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BIOWIND

SUSTAINABILITY STRATEGY

D4.5.1
Detailed report outlining a sustainability strategy tailored to the project's objectives

FAEN
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Executive Summary

This deliverable develops the BIOWIND sustainability strategy, designed to support regional partners in strengthening long-term planning for the clean energy transition, with a particular focus on wind energy. It aims to ensure the continuity and uptake of BIOWIND's results by aligning key project findings with territorial policy frameworks, strategic priorities, and stakeholder ecosystems across ten European regions.

The document begins with an overview of the Activity's objectives and its central role in enhancing the proliferation of socially accepted wind energy projects. It then introduces relevant sustainability strategies through the presentation of two case studies, assessing their transferability potential to the BIOWIND territories.

Building on this background, the deliverable also presents the core project outputs in the form of a consolidated set of policy recommendations developed during project implementation. These are followed by a structured overview of partners' key territorial policies, such as regional energy strategies, just transition plans, and operational programmes. The document further synthesises the territorial gaps and needs identified across regions, setting the foundation for targeted action.

The final section of the deliverable introduces the sustainability strategy, organised around three interdependent pillars: environmental, social and political, and economic. These pillars serve as structuring principles for the strategy's vision, objectives, and action streams. The deliverable's last sub-section translates this strategy into concrete actions and policy measures, offering both cross-cutting priorities and tailored recommendations for each region. It also provides practical guidelines for stakeholder engagement, identifying key actors and proposing mechanisms to embed participatory governance into wind energy planning processes.

Taken together, the deliverable outlines a coherent and actionable pathway for BIOWIND partners to promote a just, participatory, and territorially adapted acceleration of wind energy deployment.

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Introduction

This document presents the outcomes of BIOWIND Activity A4.5, which focuses on the formulation of a long-term sustainability strategy to ensure the continuation, implementation, and institutional uptake of the project's policy recommendations beyond its lifetime. The Activity builds on the policy insights and regional analyses developed throughout BIOWIND to provide participating territories with a roadmap for advancing wind energy deployment in a politically acceptable, socially inclusive, environmentally responsible, and economically viable manner.

The overarching objective of the Activity is to translate BIOWIND's findings into concrete strategic directions and policy actions tailored to the realities of each partner region. In doing so, it aims to enhance the coherence of territorial energy policies, strengthen public authority capacities, and promote the integration of wind energy development into long-term regional planning.

By integrating and harmonising policy recommendations across regions, aligning them with environmental, social and political, and economic sustainability pillars, and offering detailed implementation guidance, the Activity seeks to support the proliferation of wind energy projects and reinforces the strategic role of regional and local authorities in driving the energy transition. It also contributes to ensuring BIOWIND's lasting impact on both policymaking and territorial governance across Europe.

Laying the Groundwork: Context, Cases, and Gaps

This section sets the analytical foundation for the BIOWIND sustainability strategy by examining the broader landscape in which it is to be implemented. It reviews relevant approaches in the EU to long-term energy planning, with an emphasis on strategies that prioritise public participation and social and political acceptance in the deployment of wind energy. Drawing on selected case studies, key project outputs, and territorial policy frameworks, the section identifies transferable components and lessons learned that can inform strategic planning in the partner regions. In doing so, it also consolidates insights from regional energy strategies, just transition plans, and operational programmes, alongside a synthesis of territorial gaps and needs identified throughout the project implementation.

Case studies of long-term wind energy strategies in EU regions

This sub-section examines two European regions that have implemented long-term sustainability strategies centered on wind energy. It focuses on the key components of each strategy, their transferability to the BIOWIND territories, and their overall impact, with particular emphasis on how citizen and civil society involvement has influenced social acceptance of wind projects.

The Utrecht and Schleswig-Holstein case studies were selected for their relevance to BIOWIND's objectives and their capacity to offer transferable insights to partner regions. Utrecht exemplifies a densely populated, urbanised region that has recently adopted innovative tools for participatory governance and integrated spatial-energy planning, reflecting an emergent approach to sustainability strategy. In contrast, Schleswig-Holstein —a rural and wind-intensive state— stands out as a long-established wind energy leader, having developed a mature framework for citizen-led energy production, spatial zoning, and regulatory alignment over the past two decades. Taken together, the two cases offer complementary perspectives: one highlighting recent institutional innovation, the other long-term policy consolidation and grassroots mobilisation.

Utrecht Region (Netherlands): Regional Energy Strategy (RES-U16)

The Utrecht Region (known as U16, a coalition of 16 municipalities in and around Utrecht) has developed a Regional Energy Strategy as part of the Netherlands' national Climate Agreement. This strategy is aimed at achieving climate neutrality by 2050, with a major interim

goal of reducing CO_2 emissions 49% by 2030 (compared to 1990).[1] The RES-U16 is a long-term plan focusing on expanding renewable energy (notably onshore wind and solar), while improving energy efficiency and involving local stakeholders.

Key components of the Utrecht RES-U16 strategy include:

- **Clear renewable energy targets:** The U16 region is tasked with generating 2.4 TWh of renewable electricity by 2030 as a stepping stone toward full energy neutrality by 2050. This 2.4 TWh target is part of a national program dividing responsibilities among regions. To meet it, the RES plans call for a mix of new wind turbines and solar PV installations.[2]

- **Wind and solar deployment plan:** After an extensive analysis of potential sites that took place between 2019 and 2020, the region's RES 1.0 plan proposed a comprehensive package for renewable energy deployment, including the installation of 26 large onshore wind turbines across multiple municipalities, and the development of up to 1,300 hectares of solar PV fields (including 800 ha of ground-mounted solar and 300–500 ha of solar panels on large rooftops).[3] Key wind locations identified include the Rijnenburg polder near Utrecht city and sites in other municipalities such as Vijfheerenlanden and Utrechtse Heuvelrug. Notably, earlier plans had capped wind deployment in Rijnenburg and Reijerscop polders at a maximum of 8 turbines, reflecting the limited scope of the initial project. The later expansion to 26 turbines in the full RES 1.0 document illustrates a significant broadening of geographic scope, signalling a region-wide commitment to scaled-up wind energy deployment. The turbines planned are expected to reach up to 270 metres in height, significantly increasing visibility and necessitating structured stakeholder consultation. The solar deployment strategy similarly prioritises spatial diversity and balance, avoiding excessive concentration in specific localities.

- **Integration with spatial planning:** The strategy defines "search areas" for wind and solar energy, which are not fixed but instead serve as indicative zones where projects could potentially be developed. This flexible spatial approach allows for adjustment if specific sites prove technically unfeasible or face local opposition. These areas have

[1] Van der Molen, T., Stam, T., Didion-Peraza, M., Kvasnickova, B., and Pardere, L. (2021). Residents and Renewables - Research Report. Available at: https://www.np-utrechtseheuvelrug.nl/wp-content/uploads/2022/03/Research-report_5B-Residents-and-renewables-_attempt_2021-06-21-16-58-22_5B_Report.pdf.

[2] https://nos.nl/regio/utrecht/artikel/149513-u16-maakt-energieplannen-bekend-26-windturbines-en-tot-1300-hectare-aan-zonne-energie

[3] Ibid.

been visualised through interactive GIS platforms (e.g. U16's ArcGIS StoryMap), reflecting a commitment to transparency and adaptive planning.

Final project locations are expected to be confirmed by the end of 2025, following additional studies and public consultations. To date, only a portion of the RES 1.0 targets has received formal approval. Specifically, a zoning plan for four wind turbines in the Rijnenburg–Reijerscop polder was adopted by the Utrecht city council in June 2024. Although the broader RES objective of installing up to 26 wind turbines across the region has not yet been legally authorised, it remains the strategic aim of the joint municipal alliance. This phased approach —beginning with zoning approval in select areas while preparing others for future rollout— illustrates how Utrecht balances ambition with procedural caution. It is precisely this staged, participatory, and spatially distributed planning model that makes the Utrecht case valuable for regional strategies like BIOWIND, even in the current absence of full implementation.

- **Governance and collaboration:** The RES-U16 process is a collaborative effort between 16 municipal governments and 4 regional water authorities. It involves coordinating local plans under a common regional vision, with a steering committee of local aldermen to lead the effort. An example of this collaboration was appointing a mediator (a former mayor) to reconcile differing views among municipalities during the plan's development. This governance structure is meant to ensure all localities contribute to and share the benefits of the energy transition.

Citizen and civil society involvement

Public involvement in the Utrecht region's wind strategy has been a mix of top-down planning and ongoing consultation. During the initial drafting of RES-U16, direct citizen participation was limited: the concept strategy was largely formulated by governments and experts, with little active input from residents in the early stages.[4] This led to some criticism that the roadmap lacked grassroots engagement. However, as plans become concrete at the project level, extensive public consultation and participation meetings are being organised by each municipality.[5] Officials acknowledge that proposed wind and solar projects "not seldom meet resistance" and thus multiple rounds of local consultation will take place before final decisions.[6] Indeed, the RES process in 2020–2021 included public information sessions and an official

[4] Van der Molen, T., Stam, T., Didion-Peraza, M., Kvasnickova, B., and Pardere, L. (2021). ibid.
[5] https://nos.nl/regio/utrecht/artikel/149513-u16-maakt-energieplannen-bekend-26-windturbines-en-tot-1300-hectare-aan-zonne-energie
[6] Ibid.

comment period, and further participation evenings are planned through 2025 to address concerns and refine project plans.

Notably, Utrecht leaders have emphasised the need to involve citizens to build acceptance. As one regional coordinator put it, *"We want to bring along all residents and stakeholders. If we looked only at the numbers we should go faster, but we especially want to get as many people on board as possible"*.[7] This underscores that the region is deliberately balancing climate targets with the pace of public buy-in by actively prioritising social support, even if that means a more gradual implementation. There is also a recognised need to involve younger people in the dialogue (since many who attend town-hall meetings tend to be older than 30), to ensure the energy transition has broad societal backing.

Increasing social acceptance

To increase the acceptance of wind projects, the Utrecht region is implementing measures to inform and reassure the public. For example, in response to common concerns about noise, visual impact, and health effects of wind turbines, the national health institute RIVM and the regional health service (GGD) are establishing an expertise center on wind turbine impacts. This center will provide objective information about sound, vibrations, and safety, which local officials consider important for educating citizens and local councillors.

Utrecht's RES strategy does not include a fixed turbine-level tax or nationwide land-lease scheme akin to Germany's feed-in/community profit-sharing models that will be presented in the next case study. Instead, the region has introduced a provincial-level framework —ratified on June 26, 2024— which mandates at least 50% local cooperative or municipally managed ownership of new wind energy installations.[8] This local-ownership requirement encourages financial engagement and community buy-in, though payment structures (e.g., lease or revenue-sharing models) remain to be determined at the project level. On the other hand, municipalities retain the ability to collect property taxes on wind turbines, comparable to general country-level taxes, but there is no specific wind-turbine tax per se identified in current regional plans.

Many U16 municipalities already have active energy cooperatives, and these community groups can co-develop solar or wind projects, giving citizens an ownership stake and voice. Although the RES-U16 document itself is a high-level strategy, it exists within a broader Dutch context that requires citizen participation in renewable energy projects (the Dutch Climate

[7] Ibid.
[8] https://innovationorigins.com/en/utrecht-pioneers-with-citizen-led-wind-energy-projects.

Agreement mandates that communities be involved and can share in profits of local projects). In practice, in conjunction with the provincial-level framework mentioned above, this means upcoming wind farms in the Utrecht region are likely to offer community benefit arrangements or co-ownership opportunities to improve local acceptance (as seen elsewhere in the Netherlands).

It's worth noting a local case in the U16 area that highlights the impact of citizen involvement on strategy. In the municipality of Utrechtse Heuvelrug, a separate climate and energy roadmap was developed with direct input from residents and stakeholders. That local plan set an ambitious goal of climate neutrality by 2035 and aligned with many regional and national objectives (energy-efficient buildings, solar rollout). However, it deliberately de-emphasised wind turbines due to lack of public consensus. Residents in that area expressed strong reservations about wind, so the plan focused more on solar and efficiency. This demonstrates how intensive citizen participation can shape outcomes: the community's voice led to choosing development pathways with higher local acceptability (even if it meant contributing less wind capacity). The trade-off is evident: while the region's overall strategy calls for wind power, some localities opt for fewer turbines because of social resistance. The Utrecht regional authorities are attempting to navigate these differences by finding locations where wind projects have sufficient support, and by gradually building acceptance through dialogue and trust-building measures.

Transferability to BIOWIND territories

The Utrecht RES-U16 model offers several transferable insights for other territories aiming to implement wind energy in a socially sustainable way. Firstly, the **regional coordination** approach where multiple municipalities jointly plan renewable deployment could be applied to BIOWIND territories, especially if they consist of clusters of communities or holistic regional units.

Importantly, the approach of identifying "search areas" through **regional mapping** is no longer merely a voluntary innovation, but a requirement under the revised Renewable Energy Directive (RED III). Under Articles 15b and 15c, Member States must complete spatial mapping of areas needed for renewables by May 2025 and designate Renewable Acceleration Areas by February 2026.[9] Within this legal context, the Utrecht experience —especially its transparent mapping via interactive platforms— is a valuable example of compliant and participatory implementation. BIOWIND regions can emulate this process by mapping wind

[9] https://energy.ec.europa.eu/document/download/ad850f73-ab84-4ce1-9e66-7430f8f0c7e5_en?filename=SWD_2024_124_1_EN_autre_document_travail_service_part1_v3.pd.

viability zones, grid access, environmental sensitivity, and land-use compatibility, all enriched by structured stakeholder input. This ensures early transparency, regulatory alignment, and resilience to top-down backlash.

However, Utrecht's experience also teaches that technocratic planning must be paired with **genuine public engagement**. A key lesson to transfer is the importance of **involving citizens from the outset of a wind farm project**. BIOWIND territories would benefit from creating participatory platforms (e.g. citizens' assemblies, stakeholder workshops) during the strategy development phase, and not just during project permitting. The RES-U16 saw pushback in part because citizens felt decisions were made "above their heads" initially. To avoid that, other regions should embed public participation in drafting long-term energy plans. This could mean establishing local energy forums or advisory councils including civil society representatives, which can advise on the siting and design of wind projects early on. As research on social acceptance suggests, participation must be "genuine rather than pro forma": people need to see that their input can alter outcomes, such as adjusting turbine placement or adding mitigation measures.[10] By following this principle, BIOWIND can increase local buy-in significantly.

Another transferable component is Utrecht's use of **fact-based engagement tools** to address concerns. The idea of an independent **expert center on wind impacts** could be emulated in other regions to combat misinformation and unfounded concerns. Providing accessible, science-based information (on noise levels, health studies, environmental effects) via seminars or informational websites can help demystify wind technology for the public. Likewise, Utrecht's intention to involve **youth and underrepresented groups** is noteworthy. In a similar vein, BIOWIND territories could organise educational programs in schools and outreach to younger demographics so that the next generation is informed and supportive of wind projects.

Finally, Utrecht's strategy underscores balancing ambition with acceptance. The concept of setting a **realistic pace** is crucial. Other regions should set bold renewable targets, but also create flexibility in implementation timelines to allow consensus-building. For example, Utrecht's plan to finalise project decisions by 2025, a few years after the initial RES publication, provides time for additional participation rounds. BIOWIND territories could similarly **phase**

[10] Maleki-Dizaji, P., del Bufalo, N., Di Nucci, M.-R., & Krug, M. (2020). Overcoming Barriers to the Community Acceptance of Wind Energy: Lessons Learnt from a Comparative Analysis of Best Practice Cases across Europe. *Sustainability*, *12*(9), 3562. https://doi.org/10.3390/su12093562

their wind deployment in stages, with checkpoint reviews to ensure social support is keeping pace. By doing so, they can avoid severe backlashes and delays.

Schleswig-Holstein (Germany): Community-driven wind energy development

In contrast to Utrecht's relatively recent planning effort, Schleswig-Holstein (SH), Germany's northernmost state, offers a long-established case of wind energy expansion underpinned by community involvement and supportive policy. Over the past few decades, Schleswig-Holstein has become a powerhouse of wind energy as part of Germany's energy transition. By 2017, SH's onshore wind turbines were generating over 11.3 TWh annually, plus nearly 6.9 TWh from offshore wind farms in its coastal waters.[11] This output is far in excess of the state's own electricity needs, making SH a net exporter of renewable power and one of the "wind dynamos" of Europe.

Key components of Schleswig-Holstein's wind strategy include:

- **Ambitious wind energy targets and zoning:** Schleswig-Holstein embraced wind energy early, setting ambitious targets to harness its strong wind resources. The state's goal has effectively been to maximise renewable generation: by 2015, SH aimed to produce 300% of its electricity from renewables (exporting surplus) in the long term. To facilitate this, state authorities integrated wind into spatial planning, as designated wind priority zones were established across the state. In fact, SH doubled the land area allotted for wind turbines between 1998 and 2012, reaching about 1.7% of the state's land dedicated to wind farms.[12] By comparison, much larger states like Bavaria had only 0.1% land use for wind, highlighting SH's proactive allocation of space for wind development. Concentrating turbines in these approved zones helped streamline permitting and reduce random sprawl, while signalling political commitment to wind power.

- **Community ownership and investment:** The hallmark of Schleswig-Holstein's approach is the prominence of community-owned wind parks. A large share of the wind turbines in SH, especially in areas like North Frisia, are owned by local residents organised as cooperatives or investor groups. By the late 2010s, roughly 40% of Germany's renewable capacity was owned by individuals or energy cooperatives,[13] and SH was a leading example of this trend. In North Frisia, about 90% of the 750 wind turbines erected were inside citizen-owned parks. These cooperatives allow farmers,

[11] https://hakaimagazine.com/features/germanys-winds-of-change/
[12] Chezel, E.. Nadaï. A. (2018). Energy made in Northern Friesland: fair enough?. *Local Environment*, pp.1-18. Available at: https://shs.hal.science/halshs-01962717v1/document.
[13] Ibid.

villagers, and municipal entities to buy shares in wind projects. The financial returns flow back to the community, creating local income streams. For instance, the Bürgerwindpark Reußenköge in SH has 86 large turbines; nearly all of Reußenköge's 325 residents are shareholders, and this participation "has made the residents wealthy and vocal supporters of wind power" [14] This widespread local ownership is a cornerstone component: it aligns the wind farms with community interests, thereby creating social and political support.

- **Fair distribution of benefits:** Beyond formal ownership, SH has pioneered mechanisms to ensure wind project benefits are broadly shared. One such component is the use of land lease pooling models. Instead of only the few landowners who host a turbine getting all the lease payments, in many SH projects the lease revenues are pooled and distributed among a wider circle of local landowners (for example, farmers in the vicinity).[15] This approach, used in Schleswig-Holstein and exemplified also by the Finnish example that was addressed in the BIOWIND project through the participation of **South Ostrobothnia**, prevents jealousy and conflict in rural communities by spreading the financial gains from wind power to those who are impacted by the turbines.

- **Municipal revenue and community funds:** At the community level, Schleswig-Holstein established practices whereby local municipalities receive a direct share of wind park revenues or profits. In some projects, especially when turbines are on municipal land, a percentage of the income from electricity generation is paid into the town's budget or a community fund.[16] This money is then used for local development: improving infrastructure, supporting schools or clubs, or even offsetting local taxes. As such, it generates not only social but also political support.

- **Procedural and informal participation:** Another key component is the strong culture of public participation in planning. In Schleswig-Holstein, wind farm proposals typically go through thorough local consultation. Formal processes like public hearings and municipal council approvals are required by law, but SH goes further with **informal participation formats**. Crucially, stakeholders in SH emphasise that participation must be meaningful: not just a box-ticking exercise, but giving locals a real say in shaping projects.

[14] https://hakaimagazine.com/features/germanys-winds-of-change/
[15] Maleki-Dizaji, P., del Bufalo, N., Di Nucci, M.-R., & Krug, M. (2020). ibid.
[16] Ibid.

- **Local champions and trust-building:** The social success of wind in SH also comes from leadership at the community level. Local mayors, farmers, and entrepreneurs known in the community have often acted as champions for wind projects, mediating between citizens and developers. In one noted case, the mayor of Neuenkirchen (SH) helped bring stakeholders together and even had the municipality invest a symbolic €20,000 of its own funds into a community wind farm; a gesture to show the town's commitment and confidence in the project.

Impact on social acceptance

The **direct involvement of citizens in ownership and decision-making** in Schleswig-Holstein has had a profound impact on social acceptance. In communities where these practices are in place, wind farms are largely viewed as positive assets. Surveys and anecdotal evidence indicate very high local acceptance rates. For example, in the model region of North Frisia, acceptance of renewable energy projects is often said to be around 90% — dramatically higher than in regions where people feel projects are imposed from outside. The Reußenköge vs. Waabs comparison highlights this: in Reußenköge, where almost everyone is a co-owner of the 86-turbine wind park, residents have not protested the massive build-out of turbines. They have remained in the area and report no issues with health or noise, given that they were part of planning and share the profits. By contrast, in Waabs (a similar rural town in SH) the few turbines present are owned by an outside developer, and locals there formed an anti-wind initiative as more external projects were slated to arrive. This side-by-side case in the same region underscores **that when local municipalities and communities are treated as partners rather than passive hosts, acceptance soars**.

Another outcome is that where opposition does arise in SH, authorities and developers have learned to address it constructively. The state has facilitated **persistent dialogues with concerned groups**. There is also an emphasis on **transparency**, making all information about wind projects (economic, environmental) readily available to the public. Schleswig-Holstein's developers typically hold open information sessions and publish impact studies, which helps prevent misinformation from fueling opposition.

Furthermore, **environmental and aesthetic mitigation** has been part of SH's strategy to sustain public support. For example, the state has undertaken initiatives in **repowering older wind farms**. Repowering not only improves efficiency but also demonstrates responsiveness to landscape concerns, hence bolstering acceptance. In some areas, developers also invested

in restoring nearby peatlands to compensate for the presence of turbines.[17] While these indirect compensation measures are somewhat less influential than financial participation, they still contribute to a narrative that wind projects can enhance the community.

Transferability to BIOWIND territories

The Schleswig-Holstein model offers rich lessons for transferring to other regions aiming for long-term wind energy deployment. At its core is the principle of **"energy democracy"**; that is, involving and financially empowering local citizens in renewable energy. For BIOWIND territories, adopting a **community-centric approach** could dramatically increase social acceptance. Key transferable strategies include:

- **Encouraging local ownership:** Ensuring that local residents can become co-investors or shareholders in wind projects is perhaps the most powerful tool. BIOWIND territories could set up frameworks for energy cooperatives or joint ventures between communities and developers.
- **Benefit sharing mechanisms:** The land lease pool model from SH is easily replicable in agrarian BIOWIND regions, where pooling agreements can be promoted so that all landowners in a turbine's immediate radius receive some compensation. Likewise, mandating and formally regulating a community benefit fund ensures everyone sees tangible benefits. As was found during the project, Finnish regions already have a similar policy framework. BIOWIND territories can institute such policies, which have been proven to reduce opposition by addressing perceptions of fairness.
- **Stakeholder participation processes:** Transferability is not just about economics; procedural justice matters too. Schleswig-Holstein's example shows the value of ongoing dialogue. BIOWIND regions should implement robust participation processes: regular town hall meetings, community liaison committees for each wind project, and opportunities for local input on siting and design. Importantly, participation must be constant throughout the planning and implementation of projects.
- **Local leadership and capacity building:** Helping local champions emerge is a more abstract, but vital, transferable element. BIOWIND could organize knowledge exchanges where pioneers from places like Schleswig-Holstein share their experiences with communities just starting out. Programs to train community leaders in renewable energy project development would empower them to take initiative. Over

[17] https://www.interregeurope.eu/find-policy-solutions/stories/increasing-the-social-acceptance-of-wind-energy

time, this builds social capacity so that wind farms are seen as community endeavors rather than external impositions.

- Generating local political support through financial mechanisms: One of the most transferable and strategically impactful aspects of the Schleswig-Holstein model is the alignment of financial incentives with municipal interests. Measures such as local taxation on wind turbines, structured redistribution of land lease income, and the formalisation of community benefit funds have proven to be not only effective in securing social support but also essential in generating sustained political backing at the local level. These mechanisms create a clear fiscal interest for municipalities to host and promote wind energy projects, shifting the perception from external imposition to local opportunity. This dimension of political support—distinct from but complementary to community acceptance—has been critical in scaling wind deployment in both Germany and Finland. BIOWIND territories would benefit from integrated policy proposals that combine these instruments into a coherent framework for local empowerment and incentive alignment, especially in rural or politically hesitant areas.

In conclusion, the case of Schleswig-Holstein demonstrates that long-term sustainability strategies for wind energy can flourish when citizens are structurally involved and financially empowered. Community ownership, benefit sharing, and robust participatory processes have contributed to impressive outcomes in both energy production and social license. The case of Utrecht, while more recent and less mature in implementation, illustrates a different model focused on regional coordination and early-stage spatial transparency.

Both examples offer lessons for BIOWIND territories, but they also underscore a deeper distinction. While participatory schemes are essential for securing social support —particularly among the undecided or neutral segments of the population— they are not in themselves sufficient to guarantee political support. Evidence from BIOWIND regions and from studies such as Bart Decraemer's[18] suggests that political support may be more directly shaped by mechanisms that align wind energy development with tangible municipal or economic benefits, such as local taxation, structured land lease redistribution, and formalised community funds.

[18] Bart Decraemer, Coordinator Renewable Energy at the Province of West-Flanders, presented his "Study on public support for wind energy in West-Flanders, Belgium" as part of the BIOWIND A3.4 Study Visit in Finland that was organised by the **Regional Council of South Ostrobothnia.** According to his study, 75% of the population living near turbines (less than 1 km away) was in favor; 5% in the local population is against; while 20% is neutral on the matter. This is not a big difference when compared to the 90% acceptance pinpointed in the model region of North Frisin that was mentioned above.

These measures not only mitigate neighbour conflicts but also create clear incentives for municipalities to back renewable projects.

Therefore, the contrast between Utrecht and Schleswig-Holstein suggests that both forms of support—social and political—must be actively cultivated, with particular attention to the political economy of local governance. Sustainable wind development, especially in rural or contested territories, is unlikely to advance without deliberate policies that generate political will as much as public acceptance. Recognising and addressing this dual challenge is perhaps the most transferable insight these case studies can offer.

Relevant project outputs and policy recommendations

The BIOWIND project has adopted a web-based GIS consultation platform to facilitate early-stage stakeholder engagement on wind energy planning. The pilot action, implemented in two phases, combines an Online Interaction Phase, where local communities interact with spatial data on site selection and biodiversity via the GIS tool, and an Onsite Stakeholder Consultation Phase, involving structured, face-to-face dialogue with key stakeholder groups including public authorities, wind developers, environmental NGOs, and local residents. This adapted approach seeks to reinforce inclusive participation and spatial transparency in the planning of wind energy infrastructure.

In addition to this, the BIOWIND project has generated a suite of high-level policy recommendations aimed at improving territorial governance, streamlining permitting processes, enhancing public participation, and supporting environmentally and socially responsible wind energy development. The structure and content of the recommendations presented below are drawn from Deliverable A4.4, which formalised shared policy directions across regions through a joint peer-review process. These have been further enriched through the integration of insights from other project outputs and thematic policy briefs — covering topics such as biodiversity protection, decommissioning strategies, civic participation, and regional planning tools. Together, they reflect the core instruments and knowledge resources developed within BIOWIND. The recommendations are organised under five key thematic areas and constitute a shared roadmap to foster coherent, inclusive, and sustainable renewable energy planning across the participating regions.

Community engagement and public participation

A common finding across BIOWIND territories is that the success of wind energy projects hinges on fostering trust, inclusivity, and sustained dialogue with local communities. Public engagement should not be treated as a box-ticking exercise for legal compliance but must be embedded into the core of planning and implementation processes. This means creating channels for structured, ongoing interaction throughout the project lifecycle: from early-stage visioning and site identification to final design, operation, and eventual repowering or decommissioning.

These **lifecycle-long consultation** processes should include regular opportunities for feedback, context-specific consultations tailored to local needs and concerns, and mechanisms for grievance redress and transparent information sharing. Building community confidence through such participatory governance is essential for achieving social licence and

long-term support for wind development. Specific tools, such as **community engagement guidelines** for developers and educational initiatives to improve awareness about wind energy, can help close knowledge gaps and encourage community ownership of the energy transition.

To further reduce informational and procedural asymmetries, BIOWIND recommends the establishment of **regional wind energy centres**. These centres would serve as public-facing hubs offering training seminars, operational and financial guidance, and communication campaigns that build awareness about the benefits, responsibilities, and opportunities tied to wind energy development. As stressed in the Civic Participation Policy Brief, this decentralised infrastructure can also play a critical role in empowering marginalised or underrepresented groups and fostering inclusivity.

Regulatory and governance reforms

Administrative complexity, overlapping responsibilities, and inconsistent frameworks continue to hinder the timely and coordinated development of wind energy projects. BIOWIND recommendations stress the importance of **streamlining permitting processes** by integrating environmental, urban planning, and energy authorisations into unified procedures. Regulatory clarity —especially around siting criteria, setback distances, and zoning— is essential to ensure fair, efficient, and context-sensitive deployment. The **use of digital tools**, such as GIS-based decision-making platforms and interactive cartographic viewers, is encouraged to enhance transparency. Furthermore, strong **regulatory compliance monitoring** mechanisms are needed to ensure enforcement of environmental and social standards over the project lifecycle. **Coordination across governance** levels must be improved through clearly defined mandates and institutionalised communication channels.

Finally, to support **wind energy communities** (WECs), partners advocate for the development of a **consistent regulatory framework** that enables collective ownership and community co-investment in renewable energy infrastructure. Public consultation processes should evaluate and refine such frameworks in a transparent and participatory manner. Clear permitting procedures, financial incentives, and capacity-building programmes for emerging WECs —particularly in low-income areas— can help ensure these participatory forms of energy governance are accessible, sustainable, and socially embedded.

Environmental management and biodiversity protection

The ecological dimension of wind power development demands stronger and more systematic integration into planning processes. BIOWIND partners identified the need for standardised

but context-sensitive **environmental monitoring systems**, with emphasis on habitat loss, bird and bat collisions, and cumulative biodiversity impacts. In line with the biodiversity policy brief produced during project implementation, several further recommendations have been added to ensure responsible stewardship of biodiversity.

A central proposal is to embed thorough and **mandatory Environmental Impact Assessments** (EIA) as integral to the permitting process. These assessments should be complemented by robust Environmental Management Plans and Systems, aligned with recognised **standards** to ensure accountability and transparency. **Involving local stakeholders** —such as environmental NGOs, civil society groups, and mountaineering clubs— can improve the quality of assessments, incorporating situated ecological knowledge.

The brief also promotes the use of **advanced technological tools** for predictive modelling and big data analysis, including telemetry tracking and early warning systems like thermal and bio-acoustic monitoring, which can support shutdown-on-demand or automatised mechanisms. The application of the **mitigation hierarchy** (that is, prioritising avoidance over restoration) is reaffirmed as a guiding principle for planning, operation, and decommissioning phases. Proposals include the establishment of **adaptive assessment and adaptive management** protocols —where real-time environmental insights feed into project adjustments after construction—, joint monitoring programmes involving NGOs and developers, the creation of spatial buffer zones to protect ecologically sensitive areas, and the development of emergency response plans to address biodiversity risks from extreme weather or technical failures.

Sustainable decommissioning remains a critical policy area. Recommendations include setting legal and financial provisions for full site restoration, enforcing the reuse and recycling of turbine components, and avoiding landfill disposal whenever feasible. **Public awareness campaigns** and biodiversity education initiatives are also encouraged to cultivate long-term environmental responsibility and enhance stakeholder support for wind projects.

Socioeconomic and financial support mechanisms

Ensuring that wind energy projects deliver tangible benefits to host communities is vital for their long-term viability. BIOWIND's policy proposals include the adoption of tailored **compensation schemes** —such as community trusts and local environmental funds, reduced energy tariffs, land lease payments, land lease redistribution, and municipal tax revenues— based on local needs and expectations. **Shared ownership models** are highlighted as effective tools for enabling local investment and enhancing the legitimacy of wind energy developments. These can take the form of cooperative financing schemes, direct community

co-ownership of projects, and municipal or regional co-ownership of projects. In parallel, **targeted financial instruments** such as differentiated feed-in tariffs or low-interest loans should be made available for small-scale projects, especially in territories with limited access to capital or low development capacity. **Decommissioning guarantees**, along with improved regulatory framework for environmental bonds, are recommended to ensure proper site restoration and long-term project accountability.

Planning and capacity development

Strategic planning capacity remains uneven across the territories, and BIOWIND has sought to address this by promoting **integrated, multi-criteria spatial planning** methods. These planning approaches should balance technical feasibility with environmental constraints and social acceptability, ideally through participatory mapping processes. **Offshore wind potential**, though not uniformly present, should also be incorporated into regional planning frameworks where relevant. To enhance implementation, **inter-municipal collaboration** is recommended as a way to pool resources, harmonise siting decisions, and share infrastructure costs. A cross-cutting issue throughout all policy areas is the need to improve **institutional and human capacity**. Training programs for public officials, planning authorities, and environmental experts are necessary to build technical knowledge on permitting, spatial planning, project management, and community engagement.

BIOWIND Policy Recommendations

COMMUNITY ENGAGEMENT AND PUBLIC PARTICIPATION

- Mandatory consultation processes
- Participatory governance
- Stakeholder collaboration platforms
- Community engagement guidelines
- Regional wind energy centers
- Training seminars & communication campaigns

REGULATORY AND GOVERNANCE REFORMS

- Streamlining permitting processes
- Integrating authorisations
- Regulatory clarity
- Digital tools for spatial planning
- Compliance monitoring
- Coordination across levels
- Framework for collective ownership and co-investment

ENVIRONMENTAL MANAGEMENT AND BIODIVERSITY PROTECTION

- Standardised environmental monitoring
- Mandatory EIAs
- Involvement of local stakeholders in assessments
- Advanced technological tools for monitoring
- Application of the mitigation hierarchy
- Sustainable decommissioning
- Practise adaptive assessment & management

SOCIOECONOMIC AND FINANCIAL SUPPORT MECHANISMS

- Transparent, regulated and universal compensation schemes (re: landleases, funds, community trusts and taxation
- Shared ownership models
- Cooperative financing and community co-ownership
- Targeted financial instruments
- Decommissioning guarantees

PLANNING AND CAPACITY DEVELOPMENT

- Integrated, multi-criteria spatial planning methods
- Incorporation of offshore wind potential
- Inter-municipal coordination
- Training programs for public officials and experts

Policy landscape across partner regions

This sub-section provides an overview of key territorial policy frameworks relevant to wind energy development across BIOWIND partner regions. It highlights strategic documents such as energy strategies, just transition plans, wind energy targets, and regional operational programmes, outlining the institutional landscape in which the sustainability strategy will be embedded and implemented.

Region of Western Greece

The **Region of Western Greece** operates within a multi-level policy framework that combines national strategic objectives, regional programming, and targeted financial incentives to support the deployment of renewable energy, including wind power. While the region does not currently have a dedicated Just Transition Plan, it has adopted specific energy targets and implements a mix of instruments that reflect a broader commitment to sustainable energy transition. These instruments are relevant to the long-term impact goals of the BIOWIND project.

At the national level, the Greece's *National Energy and Climate Plan (NECP*) for the period 2020–2030 defines the country's principal strategic direction in the energy transition and includes provisions for the promotion of wind energy. The NECP is currently under revision, with changes expected within the project timeframe (by 2027), as noted by the regional partner. While the plan operates at the national level, it forms the reference framework for energy policy implementation across all regions.

At the regional level, the primary instrument is the *Operational Programme of Western Greece 2021–2027*. This programme serves as the basis for the use of Cohesion Policy funds in the region and has been selected by the **Region of Western Greece** as the policy instrument targeted for improvement through the BIOWIND project. The programme is operational at the regional level and functions as a strategic planning tool for economic and environmental development priorities.

Complementing the regional programme is a financial incentive initiative launched under Action 1.i.1 of the region's innovation support framework.[19] Entitled *RESEARCH & INNOVATION IN WESTERN GREECE 2024*, this call for proposals offers grants of up to €675,000 to regional enterprises, especially those collaborating with research institutions. The

[19] https://dytikiellada.gr/call_1-i-1-1-1/

eligible thematic areas include renewable energy systems, hybrid electricity systems, and offshore or floating wind energy technologies. Though focused on research and development, this instrument contributes directly to the local innovation ecosystem surrounding wind energy and is particularly important for supporting early-stage offshore wind developments, a priority echoed in national-level strategic planning.

In addition to these instruments, the region has defined specific renewable energy targets. These include a total renewable electricity capacity of 23,500 MW by 2030 and 46,200 MW by 2040. Within these targets, onshore wind is expected to reach 9,500 MW by 2030 and 10,200 MW by 2040, while offshore wind is targeted at 9,800 MW by 2040. These targets reflect the region's strategic ambition to scale up both onshore and offshore wind generation, anchoring future planning activities and infrastructure investments in clearly defined benchmarks.

Although there is currently no regional Just Transition Plan in place, the existing policy mix offers a foundation upon which more inclusive and long-term strategies for wind energy can be built. In this respect, the BIOWIND project can play a catalytic role by promoting inclusive planning processes and the establishment of participatory structures that could inform future transition frameworks. By embedding stakeholder engagement and biodiversity safeguards into formal governance instruments, the project can contribute not only to the region's wind energy ambitions but also to the broader sustainability of its territorial energy transition.

Region of South Ostrobothnia

South Ostrobothnia operates within a structured policy environment that promotes renewable energy deployment, low-carbon innovation, and circular economy development. While the region does not define specific renewable energy capacity targets or dedicated wind energy quotas, it has adopted a set of policy instruments that collectively support the uptake of renewable energy and provide an enabling context for the integration of tools and approaches introduced through the BIOWIND project.

A critical policy instrument is the *Climate and Circular Economy Roadmap of South Ostrobothnia (2022–2035*).[20] This regional strategy outlines the key orientations for promoting climate neutrality and resource efficiency, with a clear emphasis on supporting renewable energy production. The roadmap includes wind energy among the targeted sectors and highlights the importance of fostering research, development, and innovation in both combustion and non-combustion-based low-carbon technologies. Although it does not set

[20] https://epliitto.fi/aluesuunnittelu-ja-liikenne/ilmastotyo/

quantitative targets for wind energy, it defines a strategic trajectory aimed at strengthening regional energy self-sufficiency and advancing climate mitigation.

Complementing this roadmap is the *Just Transition Plan of South Ostrobothnia* (2022–2030).[21] While the region is not among the most heavily industrialised or coal-dependent areas in Finland, the plan identifies a range of measures to reduce carbon emissions and support clean energy development. These include investments in renewable energy solutions, bio- and circular economy technologies, and energy efficiency improvements. The plan does not include specific provisions for wind energy projects, but its emphasis on innovation and decarbonisation creates an overall favourable policy context.

Another core policy instrument is the *Regional Plan of South Ostrobothnia*, which serves as the guiding strategic document for territorial development. This instrument includes policy objectives related to renewable energy. It functions as a key reference point for planning decisions and regional coordination and has been identified as the instrument to be addressed through the BIOWIND project.

Finland's national targets further shape the regional context. The country aims to cover over 50% of final energy consumption with renewable sources by 2030. While these targets are not broken down at the regional level, they contribute to setting the strategic backdrop against which **South Ostrobothnia**'s regional energy policies operate.

Together, these instruments provide a coherent framework that supports the region's ambitions in renewable energy development. Their relevance to the BIOWIND project lies in their openness to innovation, climate-responsive planning, and the integration of clean energy strategies into broader territorial development objectives. Importantly, this favourable policy context is complemented by two nationally anchored mechanisms that have played a pivotal role in enabling wind farm development and securing political support in the region. First, Finland's statutory municipal taxation scheme for wind turbines—based on annual tax revenues per installed turbine—creates a direct financial incentive for municipalities to support wind projects, ensuring that local authorities see tangible public benefits. Second, land lease income in Finnish wind projects is often redistributed among a wider group of neighbouring landowners rather than limited to individual hosts. This approach reduces local opposition and fosters a sense of fairness and collective benefit. In South Ostrobothnia, both mechanisms

[21] https://epliitto.fi/jtf-etela-pohjanmaalla/

have contributed to broad political acceptance and facilitated a more stable environment for wind energy expansion.

Zemgale Planning Region

The **Zemgale Planning Region** participates in the BIOWIND project with a relatively undeveloped formal policy environment in relation to wind energy and broader clean energy planning. The region does not currently have a regional energy strategy, a Just Transition Plan, or any defined renewable energy targets at the local, regional, or national level applicable to its territory. It also lacks specific financial incentives or policy instruments focused on the promotion of wind energy.

The core strategic framework selected for BIOWIND intervention is the *Zemgale Planning Region Development Programme 2021–2027*. This document serves as the region's principal planning instrument and is intended to guide territorial development across a range of thematic priorities throughout the EU programming period. Although the programme does not presently include explicit measures or objectives related to wind energy, it constitutes the primary institutional vehicle through which wind-related planning considerations can be introduced.

Within the scope of the BIOWIND project, the region aims to improve this development programme by integrating new tools and methodologies that foster biodiversity-sensitive planning and stakeholder engagement in the context of wind energy deployment. The absence of other energy-related instruments at the regional level underscores the strategic importance of this programme, both as a locus of intervention and as a platform for long-term sustainability integration.

The region's participation in BIOWIND offers an opportunity to embed energy transition considerations in a planning environment that is currently in an early stage of strategic development. The *Development Programme* thus provides the institutional foundation upon which more detailed and sector-specific approaches may be constructed, supporting the long-term relevance and territorial uptake of the project's outcomes.

Northern and Western Region of Ireland

The Northern and **Western Region of Ireland**, represented in the BIOWIND project by the **Northern and Western Regional Assembly (NWRA**), operates within a multi-level governance framework in which key responsibilities for energy and climate policy are defined at the national level. The region does not have a dedicated regional energy strategy or a regional Just Transition Plan. Its role in clean energy planning and implementation is primarily exercised through national strategic frameworks and the statutory *Regional Spatial and*

Economic Strategy (RSES), which functions as the central planning instrument selected for improvement within the scope of the BIOWIND project.

The RSES is a legally mandated planning framework that supports regional development priorities and aligns with the objectives of Ireland's *National Planning Framework*. While not an energy strategy per se, the *RSES* serves as the institutional platform through which the **NWRA** integrates national targets and policy directions into regional planning. According to the partner's input form, the *RSES* will also serve as the mechanism for monitoring the integration of BIOWIND project outcomes, including enhanced community participation and the preservation of ecologically sensitive areas, with expected implementation by 2027.

National energy policy sets the key targets to which the region is aligned. Ireland aims to achieve an 80% renewable electricity share by 2030. This includes a minimum of 9 GW of onshore wind capacity and 5 GW of offshore wind capacity by the same year. These national objectives define the policy context within which the **NWRA** operates, even though they are not disaggregated at the regional level.

In addition, a forthcoming provision under the updated *National Planning Framework (National Policy Objective 76)* will require all local authorities to plan for the delivery of national energy capacity targets. This provision is expected to further formalise the role of subnational planning bodies in enabling wind energy deployment through spatial compatibility and governance alignment.

The **NWRA** did not identify any additional regional-level financial incentives or dedicated wind energy policies beyond those linked to national authorities. However, the selection of the RSES as the key policy instrument in BIOWIND reflects the Assembly's commitment to advancing renewable energy objectives through spatial and economic planning. This alignment offers a pathway for the incorporation of BIOWIND methodologies into statutory governance processes.

Province of Flemish Brabant

The **Province of Flemish Brabant** participates in the BIOWIND project with a coherent and multi-scalar policy framework that supports renewable energy deployment and includes strategic provisions for wind energy. At the regional level, the primary planning instrument is the *Ruimte voor Energie (Space for Energy)* strategy. This strategy, developed as part of the province's *Spatial Policy Plan* and in effect since 1st of December 2023, provides a dedicated framework for integrating wind energy infrastructure into spatial development planning. It

outlines the region's spatial logic and regulatory priorities for accommodating wind turbines and related infrastructure within its territory.

The strategy does not define a specific megawatt target for wind energy, but it contributes to a broader regional ambition of generating an additional 408 MW of renewable electricity capacity by 2040. This is coupled with a regional CO_2 reduction objective of 2,003 GWh. Wind energy is recognised as a key contributor to both targets, even though no separate breakdowns are established for onshore or offshore capacity. The planning instrument is currently not undergoing revision, but its implementation is ongoing and continues to inform regulatory coordination, permitting practices, and spatial decision-making related to renewable energy infrastructures.

In addition to the regional strategy, the province operates within a broader Flemish and national policy framework that influences wind energy development. Two major instruments are of particular relevance. First, the *"Windplan 2025"* sets a regional goal of achieving 2.5 GW of installed wind energy capacity in Flanders by 2030. This plan provides guiding benchmarks and technical parameters for local and provincial authorities. Second, the *Green Electricity Certificates scheme* provides financial support for renewable energy production through a tradable credit mechanism. Wind energy producers can benefit from this incentive, which supports the economic viability of new installations.

Together, these instruments define the strategic and operational context for wind energy planning in the province. The combination of spatial planning, capacity objectives, and financial incentives provides a well-structured policy environment for the implementation of the BIOWIND project's tools and methodologies.

Central Danube

The **Central Danube Development Agency Nonprofit** Ltd. engages in the BIOWIND project within a policy environment shaped primarily by national-level strategies and targets. While the region does not currently have its own dedicated energy strategy or a Just Transition Plan, it operates within the broader framework of Hungary's *National Energy and Climate Plan (NECP)*, which defines national renewable energy targets and guiding principles for the country's energy transition.

According to the WAM ("with additional measures") scenario of the latest Hungarian *NECP* (submitted in 2024), the country aims to reach a renewable electricity generation capacity of 14 GW by 2030, increasing to 15 GW by 2040 and 18 GW by 2050. As part of these totals, onshore wind energy is expected to contribute 1,080 MW by 2030, 2,000 MW by 2040, and

only 3,000 MW by 2050. Offshore wind energy is not foreseen, reflecting Hungary's landlocked geography. These national-level figures provide the strategic framework within which regional initiatives, such as those supported by BIOWIND, are expected to operate. It is already clear that the Hungarian government has designated only a very small geographical area in the north-west of the country for the 700 MW of wind capacity planned for 2030. The Central Danubian area will therefore certainly be left out of such developments in the coming years.

At the regional level, the most relevant instrument is the *Operational Programme (OP)* implemented by the **Central Danube Development Agency**. Although the current version of the OP does not include a dedicated measure for wind energy, plans are in place to introduce such a measure under the *Priority Axis "Innovation and Environmentally Friendly Development.*" This future inclusion is intended to promote the establishment of wind energy parks in the region and reflects the agency's commitment to aligning with national renewable energy goals.

No other policy instruments or financial incentives specific to wind energy were identified at the regional level. As such, the forthcoming modification of the *Operational Programme* constitutes the primary opportunity for embedding wind energy priorities into regional development planning. This alignment between national targets and regional programming offers a foundation for integrating wind energy within the territory's broader sustainability and economic development agenda.

Świętokrzyskie Voivodeship

Świętokrzyskie Voivodeship participates in the BIOWIND project in the context of a limited but emerging policy landscape for renewable energy at the regional level. The region does not currently possess a dedicated energy strategy or a Just Transition Plan. Instead, it operates under the broader national framework set by Poland's energy and climate commitments.

At the national level, Poland has committed to reaching a 21–23% share of renewable energy in gross final energy consumption by 2030, as outlined in the country's *National Energy and Climate Plan for 2021–2030*. While these targets shape the general direction of national energy policy, no specific capacity targets (in MW) for either onshore or offshore wind energy have been defined for **Świętokrzyskie Voivodeship** itself.

At the regional level, the key policy instrument relevant to wind energy is the *Fundusze Europejskie dla Świętokrzyskiego 2021–2027* (European Funds for Świętokrzyskie 2021–2027). This operational programme includes grants and financial instruments that support regional development priorities. Although not exclusive to wind energy, this programme

constitutes the principal institutional and financial framework through which renewable energy investments may be supported in the region. The implementation of this programme represents the main opportunity for integrating wind-related provisions into the region's strategic planning.

No other dedicated strategies, regulatory plans, or capacity-based targets for wind energy were identified at the regional level. As such, the regional operational programme remains the primary instrument through which wind energy development could be encouraged in alignment with the broader objectives of the BIOWIND project.

Region of Murcia

The **Region of Murcia** participates in the BIOWIND project through its General Directorate of the Natural Environment, operating within a multilevel governance structure that combines national strategic planning with regional programme implementation. The region does not currently possess a standalone energy strategy or a Just Transition Plan of its own. Instead, it draws on national frameworks and EU cohesion policy tools to guide renewable energy development.

The key policy instrument identified in the context of BIOWIND is the *ERDF Programme 2021–2027* of the **Region of Murcia**. This programme, financed through the *European Regional Development Fund*, serves as the main planning and funding mechanism for regional development. While the programme is not exclusively focused on wind energy, it contains priorities that are directly relevant to renewable energy infrastructure and biodiversity preservation. It is within this framework that the regional partner aims to introduce the methodologies and participatory tools developed through BIOWIND, strengthening the integration of ecological criteria and public engagement in future energy planning processes.

In addition to the ERDF programme, the region is also guided by two national-level strategic instruments. The *National Integrated Energy and Climate Plan (PNIEC) 2021–2030* sets the overarching objectives for Spain's decarbonisation strategy and includes provisions to promote wind energy. While implemented at the national scale, the *PNIEC* serves as the reference framework for all autonomous communities in Spain, including **Murcia**, providing the policy context within which regional activities are aligned.

The second national instrument is the *Just Transition Strategy (2020–2024).* This strategy outlines Spain's approach to ensuring a socially equitable energy transition. It includes measures to promote renewable energy, including wind, and to support technological upgrades, self-consumption initiatives, and the repowering of existing infrastructure. Although

the **Region of Murcia** does not currently have its own Just Transition Plan, the national strategy provides a structure that could eventually guide territorial adaptations and the introduction of socially inclusive planning processes.

Spain's renewable energy targets define the capacity benchmarks against which regional contributions are planned. By 2030, the country aims to reach a total installed renewable electricity capacity of 159,575 MW. This includes 59,054 MW of onshore wind and 3,000 MW of offshore wind. While these figures are not disaggregated at the regional level, they establish the planning horizon for the **Region of Murcia** and inform the integration of wind energy into broader territorial development priorities.

Within this strategic landscape, the **Region of Murcia** seeks to use the BIOWIND project as an opportunity to enhance the ecological and participatory dimensions of its energy planning approach. The inclusion of biodiversity-sensitive criteria and multi-actor consultation methods into the implementation of the ERDF programme will contribute to the long-term sustainability of wind energy initiatives and reinforce the region's role in supporting Spain's clean energy transition.

Asturias

The **Asturias Energy Foundation** participates in the BIOWIND project as a representative body within the **Autonomous Community of Asturias**. The region is governed by a combination of regional and national policy instruments that together shape its renewable energy strategy, including wind power. These instruments reflect **Asturias**' identity as a post-coal territory undergoing structural transformation and provide the institutional context for introducing participatory, biodiversity-sensitive, and innovation-driven planning tools in line with BIOWIND's aims.

At the regional level, the key policy instrument is the *Just Energy Transition Strategy of Asturias* (Estrategia de Transición Energética Justa de Asturias), covering the period from 2017 to 2030. This strategy sets out **Asturias**' vision for decarbonisation in coordination with broader national and European targets. It includes provisions for the promotion of wind energy and is currently undergoing revisions expected to be completed within the timeframe of the BIOWIND project.

Complementing this strategy is the national *Territorial Just Transition Plan 2021–2027*, which recognises **Asturias** as one of the Spanish regions facing the transition away from coal. Within this plan, renewable energy —including wind— is prioritised through targeted support measures. The Just Energy Transition Strategy of Asturias includes the promotion of

experimental offshore wind farms, the development of regional industrial capacities related to offshore technologies, and support for broader renewable deployment in areas affected by industrial decline.

The *Integrated National Energy and Climate Plan (PNIEC)* defines Spain's core objectives for the deployment of renewable energy by 2030. It provides the framework for onshore wind development nationwide, setting general benchmarks and enabling conditions. Offshore wind, however, is addressed separately through the *Roadmap for Offshore Wind and Marine Energies*, which outlines Spain's approach to developing offshore capacity. This includes dedicated measures such as auction schemes, financial incentives for repowering, support for demonstration initiatives like *RENMARINAS DEMOS*, and alignment with marine spatial planning instruments. These instruments together form the strategic framework within which **Asturias** coordinates its own energy planning.

Asturias has also adopted specific renewable energy targets for 2030. These include a total renewable electricity capacity of 3,442 MW to reach a 72% renewable share in regional electricity production by 2030, with 1,585 MW attributed to onshore wind and 770 MW to offshore wind. These targets define the region's quantitative trajectory and frame future planning and investment decisions in the energy sector.

Through this multi-level policy framework —regional strategies, national transition instruments, and clearly defined targets— **Asturias** provides an institutional foundation conducive to sustainable wind energy development. The BIOWIND project contributes to this framework by embedding biodiversity safeguards and participatory approaches into energy planning, thereby enhancing both the legitimacy and ecological coherence of wind energy expansion across the territory.

Berat county

The **Active Alliance for Albania** represents **Berat County** in the BIOWIND project, operating within a national policy context that is gradually aligning with European energy and climate standards. As a candidate country to the EU, Albania has begun transposing key elements of the EU's renewable energy acquis, notably through the adoption of *Law No. 24/2023 on Renewable Energy*. This legislation harmonises national provisions with *EU Directive 2018/2001*, sets a renewable energy target of 54.4% in gross final consumption by 2030, and enables demonstration projects for innovative technologies. Notably, it introduces a 15-year feed-in tariff scheme for small-scale wind energy projects up to 3 MW, a key incentive for private and community investment in regions such as **Berat**.

At the local level, **Berat**'s strategic planning framework is shaped by the *Smart Energy Municipalities Project (SEMP) 2018–2030*. Though not a binding policy, *SEMP* represents an early attempt to establish a coordinated local energy strategy and includes measures to promote wind energy development. Its current revision offers a timely opportunity to enhance local planning alignment with national and EU-level energy priorities.

Despite these foundations, **Berat** faces several structural and institutional challenges that limit its capacity to scale up wind energy planning and implementation. Chief among these is the absence of regional-level energy governance bodies—such as a dedicated permitting authority or environmental planning institution—capable of coordinating wind energy deployment. The stakeholder ecosystem remains underdeveloped, with limited public awareness and no structured mechanism for citizen engagement in energy planning.

Spatial planning for wind energy is also underdeveloped: no designated onshore or offshore wind zones exist, making it difficult for investors to assess feasibility or plan long-term infrastructure. Furthermore, there are currently no community benefit schemes or just transition initiatives in place to address potential public opposition or to distribute the socio-economic gains of wind energy projects. Finally, Albania's limited access to EU-style structural funds (e.g., cohesion or recovery funding) and comparatively low administrative capacity pose additional barriers to comprehensive wind energy governance.

Nonetheless, **Berat**'s inclusion in the BIOWIND project provides a unique opportunity to introduce biodiversity-sensitive and participatory planning tools at the municipal level, building upon the national legal framework and leveraging Albania's EU candidacy to align local action with future funding prospects under *IPA III* or the *Green Agenda for the Western Balkans*. Establishing foundational mechanisms for stakeholder engagement, regional coordination, and just transition planning will be critical to unlocking the territory's wind energy potential.

Territorial gaps and needs identified in the course of the BIOWIND

This sub-section summarises the territorial gaps, needs, and challenges identified throughout the BIOWIND project with respect to improving long-term energy planning and securing social support for renewable energy production, particularly wind energy. The analysis draws on the findings of three key project activities: Activity A1.2, which focused on policy and governance gaps; Activity A1.4, which examined organisational needs and challenges; and Activity A1.5, which assessed public perceptions and the barriers to the development of wind energy communities. Together, these inputs offer a comprehensive view of the institutional, procedural, and social challenges faced by BIOWIND partner regions. The section is structured around the main themes that emerged across these activities and concludes with a visual summary of the overarching challenges identified.

Territorial gaps in wind energy planning and governance

The report that was produced as part of Activity A1.2 lays the foundation for a territorial sustainability strategy by analysing the degree to which current regional policies across participating territories incorporate essential elements of sustainability in wind energy deployment. Drawing on a structured policy review and comparative gap analysis, the report has highlighted several cross-cutting hurdles that limit the capacity of existing governance frameworks to deliver ecologically sound, socially and politically supported, and spatially coherent wind energy transitions. These gaps are thematically organised around four key domains: permitting procedures, environmental management, consensus-building, and policy alignment.

Gaps in permitting procedures

Permitting is a pivotal component of wind energy development, with direct implications for project timelines, investor confidence, and regulatory certainty. The gap analysis in A1.2 has revealed that although specific permitting processes are generally present, they remain incomplete in several territories. Only two partner policies explicitly lacked essential permitting components, such as timelines or procedural milestones. However, the mere presence of formal procedures does not imply optimal functionality. Several regions continue to face practical delays due to fragmented responsibilities, insufficient clarity in application steps or lengthy appeal procedures. Moreover, relatively few territories have embedded deadline enforcement mechanisms or public tracking systems to monitor progress across permitting phases. These procedural ambiguities —although not always formally recorded as “gaps”— can significantly slow deployment and foster mistrust among developers.

Gaps in environmental management and biodiversity integration

The integration of environmental safeguards into the life cycle of wind energy projects remains partial and inconsistent across partner regions. Four policies were found to be missing key provisions regarding biodiversity impact monitoring, particularly during the operational and decommissioning phases of wind farms. While Environmental Impact Assessments (EIAs) are widely mandated, their implementation often reveals overlapping competences and poorly coordinated institutional roles, especially in cases where environmental and energy authorities act in parallel without a unified governance structure. These institutional inefficiencies may lead to duplicated efforts, inconsistent mitigation requirements, and weakened oversight.

Beyond formal gaps, public concerns about environmental degradation were prevalent. Eight instances of civil society criticism —related to habitat fragmentation, species disturbance, and visual intrusion— were recorded across the territories. These concerns, often voiced in the absence of accessible or unbiased monitoring data, point to a significant trust gap between regulatory bodies and affected communities. The absence of longitudinal biodiversity data and post-construction impact assessments further compounds this disconnect.

Gaps in consensus-building and participatory governance

Effective public engagement is indispensable for securing local acceptance and mitigating conflicts associated with wind energy siting. While the policy review found that most partner regions include some provisions for public consultation, particularly during the formal stages of policy or project approval, meaningful participatory planning remains underdeveloped. Only in four territories there were policies that mandated consultations during the pre-application phase of wind energy projects, when project siting and design could still be influenced. The absence of structured early-stage engagement mechanisms can limit the ability of residents and local organisations to co-shape energy developments in their territories.

More critically, institutionalised conflict resolution tools are rare. Only two policies were found to include specific mechanisms for managing disputes arising during the operational phase of wind farms. This is especially troubling given that nine conflict episodes were recorded in partner territories, of which only two have been formally resolved. These unresolved tensions underscore the need to move beyond one-off consultations and towards more durable, inclusive forms of deliberation and grievance mediation.

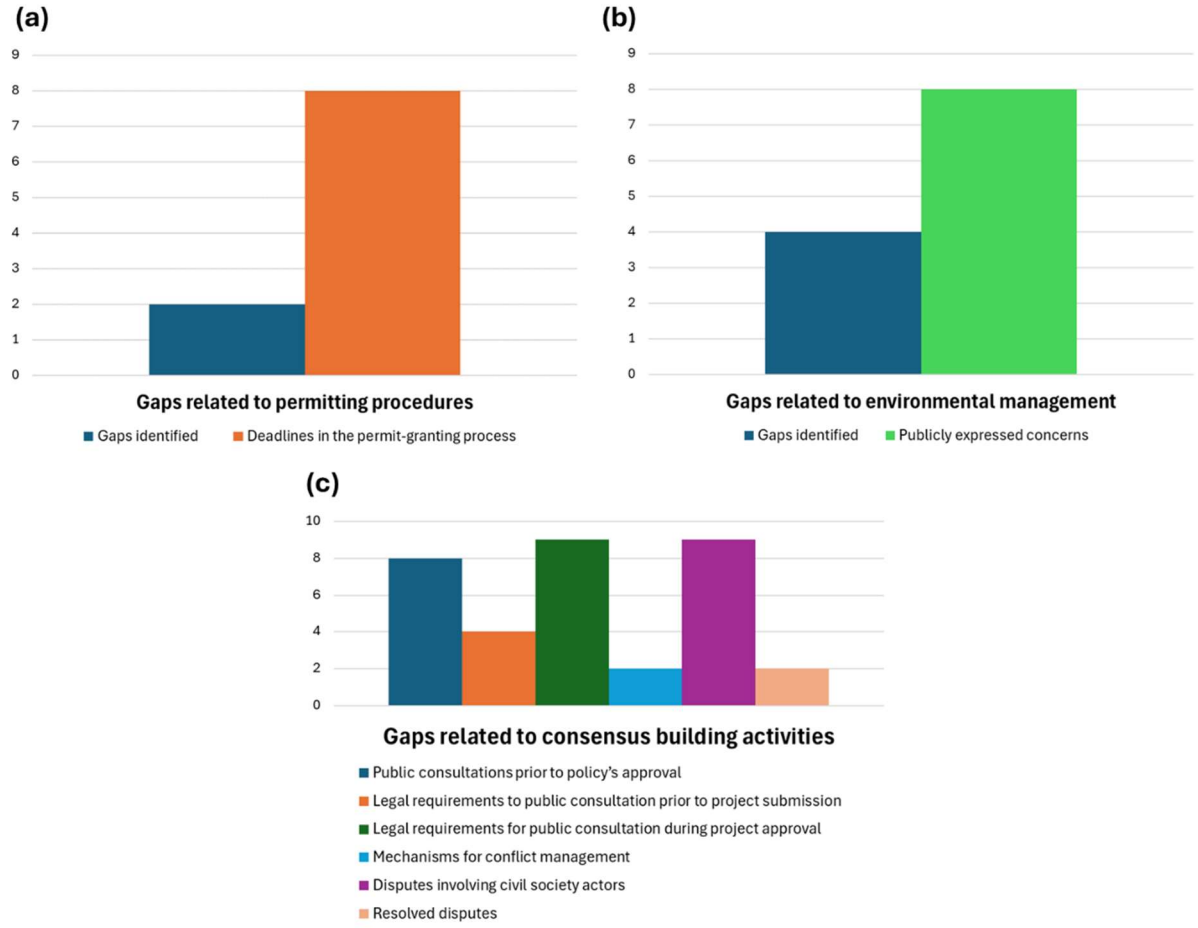


Figure 1. Identified gaps within the energy policies. a) Gaps related to permitting procedures, b) gaps related to environmental management and c) gaps related to consensus building activities (Source: BIOWIND A1.2 report)

Gaps in policy alignment and territorial coherence

A further challenge identified in the analysis is the lack of alignment between wind energy strategies and other territorial policies, particularly spatial development and environmental protection plans. While seven regions possess spatial or land-use strategies that designate areas suitable for wind energy deployment, these are not always harmonised with broader regional or national frameworks. Two specific cases of misalignment between energy and spatial planning policies were documented, along with one case of contradiction between energy planning and cultural heritage protection policies.

These inconsistencies can create regulatory bottlenecks, erode policy credibility, and undermine the coherence of long-term energy planning. For example, in some cases zoning criteria or setback distances imposed to protect landscape aesthetics or heritage sites were found to obstruct otherwise technically viable wind energy zones. A fragmented policy landscape can also hinder the integration of biodiversity conservation goals into wind planning, resulting in siloed and potentially conflicting territorial objectives.

Territorial needs for enhancing renewable energy planning and social acceptance

Following the identification of territorial gaps in the planning and governance landscape for wind energy and broader renewable deployment, the BIOWIND project has systematically assessed the needs of participating regions to strengthen long-term territorial energy planning and improve public support for renewable infrastructure. Activity A1.4 report has categorised these needs into six core areas that together define the enabling environment for inclusive and effective renewable energy transitions at the regional level. The analysis draws on structured questionnaires completed by project partners and stakeholder representatives, providing both a quantitative overview and qualitative insights into systemic barriers and opportunities for institutional improvement.

Complexity, transparency and duration of administrative procedures

Across the BIOWIND territories, complex and time-consuming administrative procedures emerged as a key barrier to the effective deployment of wind energy projects. Although many partners consider the number of required steps to be reasonable, the overall duration of permitting and appeal processes is often viewed as excessive. This is particularly evident in countries such as Finland, Belgium, and Ireland, where delays are seen to jeopardise the viability of projects.

Efforts to simplify procedures have been undertaken in several regions, including the introduction of online systems, permit consolidation, and “one-stop shop” services. Where implemented, these measures have generally led to improved timelines. However, their adoption is uneven, and several partners still operate under fragmented or outdated administrative frameworks.

Transparency of rules and criteria is generally satisfactory, but some regions —such as **South Ostrobothnia, and Murcia**— reported gaps in the public availability of selection criteria and procedural information. Access to digital information remains limited in countries like Greece and Hungary.

Institutional coordination remains a mixed picture. While most partners reported that administrative responsibilities are formally defined, some lack effective mechanisms for interdepartmental or intergovernmental coordination. Not all regions have clear internal coordination structures, and, in some cases, fragmented mandates and poor information flows hinder efficient decision-making.

Overall, the need to streamline procedures, clarify institutional roles, and enhance transparency is widely recognised as a priority for improving the governance conditions for wind energy planning.

Strategic planning

The review of territorial needs revealed considerable variation in the strategic planning capacity of regional and local administrations involved in wind energy development. While many partners reported moderate to strong involvement in setting spatial planning guidelines and renewable energy targets, their role in implementing financial incentives remains largely limited. The majority of regions consider themselves central or important actors in land-use decisions and regional strategies, as seen in the cases of the **Regional Council of South Ostrobothnia** and **FAEN** in **Asturias**, yet the majority of partners reported minimal involvement in designing or applying financial incentives like feed-in tariffs or price premiums at the regional level.

A recurrent need is the establishment of dedicated strategic planning units. While most of the participating regions already have internal coordination mechanisms in place, several others expressed the need for such bodies. Similarly, a substantial portion of regions lack standardised processes for designing wind energy strategies. Ony four regions reported using formal planning methods, and the absence of uniform planning approaches was viewed as a barrier to coherent, long-term renewable energy development.

There is also a documented underuse of preliminary assessment tools like SWOT or PESTEL analyses, which help identify risks and strategic opportunities. Only some of the territories surveyed employ such tools, even though most of those that do rate them as helpful. Likewise, only a slight majority conduct environmental and socio-economic impact assessments related to wind energy planning, despite their acknowledged utility and broad perceived necessity among those not yet undertaking them.

The findings point to a broader recognition of strategic planning as a linchpin in wind energy governance, but also highlight persistent inconsistencies in planning practices, insufficient institutional frameworks, and a general need for improvement in organisational processes and methodological approaches.

Enforcement, monitoring, and evaluation processes

Several gaps and needs emerge across partner regions regarding the enforcement, monitoring, and evaluation of wind energy policies. A majority of partners reported that their regional or local administrations do not hold direct enforcement responsibilities. Yet, even

where enforcement mandates exist, their implementation is often hampered by political considerations and inadequacies in the legal framework. Such structural issues underscore the need for clearer legal mandates and reduced political interference in policy execution.

The situation is even more concerning in the area of monitoring. Two-thirds of partners stated that they lack any structured mechanism to monitor the implementation of wind energy policies and projects, with some identifying lack of specialised personnel and insufficient data as key barriers. Even among those who do have monitoring systems, capacities are stretched, and monitoring efforts tend to focus on broader energy projects rather than wind-specific data. While a strong majority acknowledged the necessity of monitoring, actual practice is fragmented and dependent on central authorities. Spatial planning monitoring is often assigned to regional authorities, but here too, levels of responsibility and engagement vary widely.

Evaluation practices are similarly underdeveloped. Most of respondents reported no formal mechanism in place to assess policy implementation or project outcomes. In the few territories where evaluation is conducted, such as in **NWRA** and **ZPR**, the focus tends to be on spatial and environmental parameters, with some attention to policy impacts. However, the capacity to integrate evaluation findings into policy amendments remains limited. Only a minority of respondents could point to instances where evaluation had influenced regulatory change.

Overall, while the importance of monitoring and evaluation is widely acknowledged, the structural and organisational means to implement them effectively remain lacking in most partner territories. This underscores a broader institutional need: to develop dedicated units, strengthen inter-agency coordination, and support data systems that can anchor more robust oversight and learning from wind energy deployment.

Stakeholder engagement

Stakeholder engagement is widely acknowledged across partner territories as essential to ensuring the public legitimacy of wind energy projects. Most partners reported having established consultation mechanisms involving societal actors during wind farm development, with public hearings, meetings with local authorities, and involvement in spatial planning cited as common formats. However, the depth and regularity of these engagements vary considerably.

While a majority of regions have employed formal public consultation processes or expert facilitators, this practice is not universal. For instance, **FAEN** reported no dedicated public engagement specialists. Moreover, consultation often remains confined to zoning and

environmental impact assessment stages, with less attention paid to other critical phases of wind project development.

The availability of independent bodies such as *Regional Ombudsmen* offers a potential channel for citizens to raise concerns, and most partners affirmed the existence of such mechanisms. Yet less than half reported regular or effective cooperation between these bodies and regional authorities, pointing to a gap in institutional synergy that could undermine trust and responsiveness.

Several structural challenges hinder stakeholder engagement efforts. These include the absence of appropriate tools, insufficient political will, lack of personnel, and inadequate regional regulations. Despite this, many partners emphasised the importance of strategic clarity, transparency, and clear communication as tools to enhance engagement. Taken together, these findings reveal a consensus among partners on the importance of stakeholder engagement, but also signal a need to strengthen institutional cooperation, broaden participation across all project stages, and address the organisational barriers that impede more effective public involvement.

Resource availability

Financial and resource-related constraints remain a significant barrier to effective wind energy governance across many partner regions. Over half of the participating territories reported that their regional or local administrations face considerable budgetary challenges in managing wind-related projects. These constraints affect a wide range of activities —from administrative processing and strategic planning to environmental impact assessment and policy monitoring—, thereby impeding the smooth progression of wind energy initiatives.

A lack of consistent financial support from central governments exacerbates this issue. In a slight majority of cases, partners reported that delegated responsibilities in environmental and renewable energy policy are not accompanied by adequate funding. This results in implementation gaps and undermines the capacity of regional actors to fulfill their mandates effectively.

Few regions reported having the ability to mobilise their own resources through green taxes or other local financial instruments. Only MOSV indicated the use of environmental fees for funding purposes, while the vast majority of partners do not employ such mechanisms and remain divided on their usefulness.

Access to EU funding also remains uneven. While some regions such as **Western Greece**, **Zemgale**, and **Świętokrzyskie** have secured substantial funding, others, including **Central Danube, Murcia**, and **Asturias**, reported no significant EU support. Additionally, most partners lack dedicated units or systematic processes for identifying and securing funding opportunities related to renewable energy, suggesting a reactive rather than proactive financial strategy.

Finally, the overwhelming majority of partners acknowledged that they do not possess tools or procedures for the efficient use of available financial resources. Only **Flemish Brabant** reported having multi-annual financial planning mechanisms in place. These findings point to a systemic need for strengthened financial governance, enhanced funding strategies, and capacity-building to optimise available resources and support wind energy development at the territorial level.

Sufficiency of personnel and workforce skills

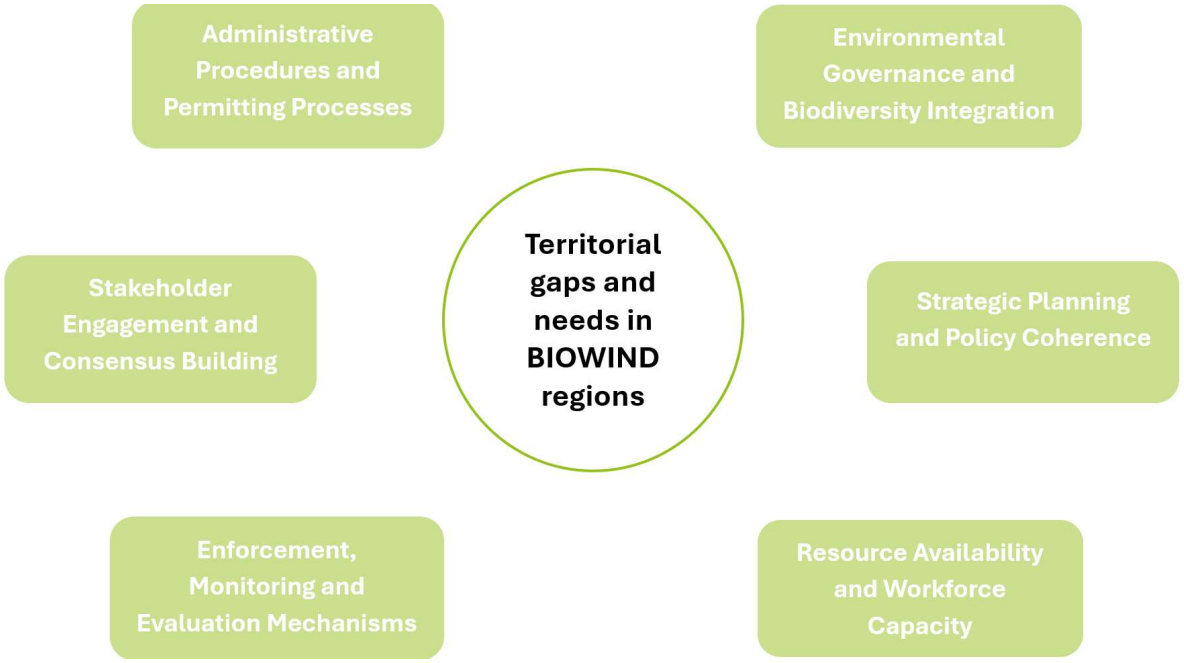
A clear gap identified across most partner regions concerns the insufficient availability of specialised personnel within public administrations to support wind energy planning and implementation. Most of respondents reported a lack of administrative or scientific staff with expertise in renewable energy procedures and policies. This shortage affects several critical areas, including permitting, monitoring, strategic planning, and technical implementation. The importance of this issue is widely acknowledged, as the lack of skilled personnel was considered important for the development of wind power in most cases.

Beyond staffing shortages, many partners also pointed to the absence of adequate training, reskilling, and peer learning programmes. A majority indicated that such opportunities were not currently available. The reasons vary by region: **RWG** cited a lack of experts; **CDDA** referred to legislative constraints; **CARM** pointed to the limited presence of wind projects; **NWRA** mentioned financial limitations; and **FAEN** highlighted administrative overload.

Synthesis of territorial gaps and needs

The BIOWIND project has undertaken a thorough assessment of both the structural gaps and operational needs hindering effective wind energy deployment across its participating regions. Drawing on reports A1.2 and A1.4, the analysis highlights a set of persistent, interlocking challenges that cut across governance levels, institutional arrangements, regulatory procedures, and stakeholder engagement mechanisms. These challenges shape the enabling —or, for that matter, disabling— environment for long-term territorial energy planning and the

development of socially supported renewable energy infrastructures. The main axes along which territorial gaps and needs crystallise are the following:



In sum, the synthesis of A1.2 and A1.4 reports reveals that while the policy architecture for renewable energy is gradually taking shape across EU regions, it remains difficult due to procedural inefficiencies, fragmented governance, and insufficient resourcing. Addressing these deficits will require both targeted institutional reforms and sustained capacity-building efforts. Streamlined permitting, robust environmental safeguards, participatory planning, and integrated strategic frameworks emerge as indispensable elements in constructing a just and sustainable wind energy transition.

Social Acceptance and Challenges for Wind Energy Communities

Activity A1.5.2 explored the public perception of wind energy projects across BIOWIND partner territories, with particular attention to the barriers facing wind energy communities. The findings revealed a consistent pattern of challenges across three interrelated domains: financial, regulatory, and social.

Financial challenges emerged as a key constraint. In several regions, communities faced difficulties accessing funding, particularly for self-consumption projects. The overall cost of

setting up wind energy infrastructure was considered significantly higher than for other renewables, such as solar, further complicating community-led initiatives.

Regulatory and policy-related hindrances were equally significant. These included the absence of a dedicated legislative framework, overly complex administrative procedures that fail to account for the specificities of wind energy, contradictory legal provisions concerning energy communities, and prohibitive authorisation processes. Such conditions often create a regulatory environment that discourages initiative, breeds uncertainty, and stalls local momentum.

Social challenges also posed serious barriers to the formation and sustainability of wind energy communities. These ranged from general scepticism towards wind energy and limited public awareness of technical and participatory aspects, to a broader lack of a cooperative culture and perceived transparency deficits in planning processes. In some regions, the mere absence of a visible trend or established precedent for energy communities at the national level was seen as inhibiting public interest and willingness to engage.

Importantly, these challenges are not isolated—they compound and reinforce one another. A lack of awareness discourages participation, which in turn stunts the growth of demonstrable success stories that might improve public perception. Overall, both the perceived success rate and level of public engagement in wind energy communities were rated as low by the majority of partners.

These findings underscore the importance of **integrated approaches to community empowerment**, including tailored financial instruments, supportive legislation, and participatory mechanisms designed to build trust and promote long-term social acceptance.

BIOWIND SUSTAINABILITY STRATEGY

This section outlines the BIOWIND Sustainability Strategy, developed to support long-term energy transition planning across partner regions, with a particular focus on accelerating socially accepted and environmentally responsible wind energy deployment. Drawing on the project's findings, regional policy priorities, and successful case studies, the strategy provides an integrated framework for action.

The sustainability strategy emerges from the recognition that the accelerated deployment of wind energy must be not only technologically and economically feasible, but also socially inclusive, environmentally sound, and institutionally embedded within regional governance frameworks. Throughout the project's implementation, a consistent insight across participating territories has been the urgent need to ground wind energy development in long-term, citizen-driven planning frameworks that address ecological, social, and economic dimensions in an integrated manner.

Drawing on the project's analytical activities, policy reviews, stakeholder consultations, and peer-review mechanisms, the strategy provides a coherent roadmap for ensuring that the deployment of wind energy contributes meaningfully to broader regional development goals, while upholding principles of democratic legitimacy, environmental stewardship, and socioeconomic equity.

At its core, the sustainability strategy is structured around **three interdependent pillars**:

1. **Environmental sustainability**, focusing on ecological safeguards, biodiversity protection, and sustainable land use.
2. **Social sustainability**, centered on civic participation, public trust, transparency, and community ownership.
3. **Economic sustainability**, addressing investment conditions, fair benefit-sharing, energy justice, and regulatory clarity.

These pillars are adapted from the global sustainability framework but are tailored here to reflect the specific responsibilities of public authorities in planning, implementing, and regulating wind energy projects at regional and local levels. Rather than providing an abstract or generic model, the strategy is informed by territorial realities and differentiated capacities —as revealed through the project's regional case studies and partner feedback— and is intended as a flexible but principled guide to implementation.

It is structured in three parts. Part A offers an **overarching vision** and strategic approach, outlining the strategy's aims. To operationalise these aims, Part B delineates the **main action streams and policy measures** corresponding to the three pillars of the strategy. These actions are not proposed in isolation but have been derived and validated through the policy analysis conducted under BIOWIND, including the collective formulation of strategic priorities.

The final sub-section, Part C, further contextualises these measures by providing **individualised recommendations per partner territory**, addressing their specific policy instruments, stakeholder ecosystems, and governance landscapes. This multi-scalar articulation, from general vision to operational pillars to regional implementation, ensures that the strategy remains both cohesive and adaptable, suited to guiding future policy developments while being grounded in present institutional and territorial conditions.

PART A. Presentation of the sustainability strategy

The strategy's overarching objective is to enhance the social acceptance and long-term viability of wind energy in BIOWIND territories by embedding inclusive governance practices, reinforcing environmental accountability, and ensuring equitable economic returns. This aligns closely with the BIOWIND project's founding rationale: that regional public authorities, when equipped with appropriate tools, knowledge, and mechanisms, can become the drivers of a just and territorially grounded energy transition. More specifically, the strategy aims to:

- **Increase transparency and reduce administrative barriers** to wind energy deployment;
- **Strengthen community participation** through lifecycle-long consultation and stakeholder co-governance;
- **Ensure biodiversity protection and ecological resilience** through adaptive spatial planning and monitoring tools;
- **Foster citizen-led energy models and shared ownership mechanisms** that democratise energy production;
- **Support policy harmonisation and capacity building** across fragmented governance levels;
- **Establish frameworks for long-term benefit-sharing** with neighbours, host communities, and local governements;
- **Monitor progress** through regionally tailored key performance indicators (KPIs).

PART B. Actions and policies

The proposed sustainability strategy for the BIOWIND territories is operationalised through a suite of actions and policy measures that are grouped under three strategic pillars: environmental, social, and economic. These pillars reflect the guiding logic of sustainable territorial development and are tailored to address the specific challenges and opportunities identified across the partner regions. The proposed actions aim to increase the social and political acceptance of wind energy, promote participatory governance, and support the long-term deployment of sustainable wind energy projects.

The strategy builds on the policy priorities and territorial needs captured during BIOWIND implementation, including findings from regional analyses, stakeholder engagement processes, and peer-review activities. It also incorporates key provisions of the Renewable Energy Directive II and III, particularly those related to citizen participation, community energy, and permitting simplification.

Environmental pillar

Under the environmental dimension, the strategy promotes policy coherence and ecological safeguards to ensure that wind energy expansion proceeds in harmony with biodiversity conservation and land-use planning objectives.

Key actions include:

- **Integration of biodiversity criteria and sensitivity mapping** into spatial planning tools, such as GIS-based multi-criteria decision support systems. These should account for protected habitats, migratory bird routes, and cumulative ecological impacts.
- **Mandating the application of the mitigation hierarchy** in environmental assessments, prioritising avoidance of environmental harm, followed by minimisation, restoration, and compensation.
- **Institutionalisation of sustainable decommissioning frameworks**, including legal and financial provisions for turbine site restoration and the recycling or reuse of materials, particularly composite blades.
- **Standardisation of environmental monitoring requirements**, including the promotion of advanced tools (e.g., AI-based prediction models, automated detection

systems and shutdown) and collaboration with citizen science initiatives to improve environmental data collection.

These actions are designed to strengthen environmental governance capacities across regions and embed biodiversity considerations in all phases of wind energy project planning.

Social pillar

The social pillar aims to foster trust, equity, and public ownership over the energy transition, ensuring that wind energy projects are not only technologically sound but socially legitimate and democratically supported.

Key actions include:

- **Mandatory and lifecycle-long public consultations**, extending across project design, permitting, construction, operation, and decommissioning phases. These consultations should include structured public forums, grievance redress mechanisms, and feedback integration processes.
- **Development and deployment of regional online consultation platforms**, enabling transparent information-sharing, project mapping, and citizen feedback mechanisms.
- **Delivery of public education and awareness-raising campaigns**, co-developed with municipalities, schools, and civil society. These campaigns should focus on wind energy literacy, climate action, and community participation rights.

These measures aim to improve public perception, reduce conflict risks, and promote a culture of participatory governance around renewable energy infrastructure.

Economic pillar

The economic pillar concerns the creation of stable investment environments, inclusive ownership models, and long-term local benefit frameworks. It also addresses regulatory bottlenecks and financing gaps that hinder project delivery.

Key actions include:

- **Streamlining permitting procedures** by consolidating environmental, urban planning, and energy authorisations into unified frameworks. Regions are encouraged to adopt GIS-based digital platforms to support multi-criteria evaluation and reduce administrative burdens.

- **Establishing regulatory frameworks and incentives for energy communities**, including provisions for collective ownership, co-investment schemes, and differentiated support for rural or low-income areas. This should include access to EU and national funding sources, capacity-building for cooperative formation, and legal assistance.
- **Introduction of tailored compensation mechanisms** for host communities, including regulated and transparent community benefit funds, reduced electricity tariffs, land lease payments and land lease sharing, local development contributions, and regionally established municipal taxation per turbine per year.
- **Promotion of offshore wind energy through targeted instruments**, where applicable, such as the RENMARINAS DEMOS strategy (Spain), alongside the refinement of onshore wind policies under national energy and climate plans (e.g., NECPs, PNIECs).

These actions seek to enhance regional capacities to manage wind energy investment flows, while ensuring that the economic benefits of the transition are distributed equitably and sustainably. This integrated action framework constitutes the backbone of the BIOWIND sustainability strategy. It aligns with EU energy and environmental policy objectives while being grounded in territorial realities and local governance structures.

PART C. Recommendations per partner for the capitalisation of BIOWIND results

Region of Western Greece

Environmental pillar

The **Region of Western Greece** is well-positioned to expand both onshore and offshore wind development in line with national targets. In this context, a priority should be the integration of robust environmental governance mechanisms into territorial planning. A key instrument could be the regional deployment of the BIOWIND online wind farm mapping and consultation tool, which includes biodiversity threat detection and citizen participation, enabling early-stage identification of environmental risks and structured engagement with civil society. Regional authorities are encouraged to formally embed this tool into environmental assessments and planning procedures between 2026 and 2027, as part of broader governance reforms.

To complement this digital infrastructure, the establishment of an Observatory for monitoring wind energy's territorial impacts is recommended. This body would include experts in ecology, data science, and environmental management, and would operate under the coordination of regional authorities. Its responsibilities could include the continuous evaluation of biodiversity outcomes, adaptive planning support, and public communication of findings. In doing so, it would reinforce evidence-based decision-making and contribute to greater environmental accountability.

Social pillar

The sustainability strategy for **Western Greece** places strong emphasis on participatory governance and procedural transparency as prerequisites for social acceptance. Public resistance to wind projects often arises from fragmented communication and limited community involvement. The consultation platform, when combined with structured engagement formats, could provide a durable channel for citizen participation. Local NGOs and civil society organisations —such as PRASINO-MPLE and Oikologiki Kinisi Patras— could play a key role in co-designing communication campaigns, facilitating public forums, and overseeing grievance mechanisms.

To further enhance local support, the introduction of community benefit schemes and shared ownership models is advised. These could include reduced tariffs, cooperative ownership structures, and agreements for reinvesting a portion of revenues into local infrastructure and

social services. Such measures could also support the formation of local wind energy communities, especially if coupled with financial instruments aligned with the Renewable Energy Directive III. Public communication strategies should highlight these benefits in accessible terms, fostering informed and inclusive local dialogue.

Economic pillar

The region already promotes energy innovation through targeted financial mechanisms. This action could serve as the foundation for a longer-term innovation program specifically targeting offshore wind and biodiversity mitigation tools. Encouraging public-private partnerships and enhancing links between research institutions and industry would increase regional innovation capacity and improve the economic sustainability and social acceptance of wind projects.

At the strategic level, the next *Operational Programme of Western Greece for 2028–2034* presents a critical opportunity to consolidate the sustainability strategy. The programme should explicitly prioritise wind energy projects that demonstrate social legitimacy, biodiversity safeguards, and inclusive planning methods. It should also integrate provisions for citizen participation, community ownership, and environmental performance monitoring as eligibility criteria for funding. Such alignment would ensure that the region's development priorities are consistent with national energy targets and the BIOWIND approach.

Stakeholder engagement guidelines

A multi-stakeholder model is essential for sustaining post-project impact. The following actors have been identified as key enablers and should be strategically involved in the rollout of the sustainability strategy:

- **Decentralised administration of Peloponnese–Western Greece and Ionian Islands**: tasked with enabling necessary regulatory reforms and ensuring coordination across administrative levels.
- **PRASINO-MPLE and Oikologiki Kinisi Patras**: NGOs playing a central role in fostering public trust, enhancing civic participation, and mediating community responses.
- **DEI Renewables and More Energy**: private sector players essential for infrastructure development and project financing.

To optimise this configuration, stakeholder roles should be formalised through memoranda of understanding (MoUs) or structured working groups under the Observatory framework. These

bodies would help coordinate inputs across the strategy's pillars and facilitate cross-sector dialogue.

Moreover, the region should consider expanding stakeholder engagement over time, especially as offshore development increases. This includes port authorities, fisheries associations, and coastal planning bodies, who may become increasingly relevant in the coming decade.

Region of South Ostrobothnia

The sustainability strategy for **South Ostrobothnia** should build upon the region's recognised leadership in onshore wind development, aligning policy, administrative capacity, and stakeholder coordination to support socially accepted, environmentally responsible, and economically beneficial wind energy projects. As one of the most advanced wind regions in Finland, **South Ostrobothnia** benefits from a strong regulatory environment and a favourable permitting system. However, future efforts must prioritise broader social inclusion, systematic monitoring, and institutional alignment to maintain momentum and foster long-term sustainability.

Environmental pillar

Environmental policy actions in **South Ostrobothnia** should reinforce biodiversity integration and environmental monitoring, particularly as wind energy infrastructure scales up further. Though the region is not facing immediate environmental constraints, it should anticipate future ecological and social limits. The adoption of standardised environmental monitoring frameworks —sensitive to bird migration and habitat fragmentation— could help maintain alignment with Finland's broader biodiversity goals. Additionally, **South Ostrobothnia** could also pilot sustainable decommissioning plans for older turbines and integrate them into spatial planning frameworks.

Social pillar

Social acceptance remains a strategic concern despite maturity of the region's wind energy sector. Regional authorities could further institutionalise participatory processes through the use of an online consultation platform. Integrating such a tool into permitting and spatial planning processes could strengthen transparency and reduce contestation. The development of stakeholder engagement guidelines and public education campaigns —targeted particularly at municipalities and local residents— could enhance informed participation and address emerging concerns such as landscape impact, noise, and biodiversity.

While no wind-specific regional targets exist, setting social inclusion benchmarks (such as number of residents participating in consultation processes or number of municipalities with active wind planning forums) could serve as performance indicators aligned with the BIOWIND Sustainability Strategy. These could be monitored through the Regional Council's annual energy reporting mechanisms.

Economic pillar

On the economic front, **South Ostrobothnia**'s permitting and investment environment is relatively robust. However, further diversification of ownership models —particularly through community co-ownership and cooperative financing— could enhance long-term project legitimacy and wealth distribution. Integrating such models into funding streams provided by national or EU-level mechanisms should be explored. The next *Regional Programme* could embed provisions supporting these models, and capacity-building seminars could be organised for local authorities and community leaders on how to structure and manage co-investment schemes.

Stakeholder engagement guidelines

The stakeholder landscape in **South Ostrobothnia** includes the Centre of Economic Development, Transport and the Environment, municipalities, wind energy companies, local residents, and the Regional Council. These actors should be further involved in structured consultation processes. Municipalities could be encouraged to establish local wind planning committees, while wind energy companies could be required to submit public engagement strategies as part of their permitting documentation. Regional authorities could develop a common framework for stakeholder roles, ensuring predictable and consistent engagement pathways.

Periodic stakeholder workshops, held in collaboration with municipalities, would provide opportunities for joint priority-setting and feedback. The Regional Council could also consider developing a stakeholder database and a public engagement calendar to track consultation activities, reinforce institutional memory, and ensure sustained dialogue.

Zemgale Planning Region: Sustainability Strategy Implementation

The **Zemgale Planning Region** presents both a challenge and an opportunity for embedding sustainability in the wind energy transition. In contrast to other BIOWIND territories, the region lacks foundational energy planning instruments, as there is no regional energy strategy, Just Transition Plan, or renewable energy targets. This regulatory and strategic vacuum, however,

allows for a relatively open policy landscape where new instruments, participatory mechanisms, and sustainability principles can be introduced in a flexible and forward-looking manner.

Environmental pillar

In the absence of dedicated environmental frameworks for renewable energy, **Zemgale** should prioritise the development of context-sensitive instruments that can guide future wind energy deployment. The integration of biodiversity considerations, particularly regarding landscape preservation, bird and bat migration routes, and habitat connectivity, should be systematically introduced into spatial planning practices.

A first step could be the elaboration of standardised Environmental Impact Assessment (EIA) protocols tailored to wind projects in low-density rural areas. These protocols should draw on the BIOWIND recommendations for mitigation hierarchies and include provisions for monitoring biodiversity over the lifecycle of wind projects. In the medium term, the **Zemgale Planning Region** could propose an amendment to its *Regional Development Programme 2021–2027* to include commitments to biodiversity-sensitive planning in future renewable energy investments. This would serve as a stepping stone toward a more comprehensive sustainability framework.

Social pillar

Public participation in energy planning is currently underdeveloped in Zemgale. Local authorities —particularly the municipalities of Jelgava, Aizkraukle, Bauska, Dobele, and Jēkabpils— should be encouraged to establish structured public engagement processes. These could include local consultation forums, training seminars for municipal staff, and communication campaigns that clarify the benefits and impacts of wind energy.

The region could also benefit from the creation of a regional wind energy consultation platform. This platform could serve as a tool for both public information dissemination and structured feedback collection throughout the project development lifecycle. In addition, public education initiatives developed in partnership with the Latvian Wind Energy Association could address knowledge gaps, strengthen transparency, and increase local ownership of wind energy projects.

Establishing long-term social inclusion benchmarks —such as participation rates in consultations or the number of municipalities hosting community planning events— could help evaluate progress and align with BIOWIND's social sustainability objectives.

Economic pillar

With limited financial incentives currently available, the economic dimension of Zemgale's sustainability strategy must begin with institutional groundwork. Regional authorities should explore the possibility of setting up a dedicated support scheme for community-based wind energy projects, building on the *European Renewable Energy Directive III* provisions. This could include cooperative financing structures and shared ownership models involving municipalities and citizen groups.

The Ministry of Climate and Energy and the Ministry of Smart Administration and Regional Development could be engaged to ensure that the legal and financial frameworks at the national level support such mechanisms. Moreover, the inclusion of wind energy provisions in the next programming cycle (2028–2034) of the *Zemgale Planning Region Development Programme* could formalise regional ambitions and attract public and private investment.

Stakeholder engagement guidelines

Although the input form provided limited information, several key stakeholders have been identified:

- **Regulatory bodies**: The Ministry of Climate and Energy and the Ministry of Smart Administration and Regional Development should support the development of clear permitting procedures, siting criteria, and funding mechanisms.
- **Local authorities**: The municipalities listed (Jelgava, Aizkraukle, Bauska, Dobele, Jēkabpils) can act as anchors for participatory governance, community mobilisation, and local co-investment schemes.
- **Private sector**: Ignitis Renewables Ltd. and similar actors can contribute infrastructure expertise and support the creation of long-term benefit-sharing agreements with host communities.
- **Associations**: The Latvian Wind Energy Association can assist with awareness campaigns, technical guidelines, and stakeholder convening.

To operationalise engagement, the region could develop a stakeholder map with roles and responsibilities linked to the proposed actions above. A regional stakeholder forum, meeting twice a year, could support continuity, coordination, and adaptation to evolving priorities. Moreover, municipalities could be supported to establish local wind energy task forces that convene residents, developers, and public officials during each project phase.

Northern and Western Region of Ireland

The sustainability strategy for the **Northern and Western Region** of Ireland must navigate a landscape characterised by strong national frameworks but limited devolved authority in energy governance. While the region lacks a dedicated energy strategy or a Just Transition Plan, its statutory *Regional Spatial and Economic Strategy (RSES)* emerges as a crucial lever for embedding the BIOWIND project's outcomes into long-term spatial and socio-economic planning. As such, the *RSES* should serve as the vehicle through which the region localises national energy targets and institutionalises participatory, ecologically sensitive wind development.

Environmental Pillar

Though energy-related environmental governance is centralised in Ireland, the **NWRA** can play a key role in mainstreaming biodiversity protection into regional and local planning. Under BIOWIND, the partner expressed a clear commitment to safeguarding ecologically sensitive areas.

Social pillar

Social acceptance of wind energy in Ireland remains uneven, especially in rural and scenic areas like parts of the **Northern and Western Region**. BIOWIND's policy recommendation to institutionalise community participation could potentially be considered in the *RSES* and carried forward through *County Development Plans*. Public consultations should move beyond statutory compliance and be adapted into lifecycle-long engagement frameworks, including early-stage fora, digital platforms, and grievance mechanisms.

The region could consider pilot collaborative planning models with citizens, building on the *National Planning Framework's new obligation (National Policy Objective 76)* for all local authorities to support national energy targets. This obligation could be accompanied by guidance documents and public capacity-building sessions to ensure legitimacy and transparency.

Economic pillar

Drawing inspiration from EU best practices, the **NWRA** could advocate for technical assistance schemes that help small-scale developers and community groups participate in procurement and permitting procedures.

Stakeholder engagement guidelines

The key stakeholders identified by the **NWRA** include regulatory authorities (SEAI), local government (Leitrim County Council), private sector actors, NGOs, and civil society. These actors should be integrated into a structured engagement architecture designed to inform, co-design, and evaluate regional energy strategies.

- Municipalities should be encouraged to form local energy planning teams tasked with facilitating consultation and supporting community wind initiatives.
- Private sector firms, such as infrastructure developers, should be required to provide community benefit plans and co-financing options as part of permitting documentation.
- NGOs and civil society organisations can be engaged as intermediaries and facilitators in awareness campaigns and participatory design processes.
- The **NWRA** could maintain a living database of key energy actors, ensuring agile and responsive governance.

Monitoring could be carried out through the existing *RSES* implementation framework, with community participation and biodiversity integration used as key performance indicators. The **NWRA** could report progress through its statutory monitoring cycles.

Province of Flemish Brabant

The **Province of Flemish Brabant** benefits from a solid policy and regulatory framework that already provides robust support for wind energy deployment. With instruments such as the spatially-integrated "*Ruimte voor Energie" strategy*[22] and the broader Flemish-level *Windplan 2025*, the region is well-positioned to embed BIOWIND recommendations across governance levels. Going forward, emphasis should be placed on mainstreaming social and political acceptance provisions, ecological safeguards, and community-oriented ownership models into municipal and regional decision-making.

Environmental pillar

Although the province does not currently face acute ecological constraints, anticipated wind energy expansion could be accompanied by stronger environmental integration. A priority action would be to incorporate BIOWIND's biodiversity and decommissioning policy recommendations into existing permit and regulatory frameworks at the Flemish and/or local level. This includes applying mitigation hierarchy principles —prioritising avoidance,

[22] https://share.vlaamsbrabant.be/Ruimtelijke-planning/Beleidsplan-ruimte/beleidsplan-ruimte-vlaams-brabant-20230919.pdf

minimisation, restoration, and offsetting of ecological impacts— and improving both baseline assessments and ongoing monitoring of environmental impacts on habitats and avian species. Monitoring tools may include radar-based systems and automated turbine shutdown protocols designed to reduce collision risks during migration periods or peak bird activity. Another action could involve establishing a general decommissioning policy concerning the end-of-life of wind turbines based on a clear set of protocols, as outlined in the project's *Decommissioning* Policy Brief.

Social pillar

Social acceptance is at the core of the province's approach, with multiple municipal-level initiatives and public-facing instruments in place. Local authorities already play an active role in participatory wind planning. Moving forward, this could be scaled into a formalised and replicable model of participatory governance and include community roundtables, lifecycle-long consultation frameworks, and integration of community feedback into permitting stages. The role of energy cooperatives such as Ecopower and Storm could be further supported to facilitate citizen co-ownership and democratise energy governance. The development of community engagement guidelines —co-designed with municipalities— could formalise these approaches and increase their long-term institutional uptake.

Economic pillar

While substantial investment in wind energy is underway, with companies such as Eoly, Engie, Eneco, and EDF Luminus playing key roles, the province could further reinforce the development of wind energy communities by exploring support mechanisms beyond existing green electricity certificates. These could include targeted municipal support schemes; local benefit-sharing arrangements such as (i) municipal taxation schemes, (ii) obligatory, regulated and transparent environmental community fund arrangements, (iii) redistribution of leasehold-income with nearby neighbours; and incentives for cooperatives involved in wind energy production. While these provisions largely fall under other governance levels, the province can act as a convener and enabler through inter-municipal platforms and pilot schemes under the Space for Energy strategy.

Stakeholder engagement guidelines

Stakeholder engagement in **Flemish Brabant** benefits from a multi-level and cross-sectoral ecosystem. Key actors include the Flemish Government (including the Flemish Department of Environment and Spatial Planning and the Flemish Energy and Climate Agency),

municipalities, cooperatives, private energy companies, and academic institutions such as KU Leuven and Vrije Universiteit Brussel. Going forward, the province could consider formalising an advisory platform composed of representatives from these stakeholder categories. This platform could in turn support the implementation of BIOWIND outcomes through periodic dialogues aligned with Flemish-level policy review processes and municipal wind energy planning cycles.

In addition, the province could develop a publicly accessible stakeholder engagement roadmap that outlines the roles, responsibilities, and participation pathways for key actors. This could be accompanied by an open-access digital dashboard that tracks engagement processes, project milestones, and feedback loops at the municipal level, provincial or Flemsih level.

Regular policy reviews —already scheduled through dialogue with the Flemish Government and strategic partnerships with municipalities— can provide a robust foundation for monitoring the uptake of the BIOWIND sustainability strategy. These could continue to be leveraged to promote the roll-out of accelerated wind energy initiatives and foster a transparent, collaborative planning environment.

Central Danube

The **Central Danube Development Agency (CDDA**), as the operative body of the **Central Danube Development Council**, plays a pivotal role in facilitating strategic planning, coordinating multi-level governance, and supporting local initiatives in the region. The **Central Danube** region currently has no specific energy and transition strategies, so the development of the region is determined by the national wind energy targets of the *National Energy and Climate Change Plan (NECP)* of Hungary. There are certainly no national plans for capacity expansion in the region until 2030. In this context, the **CDDA** is not in a good position, as it can only assert its interests for the period after 2030.

While the **Central Danube** region does not yet benefit from a Just Transition Plan or a regional energy strategy, the upcoming amendment to its *Operational Programme (OP)* under the *"Innovation and Environmentally Friendly Development"* axis offers a unique opportunity to embed wind energy within its policy framework. At the same time, the current national planning documents only allow for the consideration of low-power, essentially household-scale installations in the area - but the wind climate conditions in the area are typically not favourable for these due to the low pole heights. **CDDA** can use its project development and spatial planning competencies to lead the alignment of these instruments with the BIOWIND Sustainability Strategy.

Environmental pillar

The current national planning documents do not yet go in this direction, but the **Central Danube** Region should also expect wind energy to spread in the more distant future and therefore proactively integrate environmental sustainability aspects into future territorial policies. The region should establish context-sensitive environmental monitoring mechanisms, particularly addressing potential impacts on bird migration routes, species habitats, and landscape fragmentation.

In its role as a regional coordinator, **CDDA** can promote the adoption of standardised ecological indicators, develop environmental data collection protocols in cooperation with academic partners such as ELTE University, and facilitate capacity-building workshops for municipalities and local developers. Furthermore, the Agency should encourage early incorporation of sustainable decommissioning principles, such as turbine component recycling and site restoration standards, into regional planning and funding conditions.

Social pillar

The **Central Danube** region's path toward increased wind energy acceptance will depend heavily on strengthening civic engagement and transparency. A critical initiative on the part of the regions could pertain to the formalisation of lifecycle-long civic participation as a policy principle. Based on the current national planning documents, the only realistic focus for the time being is on awareness-raising and improving the acceptance of wind energy. In the future, as more ambitious national wind targets emerge, there can only be talk of introducing public consultation mechanisms (of course at an early planning stage) and incorporating citizen feedback into project design and evaluation. In the absence of structured consultation platforms, **CDDA** can facilitate the development of a digital regional consultation tool. This platform would serve as a repository of wind energy project information, allow public feedback, and offer participatory planning features tailored to local government capacities.

Ongoing stakeholder coordination work could also involve the rollout of targeted public awareness campaigns and educational seminars, developed in cooperation with civil society organisations and environmental education centers. These efforts should be oriented toward building public trust, clarifying environmental and economic impacts, and supporting citizen-led energy initiatives.

Economic Pillar

While the **Central Danube** region currently lacks structured financial support for wind energy development, the amendment of the OP creates space to introduce targeted funding mechanisms for:

- Wind energy project development by local authorities or SMEs;
- Community co-ownership or cooperative investment models;
- Preparatory studies and permitting support.

CDDA can support this effort by offering project development assistance and technical guidance to local actors seeking to access EU instruments.

Additionally, **CDDA** should coordinate with national agencies to ensure the alignment of regional procurement frameworks with wind energy project needs, including grid access, land availability, and spatial planning integration. Capacity-building sessions for municipal officers, energy planners, and developers should be launched to support this transition.

Stakeholder engagement guidelines

Based on the current stakeholder landscape, the following actors have been identified as key for advancing the sustainability strategy in the **Central Danube** region:

- **Municipalities**: such as Györköny and Sárszentlőrinc, can act as hosts and facilitators of public engagement and land-use planning for wind parks;
- **Private Sector**: firms like Energetic Home Ltd. can bring technical know-how and investment capacity;
- **Academia and Civil Society**: partners like ELTE University and environmental education organisations can contribute technical input and facilitate public education;
- **CDDA**: will play the coordination role, ensuring consistency across local policies, building institutional capacity, and securing multi-level dialogue.

Meaningful engagement can be further fostered through the establishment of a Regional Stakeholder Forum for Wind Energy, convened biannually, where representatives from these sectors can co-develop implementation roadmaps and monitor progress. **CDDA** could maintain a dynamic stakeholder registry and participatory planning calendar, ensuring continuity of involvement and visibility of the region's wind-related initiatives. A formal Memorandum of Cooperation could also be signed with key actors to codify long-term responsibilities and coordination mechanisms.

Świętokrzyskie Voivodeship

The **Świętokrzyskie Voivodeship** currently operates without a dedicated regional energy strategy or Just Transition Plan. Wind energy development in the region remains at an early stage, shaped primarily by national-level commitments and the regional operational programme *Fundusze Europejskie dla Świętokrzyskiego 2021–2027*. While the absence of local wind energy targets and strategic frameworks presents a challenge, it also offers an opportunity for the region to establish a coherent planning foundation that aligns with national priorities and BIOWIND's sustainability objectives.

Environmental pillar

Environmental actions should focus on strengthening policy frameworks to ensure ecological sustainability in future wind development. While wind energy is not yet widespread in the region, early adoption of robust environmental monitoring procedures and the implementation of the mitigation hierarchy could help shape high-quality planning practices from the outset. The regional operational programme may provide funding streams to pilot environmental impact assessment tools, particularly those incorporating biodiversity monitoring and citizen science collaborations.

Additionally, the region should be encouraged to support sustainable decommissioning principles, including lifecycle planning and the reuse or recycling of turbine components, to avoid future legacy issues.

Social pillar

Public acceptance and citizen participation are essential to ensuring the legitimacy of wind energy projects in **Świętokrzyskie**. Municipalities such as Ćmielów, Lipnik, Ożarów, and Kielce Miasto have been identified as important local stakeholders. Their role in fostering civic dialogue and informing residents about the benefits, risks, and spatial implications of wind energy should be reinforced through targeted campaigns and consultation frameworks.

Building on BIOWIND outcomes, the region should consider establishing an online consultation and wind mapping platform to increase transparency and enable meaningful public input. Educational campaigns, implemented in cooperation with research institutions such as Kielce University of Technology and the Świętokrzyskie Centre for Technology Transfer and Innovations, could also help raise awareness and strengthen regional energy literacy.

Economic pillar

Although there are no region-specific renewable energy targets, the regional programme provides a viable funding mechanism for supporting early-stage investments. A key policy recommendation identified by the **Marshal Office of Świętokrzyskie Voivodeship** involves including targeted grant conditions for renewable energy support in open calls for entrepreneurs. This recommendation, expected to be operational between 2025 and 2028, should prioritise wind energy projects that demonstrate social engagement, community benefit sharing, or innovative environmental approaches.

Promoting the development of energy communities —particularly by supporting SMEs and cooperatives through financial and technical assistance— could be facilitated via collaboration with actors such as Akademia Przedsiębiorczości and MB Recycling Sp. z o.o., who were identified as stakeholders with a capacity for investment and entrepreneurship support.

Stakeholder engagement guidelines

The **Świętokrzyskie Voivodeship** has identified a diverse set of actors, including local authorities (e.g., Ćmielów, Lipnik, Ożarów), the private sector (e.g., Elawan Energy Polska, Regional Development Agency in Starachowice), academia, and innovation associations. These stakeholders should be engaged through a structured framework aligned with BIOWIND's sustainability objectives.

Recommendations include:

- Creating a regional coordination platform to facilitate cross-stakeholder communication.
- Organising biannual stakeholder roundtables to review wind development progress and identify emerging challenges.
- Encouraging municipalities to establish local energy working groups, in which residents can contribute to spatial and permitting discussions.
- Mobilising research institutions to contribute to environmental and technical evaluations of proposed projects.

The implementation of the BIOWIND sustainability strategy is expected to be monitored through regular policy reviews conducted by the ERDF Department within the Marshal Office. This process should include public reporting, stakeholder input, and integration of feedback loops into programming for the 2028–2034 operational period.

Region of Murcia

The **Region of Murcia** can contribute to Spain's clean energy transition by embedding regional planning efforts within broader national frameworks. Although the region does not possess its own standalone energy or just transition plans, it actively aligns with Spain's *National Integrated Energy and Climate Plan (PNIEC)* and the *national Just Transition Strategy*. This multi-scalar governance approach provides the scaffolding for future regional actions, and the BIOWIND sustainability strategy offers a timely opportunity to localise these national ambitions through targeted policy measures and enhanced civic engagement.

Environmental pillar

A key objective for **Murcia**'s environmental strategy is to strengthen biodiversity protection in the context of wind energy expansion. Drawing from the BIOWIND policy brief on effective biodiversity management, the region could implement several ecological safeguards in its territorial planning processes. These include the application of the mitigation hierarchy, the use of early warning systems and real-time monitoring technologies, and the adoption of adaptive environmental management methods. The *ERDF Programme 2028–2034* offers a practical framework for integrating these measures, especially where regional funding supports infrastructure projects with environmental relevance. By 2027, the region aims to incorporate biodiversity-sensitive planning provisions and cumulative impact assessments into the evaluation of wind energy installations.

Social pillar

The Autonomous Community of the **Region of Murcia** recognises the importance of public participation and inclusive decision-making in achieving social acceptance of renewable energy infrastructure. To this end, the BIOWIND strategy encourages the enhancement of public consultation periods for spatial and energy plans. This would allow regional authorities to gather meaningful feedback on environmental and siting concerns and incorporate BIOWIND recommendations into future plan amendments. Civil society organisations such as the Asociación de Naturalistas del Sureste, and organisations like OTC-COITIRM, can play a vital role in encouraging citizen engagement and supporting the formation of energy communities. The development of awareness campaigns and training seminars aimed at increasing public literacy on wind energy projects could further strengthen civic trust and transparency.

Economic pillar

Although the **Region of Murcia** does not currently employ wind-specific financial incentives at the regional level, its alignment with national goals opens opportunities to benefit from Spain's broader policy and funding landscape. With the *PNIEC* setting ambitious wind energy targets, the region is well-placed to develop strategic investment pipelines. Targeted use of ERDF and national Just Transition funds could support infrastructure development, research programs, and technology upgrades that reduce environmental risks and enhance economic viability. Local universities, such as the Universidad Politécnica de Cartagena, should be mobilised to contribute to innovation in turbine technologies and ecological monitoring systems.

Additionally, fostering cooperative ownership models and local wind energy communities could generate local economic benefits and increase the legitimacy of wind energy investments. These models could be piloted through project-based initiatives initially embedded within the ERDF framework and scaled further during the next programming period.

Stakeholder engagement guidelines

The stakeholder ecosystem in the **Region of Murcia** comprises actors from public administration, academia, civil society, and the private sector. The Regional Secretary for Energy, Sustainability and Climate Action, as well as the Directorate-General for Energy and Industrial and Mining Activity, are central to steering territorial energy policies. Their coordination with project developers (e.g., ENDESA/Enel Green Power and I-DE Renovables) and civic stakeholders is essential for effective implementation of the BIOWIND strategy.

Structured stakeholder engagement can be institutionalised through the following measures:

- Stakeholder coordination platform: Establish a regional roundtable involving all identified actors to oversee the implementation of environmental and public participation measures.
- Consultation feedback loop: Introduce a standardised mechanism for responding to citizen and stakeholder feedback submitted during planning consultations.
- Capacity-building: Offer targeted training to municipal authorities and local NGOs on regulatory developments, biodiversity criteria, and participatory tools.
- Monitoring and accountability: Track public participation metrics and biodiversity indicators as part of ERDF-supported project evaluations.

Through these measures, **Murcia** can translate national strategies into regional impact, embed sustainability principles across environmental, social, and economic pillars, and reinforce public confidence in wind energy development as a socially and ecologically responsible pathway.

Asturias

The **Asturias Energy Foundation (FAEN**), acting as the regional energy agency, plays a key role in promoting the energy transition in **Asturias**. The sustainability strategy for the region should align with the objectives set in the *Just Energy Transition Strategy of Asturias 2017–2030*, while drawing from the BIOWIND project's policy outputs and territorial recommendations. **FAEN**'s efforts must focus on strengthening citizen engagement, enhancing regulatory coherence, and embedding social and environmental safeguards in wind energy planning. As the *Asturian Just Energy Strategy* is expected to be revised in the coming years, this moment provides an opportunity to incorporate new participatory, regulatory, and ecological priorities into long-term planning.

Environmental pillar

The Asturian environmental and energy planning framework already requires robust environmental impact assessments and spatial planning alignment. However, **FAEN** could support a more integrated environmental governance model for wind energy, leveraging GIS-based multi-criteria decision-making systems to evaluate land suitability.

As decommissioning gains importance, **Asturias** could lead by including binding restoration plans and waste management protocols within wind project permits. Integrating these standards into planning guidance for the 2030s —especially within the revision of the Asturian Energy Strategy— would enhance long-term sustainability.

Social pillar

To strengthen social acceptance and democratic legitimacy, **FAEN** advocates for mandatory, lifecycle-long public consultations. These include structured information sessions and open public forums at both planning and decommissioning phases. Establishing grievance redress mechanisms would reinforce participatory governance and pre-empt potential disputes. Public consultation should not only inform but actively shape project decisions.

A regional KPI framework could be introduced to monitor social inclusion, including metrics such as the number of new public forums held, grievance mechanisms activated, and citizen

contributions integrated into final project plans. These indicators would be tracked as part of **FAEN**'s annual performance reviews and tied to national reporting obligations.

An online consultation platform could be deployed regionally to consolidate information-sharing and facilitate feedback collection. Educational campaigns on wind energy and participatory rights, developed in cooperation with municipalities, schools, and civil society, would foster long-term civic engagement.

Economic pillar

Although **Asturias** has not yet implemented specific mechanisms to promote energy communities, the updated strategy should include financial and technical support for cooperative and citizen-led energy schemes. This aligns with the *Renewable Energy Directive III,* which calls for increased citizen participation in renewable generation.

FAEN could promote shared ownership models, especially in remote and low-income areas, by facilitating access to national or EU co-financing schemes. In parallel, it can provide municipalities and local stakeholders with technical assistance on legal structures and project design for energy cooperatives. These actions would be incorporated into **Asturias**' upcoming revisions of its energy and development strategies.

To improve the efficiency and transparency of wind energy permitting, **Asturias** could implement a digital platform that consolidates permitting processes into a unified system. This platform would employ GIS-based, multi-criteria evaluation methods to assess land suitability by integrating spatial, environmental, and technical criteria. By streamlining administrative workflows, such a system would reduce delays, enhance regulatory clarity, and increase investor confidence.

In the case of offshore wind, specific support measures could build upon funding programs such as *RENMARINAS DEMOS*, which encourages innovation and demonstration of marine renewable energy technologies. Additionally, coordination with Spain's national energy strategy (PNIEC) is essential for aligning financial incentives and targets between regional and national levels implementing the support mechanisms through auctions.

Stakeholder engagement guidelines

The stakeholders identified in the region include regional authorities (General Direction of Energy of the Government of the Principality of Asturias), municipalities, NGOs, academia, and private sector wind energy developers. **FAEN** should establish a stakeholder coordination

board to oversee the strategy's implementation, ensuring broad participation and alignment with **Asturias**' climate neutrality goals.

Municipalities could be encouraged to develop local wind planning guidelines, while civil society organisations should be invited to participate in consultation events and feedback sessions. Academic institutions and technical schools can serve as partners in research, public education, and skills development. In this context, **FAEN** could create a public stakeholder registry and maintain a wind energy engagement calendar that ensures consistent communication, encourages project co-design, and tracks contributions to the policy process.

Berat county

Although Albania is not yet a member of the European Union, it is a candidate country undergoing regulatory alignment with EU renewable energy directives. The **Active Alliance for Albania (AAA)**, representing **Berat** in BIOWIND, is well positioned to support this transition by promoting participatory, regulatory, and spatial planning improvements aligned with EU practices. The sustainability strategy in **Berat** should build on the *Smart Energy Municipalities Project* (*SEMP, 2018-2030*), Albania's *Renewable Energy Law No. 24/2023*, and national renewable energy targets, while fostering localised ownership, civic involvement, and institutional readiness.

Environmental Pillar

Berat currently lacks a spatial framework tailored to wind energy development. As a priority, wind siting considerations should be integrated into municipal spatial plans using low-cost GIS mapping tools, with the support of the Ministry of Infrastructure and Energy (MIE) and the National Agency of Natural Resources (AKBN). This integrated approach should account for wind potential, biodiversity constraints, and land-use compatibility. In parallel, training programmes for municipal staff should be launched, focusing on biodiversity-sensitive site screening, in collaboration with national institutions and civil society actors. These efforts would lay the groundwork for structured spatial planning, with implementation activities commencing in 2025 and targeted pilot outputs by 2026-2027.

Social Pillar

Securing public support and community participation is key to wind energy success in **Berat**. A targeted citizen engagement plan should be developed, leveraging municipal councils, local NGOs, and academic actors. This engagement should include town halls, youth outreach, and participatory visioning exercises, building upon the SEMP platform as an established entry

point for such activities. These efforts aim to strengthen trust, generate local ownership, and address existing social scepticism toward wind energy. Moreover, a regional Wind Energy Sustainability Observatory (WESO-Berat) should be established as a coordinating hub, tasked with monitoring progress, publishing transparent reports, hosting stakeholder forums, and facilitating international cooperation.

Economic Pillar

Berat's wind energy economy can be jumpstarted by capitalising on national *feed-in tariffs (FiT)* for small wind projects (<3 MW), which guarantee purchase prices for 15 years. The sustainability strategy should promote community-led pilot projects eligible for these tariffs, offering technical support and streamlined application procedures to cooperatives and local developers. Capacity-building and awareness-raising campaigns-run in collaboration with the Energy Regulatory Entity (ERE) and AKBN-should demystify the legal, technical, and financial requirements of project development.

Additionally, the strategy should position **Berat** to benefit from international development financing and EU pre-accession instruments. Partnerships with donors such as GIZ, the World Bank, EBRD, or Swiss SECO can support permitting capacity, project pipeline development, and municipal integration of wind energy investment priorities. Local governments must also be empowered to incorporate wind energy in development plans and explore funding from IPA III and the Western Balkans Investment Framework (WBIF).

Stakeholder Engagement Guidelines

Implementation should rely on a broad stakeholder base spanning public authorities, civil society, and the private sector. Municipalities in **Berat** are expected to lead citizen consultations and integrate wind energy priorities into local development plans, while the Ministry of Infrastructure and Energy (MIE) and the National Agency of Natural Resources (AKBN) will provide policy alignment and technical oversight throughout the planning and implementation process.

The Energy Regulatory Entity (ERE) and the Transmission System Operator (OST) will play a key role in facilitating access to feed-in tariff schemes and ensuring grid infrastructure readiness. Local NGOs, farmers, civil society organisations, schools, and academic institutions are envisioned as community liaisons, helping to raise public awareness and foster inclusive dialogue.

Meanwhile, energy developers will serve as primary drivers of investment and project execution. According to the timeline proposed by AAA, foundational stakeholder and policy integration activities should begin in 2025, with pilot implementation of small-scale wind energy projects envisaged for the 2026–2027 period.

Assessing Risks and Strategic Challenges

To support the effective implementation of the proposed sustainability strategy across partner territories, it is important to acknowledge the potential risks, structural limitations, and enabling conditions associated with each strategic pillar. The following SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis identifies critical internal and external factors that may shape the success of environmental, social, and economic measures proposed within the strategy. By anticipating these dimensions, partners can be better prepared to mitigate challenges such as regulatory complexity, financial shortfalls, or social resistance, while leveraging emerging opportunities and institutional strengths.

Pillar	Category	Assessment
Environmental	Strengths	Increased attention to biodiversity protection and spatial planning.
Environmental	Weaknesses	Lack of detailed spatial plans and standardised monitoring tools in several regions.
Environmental	Opportunities	Opportunity to integrate wind into local land use planning with EU support.
Environmental	Threats	Delays in permitting and appeal, and limited environmental oversight capacity.
Social	Strengths	Existing awareness of social acceptance challenges and emerging best practices.
Social	Weaknesses	Low public trust and absence of structured benefit-sharing in some regions.
Social	Opportunities	Development of community ownership schemes and engagement platforms.
Social	Threats	Persistent NIMBYism and resistance from interest groups.
Economic	Strengths	National-level feed-in tariffs and potential international donor support.
Economic	Weaknesses	Limited regional financial capacity and technical readiness for project rollout.
Economic	Opportunities	New EU funds and wind energy targets open new funding streams.
Economic	Threats	Economic downturns, policy instability, and investor uncertainty.

Glossary of Terms

Adaptive spatial planning: A planning approach that is flexible and responsive to new environmental, social, or technical data, allowing spatial policies to evolve over time.

Co-investment schemes: Financial arrangements where citizens or communities invest alongside public or private entities in renewable energy projects.

Cumulative impact: The combined effect of multiple developments or projects on the environment or communities, which may be greater than the sum of individual impacts.

Decommissioning: The process of retiring and dismantling wind turbines or infrastructure at the end of their operational life, including site restoration.

Early-stage consultation: Engagement with stakeholders and the public before the finalisation of project plans, allowing concerns to be addressed proactively.

Energy communities: Citizen-led initiatives in which individuals, local authorities, or cooperatives generate, consume, and manage renewable energy, often with collective ownership and benefit-sharing.

Energy transition: The process of shifting from fossil-fuel-based energy systems to renewable and low-carbon energy sources.

Environmental Impact Assessment (EIA): A structured process that evaluates the environmental consequences of a proposed project before decisions are made.

Feed-in Tariff (FiT): A policy mechanism that guarantees a fixed, premium price for renewable electricity fed into the grid, encouraging investment by ensuring long-term returns.

Grievance redress mechanisms: Formal procedures through which citizens or stakeholders can express concerns or complaints about energy projects and receive a structured response or resolution.

J**ust Transition**: A policy framework aimed at ensuring that the shift to a low-carbon economy is fair and inclusive, especially for workers and communities dependent on fossil fuels.

Mitigation hierarchy: A framework used in environmental planning that prioritises avoiding impacts first, then minimising them, restoring affected areas, and finally offsetting any remaining damage.

Multi-level governance: A governance structure involving coordination across local, regional, national, and sometimes EU levels.

Participatory governance: Decision-making processes that actively involve stakeholders and citizens in shaping public policies and projects.

Regulatory bottlenecks: Delays, obstacles, or inefficiencies caused by overly complex, overlapping, or unclear rules and procedures within the regulatory framework. In the context of wind energy projects, these bottlenecks can hinder planning, permitting, construction, or operation due to inconsistent legislation, slow administrative processes, or lack of coordination across governance levels.

Policy alignment: The process of ensuring that different regulations, strategies, or plans work together consistently to achieve shared objectives.

Benefit-sharing schemes: Arrangements that ensure communities affected by renewable energy developments receive tangible economic or social benefits.

Shutdown-on-demand mechanisms: Technological solutions that allow wind turbines to stop operating temporarily to protect wildlife (e.g., bats or birds) when necessary.

Spatial buffer zones: Designated areas around sensitive sites (e.g., habitats, residential areas) where development is restricted to prevent negative impacts.

Spatial zoning: The division of geographical areas into zones where specific land uses—such as wind energy installations—are allowed, restricted, or prohibited.

Stakeholder mapping: The process of identifying all relevant actors affected by or involved in a project or policy, in order to plan for their engagement.