Interreg Europe

Co-funded by the European Union

BIOWIND

Activity A3.2

Background Study

on elements of a comprehensive environmental plan and effective systems for biodiversity monitoring

JANUARY 2024

EXECUTIVE SUMMARY

Activity 3.2 of the Interreg Europe BIOWIND project, titled "*Site visit in wind farm(s) in Latvia and workshop on effective biodiversity management and conservation systems in wind areas*," is designed to enhance the understanding of project partners regarding wind farm planning and operation in the context of biodiversity conservation. Organized by the Zemgale Planning Region (ZPR), the activity is scheduled to take place on February 20^{th} and 21^{st}, 2024, in Jelgava, Zemgale Region, Latvia.

This document aims to provide project partners with the necessary theoretical background on environmental management in wind farms and practical information to facilitate their visit to the Laflora wind farm project and participation to the workshop on biodiversity management and conservation systems in wind areas.

- Chapter A serves as an introduction, offering an overview of the objectives and aims of Activity 3.2 while connecting them to the project's overarching goals.

- Chapter B comprises the main theoretical background study, divided into four sections. The first section addresses essential aspects of environmental management in wind projects, showcasing existing biodiversity management systems used in wind farms. The second section initially outlines significant energy statistics in Latvia and then provides a comprehensive overview of the wind power plant implementation process in the country. Finally, the third section offers a concise overview of the Laflora wind farm, emphasizing key findings derived from the project's Environmental Impact Assessment (EIA).

- Chapter C, the final chapter, provides essential guidelines to the organising partner (ZPR) for the preparation, communication, dissemination, and evaluation of both the workshop and accompanying site visit.

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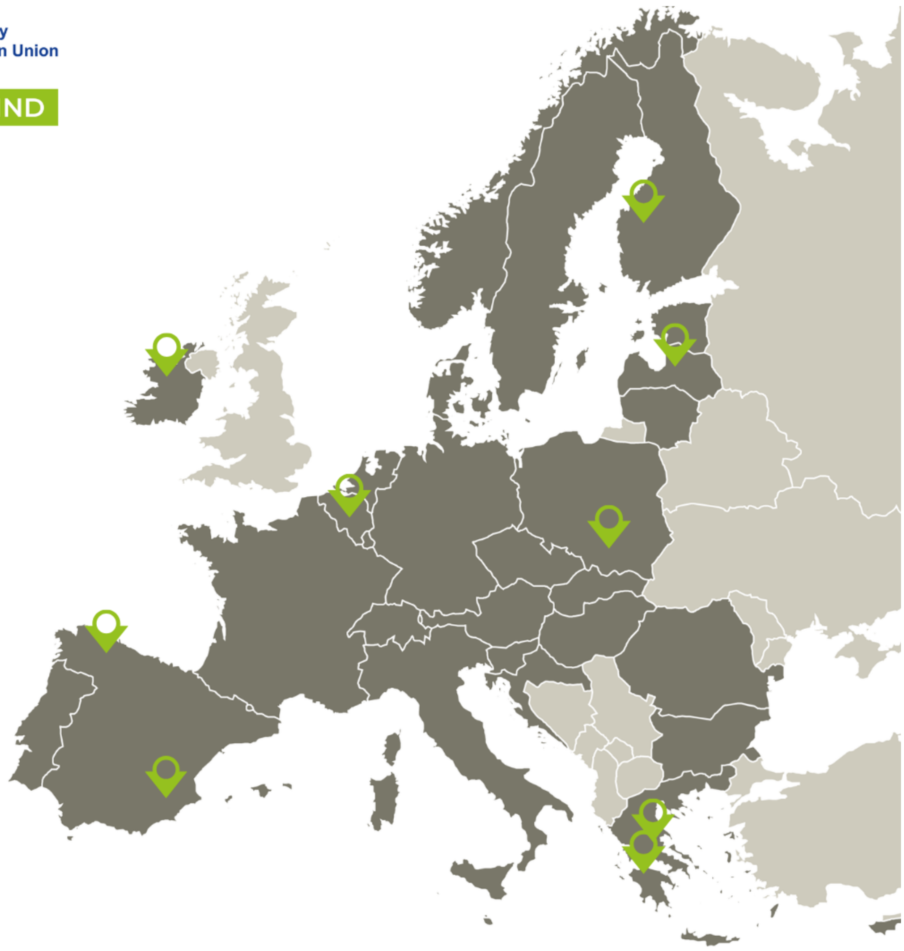

Province of Flemish Brabant (PVB)	Northern & Western Regional Authority (NWRA)
Regional Council of South Ostrobothnia (RCSO)	Zemgale Planning Region (ZPR)
Region of Western Greece (RWG)	Marshal Office of Świętokrzyskie Voivodeship (MOSV)
University of Patras (UoP)	Asturias Energy Foundation (FAEN)
Central Danube Development Agency Nonprofit Ltd (CDDA)	Autonomous Community in the Region of Murcia, General Directorate of the Natural Environment (CARM)

Advisory Partner

PROMEA - The Hellenic Society for the Promotion of Research & Development Methodologies

Chapter A. - Introduction

A.1. BIOWIND Project

The BIOWIND project is funded by the “Greener Europe” thematic area of the INTERREG Europe programme[1]. The project targets two interrelated challenges that hinder the widespread adoption of wind energy at the local level: opposition from local communities and complex permitting procedures. Involving a coalition of 11 organizations from 8 EU countries, the project's strategy involves collaborative policy learning and exchanges of experiences to establish a comprehensive and integrated approach to wind planning. With the aim of addressing every aspect of the "Climate – Biodiversity – Public Opinion" nexus, enhancing social acceptance, and ensuring sustainable wind energy expansion, the BIOWIND project has outlined four specific objectives to achieve:

- Promote alignment between territorial renewable energy sources (RES) and environmental policies while encouraging collaboration among various stakeholders in energy planning.
- Streamline permitting regulations for new and repowered wind farms while maintaining high biodiversity standards.
- Introduce community-driven wind initiatives to engage citizens and promote inclusive environmentally friendly growth in regions.
- Increase research and development (R&D) investments to enhance wind energy installations and decommissioning technologies.

On a broader EU scale, the BIOWIND project aims to secure public support and ensure fair distribution of renewable energy benefits to local communities. BIOWIND aligns with the objectives of the European Green Deal (EGD)[2] and the EU's growth strategy, supporting EU regions in meeting targets set by the Renewable Energy Directive (RED)[3,4], including the implementation of the priority actions under the

Offshore Renewable Energy Strategy[5]. The project also assists regions in integrating biodiversity considerations and environmental management measures into energy policies in line with the EU Biodiversity Strategy[6] and the Birds and Habitats Directives[7,8].

A.2. BIOWIND International Policy Learning Exchanges

The BIOWIND project foresees the organisation of three interregional workshops and two site visits during the project's Core phase to enhance and promote interregional policy learning and facilitate capacity building and policy transfer. Outcomes of these capacity building activities will be used during a series of stakeholder meetings and joint peer review working groups to develop policy advancement resources, as well as in the design and roll out of a jointly developed policy action.

The results stemming from these capacity-building initiatives will be utilized in a series of stakeholder meetings and collaborative peer review working groups. They will aid in the creation of resources to advance policy and contribute to the development and implementation of a jointly formulated pilot action.

As previously mentioned, each of the BIOWIND workshops and study visits will be focusing on a different aspect of the "Climate – Biodiversity – Public opinion" nexus within the context of the BIOWIND project's objectives (Figure 1).

A3.1 - Interregional workshop on developing measures to promote civic participation and engagement in wind energy planning	When: Semester 1 Where: IE Hosting Partner: NWRA
A3.2 - Site visit to wind farm(s) in Latvia & Workshop on effective biodiversity management systems in wind areas	When: Semester 2 Where: LV Hosting Partner: ZPR
A3.3 - Interregional workshop on sustainable approaches to wind turbine decommissioning	When: Semester 3 Where: BE Hosting Partner: PVB
A3.4 - Study visit to “Vöyrinkangas” wind farm	When: Semester 4 Where: FI Hosting Partner: RCSO

Figure 1: Workshops and study visits to be organised during the Core Phase of BIOWID project.

During the interregional workshops project partners can gain deeper insights into the different dimensions related to the wind farm deployment. In particular, they are expected to identify shared challenges and needs to be tackled through improvements in their policy instruments, while also acquainting themselves with good practices already implemented in other territories to address those policy gaps. Moreover, interregional workshops offer an excellent chance for project partners to connect with key stakeholders relevant to facilitating and fostering social acceptance of policy changes and the execution of new policy instruments.

A.3. BIOWIND Project – Activity 3.2

A.3.1 Overview, aims, and objectives

Activity “A3.2 - Site visit in wind farm(s) in Latvia and workshop on effective biodiversity management and conservation systems in wind areas” is organised by the Zemgale Planning Region (ZPR). It is going to take place from 20-21 February 2024 in Jelgava, Zemgale Region, Latvia. The Activity consists of two parts: on February 20th, participants will take part in a workshop discussing early warning systems employed in wind farms to safeguard biodiversity, and on February 21st, they will visit the Laflora wind farm project.

The aim of the interregional workshop is to provide a ground for discussions between project partners and invited key stakeholders to:

- **Exchange** experience and discuss the common challenges and gaps in environmental policies that can inhibit the deployment of wind farms.
- **Elaborate** and exchange ideas on biodiversity management and conservation systems in wind farm areas.
- **Assess** the scalability, replicability, and transferability of Laflora's approach in developing the environmental impact assessment (EIA).

A.3.2 Contribution of A3.2 to the objectives of BIOWIND Project

Insights gained from the workshop on effective biodiversity management and conservation systems in wind projects and the site visit to the Laflora wind farm will contribute to more informed policy-making regarding that will seek to balance the deployment of wind farms with environmental and biodiversity conservation in the partnership territories. In particular, both the workshop and the site visit will promote capacity building by enhancing partners' knowledge and understanding of the intricacies in managing wind energy projects in line with complex environmental regulations.

The site visit will offer participants (project partners) the opportunity of a firsthand experience of how wind farms are planned and how biodiversity conservation is integrated in their operation. The workshop will provide the opportunity to share their own territorial approaches regarding environmental management and biodiversity conservation in wind developments in different contexts. Moreover, the workshop serves as a platform to engage stakeholders involved in permitting processes. It allows for discussions among policymakers, environmentalists, industry representatives, and community members, fostering dialogue and collaboration toward finding mutually acceptable solutions.

Chapter B. - Thematic Background

The aim of the Thematic Review is to enable project partners to actively and effectively participate in both the upcoming workshop and the subsequent site visit to Laflora wind farm. To achieve this objective, the review is divided into three sections. The first section outlines the three broad types of impacts of wind farms to biodiversity and ecosystems. The second section, covers essential aspects of environmental management in wind energy projects, showcases existing biodiversity management systems utilized in wind farms, and discusses approaches for the mitigation of biodiversity impacts in wind farms. The third section initially outlines significant energy statistics in Latvia and then provides a comprehensive overview of the wind power plant implementation process in the country. Lastly, the review offers a concise overview of the Laflora wind farm, emphasizing key findings derived from the project's Environmental Impact Assessment (EIA).

B.1. Impacts of wind farms to biodiversity

Although windfarms are less land intensive than other renewables in terms of power produced per square meter, they still impact biodiversity[9,10] and ecosystems both within the wind farms' areas but also the surrounding areas. Impacts to biodiversity refer to "alterations to any components of biodiversity, including genes, species or ecosystems, whether adverse or beneficial, wholly or partially, resulting from a wind project's actions"[9]. Biodiversity loss can in turn lead to a breakdown in the functioning of the ecosystem and the services it provides to animals and people. The International Union for Biodiversity Conservation (IUCN) defines three broad types of impacts to biodiversity associated with wind energy development: direct, indirect, and cumulative[9].

- **Direct impacts** result from project activities or operational decisions, which are predictable through planned activities and knowledge of local biodiversity. Such impacts include habitat loss within the project area, habitat fragmentation caused by project infrastructure, and species disturbance or mortality due to project operations.

- **Indirect impacts** are caused by project activities or by-productsa of said activities within a project's area of influence. For instance, such impacts may arise from the creation of routes into previously inaccessible areas which can lead to increased pressure on biodiversity. Predicting the scale of indirect impacts is often challenging for wind project developers as they result from complex interactions of multiple external factors associated with the project.

- **Cumulative impacts** refer to the successive, incremental and/or combined effects of existing, planned and/or reasonably anticipated future human activities in combination with project development impacts. They may be the result of multiple wind projects in a given area and/or due to pressures from various sectors and sources. Estimating the cumulative impacts of a wind project is complex but of high significance for sensitive species and ecosystem services.

Commonly identified impacts of wind projects to biodiversity include bird collisions with wind turbines or with associated transmission lines, potentially leading to high fatality rates across a wide range of vulnerable species groups including vultures, bustards, cranes and many migratory species. In additional species vulnerable to offshore wind developments include marine mammals, sea turtles, and some fish species. Mammals and sea turtles also face risks of collision with associated vessels, while habitat alteration can affect species of the seafloor.

Moreover, wind farms can also impact biodiversity through habitat fragmentation, alterations in prey-predator dynamics, noise disturbance affecting species' behaviour, electromagnetic field interference with navigation, changes in microclimates, disturbances during construction and maintenance, and acting as barriers to wildlife movement. These indirect effects can disrupt habitat connectivity, stress species, alter ecological relationships, and create barriers to resource access.

[a] Secondary or unintended consequences of a wind project's main activities, such as construction, infrastructure development, or operational activities.

B.2. Environmental stewardship within wind projects

There are three elements that contribute to ensure responsible environmental stewardship within a wind energy project: the Environmental Impact Assessment (EIA), the Environmental Management Plan (EMP), and the Environmental Management System (EMS). In summary, EIA identifies potential environmental impacts, EMP provides specific measures to mitigate these impacts, and EMS offers a framework for integrating these measures into an organization's broader environmental management strategy, fostering a culture of continual improvement and sustainability.

B.2.1 Environmental Impact Assessment (EIA)

Environmental Impact Assessment (EIA) is a term applied to the systematic process used to identify and evaluate the potential environmental impacts of proposed projects or developments before[11]. It assesses the direct and indirect effects of a project on various areas, including air, water, land, biodiversity, human health, and cultural heritage. The primary goal of the EIA is to identify and mitigate adverse environmental effects by identifying alternatives and proposing measures to reduce or eliminate negative impacts.

According to Directive 2014/52/EU[12] an EIA is expected to include at least the following:

(a) a description of the project and information on the site, design, size, and other relevant features of the project;

(b) a description of the most important potential impacts of the project on the environment;

(c) a description of the features of the project and/or measures envisaged in order to avoid, prevent, or reduce and, if possible, offset likely significant adverse effects on the environment;

(d) a description of the reasonable alternativesb studied by the (project) developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment;

(e) a non-technical summary of the information referred to in points (a) to (d); and

(f) additional information relevant to the specific characteristics of a particular project or type of project and to the environmental features likely to be affected.

B.2.2 Environmental Management Plan (EMP)

The Environmental Management Plan (EMP) is a term that refers to a detailed strategy developed based on the findings and recommendations of the EIA[13]. It outlines specific actions, measures, and protocols to manage, mitigate, or monitor the identified environmental impacts during project implementation. Overall, the EMP includes measures to prevent or minimize adverse effects, delineates roles and responsibilities, and sets up monitoring and reporting mechanisms.

Although, there isn't a specific EU-wide guidelines document exclusively dedicated to EMPs, several directives and regulations incorporate elements relevant to environmental management planning across different sectors. They set standards and requirements that influence the development and implementation of EMPs in various contexts. The following section summarises the key directives and regulations that set the groundwork and requirements for environmental considerations, influencing the development and implementation of EMPs across different activities within the RES sector.

[b] For example, in terms of project design, technology, location, size, and scale.

B.2.2.1. Legislative Framework

Directive on the assessment of the effects of certain public and private projects on the environment (Directive 2011/92/EU)

The Environmental Impact Assessment (EIA) Directive[14] aims to ensure that projects which are likely to have a significant impact on the environment are identified and assessed, within an appraisal process, before these projects are implemented. It outlines a systematic process for identifying, assessing, and mitigating the (direct and indirect) environmental impacts of proposed initiatives. In this regard, it requires a comprehensive assessment, addressing aspects such as biodiversity, air quality, water resources, and socio-economic factors, promoting public participation, and ensuring transparency in the decision-making process. The Directive was amended in 2014[12] aiming to strengthen public participation in the EIA process, place greater emphasis on cumulative effects[c] during the assessment process, and improve the quality of EIAs.

Directive on environmental liability with regard to prevention and remedying of environmental damage (Directive 2004/35/CE)

The Environmental Liability Directive (ELD) establishes a comprehensive EU-wide liability regime for environmental damage based on the “polluter-pays” principle. The directive sets out provisions that require operators to take preventive measures and remedial actions in the event of environmental damage to protected species, natural habitats, water resources, and land. The ELD Directive aims to prevent and fully remedy damaged natural resources and their services to the condition that would have existed if no damage had occurred.

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[c] Cumulative impacts may arise a s a result of: a) the combined impact of a number of different environmental impacts on a single receptor/resource where these impacts have been identified in the EIA of a single project; and b) the combined impact of a number of different projects (including the EIA’s project) within the vicinity on a single receptor/resource.

Habitats Directive (Directive 92/43/EEC) and Birds Directive (Directive 2009/147/EC)

The Birds[7] and Habitats[14] Directives are cornerstones of EU's biodiversity policy, providing the legislative framework to protect valuable and threatened species and habitats. These directives together form the basis for the creation of the Natura 2000 Network, the largest coordinated network of protected areas in the world. The Birds Directive regulates the conservation, management, and exploitation of vulnerable bird species and their habitats, while the Habitats Directive expands the scope to safeguarding a wide range of species and habitats of importance for EU biodiversity.

B.2.2.2. Key elements of an EMP for a wind energy project

Building on the outcomes of the EIA, the EMP for a wind energy project should provide a comprehensive strategy to identify, mitigate, and manage any potential environmental impacts associated with the project's development, construction, operation, and decommissioning phases. The following are some key elements to be included in the EMP for a wind project:

- Environmental Policy Statement: A clear and concise environmental policy statement that emphasises the project's commitment to preserving and protecting the environment. Furthermore, the integration of specific environmental objectives and targets within the policy statement demonstrates that these goals align with regulatory obligations. These objectives need to be measurable, achievable, and time-bound, ensuring clarity and accountability in the pursuit of environmental excellence.

- Site Selection and Design: A brief explication regarding the selection of the project site as well as the choice of turbine placement and design, outlining the environmental parameters considered.

- Regulatory Compliance: A summary demonstrating compliance with all relevant environmental laws, regulations, and permits applicable to wind energy developments both at EU and at national/regional level. By aligning with these statutes, regulations, and licensing requirements, project developers engaged in wind energy projects not only assure the legality of the project but also demonstrate their accountability and respect for environmental norms.

- Risk assessment and mitigation measures: A report that outlines and evaluates the potential impacts (direct and indirect) during the construction and operation of the wind project. Based on the findings of the risk assessment the report also includes mitigation measures and strategies to minimise or eliminate adverse environmental impacts, including prevention, reduction, and control measures. Aspects to be discussed include:

- **Biodiversity and habitat conservation** → The strategies developed to protect local biodiversity, including endangered species and habitats, as well as the measures incorporated to minimise disturbance of wildlife during construction and operation.
- **Noise and visual impacts** → The measures to be implemented to reduce noise levels generated by wind turbines and mitigate visual impacts through strategic turbine placement, screening, and landscaping.
- **Water resource management** → The assessment and management of water use during the construction and operation of a wind project, as well as erosion control measures implemented to prevent soil runoff and protect water bodies.
- **Waste management** → The plans for managing construction and operation waste, with an emphasis on recycling, reuse, and/or responsible disposal methods.

- **Emergency** Response: The developed emergency response protocols, summarising procedures to address environmental incidents or accidents.

- **Monitoring and Reporting:** The monitoring indicators (e.g., bird collisions, water usage, noise levels, etc.) and the processes developed to track those indicators. Monitoring findings should be reported, both internally and externally (regulatory parties, public, etc.), preferably in a standardised manner in regular time intervals as mandated by legislation or stipulated in the wind project's environmental management plan.

- **Stakeholder Engagement and Communication:** The strategies for stakeholder engagement and the communication channels used to disseminate information to key target groups, including employees, local communities, regulatory agencies, and other interested parties.

- **Training and Competence Building:** The training, including reskilling and upskilling, provided to project personnel (employees and contractors) on environmental policies, procedures, and emergency response, also highlighting their roles (e.g., auditor, regulatory liaison, committee member, etc.) in environmental protection.

- **Decommissioning and Site Rehabilitation:** The plans developed for the decommissioning phase, including the dismantling of turbines and the restoration of the project's site.

It should be noted, that the EMP should be regularly reviewed and updated to ensure its effectiveness and relevance. In addition, based on monitoring, feedback, and lessons learned throughout the project's lifetime, improvement measures should be implemented. Lastly, the EMP needs to be flexible to adapt to changing environmental conditions or new scientific findings.

B.2.3 Environmental Management System (EMS)

Environmental Management System (EMS) is a term that describes a broader framework or management approach implemented within an organization to systematically address environmental concerns across all operations[15]. It encompasses policies, procedures, and practices designed to identify, manage, control, and improve an organization's environmental performance. The EMS focuses on continuous improvement, compliance with regulations, and sustainable practices, and it is often structured according to the ISO 14001 standard or alternatively the EMAS[d].

The employment and implementation of EMS frameworks can also lead to increased operational efficiency by identifying opportunities for innovation, resource optimization, and risk management. By integrating environmental considerations into core business processes, EMS frameworks help organizations achieve their environmental goals, while aligning with broader societal expectations for sustainable and responsible practices.

The development and implementation of an EMS typically involves a multi-step approach known as the "Plan-Do-Check-Act" (PDCA) Cycle. In the "Plan" phase, organizations establish environmental objectives, policies, and procedures aligned with legal requirements and stakeholder expectations. The "Do" phase involves implementation and execution of these plans, integrating environmental considerations into daily operations. Subsequently, the "Check" phase entails regular monitoring, measurement, and evaluation of environmental performance, ensuring compliance and identifying areas for improvement. Finally, the "Act" phase involves taking corrective actions and making necessary adjustments based on the evaluation, thereby establishing a cycle of ongoing improvement.

It is important to note that the EMS itself does not dictate a predefined level of environmental performance that must be reached; rather, it is each organization that tailors its EMS to align with its unique objectives and targets.

[d] Eco-Management and Audit Scheme (EMAS) is a voluntary environmental management instrument established by the European Commission[16].

Differences between ISO14001:2015 and EMAS

- ISO 14001 is an international standard applicable worldwide, while EMAS is primarily adopted within EU.
- ISO14001 compliance is voluntary and does not require external verification, while EMAS registered organisation must undergo third-party verification.
- ISO14001 does not define a mandatory level of public disclosure, while organisations registered in EMAS are required to publish an independently verified environmental statement that is accessible to the public.

B.2.3.1. ISO14001:2015

The ISO14001:2015 – Environmental management systems[17] is an internationally recognised standard that sets out criteria for EMS. The current version emphasises on a strategic approach to environmental management, with a focus on leadership management, risk-based thinking, and integration with overall business processes. It aims to help organisations enhance their environmental performance, compliance with regulations, and fulfilment of stakeholder expectations.

B.2.3.2. EMAS

The Eco-Management and Audit Scheme (EMAS)[16] is a voluntary environmental management tool designed by the European Commission. The EMAS emphasises active engagement with stakeholders, rigorous environmental reporting, and regular external verification by competent authorities. In order to register with EMAS, organisations must meet the requirements of the EU EMAS-Regulation[18].

B.2.4 Biodiversity monitoring in wind farms

Wind energy projects, while offering a sustainable alternative for fossil fuel based power generation, have raised concerns about their potential impacts on biodiversity[9]. The construction and operation of wind farms, particularly in ecologically sensitive areas, pose challenges to local ecosystems and wildlife habitats. Understanding and mitigating these impacts is crucial to ensure the coexistence of wind energy production and biodiversity conservation.

Biodiversity monitoring systems play a pivotal role in assessing and managing the environmental impacts of wind projects on local ecosystems[19]. These systems involve comprehensive methodologies, employing various tools and technologies to track and evaluate changes in biodiversity due to wind farm installations. Modern technologies, or the so-called “early warning systems”, and best practices can help to avoid and/or to reduce to a tolerable level the impacts of the wind farms on biodiversity during their design, construction, and operation. Such systematic monitoring is essential for informed decision-making and the development of effective conservation strategies.

Avian and bat radar systems

Radar systems can be used to identify flying animals, distinguished roughly by size, based on echo characteristics and/or wing beat frequencies. They can be paired with automated analysis of the images, using specialised computer software[9]. These systems can track flying animals in the vicinity of the wind turbines, providing real-time data on their behaviour, flight paths, and potential collision risks. Operators can activate wind turbine shutdown after receiving real-time information from the system or alternatively an automated shutdown by the system itself. These approaches are called “shutdown on demand”.

Owing to current technological limitations, it will usually be advisable to support image-based and radar systems with human observers. For example, radar systems can only distinguish object-size classes rather between species or species-groups of interest, unless their size is different from all other species present.

Acoustic monitoring

Passive acoustic monitoring (PAM) is a relatively modern technology that has gained attention as an effective method for observing patterns in the existence of species and the overall soundscape in marine environments. It is particularly useful in assessing and reducing risks associated with offshore wind farms. Passive acoustic surveys have also been successfully used to monitor songbird communities.[20] Specialized microphones or acoustic sensors can detect and record bird and bat calls. This information helps identify species present in the area and assess their activity patterns.

Thermal imaging cameras

Thermal cameras can be installed to detect and monitor wildlife, including birds and bats, by detecting their heat signatures. These cameras are particularly useful during nighttime or low-light conditions when visual observation is challenging. They provide a non-intrusive method to track wildlife movement and behaviour in the proximity of wind farms. Utilising the data acquired from the thermal cameras in combination with weather data, it is possible to model the factors that influence wildlife activity, such as flight patterns and roosting sites. Integrating thermal imaging data with other monitoring tools enhances the comprehensive assessment of wildlife behaviour and the potential collision risks near wind turbines, aiding the development of targeted mitigation strategies to minimise potential impacts on biodiversity within wind farm areas.

Weather sensors

Although not directly monitoring wildlife species, weather sensors are integral tools used in biodiversity monitoring within wind farms, offering crucial insights into the ecosystem dynamics. Sensors provide data on climatic conditions, such as temperature, humidity, and precipitation, aiding the understanding of how environmental conditions affect wildlife around wind farms. Integrating data collected from weather sensors with other biodiversity monitoring tools like thermal image cameras and acoustic monitoring can help assess how extreme weather events or changes in weather patterns affect wildlife behaviour and habitat usage around wind turbines.

Behavioural studies and research

Behavioural studies involve the observation and analysis of the behaviour of various birds, bats, and other wildlife, in proximity to wind turbines. Researchers conduct behavioural studies using methods such as visual observations, acoustic monitoring, radar technology, and GPS tracking to understand how different species use the area around wind farms for foraging, nesting, mating, and migration. These studies help to identify the potential risks and impacts of wind turbines on wildlife behaviour, such as collision risks or changes in habitat use patterns due to the presence of wind infrastructure. By analysing behavioural responses, researchers in cooperation with wind farm operators can develop mitigation measures to minimize adverse effects on biodiversity, including adjusting turbine operations during sensitive periods for wildlife or modifying the placement of turbines to reduce collision risks.

Data integration and analysis

The integration of data collected through different monitoring techniques (e.g., visual observations, radars, weather sensors, etc.) enables a systematic approach to understanding and effectively mitigating the potential impacts of wind farms on wildlife and ecosystems. Utilising these diverse data sets and employing robust data analysis techniques, including statistical modelling, data mining, and spatial analysis, can facilitate the identification of patterns, trends, and correlations between environmental conditions and wildlife behaviour in wind farm areas.

Adaptive management

Adaptive management refers to a systematic approach intended to improve policies and practices and reduce scientific uncertainty by learning form the outcome of management decisions[21,22]. It is an iterative process of data integration, analysis, and decision making to refine mitigation measures and conservation efforts based on both real-time and long-term monitoring data. For instance, if data analysis reveals an increased collision risk for certain bird species during specific weather conditions, adaptive management might involve adjusting turbine operations during those periods to reduce risks.

B.2.5 Biodiversity conservation in wind farms

Biodiversity conservation actions in wind projects aim to mitigate bioidversity impacts associated with the projects. Mitigation can be achieved through avoidance and minimization measures, as well as restoration and offset measures[9,23]. Avoidance and minimisation measures prevent or reduce impacts of wind projects, while restoration and offset measures remediate impacts that have already occurred. Preventive measures are more favourable from an economic, social, and ecological perspective project developers as well as local communities and other project stakeholders. Compared to avoidance and minimisation, restoration and offset measures often carry less certainty of success and involve higher costs for project developers.

Avoidance measures

For avoidance measures to be effective, biodiversity-related risks need to be identified early in the project planning stages. This is why biodiversity risk assessment is an essential element of the EIA of wind projects. During the planning stage effective avoidance can be achieved through site selection to ensure projects are not located in areas of high biodiversity risks (e.g., protected areas, areas used by sensitive or vulnerable species, etc.), and re-routing of onshore electricity lines to avoid collision risks. During the construction and decommissioning phase avoidance can be achieved through scheduling to ensure the timing of construction and/or decommissioning activities is not disturbing biodiversity during sensitive periods (e.g., breeding seasons, migration seasons, etc.)

Minimisation measures

Minimisation measures can be identified and employed throughout the wind project's cycle, from planning and construction to operation and decommissioning. Configuration of wind turbines during the construction stage, including minimum distances between turbines and parallel alignment of turbines, can help reduce barriers to bird movement and minimize the risk of collision. Minimisation measures in the construction stage include operational controls to manage and regulate contractor activity and movement (e.g., restricted vehicle/vessel movement during particularly sensitive periods), limiting natural vegetation clearance to the minimum necessary during construction works, protecting existing vegetation through establishment of exclusion zones using fencing/ barriers, and selection of the appropriate vessel types and controls on vessel activity in the case of offshore wind farms. During the operation stage minimisation measures include physical controls (e.g., shutdown on demand to minimise collision risk and installation of bird flight diverters on transmission lines), and operational controls to make sites less suitable for sensitive species (e.g., altering vegetation and habitat conditions to reduce suitable foraging and nesting habitat). Lastly, during the decommissioning stage, minimisation measures employed include operational controls to manage and regulate contractor activity and movement, in a manner similar to the construction stage.

Restoration measures

Restoration measures, including rehabilitation[e], reclamation[f], and remediation[g], are employed either during construction or decommissioning of wind farms. During the construction stage, restoration measures include revegetation of temporary use areas as they come available, as well as using topsoil and indigenous plants from the site for landscaping and rehabilitation works. During and after decommissioning

[e] The act of restoring a level of ecosystem functioning in degraded sites.

[f] The act of returning something to a former, better state.

[g] The process of improving or correcting a situation.

commonly used restoration measures include revegetation of the disturbed area, and reinstatement of original vegetation, as far as feasible.

Offset measures

Offsets should only be considered as a last resort to address residual impacts on biodiversity, and only after all avoidance, minimisation and restoration options have been exhausted. Offsets involve positive conservation interventions to generate biodiversity gains either through avoided loss (addressing threats to prevent predicted biodiversity loss) or restoration (for example, improving the quality of degraded habitat). There is a diverse range of possible offset activities, including retrofitting of non-project power lines to prevent electrocutions, removal of carcasses from roads to prevent raptor collisions with vehicle traffic, or implementation of anti-poisoning programs to reduce deaths of scavenging species from eating poisoned carcasses. In addition, offsetting can be achieved through funding conservation initiatives in other areas that help protect or restore ecosystems and species equivalent to those affected by the wind farm.

B.2.6 Barriers and enablers to the application of environmental management plans in wind farms

The implementation of effective EMPs in wind farms necessitates a delicate balance between harnessing (renewable) wind energy and preserving local wildlife, habitats, and ecological processes. As discussed in previous sections, monitoring biodiversity and mitigating impacts on diverse wildlife and ecosystems within wind farm areas are critical components of these plans. The following paragraphs discuss barriers and enablers (Figure 2) influencing the application of environmental management plans specifically focused on monitoring biodiversity and mitigating impacts to biodiversity within wind farms.

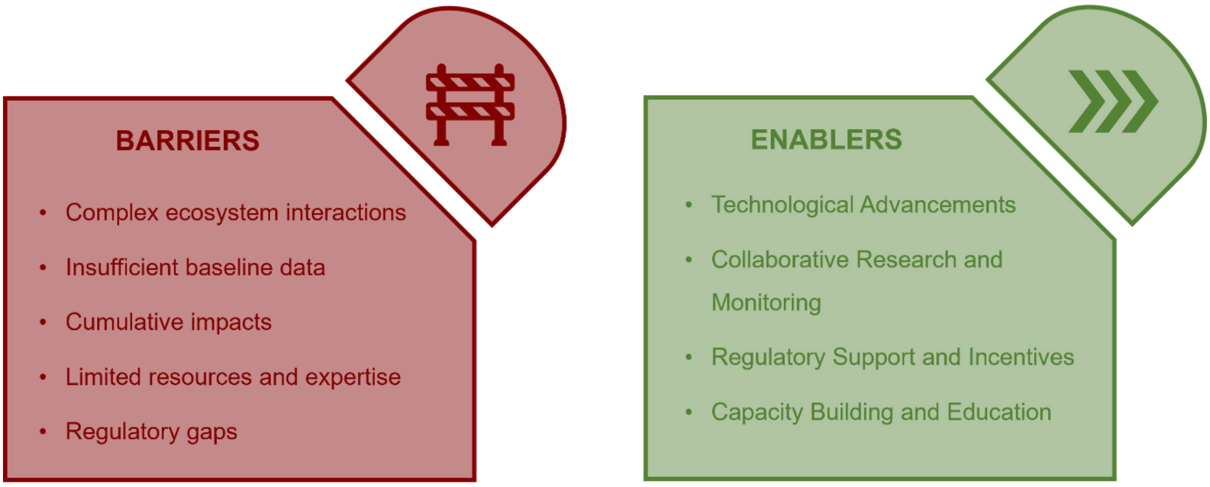

Figure 2: Overview of barriers and enablers to the application of environmental management plans in wind farms

Barriers

- **Complex Ecosystem Interactions:** The intricate relationships between species and ecosystems within wind farm areas and/or surrounding areas can make it challenging to predict and develop appropriate and comprehensive avoidance, minimisation, and restoration measures to mitigate the diverse impacts on biodiversity of wind farms throughout their lifecycle.

- **Insufficient Baseline Data:** In some cases, there is lack of adequate baseline data on local biodiversity which may hinder accurate monitoring and evaluation of specific impacts of wind farms on wildlife and ecosystems.

- **Cumulative Impacts:** Identifying and managing cumulative impacts can be challenging for project developers due to the necessity for co-operation and collaboration among project developers, wind farm operators and/or industry consortiums. This makes the process time-consuming, complex, and potentially costly.

- **Limited Resources and Expertise:** Inadequate financial resources for the acquisition of modern technological equipment, including apparatus and software, as well as insufficient training among employees and contractors regarding environmental management practices and techniques can limit the capacity to successfully implement and effectively sustain biodiversity monitoring plans in wind farm areas.

- **Regulatory Gaps:** Inconsistencies or discrepancies across regulations and policies may pose challenges for project developers and wind farm operators in harmonizing biodiversity monitoring plans and mitigation strategies with sector standards and regulatory requirements, resulting in compliance complexities.

Enablers

- **Technological Advancements:** Innovative technologies such as remote sensing, thermal imaging cameras, and acoustic monitoring tools can significantly enhance the precision and efficiency of biodiversity monitoring and impact mitigation.

- **Collaborative Research and Monitoring:** Collaboration between wind farm operators, research institutions, and conservation organizations facilitates comprehensive biodiversity monitoring, leveraging expertise and resources for effective data collection and analysis.

- **Regulatory Support and Incentives:** Clear and consistent regulatory frameworks, along with incentives promoting biodiversity conservation, encourage project developers and wind farm operators to proactively implement effective mitigation measures and monitoring protocols.

- **Capacity Building and Education:** Training programs, workshops, and knowledge-sharing initiatives designed to upskill and reskill wind farms' personnel (employees and contractors) in handling and operating advanced equipment and software for biodiversity monitoring and impact mitigation enable wind farm operators to leverage technological advancements.

B.2.7 Good practice case studies

Chemin d'Ablis wind power plant

Chemin d'Ablis Wind Farm, situated in the Normandy region of northwestern France[9], comprises 26 wind turbines , each with a rotor diameter of 92 m. The EIA conducted for the Chemin d'Ablis wind farm, as well as a research programme examining the broader impact of wind power plants in the region, identified a significantly high risk to broods of Montagu's harrier (Circus pygargus), an endangered raptor species listed on France's National Red List and protected in Europe during harvest time[h].

Montagu's harriers nest on expansive and dense farmlands where their broods are protected from predators. Although not vulnerable to wind turbines, which have little impact on this species in the Normandy region, the broods are threatened by farm vehicles utilized during harvesting, occurring at a time when young harriers are typically unable to fly.

In 2014, EDF Renewables France, the company overseeing the Chemin d'Ablis wind farm, established a partnership with Eure-et-Loir Nature[i], a local environmental NGO. The collaboration aimed at safeguarding the raptors through the implementation of several tangible measures, including:

- A search for Montagu's harrier pairs (close to 3,700 km was travelled throughout the Eure-et-Loir department) and a monitoring system.
- Monitoring of broods until the offsprings fly away.
- A campaign to inform and raise awareness among farmers and landowners about the need to fence off areas around the nests.

[h] https://eunis.eea.europa.eu/species/976

[i] https://www.eln28.org/

Due to the implemented conservation measures, a total of seven broods, comprising 22 young Montagu's harriers, were successfully safeguarded throughout the Eure-et-Loir department in 2014.

Barão de São João wind farm in Portugal

The Barão de São João wind farm, situated within a forested area in the Algarve region of south-western Portugal, has been operational since 2010[24]. The wind farm is composed of 25 turbines with an installed capacity of 50 MW, making it amongst Portugal's largest wind farms. The turbine blades swept area ranges from 35 to 125 m, with distances between turbines spanning from 273 to 539 m. Due to its location within a sensitive area for soaring bird migration, the wind farm's licensing was contingent upon the development of extensive monitoring programs and the implementation of mitigation measures, namely a Radar Assisted Shutdown on Demand (RASOD) protocol to reduce the probability of bird casualties.

Shutdown commands are issued by observers stationed at up to five sites surrounding the wind farm and two additional viewpoints within the wind farm itself. These actions are complemented by radar systems capable of detecting and tracking birds at greater distances (6–8 km). Observers are present throughout the southward migration season, while radar support is specifically employed during the peak migratory period (September 15th to November 15th). In the first three years, shutdown orders were relayed from the observers to the control centre, which then executed turbine shutdowns. Currently observers possess direct turbine shutdown capabilities through access to the Supervisory Control And Data Acquisition (SCADA) system. This direct access to SCADA has facilitated adaptive management and enhanced the expertise of the monitoring team.

The criteria to trigger the RASOD are:

- Detection of intense migratory flux of soaring birds (more than 10 birds) within one day, either near or approaching the wind farm area.

- Detection of flocks of migrating soaring birds (three or more individuals per flock) either near or approaching the wind farm area at high collision risk flight heights.
- Detection of threatened soaring bird species either near or approaching the wind farm area at high collision risk flight heights. The list includes seven species threatened at the national level: the black stork (Ciconia nigra), the golden eagle (Aquila chrysaetos), the Spanish imperial eagle (Aquila adalberti), the cinereous vulture (Aegypius monachus), the osprey (Pandion haliaetus), the lesser kestrel (Falco naumanni) and Bonelli's eagle (Aquila fasciata).
- Imminent collision risk of a migratory soaring bird with one of the turbines even if aforementioned criteria are not met.

Over time, the implementation of the RASOD protocl has resulted in the steady decline of the annual shutdown duration, which has decreased from over 100 hours in 2010 to fewer than 10 hours between 2017 and 2020.

B.2.8 Conclusions and recomendations

Ensuring the implementation of robust biodiversity and environmental protection measures in wind farms is vital for fostering sustainable energy development. As extensively deliberated in the preceding sections of Chapter 8, various considerations must be integrated into different phases of the design and execution of wind energy projects.

From the **standpoint of developers and operators involved in wind energy projects and wind farm management**, the following conclusions can be drawn:

- **Thorough and Detailed EIA process:** In the development of wind energy projects, the cornerstone of effective environmental protection and biodiversity conservation lies in developing a comprehensive EIA. This initial step is critical for identifying potential impacts on ecosystems and biodiversity, and design appropriate mitigation measures.

- **Consideration of Direct, Indirect, and Cumulative Impacts:** When formulating environmental management plans, it is crucial to consider not only direct impacts but also indirect and cumulative effects. Addressing these nuances ensures a holistic understanding of the potential consequences of the wind farm throughout its life-cycle on biodiversity, guiding effective mitigation strategies.

- **Advantages of Early Warning Systems in Biodiversity Monitoring:** The integration of early warning systems emerges as a key advantage in enhancing biodiversity monitoring within wind farms. This proactive approach not only safeguards biodiversity but also fosters a harmonious coexistence between renewable energy initiatives and local ecosystems.

- **The Mitigation Hierarchy:** In the context of biodiversity protection, adopting the mitigation hierarchy is crucial. This structured approach ensures a comprehensive and systematic strategy for minimizing and compensating for environmental impacts associated with wind energy projects.

- **Adherence to Standards (EMAS and ISO 14001):** Conforming to recognized standards such as EMAS and ISO 14001 provides a framework for continuous improvement, accountability, and transparency. Compliance with such standards not only fosters environmental responsibility but also enhances the credibility of wind energy projects, garnering support from stakeholders and regulatory bodies.

Conversely, **policymakers** should also strive to achieve an equilibrium between advancing renewable energy development and safeguarding biodiversity, thereby ensuring a sustainable and conscientious approach to wind farm projects.

- **Mandate Comprehensive EIAs:** In the pursuit of a balanced approach to wind energy development and biodiversity conservation, policymakers need to establish a mandatory requirement for comprehensive EIAs. These assessments should be an integral part of the approval process for wind farm projects, thoroughly evaluating potential impacts on local ecosystems, wildlife habitats, and overall biodiversity. Emphasis should also be placed on proposing effective mitigation measures to address and minimize any adverse effects.

- **Revise Spatial Planning to Include Buffer Zones:** To further ensure the harmony between wind energy initiatives and biodiversity protection, spatial planning regulations need revision. This involves the incorporation of buffer zones with specific guidelines and limits on the proximity of wind turbines to ecologically sensitive areas. Clear criteria for setback distances should be defined, providing a protective radius around critical habitats and migration routes, thus preventing undue disruption to local wildlife.

- **Implement Monitoring Programs:** A crucial aspect of responsible wind farm management involves the implementation of continuous monitoring programs. National, regional, and local governments should collaborate with non-governmental organizations (NGOs) and / or project developers to track and analyse the impact of wind farms on avian and bat populations. By actively involving NGOs or project developers in the monitoring process, policymakers can foster a collective effort to ensure the ongoing protection of wildlife, combining expertise and resources for more effective outcomes.

- **Promote Public Awareness and Education:** In tandem with regulatory measures, policymakers should prioritize public awareness and education campaigns. These initiatives play a pivotal role in emphasizing the importance of biodiversity conservation within the context of wind energy projects. Moreover, efforts should be directed towards fostering educational programs that actively engage local communities, schools, and organizations. Through increased understanding and support, these initiatives contribute to building a foundation for responsible environmental stewardship.

B.3. Wind energy in Latvia

B.3.1 Energy Figures

While Latvia has considerable wind energy potential, its wind energy sector is still (relatively to other countries) less developed (Figure 3). Instead, the focus has been primarily on biomass and hydroelectric power[25].

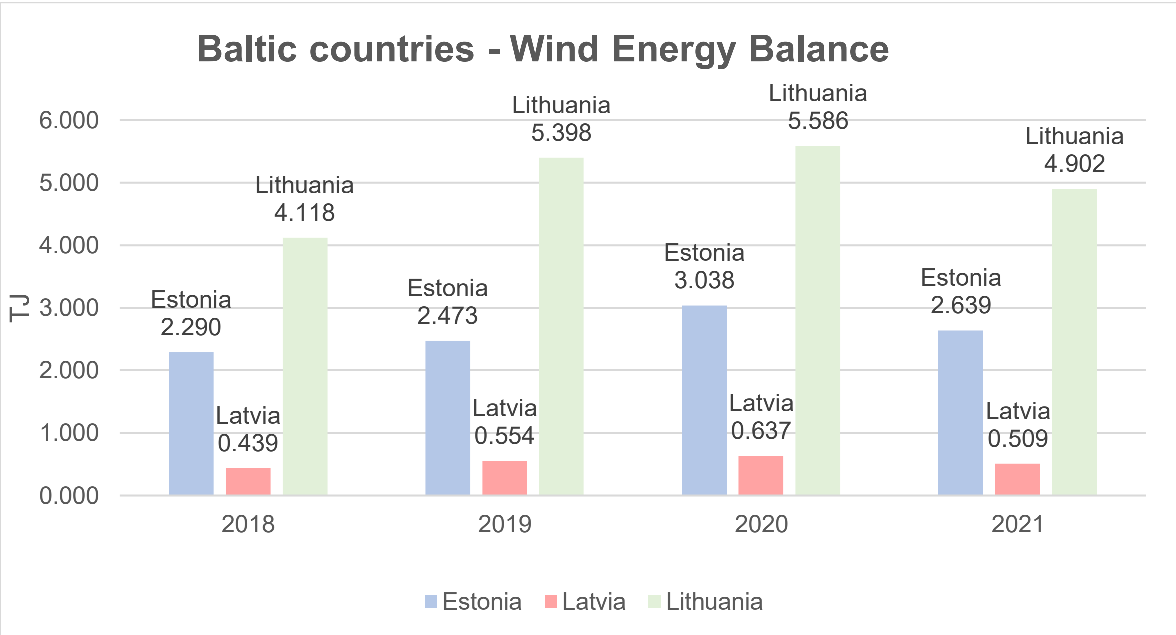

Figure 3: Wind energy balance in the three Baltic countries (EE, LV, LT) in the years form 2018-2021. (data source: Eurostat)

Data form the Central Statistical Bureau of Latvia[25] show that in 2022 the gross consumption of RES in the country reached 79.8 PJ, rising by 0.3% from 2021. Overall, gross consumption of RES in Latvia has grown by 2.4% or 1.9 PJ over the period from 2018 to 2022.

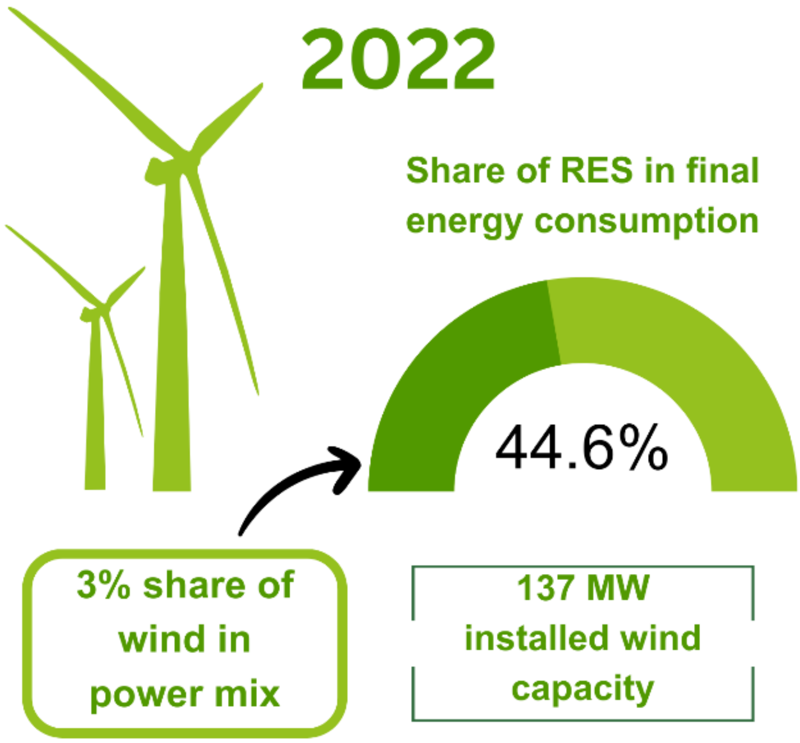

Figure 4: Key RES figures for Latvia in 2022

However, it is important to note that although in 2022 electricity generated in Latvia showed a decrease of 14.5% compared to 2021, electricity generation from renewables increased by 1.7% or 65 GWh compared to 2021[25]. Furthermore, in 2022 the volume of primary electricity produced by wind power plants increased, reaching 190 GWh which is 34.8% (49 GWh) more than in 2021.

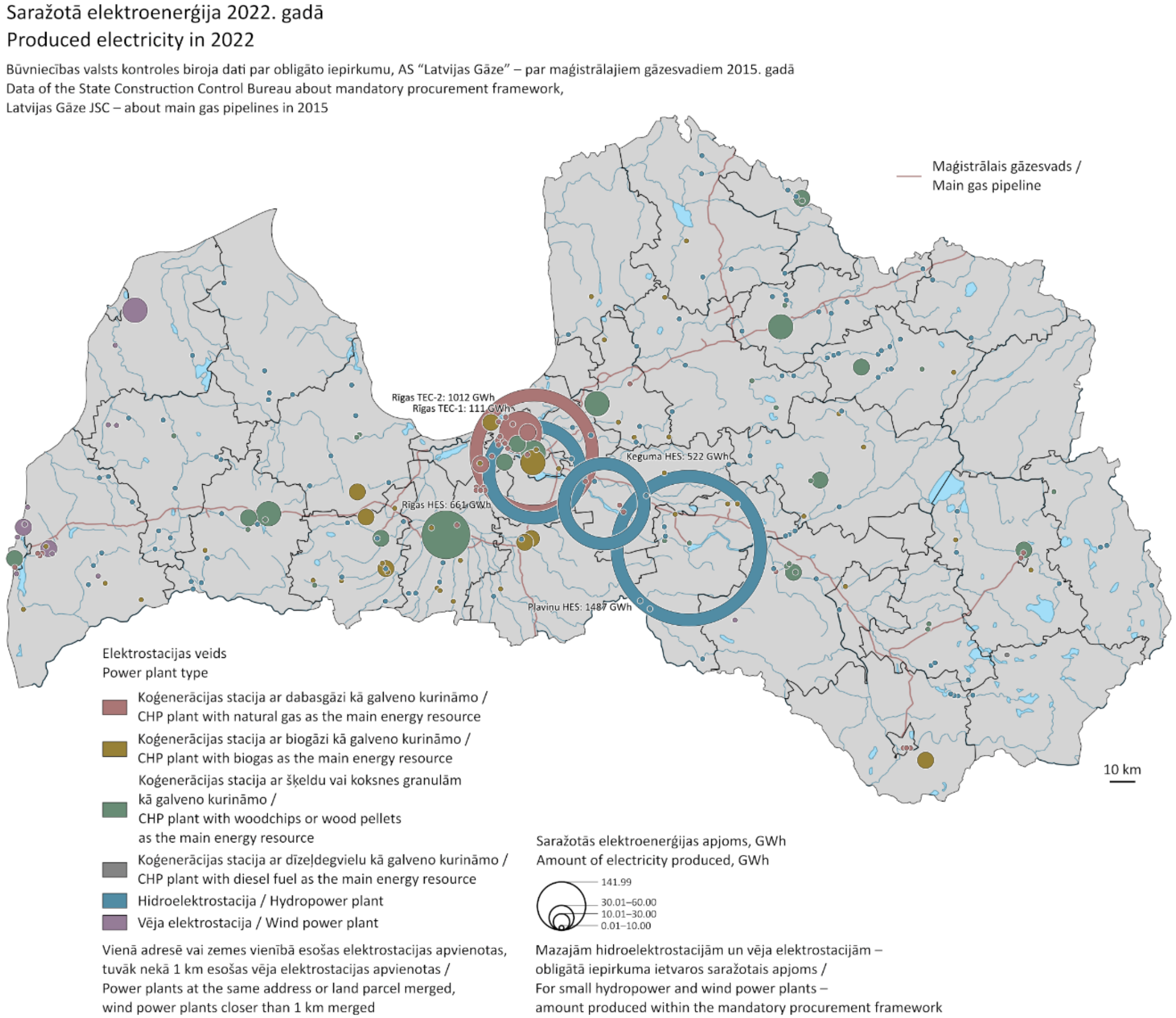

Figure 5: Produced electricity in Latvia in 2022 (source: TSO of Latvia, ast.lv)

Overall, Latvia is progressively getting closer to the EU's strategic goal of reaching 50% of RES in gross final energy consumption by 2030[4]. In terms of share of renewables in the final energy consumption Latvia reached 42.11% in 2021 (ranking third in the EU-27), while the EU average was 21.78%[26] (Figure 6).

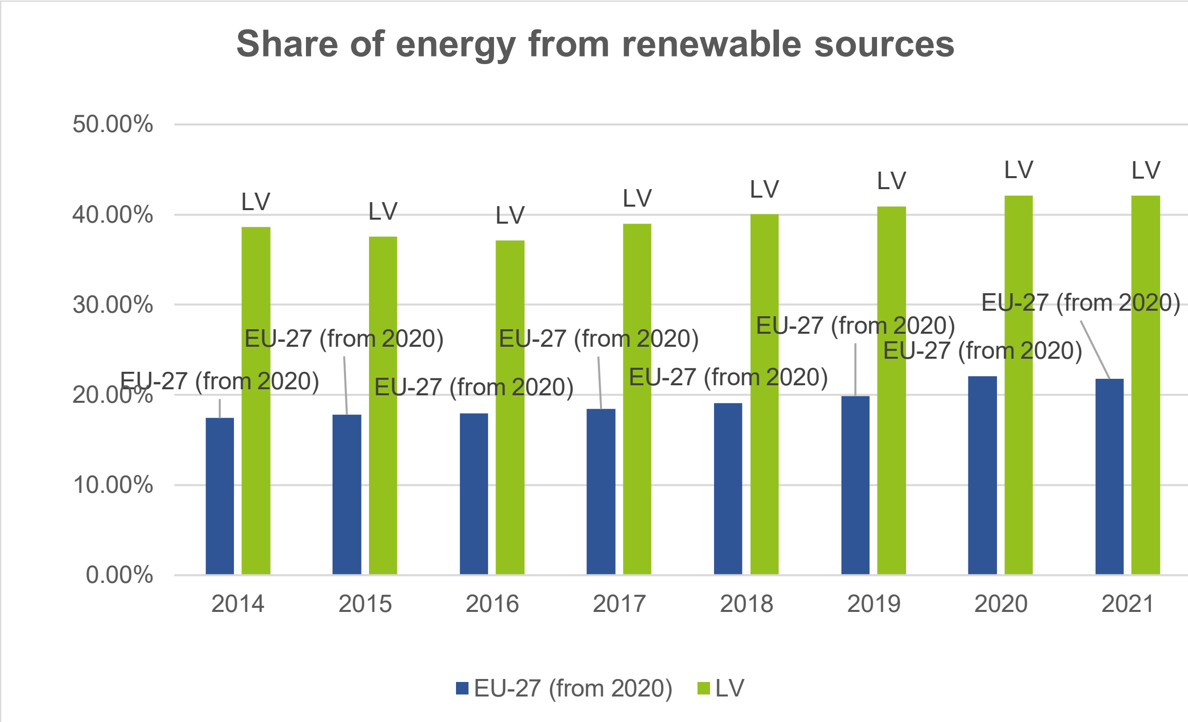

Figure 6: Share of energy for renewables for EU and Latvia over the period 2014-2021. (source: Eurostat)

Aiming to boost RES production, Latvia has recently introduced several changes in national energy legislation, including simplified EIA processes[27]. Since historically, EIA processes have been one of the most significant bottlenecks for Latvian wind power developers, this change is expected to accelerate the deployment of wind farms in the country. Moreover, according to the country's "National Energy and Climate Plan for 2021-2030"[28] in 2030, 50% of Latvia's total final energy consumption will come from renewable energy sources and wind power (mainly onshore) will account up to 15% of the electricity production.

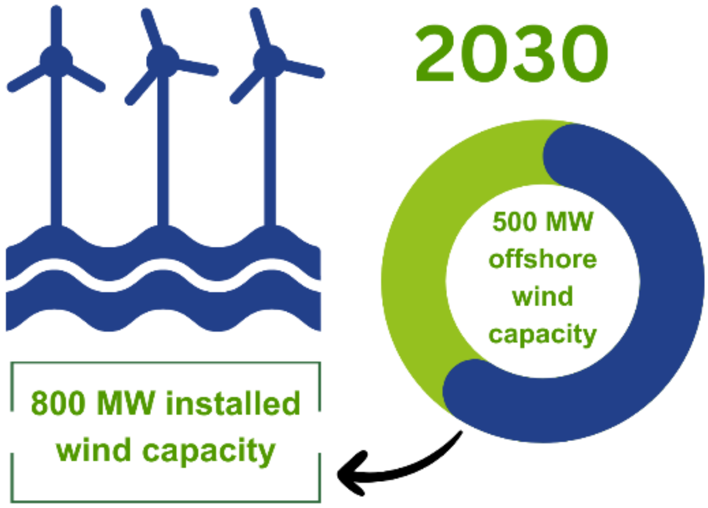

Figure 7: Latvia's wind energy targets to 2030

In particular, the country's National Energy and Climate Plan (NECP) foresees the development of at least 800 MW of installed wind capacity in the country by 2030. Furthermore, the national Transmission System Operator (TSO) estimates that by 2030 offshore wind farms will reach 500 MW of installed capacity[29]. A stated in the NECP the potential of offshore wind farms has not been realised due to lack of regulation and due to the high costs of wind farms, therefore implementation of wind farms shall be done gradually.

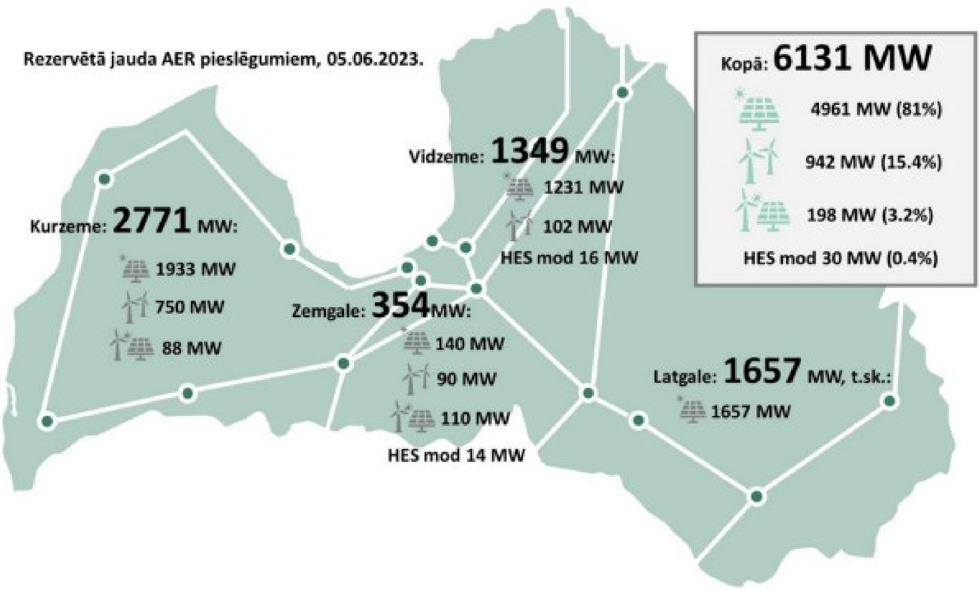

Figure 8: Reserve capacity for wind and solar projects in Latvia (source: ast.lv)

B.3.2 Protected areas and biodiversity

In total Specially Protected Nature Territories, including the Natura 2000 network, occupy 18% of Latvian territory[30]. Currently, 326 terrestrial and 7 marine sites have been designated as Natura 2000 sites. The country is home to 59 protected types of terrestrial habitats of EU importance, with 51% being in unfavourable and poor status and only 10% in good status.

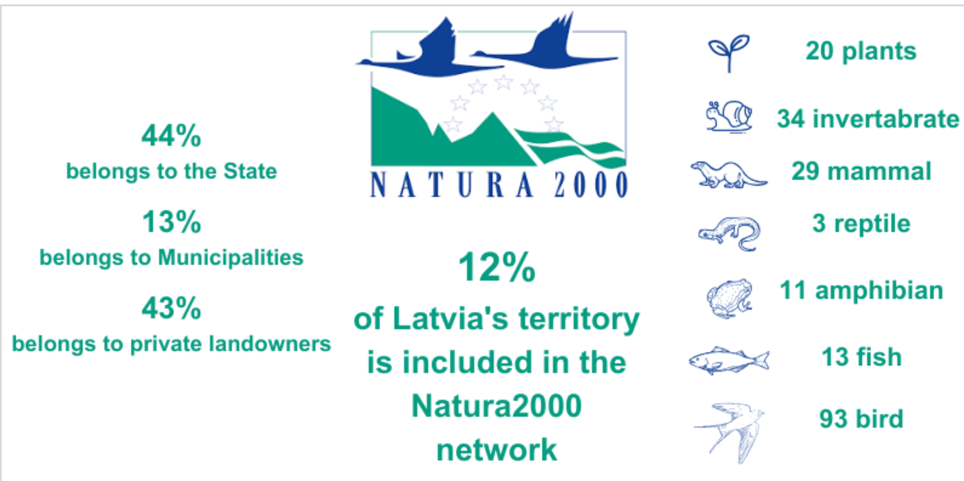

Figure 9: **:** Key figures about the Natura 2000 network in Latvia. (source: latvianature.daba.gov.lv)

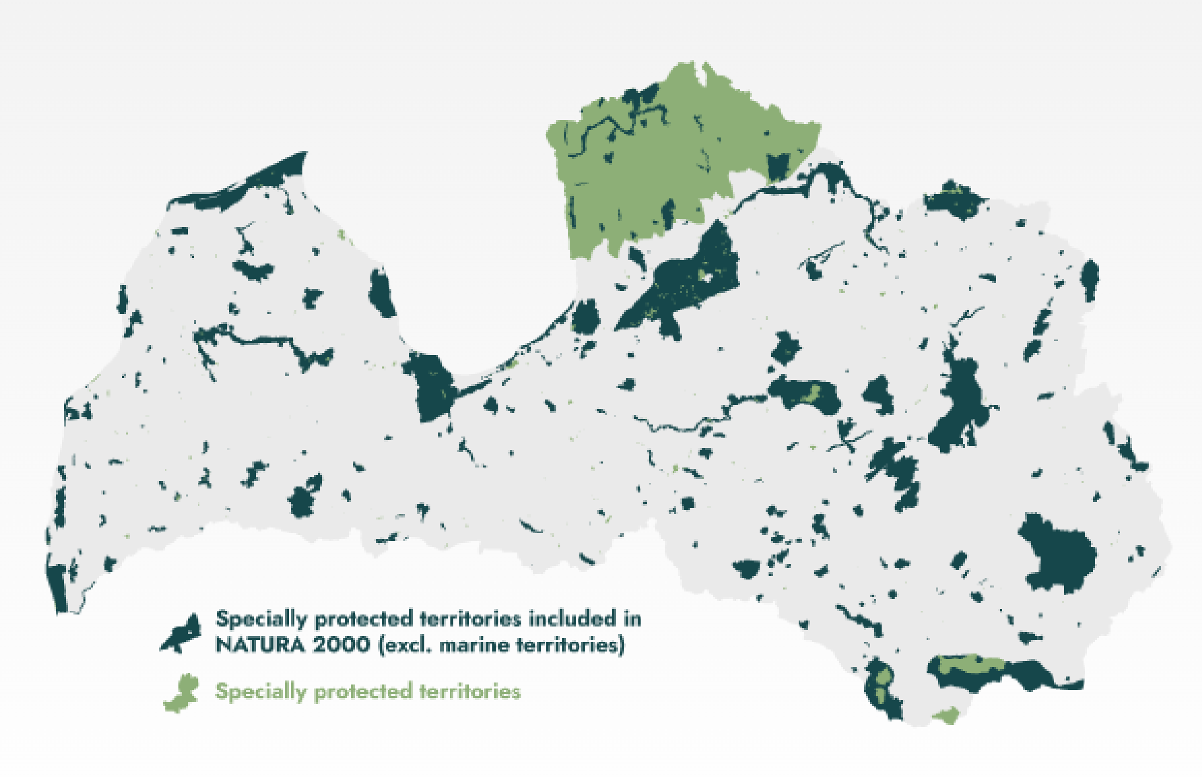

Figure 10: Map of specially protected territories in Latvia. (source: latvianature.daba.gov.lv

B.3.3 Legislative framework

Cabinet of Ministers Regulation No.240 "General Regulations on Spatial Planning, Use and Building of the Territory"

Regulation No. 240 ("Vispārīgie noteikumi par telpiskās attīstības, lietošanas un būvniecības kārtību teritorijā") was adopted in 2013[31]. It sets out comprehensive guidelines and rules for spatial planning, land use, and construction within the territory of Latvia. It aims to establish a framework that governs the organized development and utilization of land, ensuring sustainable use while considering environmental, economic, and social factors. The regulation covers aspects related to zoning, land use planning, construction requirements, infrastructure development, protection of natural resources, and the overall development and management of the territory.

The Regulation underwent amendments in 2019 and 2020, including revisions to provisions related to the placement of wind power plants and wind farms. The revised Regulation specifically outlines in “Sub - Article 8.3 – Electric Power Supply and Alternative Energy” the following provisions for wind power plants above 20 kW (0.02 MW) (paragraph 163)[32]:

- Wind power plants generating from 20 kW up to 2 MW should maintain a minimum distance of 500 meters from the nearest planned wind power plant and the boundaries of the wind farm to residential and public buildings.
- Wind power plants with a capacity exceeding 2 MW are required to maintain a distance of at least 800 meters from the nearest planned wind power plant and the boundaries of the wind farm to residential and public buildings.
- To safeguard bird species and natural values from potential impacts, specific conditions for wind power plants and wind farms are established, and the minimum permissible placement distance for wind power plants is determined based on environmental impact assessments.
- An evaluation of the visual impact on the landscape is conducted for wind power plants and wind farms within the perceptibility zone of State-protected cultural monuments. This assessment considers the unique circumstances and cultural specifics of the monument.
- The wind farm's boundary is defined starting from the edge of the wind power plant tower.

Cabinet of Ministers Regulation No. 628 "Regulations on Local Government Territorial Development Planning Documents"

Regulation No. 628 ("Noteikumi par pašvaldību teritorijas attīstības plānošanas dokumentiem") was adopted in 2014[33]. It outlines the guidelines and rules governing the creation, management, and implementation of spatial development planning documents at the local government level in Latvia. It sets the framework for the planning and organization of land use, infrastructure, urban development, and environmental protection within the territories governed by local municipalities. It covers aspects such as the procedures for creating spatial development plans, requirements for land use zoning, guidelines for infrastructure development, considerations for environmental protection, public participation in the planning process, and mechanisms for evaluating and updating these planning documents.

According to the Regulation the spatial plan for the State city must cover the complete administrative area of the local government. When devising a spatial plan for a section of the administrative region (local plan), the local plan should be treated as an amendment to the existing spatial plan. In cases where a private individual proposes the development of a local plan, the local government is responsible for determining the specific territory for that plan. Additionally, the council of the local government is mandated to make a decision regarding initiating public discussions and gathering feedback from relevant authorities about the wording of the spatial plan or local plan. The period set aside for public consultation should not be shorter than four weeks.

Law on Environmental Impact Assessment

The Law on "Environmental Impact Assessment" (Par ietekmes uz vidi novērtējumu) was initially adopted in 1998, but has since been amended several times[34]. It aims to ensure that environmental considerations are integrated into decision-making processes regarding projects or activities that might have significant impacts on the environment. The Law distinguishes between the EIA and the initial impact assessment. The former refers to "*the procedure to be performed […] to assess the possible impact of the implementation of intended activities or a planning document on the environment and to develop proposals for the prevention or decrease of negative effects or to prohibit the initiation of an intended activity in cases of the violation of the requirements laid down in laws and regulations*", while the latter refers to "*the procedure to be performed […] for an intended activity which may have a substantial impact on the environment in order to assess the significance of the potential negative impact of such activity and to decide on the application of impact assessment*"

According to the Law, an EIA is required for the construction of wind power plants with a total capacity of 50 MW or more. However, this requirement doesn't apply to wind power plants subject to initial assessment under the Law on Facilitated

Procedures for Constructing Energy Supply Buildings. For wind power plant construction, an initial impact assessment is necessary if:

- The plant consists of 5 or more turbines.
- The capacity of the plant is 5 MW or higher.
- The intended location is within a distance of fewer than 500 m from residential houses, except when the plant aims to supply electricity solely to the residential house, provided its capacity is 20 kW or more.
- The structure's height surpasses 30 m, and it's planned within a specially protected natural area or within a distance of less than 1 km from such an area, excluding natural monuments like protected stones and trees or from a micro-reserve designated for safeguarding specially protected bird species.

B.3.4 Wind power plant implementation process

The regulative and legislative framework in Latvia distinguishes among four types of wind power generation, microgeneration, small scale, medium scale, large scale, and offshore[35]. Microgeneration refers to projects below 11.1 kW, which have a simplified approval process and an environmental impact assessment and building permit are not necessary. Small-scale systems include power stations from 11.1 kW to 0.99 MW, and they also have a simplified power generation and grid permit receiving procedure from the Ministry of Economics. Power stations with a capacity from 1 MW to 10 MW are considered medium-scale systems, whereas large-scale power systems refer to wind farms above 10 MW. Wind farms with over 5 MW are required by law to undergo an Environmental Impact Assessment procedure.

Figure 11 shows an overview of the main steps for the wind farm installation process from the idea to the launching operation[35]. The process description includes the maximum number of steps to set up a wind farm or park, and the time cut-offs include both the minimum and maximum timeframe for the process.

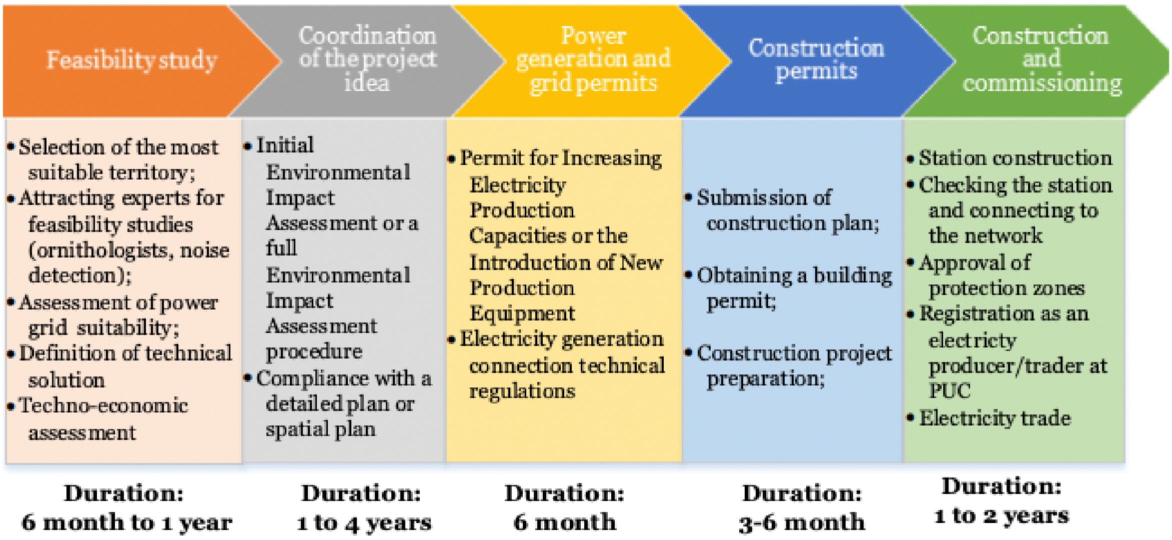

Figure 11: Main steps for large scale wind farm installation and average duration of each step. (source: RTU Vassi)

The main steps and key points of the implementation process are presented below. Partners are advised to refer to the recent study by the Riga Technical University on the current situation regarding the process of implementation of RES electricity generation infrastructure projects in Latvia, Lithuania, and Estonia (link) for further analysis of the process and individual steps.

Before proceeding with the installation of wind turbines, the project developer (also called the applicant) is required to carry out a **feasibility study related to spatial planning**. This study aims to verify whether the specific plot of land intended for the project is included in the local municipality's spatial plan. If the existing spatial plan does not include wind power plans for the designated land, the project developer needs to officially request the municipality to modify the plan accordingly.

Subsequently, if the local municipality agrees to make the necessary changes to the spatial plan, the project developer is required to prepare a comprehensive **feasibility study, this time to identify the most suitable site for development**. This study must consider various criteria, including the area's wind profile, the environmental impact of the project, its economic viability, as well as additional ad hoc restrictions which may prohibit the installation of wind turbines.

The next step involves the **Environmental Impact Assessment (EIA)**, which is carried out according to the project-specific requirements issued by the Environmental State Bureau. These requirements also provide a list of institutions and organizations to be consulted during the development of the EIA report. The project developer is also required to make publicly available details about and launch a public consultation meeting on the proposed wind project. Following the public consultation and considering inputs from the public and other organizations, the project developer is obligated to update the EIA report, encompassing a summary of the public involvement measures and received proposals. The EIA process and revisions to the detailed plan represent the most time-intensive phases within the implementation process.

Upon successful completion of the EIA, the next step involves obtaining a **permit to increase electricity production capacities** or introduce new electricity production equipment. Once the permit is secured, the subsequent phase entails obtaining a construction permit and commencing construction activities. The timeframe for the construction of wind farms and their connection to the grid is project-specific, contingent upon factors such as available financial resources, procurement processes, and project planning.

B.3.5 Laflora wind farm

B.3.5.1. About the project

Laflora Ltd.[j] is primarily engaged in peat extraction and processing. However, given that the peat extraction process in a portion of the company-owned deposit has either concluded or is slated for completion soon, the company haδ to devise sustainable solutions for the continued use of this area. To that end, Laflora Ltd. is planning to utilise the land within a peat extraction deposit for constructing a wind farm in the Līvbērze parish within the Jelgava region.

[j] http://laflora.lv/en

Laflora's planned wind farm contemplates the installation of 22 wind power plants, each with a nominal capacity potentially reaching 6 MW. The placement of these plants is envisioned to cover both the mining area and the adjacent forest lands. Once completed, the wind power farm is going to have a capacity of 90 MW, contributing approximately one-tenth of the national green energy goal for 2030. Additionally, the generated energy would be utilised to power a complex of greenhouses situated on the marsh territory, further serving to offset greenhouse gas emissions associated with peat extraction activities.

1. The Laflora wind power farm (also called wind power plant or WPP) planning process started in 2018 and construction is expected to be completed in 2025. In general, the initial construction planning could be divided into five large blocks of activities:
2. Feasibility study (site assessment, wind measurements, feasibility study)
3. Environmental impact assessment
4. Changes to the local spatial plan, if necessary
5. Engineering research
6. Technical projects

B.3.5.2. The project's area

Wind turbines are planned to be located both in the peat extraction area of the Kaigu peat bog near Jelgava and in the forest areas on its periphery. The Kaigu Bog spans a total of 19.55 km^2 (1955 ha), with approximately 9.1 km^2 (910 ha) designated for developed and under-development peat fields. Laflora, managing around 7.74 km^2 (774 ha) since 1995, conducts peat extraction in Kaigu Bog, making it one of Latvia's major peat extraction sites with a history dating back to the 1920s.

The land required for construction is anticipated to range from 10.4 to 17.6 hectares. However, once the wind farm is operational, a smaller area of 3.12 to 5.28 hectares will also be reserved for ancillary purposes such as support facilities, access roads and other operational necessities for the wind farm's continual operation. In addition, adjacent forest areas, legally owned by Latvia State Forests and forming part of the proposed operation area, are earmarked for turbine construction. These areas primarily consist of economically exploitable drained forests[k].

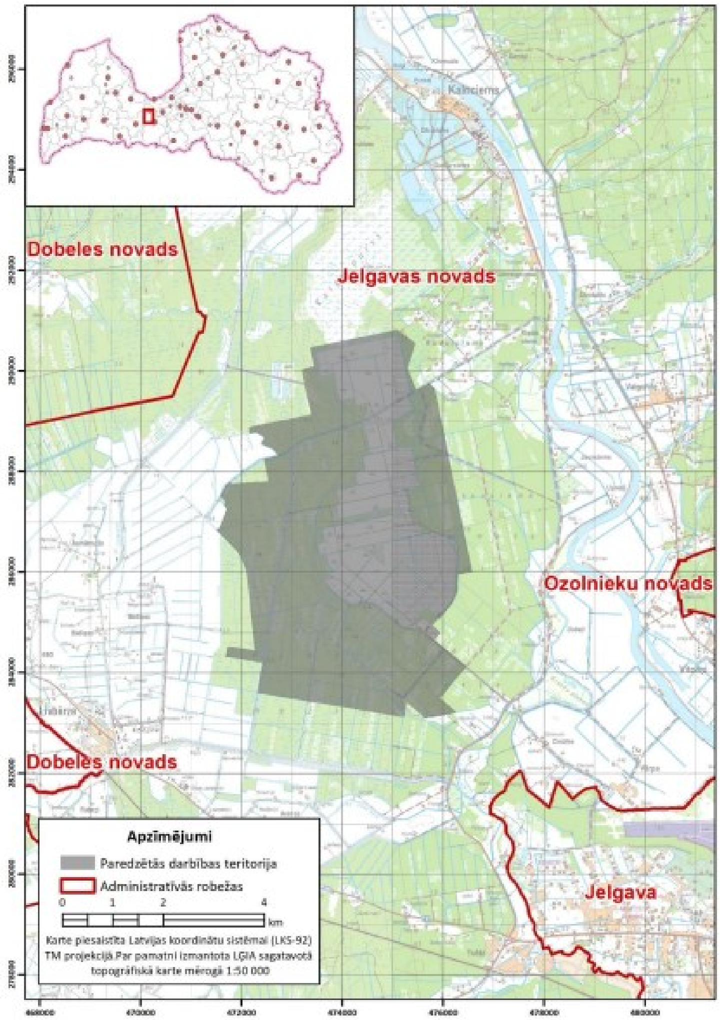

Figure 12: Location of Laflora WPP (source: Laflora EIA, 2021) The grey area marks the area of intended operation. And the red lines mark administrative boundaries.

[k] Drained forests refer to forest areas where the natural water levels have been reduced (or even water has been removed) through human interventions such as drainage systems. These alterations often aim to dry out the land for various purposes like agriculture, infrastructure development, or other human activities that require drier conditions.

B.3.5.3. Feasibility study

According to the Jelgava municipality spatial plan 2011–2023, wind generators with a maximum capacity of 20 kW and more are allowed to be located only outside the village territories by the requirements of regulatory enactments. Consequently, the conditions of the valid (at the time) municipal spatial plan were considered a limiting factor for implementing the planned WPP. To which end, Laflora Ltd requested for amendments to the spatial plan of the Jelgava region.

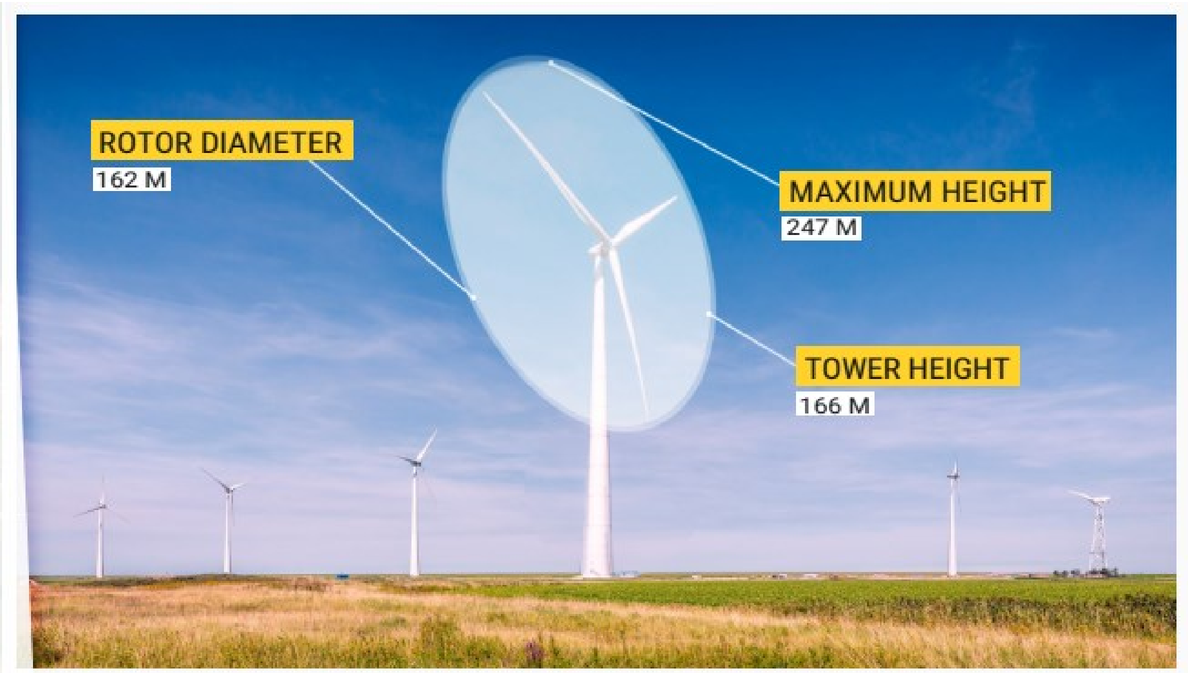

Figure 13: Illustration of the wind turbines to be installed in Laflora wind farm. (source: laflora.lv)

B.3.5.4. Key finding from the EIA

The initial EIA Report of the Laflora wind farm was prepared by Estonian, Latvian & Lithuanian Environment Ltd. in January 2021, involving industry experts who assessed the impact of the proposed wind project (wind farm) on ornithofauna, bat populations, specially protected habitats and plant species, cultural, historical values, and landscapes. In addition, a public consultation was held from January 14th to February 15th 2021, and a public consultation meeting on the initial EIA Report was held remotely on January 25th, 2021. The updated EIA Report was prepared and submitted to the State Environmental Bureau on August 4th, 2021.

In line with project-specific requirements issued by the Environment State Bureau, the EIA report included details of the proposed activity, the wind farm's planning criteria, and information on the expected impacts of the activity, as well as made proposals for mitigation and further monitoring.

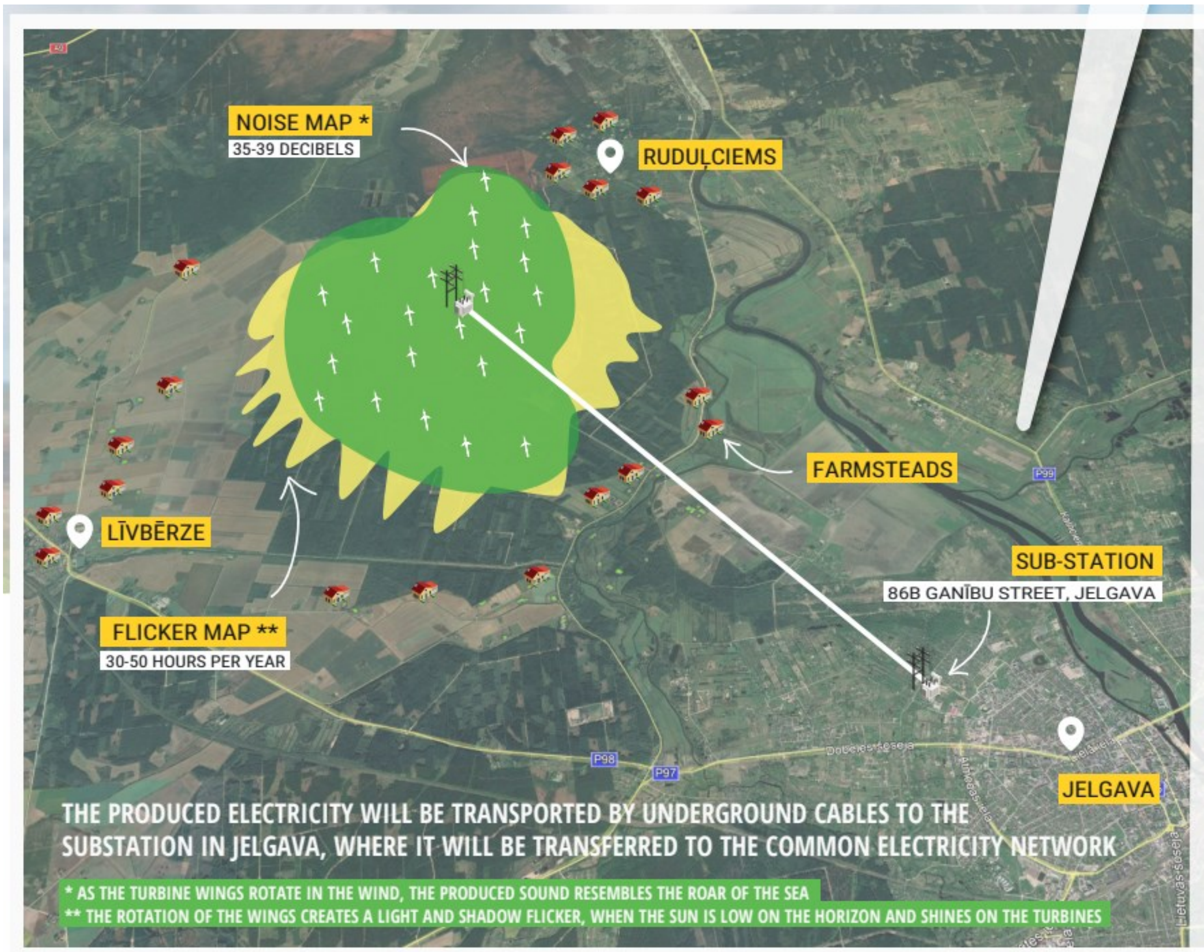

Figure 14: Map of the Laflora wind project, including noise and flicker maps. (source: laflora.lv)

The wind farm area borders to the north a Specially Protected Nature Area (SPNA) – the Kaigu purvs nature reserve. Additionally, there are three other SPNAs, all designated as Natura 2000 sites, in close proximity to the proposed area. As a result, it has been essential to assess the impact of the wind farm on these ecosystems in order to prevent any long-term damage. The results of this assessment are the following:

Potential habitat & species disturbance

- Overall, the wind farm is not expected to have any significant, direct or indirect, adverse effects on the neighbouring protected areas.
- Depending on the construction alternative chosen, the (proposed) wind farm might overlap with specially protected biotopes whose conservation status in Latvia is assessed as unfavourable and thus are a conservation and protected status.
- The construction of the high-voltage lines that are necessary for the connection of the wind farm to the electricity grid would, partially, take place inside the specially protected habitats and potentially impact the local ecosystems.
- The construction of drainage facilities may have both direct and indirect impacts to the protected habitats. Drainage facilities can significantly alter the moisture regime within habitats. These alterations can impact vegetation, wildlife, and the overall ecological balance of the habitat, leading to changes in biodiversity and ecosystem functioning.

Mitigation measures suggested by experts

In this context, the following measures have been recommended, and are likely to be implemented, in order to curtail the environmental impact of the wind farm.

- Restrict logging activities over a specified period during the construction phase in order to further restrict the impact on protected species (e.g., eagle owl).
- Utilize GPS transmitters fitted to birds for monitoring ornithofauna to manage the impact caused by the wind farm. Specifically for the protected species of white-tailed eagle (Haliaeetus albicilla), it is recommended to monitor the population at the Līvbērze nesting site, by fitting them with GPS transmitters one year prior to beginning of the construction phase and during the first and second years of operations, so as to also track their flight paths for at least three years and gather sufficient data.

- Relocate the planned station (wind turbine) and the associated construction site so that the impact on the protected habitats, and the local ecosystems is minimised or eliminated.
- Use trenchless installation solutions for power cables during Laflora's construction to alleviate the impact of the high-voltage transmission lines on the local habitats.
- Stopping or refraining from starting turbine operation between May 1st and September 30th during night-time hours (from sunset to sunrise) to mitigate impact on bat population[l].
- Outfit turbines with acoustic bat deterrents.

[l] Bats are nocturnal creatures, and their activity is significantly correlated with various meteorological variables such as air temperature, wind speed, relative humidity and fog. In addition, during the period from May to September bats are known to mitigate or forage in areas where wind turbines are located. (UNEP/EUROBATS)

Chapter C. - Guidelines

C.1. Workshop Venue & Accommodation Selection

Organizing a successful project workshop meeting requires careful planning and it is essential to consider several factors to ensure a smooth and successful event. Firstly, location plays a pivotal role. Meeting organisers are advised to opt for venues situated in a central and easily accessible location, ideally close to major transportation hubs, to facilitate convenient travel for participants arriving from abroad.

Additionally, for optimal convenience, organisers are advised to select a hotel that offers meeting facilities within the same premises where partners will be staying. This not only streamlines logistics but also provides a cohesive and focused environment for collaborative discussions. Having the meeting room within the same hotel can enhance networking opportunities, as participants can easily engage in informal discussions outside the formal meeting sessions. Moreover, booking a meeting room that is equipped with modern amenities, comfortable seating, and technical support, helps foster a conducive atmosphere for effective workshops and discussions.

C.2. Stakeholders' Engagement

C.2.1 Identification of key stakeholders to be invited

Successful stakeholder engagement is crucial for the success of the BIOWIND project's site visit and workshop scheduled to take place in Talsi and Jelgava in Latvia. It involves the identification of key stakeholder groups while also ensuring a well-balanced representation of each group during the site visit and particularly the workshop. Employing tools such as stakeholder analysis and mapping is essential to pinpoint regional stakeholders, highlight their interactions, and assess impacts of their interaction in the policy areas in concern.

Initially, the stakeholder analysis, aims to identify relevant actors (e.g., primary decision makers, influential actors, etc.). Understanding their interests and goals related to wind deployment is key for gauging their level of involvement. Once the stakeholder analysis is complete, the next step is to construct a stakeholder map, revealing the impact level of each stakeholder and highlighting potential trade-offs with regards to environmental and biodiversity impacts of wind farms as well as their mitigation. This comprehensive approach ensures a thorough understanding of the stakeholder landscape, paving the way for effective collaboration and decision-making.

Target stakeholder groups to be represented in the workshop include public administrations, regional agencies, universities and research institutions, environmental organisations, as well as local communities and actors in the wind power value chain (producers, distributors, retailers). These stakeholder groups can be impacted by the workshop's outputs or can utilise the workshop's outputs to improve and enhance biodiversity management, monitoring, and conservation in wind areas.

An indicative list of key regional stakeholders per project partner country, is provided in **Annex VIII**. The list should be viewed as complimentary to the stakeholders partners had identified in the project's Application Form.

C.2.2 Added-value of stakeholder's engagement

For **public administrations and regional agencies**, the site visit and workshop present an opportunity to obtain first-hand knowledge about the integration of wind farms with local ecosystems, as well as familiarise themselves with the practical challenges and conservation strategies that can be employed by wind project developers and operators to mitigate the environmental impact of wind farms. As a result, it is expected that their participation can inform the territorial policies that will harmonize the expansion of renewable energy production with environmental and biodiversity protection.

Universities and research institutions can benefit from their participation in the site visit and workshop as it offers real-world case studies, enabling a deeper understanding of the environmental impacts of wind farms and effective conservation measures. Additionally. collaborative partnerships may arise, fostering joint research projects in the field of wind energy and biodiversity conservation.

Environmental organizations can utilise the site visit and workshop to obtain insights about the practical challenges in developing and implementing biodiversity management strategies in wind farms. They will also have the opportunity to advocate for responsible wind energy development in balance with nature conservation strategies, and potentially establish collaborations with key actors in wind deployment to increase public awareness for sustainable wind energy deployment.

Local communities, often most affected by the presence of wind farms, will be able to gain a better understanding about the environmental management systems and conservation strategies employed by wind project developers and wind farm operators. They will be able to express their concerns and actively engage in discussions aiming to influence decision making in their regions.

Actors in the wind power value chain, including producers, distributors, and retailers, can benefit by gaining insights into the policies and strategies that pertain to biodiversity management. They will also have the opportunity to share their own experience from the implementation of wind energy projects in their area, shedding light to the strong and weak points of the regulatory framework regarding environmental management in wind areas.

C.2.3 Communication Material

Two invitation templates to be used for inviting project partners and regional stakeholders to the workshop are included in **ANNEX I**. A supplementary template of a registration form is provided in **ANNEX II**. The registration form should be sent to invitees upon their confirmation of attendance for the activity. It aims to assist the organizing partner in managing logistics for the site visit and workshop, while also obtaining participants' consent for the collection, utilization, disclosure, and/or processing of their personal data and any audio or visual materials involved with the site visit and workshop.

C.3. Workshop's Format

C.3.1 Suggested topics

To identify the most relevant and up-to-date topics for the "Workshop on early warning systems used in wind farms for biodiversity conservation" a series of criteria need to be considered, which are presented in Figure 15**Error! Reference source not found.**.

Suggested topics are grouped in two broader thematic areas aiming to provide a balanced coverage of the workshop's objectives, offering participants insights into both the technical and strategic dimensions of early warning systems in wind farms for biodiversity conservation. It is noted that the topics presented below are only indicative and subject to change depending on invited speakers, participating stakeholder groups etc.

Figure 15: Workshop's topic selection criteria

C.3.1.1. Thematic A: Technology and Monitoring Strategies

The thematic area focuses on the technological aspects and monitoring approaches for biodiversity conservation in wind farms.

Indicative topics to be discussed:

- Overview of current and emerging technologies for early warning systems.
- Sensor technologies and their applications in biodiversity monitoring.
- Integration of artificial intelligence and machine learning in environmental management.
- Designing effective monitoring protocols and identifying key indicators.
- Best practices in data collection, analysis, and interpretation.

C.3.1.2. Thematic B: Collaboration, Policy, and Future Perspectives

The thematic area focuses on collaborative efforts, policy considerations, and future perspectives regarding biodiversity conservation in wind farms.

Indicative topics to be discussed:

- Engaging local communities and environmental organizations.
- Strategies for collaboration between stakeholders.
- Policy and regulatory frameworks for biodiversity conservation.
- Education and outreach programs for awareness.
- Addressing challenges, exploring future trends, and identifying research gaps.

C.3.2 Activities included

A draft agenda of the workshop is given in **ANNEX III**. The Agenda includes topics from the thematic areas discussed previously. To facilitate capacity building and the exchange of experiences among participants, the workshop could employ different types of activities. Suggested types of activities include a) informative oral presentations, b) Q&A sessions, c) roundtable discussions.

- **Oral presentations** are brief discussions of a defined topic delivered to a group of listeners to advance their knowledge on the topic and stimulate further debate. They could act as the backbone of the workshop as they will provide a comprehensive understanding of early warning systems, laying the foundation for informed discussions. To this end, expert speakers (e.g., environmental managers of wind farms, researchers, etc.) could deliver presentations on each thematic area, offering in-depth insights into technology, monitoring strategies, collaboration efforts, policies, and future perspectives.

- **Questions and Answers (Q&A) sessions** usually follow each oral presentation. During Q&A sessions the audience can directly ask questions to the guest-speaker, offering the opportunity to the guest-speaker to further elaborate on points made earlier during the oral presentation. This interactive format promotes an open dialogue, enabling participants to gain additional perspectives and address any uncertainties, ensuring a richer learning experience.

- **Roundtable discussions** often follow the completion of one or more oral presentations. They are a flexible form of discussion employed at workshops to facilitate participants' interaction and exchange of experience and ideas. Participants could be divided into groups to discuss key challenges, opportunities, and potential solutions related to early warning systems for biodiversity conservation in wind farms. This format promotes active engagement, diverse viewpoints, and the generation of practical insights that can contribute to the advancement of policy instruments in the field.

C.4. Workshop's Evaluation

C.4.1 Evaluation's aims and objectives

The evaluation of the workshop along with the participation metrics (registered participants, registered participants per stakeholder group/country, completed evaluation questionnaires, etc.) serve as feedback for the Summary Paper on policy learning guidelines and recommendations for effective biodiversity management and conservation systems in wind areas (Final Report). The Final Report will also present key discussions, insights, and lessons learned from the workshop; as well as important outcomes form the site visit to the Laflora wind project.

C.4.2 Forms

The assessment of the site visit and the workshop's effectiveness by participants will be conducted through an evaluation process utilising the evaluation forms presented in **ANNEX IV**. The site visit's evaluation form will be distributed by the host organization (ZPR) before the beginning of the site visit, and in a similar manner the workshop's evaluation form will be distributed to participants before the official conclusion of the workshop; encouraging them to take notes during presentations, roundtable discussions, and Q&A sessions so they can later better reflect to the evaluation questions.

Additionally, the organizing partner (ZPR) will complete an input form (**ANNEX V**) to consolidate participation metrics and provide supplementary details on the workshop's implementation. This input form will primarily utilize data from participants' registration forms (**ANNEX II**), supplemented by ZPR's communication inventory during the workshop's preparatory phase (i.e., record of invitations sent, invitees that declined the invitation, etc).

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Annexes

Annex I: Invitation templates

Interreg Europe Co-funded by the European Union
BIOWIND

[Recipient's Name]
[No, Street]
[City, Postal Code]
[Country]

Place, Date

Dear [XXX],

I am pleased to extend a warm invitation to our upcoming BIOWIND project activity ***"A3.2: Site visit to wind farm(s) in Latvia and workshop on effective biodiversity management and conservation systems in wind areas"***.

Details of the activity:

- Dates: *February 20th-21st, 2024*
- Location: *Jelgava, Zemgale Region, Latvia*

The activity will comprise an insightful workshop focused on early warning systems in wind farms for biodiversity conservation, followed by a comprehensive site visit to a local wind farm.

The detailed agenda and logistical information will be provided shortly. We kindly request your confirmation of attendance and any specific requirements you may have by [RSVP Deadline].

We are excited about this opportunity for experiential learning and collaborative engagement and look forward to your active participation. Please feel free to reach out should you have any queries or need further details.

Warm regards,

[Name /Affiliation / Signature]

Interreg Europe Co-funded by the European Union
BIOWIND

[Recipient's Name]
[No, Street]
[City, Postal Code]
[Country]

Place, Date

Subject: ***Invitation to Biodiversity Conservation Workshop & Wind Farm Site Visit, 20 - 21 February, 2024, in Jelgava, Latvia.***

Dear [XXX],

On behalf of the BIOWIND partnership, we are excited to extend a special invitation to you for our upcoming project event scheduled to take place from 20th to 21st February, 2024, in Zelgava, Latvia.

The activity encompasses an interactive workshop centered on the crucial theme of biodiversity conservation in wind areas, followed by an enriching site visit to a local wind farm. Your insights/expertise/knowledge/experience would greatly contribute to exploring strategies for developing early warning systems and effective biodiversity management strategies in wind farms.

Further details including the agenda and logistical information will follow shortly. As space is limited, your confirmation of attendance and any specific requirements are kindly requested by [RSVP Deadline].

We believe that your participation would greatly enrich our discussions and efforts toward sustainable practices in wind areas. Should you have any queries or require additional information, please do not hesitate to reach out.

Warm regards,

[Name / Affiliation / Signature]

Annex II: Registration Form

WORKSHOP ON EFFECTIVE MANAGEMENT AND CONSERVATION SYSTEMS IN WIND AREAS & WIND FARM SITE VISIT

20-21 February 2024, Latvia

[Participant Registration Form]

Participant's information

- Name:
- Surname:
- Partner / Stakeholder:
- Affiliation:
- Position:
- Region & Country:
- E-mail address:
- Mobile phone number:
- Special diet requirements:
- Disabilities:

Travel and Accommodation

- Arrival at Riga Airport (RIX)
  - Date:
  - Time:
- Departure from Riga Airport (RIX)
  - Date:

Time:

- Arrival in Jelgava

  Date:

  Time:

- Departure from Jelgava

  Date:

  Time:

- Accommodation

  Hotel

  Hotel Address

Attendance to Activities

(please tick if “Yes, planning to attend”)

- 20 February 2024

  ☐ Workshop on effective management and conservation systems in wind areas

  ☐ Dinner

- 21 February 2024

  ☐ Site visit to Laflora wind farm project

  ☐ Dinner

Consent

☐ By attending the site visit and/or the workshop, I consent to the use of my name, photograph, voice, likeness, and image in any broadcasts of this workshop and in subsequent productions drawn from video or audio recordings of the site visit and/or the workshop.

- ☐ I consent to Zemgale Planning Region collecting, using, disclosing, and/or processing my personal data for the purposes of the BIOWIND Interreg Europe project.

We will be grateful if you would send the registration form by 20th January 2024 to: xxx@email.com.

Annex III: Indicative Workshop Agenda

WORKSHOP ON EFFECTIVE MANAGEMENT AND CONSERVATION SYSTEMS IN WIND AREAS

09:30 - 10:00: Arrivals & Registration

10:00 - 10:15: Overview & Objectives of the Workshop (Rapporteur: ZPR)

10:15 - 10:45: Guest Speaker "Incorporating biodiversity management in wind farm planning and operation", Policy expert (includes brief Q&A session)

10:45 - 11:15: "Laflora wind farm project: overview and outcomes of site visit", Short recap of the site visit & the EMS of Laflora wind farm (Rapporteur: ZPR)

11:15 - 11:45: Coffee Break

Thematic A: Technologies and Monitoring Strategies for biodiversity conservation in wind farms (09:30 -13:00)

11:45 - 12:15: Guest Speaker "Emerging technologies for early warning systems in wind farms", Research / Academia expert (includes brief Q&A session)

12:15 - 13:00: Roundtable discussion "Challenges and effective approaches for biodiversity conservation in wind farms" (Moderator: ZPR)

13:00 -13:45: Lunch Break

Thematic B: Collaborative efforts and policy considerations regarding biodiversity conservation in wind farms (14:45 – 16:00)

14:45 - 15:15: Guest Speaker “Policy frameworks and strategies for collaboration for biodiversity conservation”, Policy expert (includes brief Q&A session)

15:15 - 16:00: Roundtable discussion “Identifying gaps and exploring policy actions to address challenges in biodiversity management in wind farms” (Moderator: ZPR)

16:00 - 16:15: Coffee Break

16:15 - 16:30: Outcomes & Lessons learned form the workshop (Rapporteur: ZPR)

16:30 - 16:45: Workshop wrap-up Next steps & upcoming activities (Rapporteur: ZPR)

Annex IV: Evaluation Forms (attendees)

Interreg Europe Co-funded by the European Union BIOWIND

WORKSHOP ON EFFECTIVE MANAGEMENT AND CONSERVATION SYSTEMS IN WIND AREAS
20 February 2024, Latvia

Evaluation Form

Country:

Organisation:

Position in the organisation:

Stakeholder Group:

☐ Public authority

☐ Regional development agency

☐ Research institution

☐ Energy co-operative

☐ Wind power producer/distributor/retailer

☐ Academic institution

☐ Environmental NGO

☐ Local resident in the vicinity of wind farm

☐ Professional association

☐ Other (please specify)

Please rate the following aspects of the workshop on a scale from 1 to 5, where:

1 – Poor
2 – Fair
3 – Average
4 – Good
5 - Excellent

1. Relevance of the workshop's topics to biodiversity conservation management in wind areas.

2. Clarity and effectiveness of presentations and roundtable discussions.
3. The information and analysis disseminated during the workshop were of relevance to policymakers in my country.
4. Opportunities for networking and knowledge sharing.
5. Contribution to developing strategies for effective biodiversity management in wind areas.
6. Overall facilitation and organisation of the workshop.

SITE VISIT TO LAFLORA WIND FARM
21 February 2024, Latvia

Country:

Organisation:

Position in the organisation:

Stakeholder Group:

☐ Public authority

☐ Regional development agency

☐ Research institution

☐ Energy co-operative

☐ Wind power producer/distributor/retailer

☐ Academic institution

☐ Environmental NGO

☐ Local resident in the vicinity of wind farm

☐ Professional association

☐ Other (please specify)

Please rate the following aspects of the site visit to Laflora wind farm project on a scale from 1 to 5, where:

1 – Poor
2 – Fair
3 – Average
4 – Good
5 - Excellent

7. Quality of information provided during the site visit.
8. Relevance of the site visit to understanding wind farm operations.
9. Engagement and interaction opportunities during the site visit.
10. Clarity and effectiveness of presentations and/or demonstrations.
11. Contribution to understanding environmental management systems in wind farms
12. Overall organisation and logistics of the site visit.

Annex V: Input Form (organiser)

Site visit & Workshop on effective biodiversity management and conservation systems in wind areas

20-21 February 2024, Jalgava, Latvia

ORGANISER'S INPUT FORM

Workshop (20/02/2024)

Total number of attendees:

Partners:

Stakeholders:

Number of attendants per project partner country:

- BE
- FI
- GR
- HU
- IE
- LV
- PI
- ES

Number of attendants per stakeholder group (non-project partner attendees)

- Public authorities
- Regional development agencies
- Energy co-operative
- Wind power producers/distributors/retailers
- Research institutions

- Academic institutions
- Environmental NGOs
- Local residents in the vicinity of wind farms
- Professional associations
- Other(s)

Site visit to Laflora wind farm project – (21/02/2024)

Total number of attendees

Partners

Stakeholders

Number of attendants per project partner country

- BE
- FI
- GR
- HU
- IE
- LV
- PI
- ES

Number of attendants per stakeholder group (non-project partner attendees)

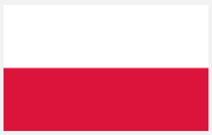
- Public authorities
- Regional development agencies
- Energy co-operative
- Wind power producers/distributors/retailers
- Research institutions
- Academic institutions
- Environmental NGOs
- Local residents in the vicinity of wind farms

- Professional associations
- Other(s)

Annex VI: Key regional stakeholders per Country

Country	Partner	Key Regional Stakeholders
	**Province of Flemish Brabant (PVB)**	• Research Institute for Nature and Forest (INBO) • Flanders Environment Agency • Belgian Biodiversity Platform (BBPF) • Smart Hub Vlaams-Brabant • European Marine Biology Resource Centre (EMBRC)
	**Regional Council of South Ostrobothnia (RCSO)**	• The Finnish Association for Nature Conservation • LAPUA Renewable Energy Cluster • Helsinki Institute Of Sustainability Science (HELSUS) • Natural Resources Institute Finland (LUKE) • OX2
	**Region of Western Greece (RWA)** **University of Patras (UoP)**	• Archipelagos - Institute of Marine Conservation • Institute of Marine Biology, Biotechnology, and Aquaculture (iMBBC) • NCSR Demokritos • ENVECO S.A. • University of the Aegean

Country	Partner	Key Regional Stakeholders
	**Central Danube Development Agency Nonprofit Ltd (CDDA)**	• Hungarian Wind Energy • Hungarian Ministry for Environmental Protection • Centre for Ecological Research (HUN-REN) • Eotvos Lorand University • Ikervár Wind Farm IIberdola Renovables Energia SA)
	**Northern & Western Regional Authority (NWRA)**	• SFI Research Centre for Energy, Climate and Marine (MaREI) • Environmental Research Institute, University of Cork • National Biodiversity Data Centre • Codling Wind Park Ltd. (CWPL) • Marine Institute
	**Zemgale Planning Region (ZPR)**	• Latvia University of Life Sciences and Technologies • Institute for Environmental Solutions (IES) • ELWIND – joint Latvian-Estonian offshore wind project • Latvian State Forest Research Institute "Silava" • Latvian Institute of Aquatic Ecology (LIAE)

Country	Partner	Key Regional Stakeholders
	**Marshal Office of Świętokrzyskie Voivodeship (MOSV)**	• Polish Environmental Partnership • Polish Biodiversity Information Network (PolBIN, KSIB) • Forest Research Institute (IBL) • Polish Green Network (Polska Zielona Siec) • Polskie Towarzystwo Ochrony Przyrody “Salamandra” (Polish Society for Nature Protection “Salamandra”)
	**Asturias Energy Foundation (FAEN)** **Autonomous Community in the Region of Murcia, General Directorate of the Natural Environment (CARM)**	◆ Instituto Mixto de Investigación en Biodiversidad (IMIB) ◆ Centro Tecnológico Forestal y de la Madera (CETEMAS) ◆ Eurofins Control Ambiental y EcoGestor Asturias ◆ Naturgy Energy Group ◆ Siemens Gamesa ○ Local Energy and Climate Change Agency of Murcia (ALEM)

Country	Partner	Key Regional Stakeholders
		◆ Concejalía de Turismo Ayto de Murcia ◆ Instituto de Fomento ◆ Fundación Séneca ◆ ITREM (Institute of Tourism in the Region of Murcia)