# Kelme Wind Farm, Lithuania

## Ecosystem Services Assessment Report

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SIGNATURE PAGE

# Kelme Wind Farm, Lithuania

## Ecosystem Services Assessment Report

0779257

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# LIST OF ACRONYMS & ABBREVIATIONS

| Name | Description |
|---|---|
| AoI | Area of Influence |
| E&S | Environmental and Social |
| EBRD | European Bank for Reconstruction and Development |
| ERM | Environmental Resources Management Ltd. |
| ES | Ecosystem Service |
| ESIA | Environmental and Social Impact Assessment |
| ESS | Environmental and Social Standard |
| EU | European Union |
| GN | Guidance Note |
| IFI | International Finance Institution |
| kV | Kilo Volt |
| MW | Mega Watt |
| PR | Performance Requirement |
| TNFD | Task-force Nature-related Financial Diclosures |
| WF | Wind Farm |
| WT | Wind Turbine |

## DEFINITIONS OF KEY TERMS

**Ecosystem services:**

An ecosystem service is any positive benefit that nature provides to people. These are essentially direct and indirect contributions that natural ecosystems (known as natural capital) provide for human well-being and quality of life. This can be in a practical sense through providing food and water and regulating climate, as well as less tangible cultural aspects such as providing spaces for recreation to reduce stress. What is important to acknowledge is that underpinning all these services is biodiversity (nature).

**Mitigation hierarchy:**

A tool commonly applied in Environmental Impact Assessments (EIAs) which helps to manage biodiversity risk. The hierarchy of controls that begins with avoidance, then considers minimization or reduction of impacts, followed by restoration actions and finally compensation for biodiversity loss (e.g. through offsetting) as a last resort measure only once all other options have been considered/exhausted.

# EXECUTIVE SUMMARY

ERM undertook a rapid assessment of ecosystem services aligned with the requirements of the European Bank for Reconstruction and Development (EBRD)) Performance Requirement 6, for the Kelme Wind Farm Project in Lithuania. The assessment formed part of a supplementary lenders' information package for the Project, required by EBRD in support of Project financing.

Ecosystem services were identified for the Project within an appropriate study and informed by the baseline environmental, biodiversity and social data collected for the Project thus far. Based on the joint consideration of Project and community demand for ecosystem services and factoring in replaceability for the services concerned, the relative importance of each ecosystem services was rated at a high level and used to identify 'priority' ecosystem services.

The assessment concluded that no 'priority' ecosystem services are identified for the Project and which the Project or local communities could impact on or be highly dependent on. The only ES considered Moderate priority relates to 'Global/local climate regulation', for which both the Project and community has an expected level of dependency/demand and for which there are limited alternatives available to replace this service. However, the Project has no significant influence or control over this service.

Through the mitigation and management actions for social and biodiversity aspects of the Project, it is unlikely that the Project will impact negatively on ES in general, particularly those where local communities show low to moderate levels of dependency (no high levels of dependency identified).

As such, the ES assessment and management requirements of para. 9 of EBRD PR6 described above are considered to have been satisfied for the Project.

# 1. INTRODUCTION

## 1.1 BACKGROUND

Ignitis is seeking financing from various financial institutions (Lenders), including the European Bank for Reconstruction and Development ("EBRD"), for the Kelme Wind Farm in Lithuania, referred to hereafter as "the Project".

Environmental Resources Management ("ERM") was appointed by Ignitis Renewables (referred to hereafter as "Ignitis" or "the Client") to provide supplementary information towards meeting EBRDs requirements for Project financing.

In line with the EBRD's requirements, one component of the supplementary information that was identified in the Environmental and Socual Action Plan ("ESAP") as an outcome of a due diligence exercuse, is an assessment of ecosystem services aligned with the requirements of EBRD Performance Requirement 6 ("PR6") concerning '*Biodiversity Conservation and Sustainable Management of Living Natural Resources'* (EBRD, 2019). This report fulfills this requirement and presents the ecosystem services assessment.

## 1.2 EBRD PR6 REQUIREMENTS

EBRD PR6 requires the following in terms of ES:

- The PR applies to situations where livelihood of affected communities, including of indigenous peoples whose access to, or use of, biodiversity, ecosystem services and/or living natural resources may be affected by project activities.
- The baseline assessment will consider but will not be limited to relevant risks to biodiversity and ecosystem services.
- In accordance with GIP (Good International Practice), the assessment will consider: (i) the project's potential impacts on ecosystem services, including those that could be exacerbated by climate change; (ii) the use of, and dependence on, these ecosystem services by potentially affected communities and/or indigenous peoples; and (iii) the project's dependence on these ecosystem services.
- Where the project has the potential to impact ecosystems services, and where the client has direct management control or significant influence, adverse impacts should be avoided. If these impacts are unavoidable, measures to minimise impacts and/or restore biodiversity and ecosystem services will be implemented.

## 1.3 PURPOSE OF THIS DOCUMENT

A high-level assessment of Ecosystem Services (ES) was undertaken based on the biodiversity and social baseline information collected to date for the Project. This report presents the ES assessment for the Project, which has been prepared in support of the Project's alignment with EBRD PR 6 and which aims to:

- Rapidly identify 'priority' ES for the Project study area based on Project and community demand/dependency and ES replaceability;
- Define the implications for the Project from an ES impact and management perspective; and

- Identify recommended next steps (as necessary).

## 1.4 DEFINITIONS

An Ecosystem Service is any positive benefit that nature provides to people. These are essentially direct and indirect contributions that natural ecosystems (known as natural capital) provide for human well-being and quality of life. This can be in a practical sense through providing food and water and regulating climate, as well as less tangible cultural aspects such as providing spaces for recreation to reduce stress.

According to EBRD PR6, ecosystem services are defined as:

> *"…benefits that people, including businesses, derive from ecosystems. Ecosystem services are organised into four types: (i) provisioning services, which are the products people obtain from ecosystems; (ii) regulating services, which are the benefits people obtain from the regulation of ecosystem processes; (iii) cultural services, which are the non-material benefits people obtain from ecosystems; and (iv) supporting services, which are the natural processes that maintain the other services."* – EBRD (2019).

Aligned with the EBRD PR6 definition and international guidance on the topic, ecosystem services are typically categorized into the following groups:

- **Provisioning**: *these are the tangible goods or products that people can extract or obtain from nature, such as food, materials (wood/fibre), fuel, medicines and water.*
- **Regulating**: *these are the benefits obtained from an ecosystem's control of natural processes, such as climate regulation, disease control, erosion prevention, water flow regulation, water filtration and protection from natural hazards (e.g. flood control).*
- **Cultural**: *these are the nonmaterial benefits obtained from ecosystems, such as recreation and aesthetic enjoyment. These include ways in which nature impacts people's health and wellbeing through recreational and education benefits as well as improving mental health and building spiritual connections.*
- **Supporting**: *ecosystems could not function without supporting services, such as the nutrient cycle, soil formation and habitat provision for biodiversity, forming the basis for the other three types of services.*

What is important to acknowledge is that **underpinning all these services is nature or biodiversity**.

## 1.5 PROJECT DESCRIPTION

### 1.5.1 BACKGROUND

Ignitis Renewables (Ignitis) has developed the Kelme I and Kelme II wind farms, collectively referred to as "Kelme Wind Farm" and "the Project" with a combined capacity of 300 Mega Watts ("MW").

Ignitis acquired the Kelme Project (Kelme I and Kelme II) in 2023 from the Lithuanian renewable energy company "E Energija" at the ready-to-build stage, and prior to the acquisition, E Energija had already completed the Project's design, site selection, environmental impact assessment (EIA) processes, permitting, land acquisition, etc.

### 1.5.2 LOCATION

The Project is a large-scale renewable energy development located in the Kelmė district Šiauliai County, in northwestern Lithuania. The region features flat terrain and steady wind conditions, making it well-suited for wind energy development.

The Project area is largely rural, characterized by agricultural landscapes and a low population density. The wind farm is located away from densely populated areas to avoid potential impacts on residential, recreational, public, and industrial zones. The Project area does not overlap with any nationally or internationally designated protected areas.

### 1.5.3 PROJECT COMPONENTS

The Project consists of two phases: Kelme I, with a capacity of 105 MW, and Kelme II, contributing 195 MW, resulting in a combined total capacity of 300 MW.

Project components include:

- A total of 52 wind turbines — 18 at Kelme I and 34 at Kelme II — all manufactured and installed by the German Nordex Group. Each turbine has a capacity ranging from 5.5 MW to 8 MW, with a maximum blade tip height of 250 meters.
- The Project also includes a 28.8 km underground transmission line, which has already been constructed by Ignitis, to enable the connection of both wind farms to the electrical grid.
- The general layout of the Project is shown in Figure 1-1.

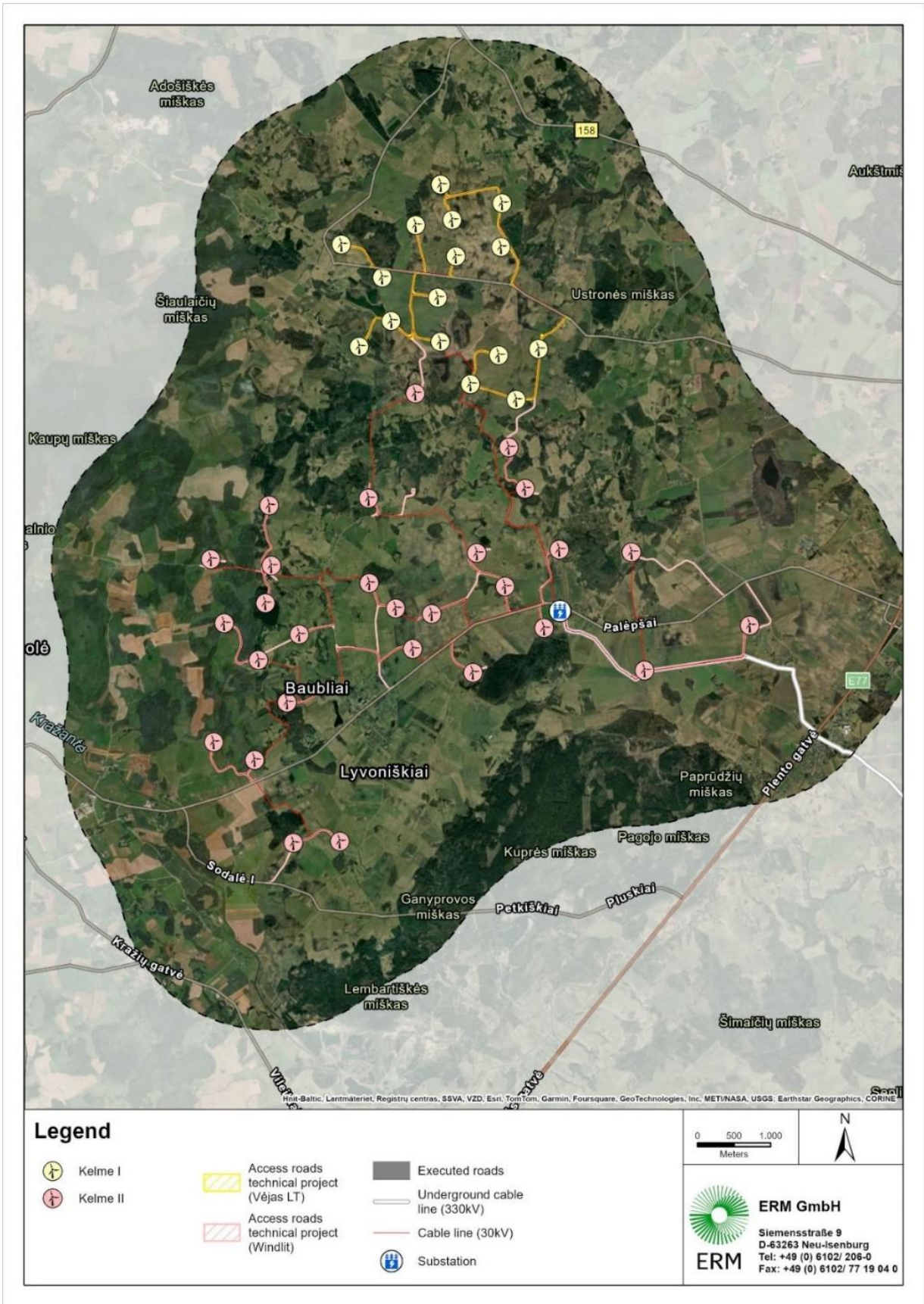



FIGURE 1-1 PROJECT LAYOUT

Source: ERM, based on Client data

# 2. APPROACH AND METHODS

## 2.1 LENDER REQUIREMENTS / GUIDELINES

The approach to the assessment of ES has been tailored to meet the requirements and guidelines of EBRD, which are generally as follows:

- The assessment shall consider the use of, and dependence on, these ES by potentially affected communities and/or indigenous peoples; and
- the project's dependence on these ES.

According to EBRD Guidance Note 6 (EBRD, 2023), ecosystem services should be prioritized, in coordination with the social baseline analysis, according to the importance of, and dependence on, the ecosystem services by relevant stakeholders.
EBRD has also developed a draft guideline document, '*Structured Approach to Ecosystem Services for EBRD-financed Projects'* (EBRD, 2022), which includes a stepped approach as follows:

- Defining the study area at the appropriate spatial scale;
- Scoping;
- Conducting field work; and
- Prioritization of ES for impact assessment and mitigation planning.

In terms of prioritization of ES, this is based on two key questions:

- Could the project affect ES that benefit project stakeholders?
- Is the ES important to the stakeholders' livelihoods, health, safety, or culture?
- If the answer is "yes" to both of these questions, then the ES should be considered a priority for further impact analysis.

## 2.2 APPROACH TO ES IDENTIFICATION, ASSESSMENT AND PRIORITISATION

The approach that ERM has taken for the ES assessment has been informed by the lender's requirements and guidance in Section 2.1 and tailored to provide a stepped and rapid approach for the Project.

The assessment and prioritization is based on the following:

- Defining the study area for the ES assessment;
- Identifying ES relevant to the Project based on assumed Project demand for ES;
- Identifying ES relevant to local stakeholders and communities, especially those that are important for supporting or contributing to local livelihoods;
- Contextualizing ES supply based on the presence, condition and functioning of ecosystems and habitats present in the study area; and
- Prioritizing ES based on demand (project and community related) as well the assumed level of replaceability of the ES.

### 2.2.1 DEFINING THE STUDY AREA

The study area has been defined based on the study areas considered for the baseline assessment of biodiversity and social aspects of the Project and taking into consideration the

Project's Area of Influence (AoI) for biodiversity, environmental and social topics. This comprises all settlements impacted by land take for the Project components, together with the settlements that could be affected by potential temporary environmental impacts during the construction phase and long-term during operations (such as noise, shadow flicker, etc.).

Also, in terms of natural ecosystems likely to be affected by the Project, the Area of Influence (AoI) for the project was defined to include the development footprint and any temporary works infrastructure, operational activities and infrastructure, any offsite facilities (borrow areas for example) as well as areas beyond the immediate area of effect that could be subjected to indirect impacts (e.g. emissions, noise, water quality issues, etc.).

### 2.2.2 IDENTIFYING ECOSYSTEM SERVICES

ES were identified for provisioning, regulation/maintenance, supporting and social/cultural services, as listed and described below in Table 2-1, based on information gained from the baseline assessments for biodiversity and social topics and supplemented by additional desktop research of global databased and literature as relevant and publicly available.

TABLE 2-1 GROUPING OF VARIOUS ES

| | |
|---|---|
| **Provisioning Services** | |
| Food | *Almost all natural ecosystems provide conditions for growing, collecting, hunting and harvesting food. Herbaceous plants, fruits and seeds are some of the typical food types that can be directly harvested, whereas other ecosystems such as wetlands provide fertile soils that are commonly used for growing crops and vegetables.* |
| Raw Materials (Timber) | *Ecosystems provide a diversity of materials including wood, biofuels, and fibers from wild or cultivated plants and animal species. Wooded ecosystems such as forests, woodland and shrubland provide both timber and non-timber related resources.* |
| Raw Materials (Biomass Fuel) | *Wooded ecosystems such as forests, woodland and shrublands can provide wood and wood residues used for biomass fuel when harvested and processed.* |
| Water Supply | *Water supply is provided through surface water and groundwater resources such as wetlands, freshwater lakes, rivers, streams and aquifers. This can be for both potable and non-potable use.* |
| Genetic Material | *Genetic diversity (the variety of genes between, and within, species populations) distinguishes different breeds or races from each other, providing the basis for locally well-adapted cultivars and a gene pool for developing commercial crops and livestock.* |
| Other (NTFPs) | *Ecosystems provide several Non-Timber Forest Products (NTFPs). One example is medicinal resources. A variety of plants are commonly harvested for traditional medicine and for developing pharmaceuticals in modern medicine.* |
| **Regulation & Maintenance Services** | |
| Global/local climate regulation | *Ecosystems influence climate at local and regional levels. Evapotranspiration from trees, vegetation and soils controls the amount of water vapor entering the atmosphere, influencing atmospheric moisture, rainfall, cloud formation, radiation transfer in the atmosphere and temperature control. Trees also serve to provide shade.* |
| Carbon sequestration | *Ecosystems, including vegetation, soils, peatlands and freshwater systems are capable of storing, regulating the global climate and mitigating climate change. Different ecosystems allow for varying degrees of carbon storage.* |
| Flood / Drought Protection | *Trees, forests, vegetation, wetlands and soil can reduce the effects of flooding and drought through interception, holding and/or delaying the passage of rainwater to streams and rivers.* |
| Water Purification | *Ecosystems help to regulate water quality by purification and waste treatment, through the trapping of sediments and dilution/ removal of harmful nutrients and chemicals. Ecosystems such as wetlands filter effluents, decompose waste through biological activity of microorganisms and eliminate harmful pathogens.* |
| Air Filtration | *Trees, vegetation and soil play an important role in regulating air quality by removing pollutants including carbon monoxide, particulate matter and nitrogen oxide from the air and releasing oxygen.* |

| | |
|---|---|
| Soil and Sediment Retention | *Trees and vegetation assist with stabilizing soil, preventing erosion during intense rainfall, flooding, wind and moderate soil moisture and temperatures. Soil erosion is a key factor in the process of land degradation, loss of soil fertility and desertification, and contributes to decreased productivity of downstream fisheries.* |
| Pollination | *Insects, wind, birds and bats pollinate plants and trees, which is essential for the development of fruits, vegetables and seeds. In agro-ecosystems, pollinators are essential for orchard, horticultural and forage production as well as the production of seed for root and fiber crops. They are also important for the development and maintenance of non agro- ecosystems, such as forest ecosystems that serve as habitat for animal species.* |
| Pest and disease control | *Predators and parasite activities in ecosystems control populations of potential pest and disease vectors, which can impact crops, water quality and species health.* |
| **Supporting Services** | |
| Soil Formation and Quality Regulation | *Trees and herbaceous vegetation create the organic matter content of soils through natural decay and soil formation processes. Buffering, filtering, degradation and retention of pollutants and nutrients occur within soils. This ensures soil fertility is maintained to support vegetation communities and human activities such as crop cultivation.* |
| Nutrient Cycling | *Nutrient cycling describes the movement of nutrients between living and non-living organisms in the environment. It is enabled by having a large diversity of organisms and leads to the creation of structures and mechanisms that further regulate nutrient cycling. It underpins all ecosystem services.* |
| Water Cycling | *Freshwater ecosystems, such as wetlands, rivers, mangroves and aquifers, are a critical part of the global water cycle – supplying, purifying and protecting freshwater resources.* |
| Habitat maintenance | *Habitats provide everything that an individual plant or animal needs to survive food; water; and shelter. Each ecosystem provides different habitats that can be essential for a species' lifecycle. Some habitats have an exceptionally high number of species which makes them more genetically diverse than others, known as biodiversity hotspots. Habitats also maintain a diversity of complex processes that underpin other ecosystem services. Species are a critical component in the building of habitats, with habitats and species intrinsic to one another's survival.* |
| **Social & Cultural Services** | |
| Recreational / tourism related services | *Nature-based opportunities for recreation play an important role in maintaining mental and physical health. Enjoyment of nature attracts millions of travelers worldwide. This cultural ecosystem service includes both benefits to visitors and income opportunities for nature tourism service providers* |
| Visual amenity services | *Animals, plants and ecosystems inspire art, culture and design.* |
| Education, scientific & research services | *Ecosystems and landscapes provide educational, scientific and research purposes that develop our understanding of the natural world and can lead to important scientific discoveries.* |
| Spiritual, artistic and symbolic services | *Nature is a common element in most major religions. Natural heritage, spiritual sense of belonging, traditional knowledge, and associated customs are important for creating a sense of belonging.* |

Source: ERM, based on various sources, unpublished

### 2.2.3 ASSESSMENT OF ES DEMAND

**Project demand for ES:**

Initially, the ENCORE[1] (Exploring Natural Capital Opportunities, Risks and Exposure) free-to-use online tool was used to provide a preliminary indication of sector-based relevance for various ES. The ISIC (International Standard Industrial Classification) group/class: 'Wind energy production' was used to identify the most material/significant dependencies of the wind energy sector on ES. This was also refined based on information contained in the TNFD (Task-

[1] ENCORE (Exploring Natural Capital Opportunities, Risks and Exposure) is a free, online tool that helps organizations explore their exposure to nature-related risk and take the first steps to understand their dependencies and impacts on nature. The tool sets out how the economy – sectors, subsectors and activities – depends and impacts on nature. Available online at: https://www.encorenature.org/

force on Nature-related Financial Disclosures) draft sector guidance for 'Electric utilities and power generators' (TNFD, 2023).

Project demand was further considered in light of regional exposure to particular natural hazards, as described at a high level for the 'Siauliu-Kelme Raj' administration area/region based on the free-to-use tool - ThinkHazard (https://www.thinkhazard.org). This robust and simple to use web-based tool considers regional risk of exposure to potential natural hazards such as wildlife, flood, earthquake, extreme head, land slide and water scarcity to assist with project planning and design.

Project demand was then refined based on the understanding of the Project specifics and findings of the biodiversity baseline assessment for the Project, as well as ERMs understanding and interpretation of the ecosystems present in the study area, their condition, extent and functioning.

**Community/local demand for ES:**

Local demand for ES was ascertained by reviewing the Project social baseline data collection, specifically related to communities and stakeholders engaged during the Project ESIA process.

The influencing factors potentially affecting ES in the Project area can be summarized into three types: natural factors, land use factors, and socio-economic factors, as detailed below:

- Natural factors, including biological factors, soil factors, topographic factors and climate factors, that are the foundations of ecosystem services.
- Natural ecosystems are at the core of ecosystem service supply, represented by natural forests, meadows/grasslands, wetlands and rivers/streams.
- Modified/artificial habitats are also providers of services to people, largely represented by agricultural land under active cultivation for crops, pasturelands and human settlement.
- Socio-economic factors, including the economic level and economic development, population density, cultural, tourism and recreational factors, all influence ecosystem services by affecting demand and the intensity of use of natural ecosystems.

Potential regional exposure to particular natural hazards (as above for Project demand) was taken into consideration using the ThinkHazard tool.

The demand/dependency ratings in Table 2-2 were used:

TABLE 2-2 RATING ES DEMAND / DEPENDENCY

| Demand/ Dependency Rating | Description: Project demand | Description: Community demand |
|---|---|---|
| **Low / None** | The Project is not reliant on the ES at all, or the company or operation can continue as is or with minor modifications | The ES may be used and valued by parts of the local community, but it is not considered important in maintaining quality of life or local livelihoods. |

| Demand/ Dependency Rating | Description: Project demand | Description: Community demand |
|---|---|---|
| **Medium** | The Project is somewhat dependent on the ES but can probably still operate in the long term in its absence or only with some modifications (e.g. slower production or use of substitutes). | The ES may be readily used by some members of the community for income or subsistence, but they are not solely dependent upon the service for their livelihoods, and not everyone utilizes the service. |
| **High** | The ES is critical for the continued operation of the Project. Disruption in company or operation sites is likely to prevent or severely constrain operation. | The ES is highly important in maintaining the livelihoods of the communities and is used by most of the community regularly. In some cases, the service may be considered critical or essential towards maintaining the health and well-being of the community. |

Source: ERM, unpublished

### 2.2.4 CONSIDERATION OF ES REPLACEABILITY

In order to prioritize Project/local community dependencies on ES and thereby rate the importance of ES, it is not only necessary to evaluate the overall dependency level or demand associated with ES but also to consider alternative options for ES that are available to replace them. This is essentially a rating of replaceability, that was informed by an analysis for each ES based on the baseline from field surveys and understanding developed for the ecosystems in the study area, using the following qualitative statements in Table 2-3 below.

TABLE 2-3 RATING ES REPLACEABILITY

| ES Replaceability | Description |
|---|---|
| **High** | Many spatial alternatives exist that are readily available to the Project and/or Affected Communities, and there are no major impediments to their usage, meaning that ES are considered easily and readily replaceable. |
| **Medium** | Relatively few alternatives for the ES are readily available, or replacement cost could be high. |
| **Low** | There are few to no alternatives to replace the ES, or replacement cost would be very high. |

Source: ERM, unpublished

### 2.2.5 SCREENING MATRIX

Once ES demand (Project and community level) and replaceability were rated, the relative importance of each ES was determined which led to the identification of 'priority' ES using the matrix in Figure 2-1, below.

| Demand (Project / community) | Replaceability Rating | | |
|---|---|---|---|
| | High | Medium | Low |
| High | Medium (not priority) | **High (priority ES)** | |
| Medium | Low (not priority) | Medium (not priority) | **High (priority ES)** |
| Low | Very Low (not priority) | | Low (not priority) |

FIGURE 2-1 ES SCREENING MATRIX

Source: ERM, unpublished

# 3. ASSESSMENT RESULTS

## 3.1 DEMAND FOR ES

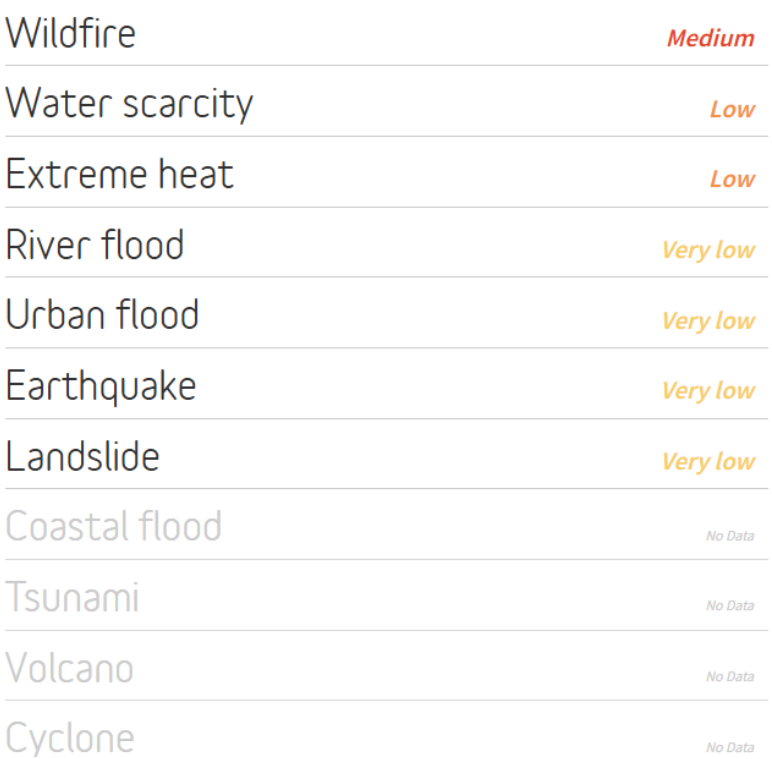
### 3.1.1 PROJECT DEMAND FOR ES

Using the ENCORE tool for the ISIC (International Standard Industrial Classification) group/class: 'Wind energy production', yields the following high-level dependencies for the Project are highlighted:

- **Provisioning services:**
  - Water supply – Very low
    - *Water may be used in cooling systems of wind energy production to prevent overheating*.
- **Regulating and maintenance services:**
  - Global/local climate regulation – Medium to High
    - *Wind energy production facilities depend on climate regulation to maintain a relatively steady climate and to mitigate and reduce the frequency and intensity of major climate events that could damage buildings and infrastructure. Ecosystems regulate the microclimate in the locations of wind power stations (e.g. stabilizing local temperatures, regulating local humidity levels), increasing their productivity (e.g. range of wind speeds for well-functioning wind turbines), reducing maintenance costs and extending longevity of the facilities and infrastructure.*
  - Soil/sediment retention and erosion control – Medium

        - *Wind energy provision is dependent on soil and sediment retention to provide a stable substrate, erosion control, and landslide mitigation for infrastructure.*
    - Water cycling and base flow maintenance - Medium
        - *Wind energy production is dependent on water flow regulation to ensure enough water to use in cooling systems to prevent overheating.*
    - Flood protection - High
        - *Wind energy production is dependent on flood mitigation ecosystem services to protect infrastructure from flooding.*
    - Storm mitigation - Medium
        - *Wind energy production is dependent on storm mitigation ecosystem services to protect production sites and other infrastructure from the impacts of wind, sand and other storms.*
    - Noise attenuation - Medium
        - *Wind energy production depends on the ecosystems providing noise attenuation, such as vegetation, natural sound barrier walls or landscaping, that can act as a noise barrier, reducing the impact of noise pollution. This activity benefits from this ecosystem service, particularly in areas where concerns about noise pollution from wind turbines arise, which could then lead to potential opposition to wind energy projects.*

Considering natural hazard exposure using the ThinkHazard tool for the 'Siaulia-Kelme Raj' administration area/region (https://www.thinkhazard.org/), the following risk levels are relevant to the region:




Source: ThinkHazard tool (https://www.thinkhazard.org/en/report/19149-lithuania-siauliu-kelmes-raj)

TABLE 3-1 PROJECT DEMAND RATING FOR ES

| Grouping | Ecosystem Service | Project Demand | Comments |
|---|---|---|---|
| **Provisioning Services** | Food | Very Low/None | *Not a key ES regarded by ENCORE.*<br><br>*Water scarcity risk is regarded as 'Low' for the region according to ThinkHazard.* |
| | Raw Materials (Timber) | | |
| | Raw Materials (Biomass Fuel) | | |
| | Water Supply | | |
| | Genetic Material | | |
| | Other (NTFPs) | | |
| **Regulation & Maintenance Services** | Global/local climate regulation | **Medium** | *Wildfire risk is regarded as 'Medium' for the region according to ThinkHazard.*<br><br>*The Project is also reliant on a steady supply of wind to operate successfully.*<br><br>*The region features flat terrain and steady wind conditions, making it well-suited for wind energy development* |
| | Carbon sequestration | Very Low/None | *Not a key ES regarded by ENCORE* |
| | Flood / Drought Protection | Low | *Considering that some of the turbines as well as access roads are located near to surface water resources (rivers, streams, wetlands), flood protection demand may be considered somewhat important due to potential flood exposure risk. However, river flood risk is rated as 'very low' for the region according to ThinkHazard.* |
| | Water Purification | Very Low/None | *Not a key ES regarded by ENCORE* |
| | Air Filtration | | |
| | Soil and Sediment Retention | Low | *For the WF located on a relatively flat to slightly undulating landscape, soil erosion risk is likely to be limited.*<br><br>*Landslide risk is considered to be 'very low' for the region according to ThinkHazard.* |
| | Pollination | Very Low/None | *Not a key ES regarded by ENCORE.*<br><br>*Water scarcity risk is regarded as 'low' for the region according to ThinkHazard.* |
| | Pest and disease control | | |
| **Supporting Services** | Soil Formation and Quality Regulation | | |
| | Nutrient Cycling | | |
| | Water Cycling | | |
| | Habitat maintenance | | |
| **Social & Cultural Services** | Recreational / tourism related services | | |
| | Visual amenity services | | |
| | Education, scientific & research services | | |
| | Spiritual, artistic and symbolic services | | |

Source: ERM, unpublished

### 3.1.2 RATING COMMUNITY DEMAND FOR ES

Community demand for ES was gauged through a review and interpretation of the socio-economic baseline information contained in the EIA report and other publicly available sources of information.

Considering natural hazard exposure and risk ratings for the 'Siaulia-Kelme Raj' region, informed by the ThinkHazard tool (https://www.thinkhazard.org/en/report/19149-lithuania-siauliu-kelmes-raj), the most relevant risk is a medium risk for wildfire.

TABLE 3-2 COMMUNITY DEMAND RATING FOR ES

| Grouping | Ecosystem Service | Community Demand | Comments |
|---|---|---|---|
| **Provisioning Services** | Food | Medium | *The project area is predominantly agricultural in character, as confirmed by both EIA findings (Ekosistema, 2022) and the General Plan of the Kelmė district municipality. The wind turbine locations are situated within or adjacent to actively cultivated agricultural plots. The land is classified as medium-value agricultural land with potential for intensive agriculture, as designated under the Kelmė District General Plan. This indicates a potentially moderate level of community reliance on provisioning services related to food production, as local residents are likely engaged in commercial farming.* |
| | Raw Materials (Timber) | Low | *There is no indication of significant forested areas or commercial timber harvesting activities within the immediate project site. Consequently, the local community's reliance on timber as a raw material in the project's immediate area is considered low (Bioenergy International, 2022).* |
| | Raw Materials (Biomass Fuel) | Low | *The planned wind farm is situated primarily in intensively cultivated agricultural zones, with no direct indication of organized biomass production or processing nearby. Therefore, the local community demand for biomass fuel in the context of the project site is assessed as low (Bioenergy International, 2022).* |
| | Water Supply | Low | *The project area is not located within or adjacent to freshwater or mineral water bodies or their sanitary protection zones according to the EIA report (Ekosistema, 2022). The nearest drinking water boreholes are located at distances of approximately 0.9 to 5 kilometers from the planned wind turbine locations. These include boreholes in Pakėvis, Butkiškės, and Mažūnai, which are actively used for local or municipal water supply. No evidence was found of river water abstraction or ecosystem-based water reliance. The water supply in the Project area is not considered to be at risk, as the region is classified as having low water scarcity according to ThinkHazard. Therefore, the community demand for ecosystem services related to water supply is assessed as low.* |
| | Genetic Material | Low | *There is no indication of unique or commercially significant species being cultivated or collected by the local population for genetic or breeding purposes within the project area based on the EIA findings (Ekosistema, 2022). The area's land use is predominantly agricultural, focused on staple crop production rather than the conservation or development of plant genetic resources. As such, community reliance on ecosystem services related to genetic material is assessed as low.* |

| Grouping | Ecosystem Service | Community Demand | Comments |
|---|---|---|---|
| | Other (NTFPs) | Low | *The project site is largely composed of intensively managed agricultural land and fragmented forest patches, with no evidence from the EIA findings (Ekosistema, 2022) or regional data suggesting notable collection or use of non-timber forest products (NTFPs) such as berries, mushrooms, medicinal plants, or resins by local residents.* |
| **Regulation & Maintenance Services** | Global/local climate regulation | **Low-Medium** | *Community demand for climate regulation at the global level is likely to be relatively significant in light of global climate change indications. At the local level, this is driven more by risks that relate to natural disasters and heat exposure, etc. Wildfire risk is regarded as 'Medium' for the region according to ThinkHazard, whilst river flood risk is regarded as 'Very Low' and water scarcity and extreme heat risks rated as 'low'. Therefore a low-medium demand has been considered relevant to the Project area.* |
| | Carbon sequestration | Low | *The project area is predominantly characterized by intensively managed agricultural land, with limited presence of mature forests or peatlands that are typically associated with significant carbon sequestration capacities. While the existing vegetation contributes to baseline carbon storage, there is no evidence of community engagement in activities aimed at enhancing carbon sequestration, such as afforestation or regenerative agriculture. In light of this, a low demand rating has been considered relevant.* |
| | Flood / Drought Protection | Low | *Flood/drought protection relates to risks of flooding and drought facing the region. River flood risk is regarded as 'Very Low' for the region according to ThinkHazard, whilst water scarcity and extreme heat risks are rated as 'low'. Overall, a low level of demand is considered appropriate.* |
| | Water Purification | Low | *This is linked to water supply and water scarcity risks facing the region, as well as pollution potential. Water scarcity risk is regarded as 'Low' for the region according to ThinkHazard. There is limited information on pollution potential in the Project area, however based on the absence of industry and heavy polluters, this is considered to be of low demand.* |
| | Air Filtration | Low | *Air quality in the Kelmė region is generally good, with PM2.5 concentrations averaging around 10.13 μg/m³, which is approximately twice the World Health Organization's annual guideline value (IQ Air, 2025). The area lacks significant industrial activities, and the population density is low, reducing the demand for natural air filtration services. Therefore, the community demand for this ecosystem service is regarded as low based on the current situation.* |
| | Soil and Sediment Retention | Low | *The area of the planned economic activity is mainly composed of medium-value agricultural lands, no significant forest or highly sloped terrain noted. Kelmė, being part of central Lithuania with low slope values, is in a low erosion-risk zone, meaning less dependency on sediment retention by vegetation. Demand is therefore regarded as relatively low for this service.* |
| | Pollination | Low | *Conventional agricultural practices in the Kelmė district rely primarily on mechanized farming and the use of chemical inputs. Many crops in the area are managed with techniques that minimize dependency on natural pollinators. As a result, there is little evidence that local communities significantly rely on pollination services provided by natural ecosystems.* |

| Grouping | Ecosystem Service | Community Demand | Comments |
|---|---|---|---|
| | | | *The limited reliance on natural pollination is reflected in the social baseline data from the EIA (Ekosistema, 2022) and regional agricultural assessments.* |
| | Pest and disease control | Low | *In the Kelmė region, conventional agricultural practices dominate, often involving the use of chemical pesticides for pest and disease management. This reliance on chemical control methods reduces the community's dependence on natural pest and disease regulation services provided by ecosystems.*<br>*Lithuania, including regions like Kelmė, has relatively high pesticide application rates in its intensive farming zones (Eurostat, 2023). This implies reduced demand or reliance on natural pest regulation, such as insectivorous birds or beneficial insects.* |
| **Supporting Services** | Soil Formation and Quality Regulation | Low | *The intensive agricultural practices in the Kelmė district, including frequent tillage and monoculture cropping, can degrade soil structure and quality over time (Pereira et al., 2020). While soil formation and quality regulation are vital ecosystem services, there is limited evidence of community engagement in practices that enhance these services, indicating a low level of direct reliance and therefore comparatively low level of demand for this service.* |
| | Nutrient Cycling | Low | *Nutrient cycling is considered to have low community demand, as the region's agricultural practices are dominated by conventional, intensive farming that relies heavily on synthetic fertilizers, thereby diminishing the local dependence on natural soil nutrient regeneration processes (Pereira et al., 2020). Demand is considered low as a result.* |
| | Water Cycling | Low | *This is linked to water supply and water scarcity risks facing the region which is regarded as 'Low' for the region according to ThinkHazard. Demand is considered relatively low.* |
| | Habitat maintenance | **Medium** | *Habitats are important for supporting flora and faunal species. The area is considered to be relatively diverse in terms of habitat, with numerous wetlands (marsh habitat), fragmented forest patches, meadows and agricultural land. This heterogenity and diversity of habitats contributes to bird activity and the use of various habitats for foraging, resting and breeding, with a variety of breeding birds present in the study area as a result.* |
| **Social & Cultural Services** | Recreational / tourism related services | Low | *The wind farm is located away from densely populated areas to avoid potential impacts on residential, recreational, public, and industrial zones. Demand for these services is considered low at present as the area is predominantly agricultural with limited recreation or tourism use potential.* |
| | Visual amenity services | Low | *The project area is located in an agrarian, sparsely populated landscape, characterized by low aesthetic value according to national assessments (EIA, Ekosistema, 2022). The site does not fall within any nationally designated visual protection zones, and the nearest areas of notable visual landscape value (e.g., mounds, hills) are located at distances exceeding 20 km. Demand is therefore considered to be low.* |
| | Education, scientific & research services | Low | *No formal educational or research institutions are identified within the immediate project area, and there is no evidence that the local ecosystems are regularly utilized for scientific purposes or research studies. The wind farm development is situated away from urban centers and does not intersect with sites designated* |

| Grouping | Ecosystem Service | Community Demand | Comments |
|---|---|---|---|
| | | | *for environmental education or research. Demand is therefore considered to be low.* |
| | Spiritual, artistic and symbolic services | Low | *The EIA (Ekosistema, 2022) does not identify any spiritual or culturally symbolic sites within the direct project area. The nearest cultural heritage sites, including churches and historic landmarks in Kražiai, were considered during project planning, resulting in the removal of wind turbine locations that could interfere with their visual integrity. These sites are now located over 3 km away, reducing potential for disruption to cultural or symbolic values. Demand is therefore low for cultural services such as these.* |

Source: ERM (with references to third party information/data in text)

## 3.2 ES REPLACEABILITY

The potential replaceability of ES (availability of other alternatives to replace ES in the study area) was considered and rated in the table below, relying on interpretation of baseline biodiversity/social data and desktop analysis. Most ES are considered to be moderately to highly replaceable as there are several alternatives in the region.

TABLE 3-3 ES REPLACEABILITY RATING

| Grouping | Ecosystem Service | ES Replaceability | Comments |
|---|---|---|---|
| **Provisioning Services** | Food | High | *Several alternatives are available regionally, with no strong reliance on natural ecosystems for food. Communities have access to markets, commercial agriculture, and external food sources.* |
| | Raw Materials (Timber) | Medium | *There are several alternatives in the region, but local supply may be limited due to lack of extensive forest cover.* |
| | Raw Materials (Biomass Fuel) | High | *Biomass is available in Lithuania's rural regions, including Kelme, primarily as agricultural by-products. While not the primary energy source, alternatives like wind, solar, and fossil fuels are accessible, making this service replaceable.* |
| | Water Supply | High | *Not a water-scarce region according to ThinkHazard (low risk level) which suggests that water supply alternatives are readily available.* |
| | Genetic Material | High | *Genetic material is not a critical local resource in the project area. Several regional and national repositories or ecosystems in Lithuania offer genetic diversity, making this service readily replaceable.* |
| | Other (NTFPs) | High | *The Kelmė region has limited forest coverage, implying minimal reliance on NTFPs by the local community. Similar products can also be sourced from other parts of Lithuania.* |
| **Regulation & Maintenance Services** | Global/local climate regulation | Medium | *Natural ecosystems in the Kelmė district, such as forest patches and wetlands, help regulate the local climate by stabilizing temperatures, retaining moisture, and supporting regional hydrological cycles. While engineered infrastructure can offer partial substitutes (e.g. through irrigation or artificial cooling), the integrated regulatory functions provided by these ecosystems are complex and not easily replicated, making replaceability moderate.* |
| | Carbon sequestration | Medium-High | *The agricultural and forested landscapes in Kelmė have moderate carbon sequestration potential. However, this service is replaceable to some extent through afforestation, improved land management practices, or carbon offset schemes in other regions of Lithuania.* |

| Grouping | Ecosystem Service | ES Replaceability | Comments |
|---|---|---|---|
| | Flood / Drought Protection | Medium | *See comments above under 'Global/local climate regulation'.* |
| | Water Purification | High | *The Kelmė district is not identified as a water-scarce region. Multiple water sources, including groundwater and rivers, are available, ensuring that water needs can be met through various means.* |
| | Air Filtration | Medium | *Natural vegetation in the Kelmė region plays a significant role in air purification. While technological solutions exist, they may not fully replicate the efficiency and cost-effectiveness of natural air filtration.* |
| | Soil and Sediment Retention | Medium | *The agricultural practices in Kelmė contribute to soil erosion. While soil conservation techniques can mitigate this, the natural retention provided by vegetation and undisturbed soils can be challenging to replace entirely.* |
| | Pollination | Medium | *Pollination services in Kelmė are primarily provided by wild pollinators. While managed pollination can supplement, it may not fully replace the diversity and resilience offered by natural pollinator populations.* |
| | Pest and disease control | High | *Conventional agricultural practices in Kelmė often involve the use of chemical pesticides for pest and disease management. This has replaced natural controls in a sense.* |
| **Supporting Services** | Soil Formation and Quality Regulation | Medium | *Soil formation is a slow process influenced by various factors. While soil amendments can improve fertility, the natural development of soil structure and composition can be difficult to replicate.* |
| | Nutrient Cycling | Medium | *Natural nutrient cycling processes are essential for maintaining soil fertility. While fertilizers can supplement nutrients, they may not be capable of fully sustaining long-term soil health without some support from natural cycles.* |
| | Water Cycling | High | *The Kelmė district is not identified as a water-scarce region. Multiple water sources, including groundwater and rivers, are available, ensuring that water needs can be met through various means.* |
| | Habitat maintenance | Medium | *Although the Kelmė district features a mosaic of habitats such as wetlands, fragmented forests, and meadows, these ecosystems are typical of the region and do not support any identified endemic or highly sensitive/important species. Given their common occurrence across the broader landscape, similar ecological functions and biodiversity values can be maintained elsewhere within the region.* |
| **Social & Cultural Services** | Recreational / tourism related services | High | *The Kelmė region offers general outdoor recreational opportunities such as hiking, cycling, and nature observation, but the project site itself is not designated for tourism nor does it feature unique recreational infrastructure. Similar experiences are readily available in nearby parks, lakes, and natural areas within the district and the broader Šiauliai County. Therefore, the recreational and tourism services in the immediate project area are considered highly replaceable.* |
| | Visual amenity services | High | *The project site is located in a sparsely populated, predominantly agricultural landscape without significant natural landmarks or scenic features. The visual character of the area is typical for the region, and similar visual settings are common throughout Kelmė district. Therefore, any changes to visual amenity from the wind farm are not considered unique or irreplaceable.* |
| | Education, scientific & research services | High | *There are no known research institutions, education centres, or ongoing scientific studies located within or adjacent to the project area. The land is primarily used for agriculture, and educational activities can be relocated or* |

| Grouping | Ecosystem Service | ES Replaceability | Comments |
|---|---|---|---|
| | | | *replicated elsewhere in the region without significant loss of value or opportunity* |
| | Spiritual, artistic and symbolic services | High | *No spiritual, religious, or culturally symbolic sites are identified. While some minor cultural or historical associations may exist in the broader district, these are not tied specifically to the wind farm location. As such, these services are not considered irreplaceable in the context of the project area.* |

Source: ERM (with references to third party information/data in text)

## 3.3 PRIORITY ES IDENTIFICATION

Based on relatively moderate-high levels of replaceability for key ES and low-medium demand for ES, ES are generally regarded as being of low priority and there are no priority ES identified for the Project.

TABLE 3-4 RESULTS OF ES ASSESSMENT

| Grouping | Ecosystem Service | Project Demand [A] | Community Demand [B] | Maximum Demand [Max of A and B] | Replace-ability | Priority ES? |
|---|---|---|---|---|---|---|
| **Provisioning Services** | Food | Very Low / None | Medium | Medium | High | Low (not priority ES) |
| | Raw Materials (Timber) | | Low | Low | Medium | |
| | Raw Materials (Biomass Fuel) | | | | | |
| | Water Supply | | | | High | |
| | Genetic Material | | | | | |
| | Other (NTFPs) | | | | | |
| **Regulation & Maintenance Services** | Global/local climate regulation | **Medium** | **Low-Medium** | Medium | Medium | Medium (not priority ES) |
| | Carbon sequestration | Very Low / None | Low | Low | Medium-High | Very Low (not priority ES) |
| | Flood / Drought Protection | Low | Low | Low | Medium | |
| | Water Purification | Very Low / None | Low | Low | High | |
| | Air Filtration | | | | Medium | |
| | Soil and Sediment Retention | Low | | | | |
| | Pollination | Very Low / None | | | | |
| | Pest and disease control | Very Low / None | | | High | |
| **Supporting Services** | Soil Formation and Quality Regulation | Very Low / None | Low | | Medium | Very Low (not priority ES |
| | Nutrient Cycling | | | | | |
| | Water Cycling | | | | High | |
| | Habitat maintenance | | Medium | Medium | Medium | |
| **Social & Cultural Services** | Recreational / tourism related services | | Low | Low | High | Very Low (not priority ES) |
| | Visual amenity services | | | | | |

| Grouping | Ecosystem Service | Project Demand [A] | Community Demand [B] | Maximum Demand [Max of A and B] | Replace-ability | Priority ES? |
|---|---|---|---|---|---|---|
| | Education, scientific & research services | | | | | |
| | Spiritual, artistic and symbolic services | | | | | |

Source: ERM

# 4. SUMMARY AND CONCLUSIONS

The assessment concluded that no 'priority' ecosystem services are identified for the Project and which the Project or local communities could impact on or be highly dependent on. Through the mitigation and management actions for social and biodiversity aspects of the Project, it is unlikely that the Project will impact negatively on ES in general, particularly those where local communities show low to moderate levels of dependency (no high levels of dependency identified).

The only ES considered Moderate priority relates to 'Global/local climate regulation', for which both the Project and community has an expected level of dependency/demand and for which there are limited alternatives available to replace this service. However, the Project has no significant influence or control over this service.

As such, the requirements of para. 9 of EBRD PR6 described above are considered to have been satisfied for the Project, as follows:

> *para 9. "In accordance with GIP, the assessment will consider: (i) the project's potential impacts on ecosystem services, including those that could be exacerbated by climate change; (ii) the use of, and dependence on, these ecosystem services by potentially affected communities and/or indigenous peoples; and (iii) the project's dependence on these ecosystem services. Where the project has the potential to impact ecosystems services, and where the client has direct management control or significant influence, adverse impacts should be avoided. If these impacts are unavoidable, measures to minimise impacts and/or restore biodiversity and ecosystem services will be implemented."* - Source: EBRD PR6 (2019).

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