group leads a dedicated offshore wind development program aimed at helping emerging countries integrate offshore wind into their energy portfolios as a strategic resource. Funded through the Energy Sector Management Assistance Program – ESMAP and in partnership with the International Finance Corporation – IFC, the initiative connects experts from mature offshore wind markets with professionals in emerging economies to facilitate the transfer of best practices and lessons learned.

In Brazil, the program is supported by a specialized team working closely with federal agencies such as the Ministry of Environment – MMA and the Energy Research Office – EPE. In addition to country-specific studies, the program produces broader technical outputs which support informed decision-making and effective risk management.

This approach highlights the value of global experience while emphasizing the need for local solutions to ensure the development of a resilient and competitive offshore wind sector in Brazil and beyond.

4.3.4 Pilot Offshore Wind Project in Rio de Janeiro

Fully financed through research and development funds, the pilot offshore wind plant is a partnership between the Rio de Janeiro State Government and Petrobras, aiming to install an 18 MW turbine approximately 20 kilometers offshore in 16-meter-deep waters — conditions well-suited for such infrastructure.



The project reflects a strategic and practical approach to overcoming challenges through hands-on experience. It is considered a vital step for the industry, as it addresses critical early engineering and logistical issues, including the transport and assembly of large turbine components.

The strategic value of offshore wind energy becomes even more evident considering the transformation of Brazil's energy matrix, which is shifting from a strong reliance on hydropower to a more balanced mix of hydro and thermal sources. While the temporal complementarity between offshore wind and

hydropower is more pronounced in Brazil's Northeast, the wind resources in the Southeast also offer important contributions by mitigating supply fluctuations and enhancing power system reliability.

The project benefits from a built-in market for offshore wind power, as Rio de Janeiro is Brazil's second-largest electricity demand center. Beyond immediate electricity supply, the long-term vision includes producing green hydrogen to support sustainable industries such as green steel and fertilizers, contributing to a broader neo-industrialization strategy.

The project team has formally requested energy zoning approval from the Ministry of Mines and Energy – MME for a designated offshore area, which will enable project execution to move forward. The pilot not only tests new technologies but also positions Rio de Janeiro as a future hub for offshore wind and industrial transformation, aligning infrastructure development with broader energy transition goals.

4.3.5 Regulatory Sandbox and Innovations

Pilot projects such as the one in Rio de Janeiro are crucial not only for advancing technological development but also for enabling regulatory innovation. The implementation of new technologies as offshore wind inevitably presents engineering and logistical challenges that are best addressed through hands-on experience — by building, testing, and adapting.

The same applies to regulation: capital-intensive technologies requiring long-term investments often emerge in contexts where regulatory frameworks are still evolving or underdeveloped.

The primary challenge is ensuring legal certainty for investors amid the incomplete regulatory framework for the offshore wind sector. One of the most effective solutions for addressing this challenge is the regulatory sandbox, already used in Brazil in other sectors.

It consists of creating a controlled environment with flexible regulatory and licensing conditions to test new technologies or policies. Regulatory sandboxes are time-bound, geographically limited, and closely monitored, minimizing systemic risk while informing regulatory evolution.

> "A regulatory sandbox is a special environment established by the regulator or government in which certain regulatory and licensing requirements are temporarily relaxed to enable the development of a product, technology, or public policy, all within a controlled setting. As the regulator carries out this pilot, it gains valuable insights into how regulation should evolve. This process enables the creation of an initial regulatory framework based on practical experience and real-world outcomes."
>
> Marcelo Frazão,
> COSRO

Regulatory Sandbox

Offshore Wind Energy Industry
a new industry in Brazil

Regulatory Barriers
e.g., lack of regulations and discussions on licensing

Regulatory Sandbox
a controlled enviroment with flexbible regulatory and licensing conditions

Characteristics

- Time bound
- Geographically limited
- Closely monitored by the relevant authorities

What it promotes

- Gathering data
- Building investor confidence
- Testing and refining
  - Public policies
  - Regulatory requirements
  - New technologies
  - Project structuring

Reduces risks

- of adopting regulations misaligned with the characteristics of offshore wind projects
- of having to revise regulations which can be time-consuming, costly and bureaucratic.

Published final regulation

International experience reinforces the value of this approach. Regulatory sandboxes, first introduced in the UK's financial sector during the crisis, have since been adopted in countries such as the United States and the Netherlands to support offshore wind development. For Brazil, regulatory sandboxes offer a pragmatic way to gather data, refine instruments, and build investor confidence without delaying industry development. This approach is particularly useful as Brazil navigates challenges like environmental licensing, stakeholder coordination, and sectoral integration.

Ongoing pilot projects in Rio de Janeiro and Rio Grande do Norte offer opportunities to test technologies and gather data specific to Brazil's maritime ecosystems. Adopting regulatory sandboxes may accelerate offshore wind deployment while shaping a flexible policy framework.

> The regulatory sandbox is a solution that enables the development of projects with legal certainty, while acknowledging that the regulatory framework will evolve over time to become more efficient, both in protecting the public interest and in encouraging investment attractiveness."
>
> Marcelo Frazão
> COSRO

4.3.6 Leveraging Experience from the Oil & Gas Industry

Considering Brazil's advanced oil and gas infrastructure, technology, investment capacity, and regulatory experience, the oil and gas sector can play a pivotal role in shaping the country's offshore wind industry. The country's skilled workforce is well-used to offshore works, creating a natural foundation for collaboration and even migration between these two sectors. International experience, such as from the UK, demonstrates how oil and gas professionals can smoothly transition into offshore wind roles due to their existing skills.

Offshore wind's potential to decarbonize oil and gas production is also significant. In the near future, energy from offshore wind farms could not only supply the onshore grid but also be used to reduce emissions directly at offshore production sites — thereby nimizing the carbon footprint of oil production.

In Rio de Janeiro, where the economy is heavily reliant on oil revenues, the oil and gas sector generate substantial tax income and employment. This economic dependency should ideally be carefully balanced with environmental goals, particularly decarbonization efforts.

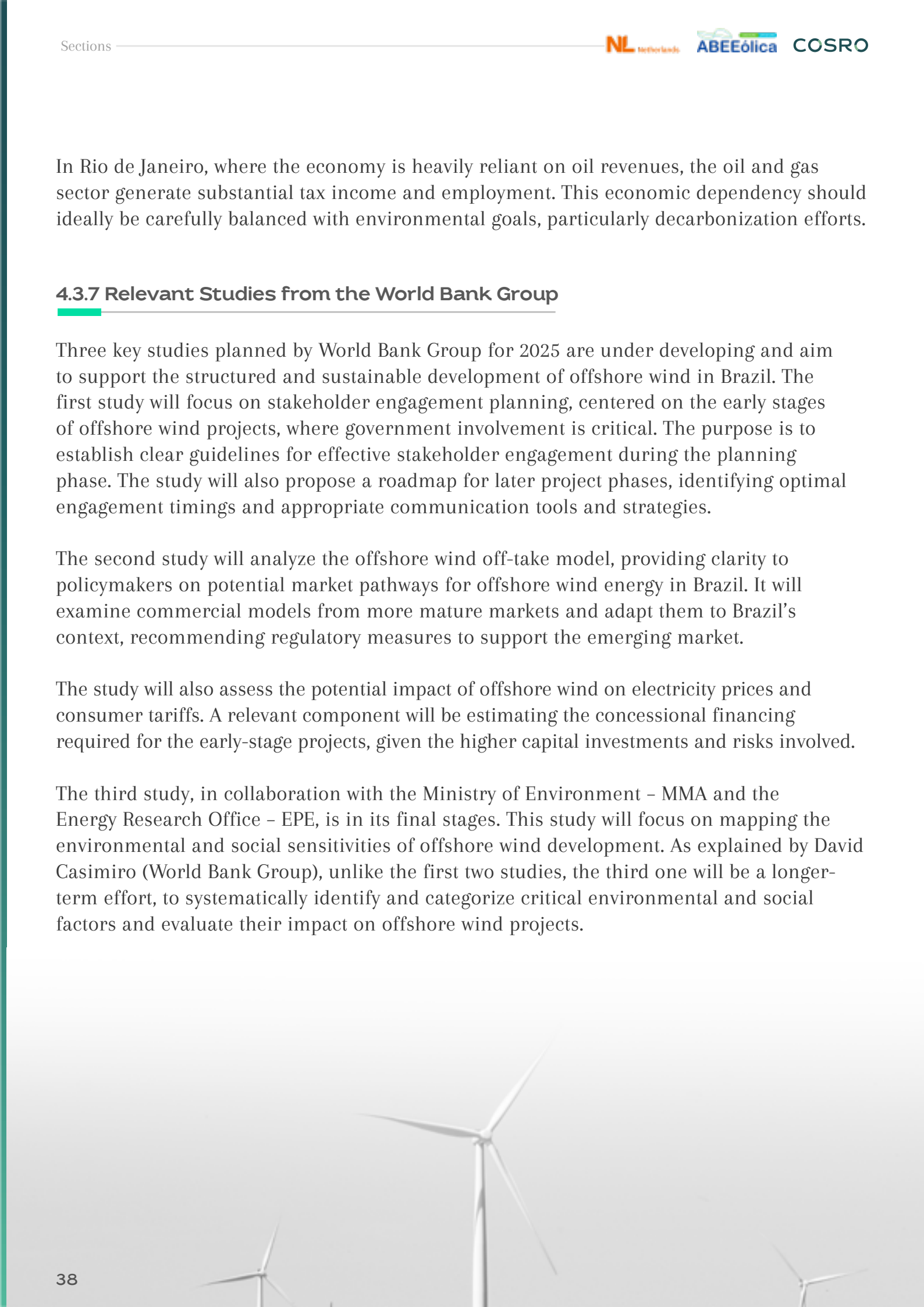
4.3.7 Relevant Studies from the World Bank Group

Three key studies planned by World Bank Group for 2025 are under developing and aim to support the structured and sustainable development of offshore wind in Brazil. The first study will focus on stakeholder engagement planning, centered on the early stages of offshore wind projects, where government involvement is critical. The purpose is to establish clear guidelines for effective stakeholder engagement during the planning phase. The study will also propose a roadmap for later project phases, identifying optimal engagement timings and appropriate communication tools and strategies.

The second study will analyze the offshore wind off-take model, providing clarity to policymakers on potential market pathways for offshore wind energy in Brazil. It will examine commercial models from more mature markets and adapt them to Brazil's context, recommending regulatory measures to support the emerging market.

The study will also assess the potential impact of offshore wind on electricity prices and consumer tariffs. A relevant component will be estimating the concessional financing required for the early-stage projects, given the higher capital investments and risks involved.

The third study, in collaboration with the Ministry of Environment – MMA and the Energy Research Office – EPE, is in its final stages. This study will focus on mapping the environmental and social sensitivities of offshore wind development. As explained by David Casimiro (World Bank Group), unlike the first two studies, the third one will be a longer-term effort, to systematically identify and categorize critical environmental and social factors and evaluate their impact on offshore wind projects.



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4.3.9 Connecting Investors with Offshore Wind Developers

The Brazil Investment Platform for Climate and Energy Transition – BIP is the official program designed to connect investors with offshore wind developers. Its core function is to match large-scale projects, aligned with Brazil's climate and energy transition policies, with potential investors, including private and commercial banks, the Brazilian Development Bank – BNDES, multilateral institutions, sovereign wealth funds, and climate-focused investment funds.

The goal is to create a curated space where government-endorsed projects are paired with suitable capital sources. Drawing a parallel to the earlier-discussed regulatory sandbox, BNDES representative referred to BIP as a "financial sandbox", a controlled environment for testing new instruments and mechanisms to mobilize investment at the scale required for Brazil's ambitious energy transition.
The platform includes both a project and investor selection process, ensuring alignment

> "BIP functions as a matchmaking tool connecting major climate and energy transition projects with a diverse ecosystem of investors, including national banks, multilateral institutions, sovereign wealth funds, and private capital. By ensuring projects align with Brazilian government policies, the platform facilitates a selective process for both projects and investors, promoting targeted investment in sustainable initiatives. While still under development, BIP has already begun publicly showcasing some key projects, such as hydrogen, reforestation, and industrial decarbonization projects."
>
> Renato Santos
> Brazilian Development Bank – BNDES

with national priorities. While still under development, with procedures and criteria being finalized, some projects, including those in hydrogen, reforestation, and industrial decarbonization, have already been disclosed as part of a preliminary selection.

Bloomberg is also collaborating with the platform to connect global financial institutions that may not typically engage with Brazilian counterparts. Their involvement aims to expand the platform's reach and attract a more diverse range of investors.

4.3.10 Local Content and industry signals

In the final discussion of the event, Marcelo Frazão (COSRO) shared lessons from Brazil's experience with local content policies, particularly in the oil and gas sector, and how these could inform offshore wind development. While local content is an important public policy tool, it should be applied strategically, with clear objectives and timelines.

Brazil successfully developed sectors as offshore supply vessels through policies prioritizing national investment. However, rigid, top-down local content requirements can potentially delay investments and raise costs. For offshore wind, one option is to initially focus on pilot projects to demonstrate capabilities and build experience.

As the market matures Brazil could develop a robust and competitive offshore wind value chain, attracting both international and domestic partners. Drawing a parallel to Brazil's success in exporting oil and gas equipment globally, a competitive offshore wind supply chain could achieve similar outcomes.

The significant cost reductions achieved in the Netherlands' offshore wind sector result from a deliberate combination of strategic policies and favorable market conditions. A key factor in his success has been the conscious decision not to impose local content requirements, which played a pivotal role in fostering open competition and attracting a broad range of global participants. This approach has encouraged the entry of international players, intensified competitive pressure, and accelerated the adoption of advanced technologies, all contributing to lower overall project costs.

Government intervention has focused on de-risking investments, creating a stable and attractive environment for private capital. At the same time, the development of larger, more efficient wind farms has generated economies of scale, further enhancing cost efficiency. The Dutch transmission system operator, TenneT, has played a key role in driving the standardization of technology—particularly in substation design—thereby reducing complexity and promoting consistency across projects.

Additionally, innovation has been embedded into the tendering process itself, with Dutch frameworks requiring the integration of new technologies and methods to ensure continued industry advancement.

These combined measures have not only led to a marked reduction in the levelized cost of energy but have also contributed significantly to employment growth across both blue-collar and green-collar segments. The broader economic impact of this policy and market design approach underscores the effectiveness of prioritizing competitiveness and innovation over protectionist local content mandates.

05 Final Considerations and Next Steps

Brazil stands at a pivotal moment in the global offshore wind energy landscape. The sections on this report brought to light a clear consensus: while the country has taken a major step with the enactment of Law No. 15,097/2025, its success hinges on the prompt, efficient, and collaborative implementation of secondary regulations and policy instruments.

Industry representatives underscored the importance of defining a robust regulatory framework that ensures legal certainty, minimizes risks, and builds investor confidence. The Marine Spatial Planning – PEM, while still in development, is a strategic tool to guide sustainable growth, avoid conflicts, and streamline environmental licensing. As implementation measures, regulatory sandboxes and pilot projects were also highlighted as relevant mechanisms to stimulate innovation, test regulatory instruments, and pave the way for scaled deployment.

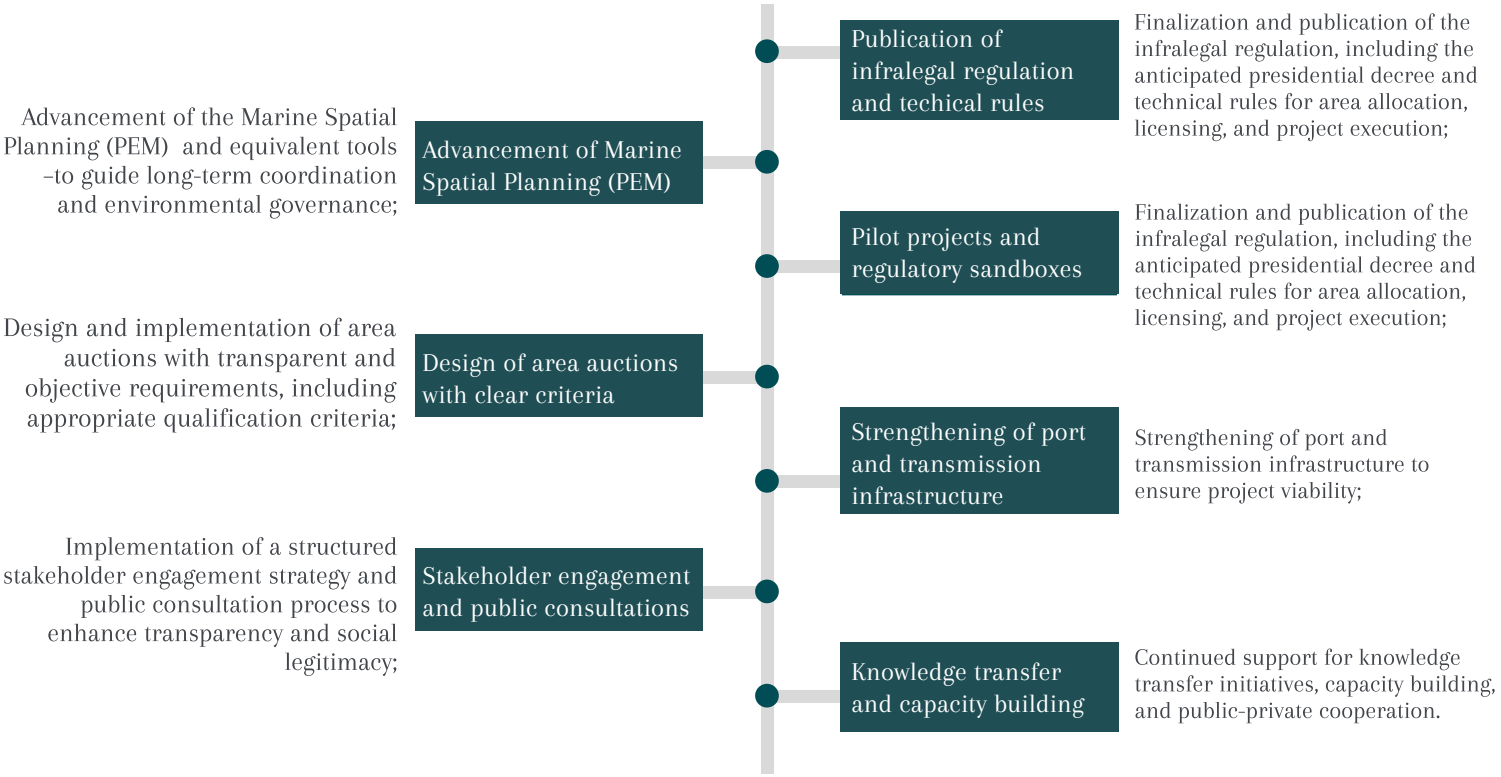
Another recurring theme was the essential role of infrastructure and transmission capacity. Offshore wind projects will have to prepare a pathway considering a strategic plan for grid modernization, port infrastructure readiness, and a strong local supply chain. In this regard, stakeholders emphasized the value of creating enabling conditions for long-term investments and industrial transformation.

Panelists also pointed to the importance of designing transparent and technically viable auctions for the assignment of areas, supported by clear qualification criteria that balance market competitiveness, project feasibility, and national development goals. Early access to development areas, market signals, and reliable project timelines are also necessary to maintain industry engagement and mobilize capital.

International collaboration and knowledge transfer emerged as fundamental enablers for Brazil's offshore wind development. Leveraging global experience and adapting it to local conditions can accelerate regulatory maturity and foster a resilient, innovative, and globally competitive industry.

The path forward includes the following next steps:

The path forward for Brazil's offshore wind development



Brazil is positioned to become a global reference in offshore wind energy.

Brazil has all the elements to become a global reference in offshore wind energy. By aligning regulatory, technical, and financial instruments with a strategic and inclusive vision, the country can unlock significant opportunities for green industrialization, energy transition, and sustainable economic development.

Figure List

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