

## Chapter 2. Biodiversity and forests in the context of climate change

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As in most European countries, biodiversity in Slovakia is under pressure. Since 2011, the country has taken important steps to improve its biodiversity policy. However, it needs to now align its strategy with the Kunming-Montreal Global Biodiversity Framework and the EU Biodiversity Strategy for 2030. Most species and habitats are in an unfavourable state and biodiversity considerations are not sufficiently integrated into sectoral policies. This chapter reviews Slovakia's policy to promote the conservation and sustainable use of biodiversity, examining both its effectiveness and efficiency. It assesses progress in mainstreaming biodiversity considerations into sectoral and other policies, particularly those related to forestry and climate change.

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## 2.1. Introduction

Slovakia is a mountainous landlocked country that spans two biogeographic zones: the Carpathian Mountains and the Pannonian Lowlands, which are adjacent to the Danube River. The predominant ecosystems are forests, cultivated land and grasslands. With about 40% of its territory covered by forests, Slovakia is among the most forested countries in Europe. Approximately 11 300 plant species and 28 800 animal species inhabit Slovakia (MoE, 2020a). Approximately 28% (66) of the habitat types and 425 species protected under EU law are found in Slovakia (EEA, 2023).

Slovakia has taken important steps to improve the strategic, legislative and institutional framework for biodiversity since its last review in 2011. Key areas of progress include mainstreaming biodiversity in agriculture and forestry, reforming protected areas (PAs) to enhance their effectiveness and combating invasive alien species (IAS). The development of a National Biodiversity Strategy and Action Plan (NBSAP) to 2030 is a key opportunity to further strengthen the strategic framework and ensure its alignment with the EU Biodiversity Strategy 2030 and the Kunming-Montreal Global Biodiversity Framework.

While there are examples of conservation successes, implementation remains a challenge. Considerable scope exists to further promote biodiversity mainstreaming across sectors; strengthen economic incentives; scale up and increase the efficiency of biodiversity finance; enhance capacity and co-ordination of government institutions; and improve stakeholder engagement. Completing the PA reform is critical. Slovakia has a strong case for protecting and restoring ecosystems: the total economic cost of ecosystem degradation is approximately EUR 20 billion per year in forgone ecosystem services (Černecký et al., 2021).

This review first examines the state of Slovakia's biodiversity and key pressures facing species and ecosystems. It then explores the strategic, institutional and legislative framework for nature in Slovakia and progress to mainstream biodiversity across policy areas. Next, the chapter reviews policy instruments and finance for promoting the conservation, sustainable use and restoration of biodiversity in Slovakia. Finally, it examines the links between biodiversity and climate change policy, with a focus on land use, land-use change and forestry (LULUCF) policy and climate change adaptation.

## 2.2. State, pressures and trends

### 2.2.1. State of Slovakia's biodiversity

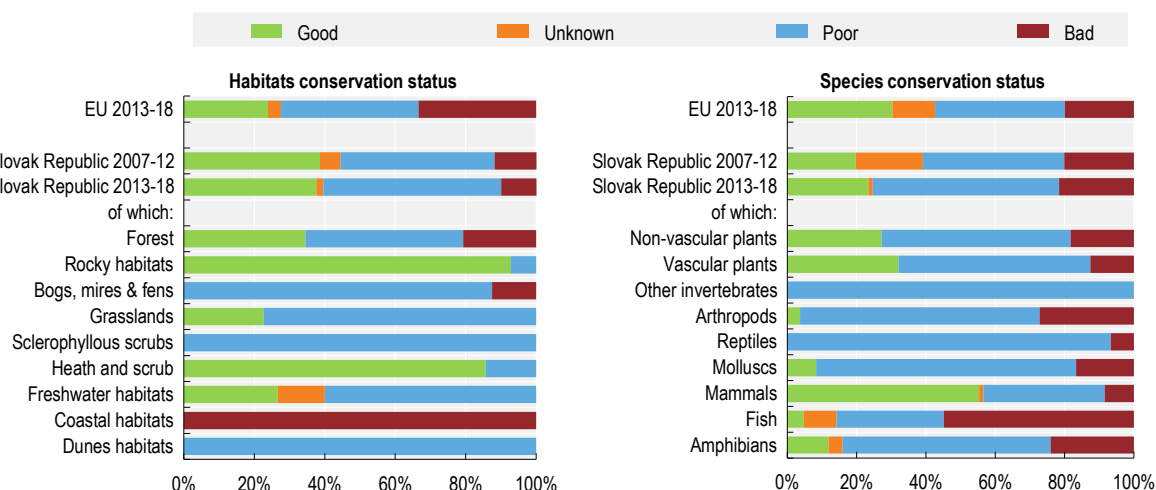
The conservation status of most habitats and species in Slovakia is unfavourable. Approximately 60% of habitats and 75% of species of European interest<sup>1</sup> in Slovakia are in a poor or bad state (Figure 2.1) (EEA, 2021). The share of habitats with an unfavourable conservation status in Slovakia is lower than the EU average, whereas the share of species with an unfavourable status is higher. The number of habitats and species evaluated to have an unfavourable conservation status increased during 2013-18 compared to 2007-12. However, this change is partly attributable to data improvements. The conservation status of habitats and species in aggregate has not significantly changed (MoE/SEA, 2023).

All of Slovakia's bogs, mires and fens, sclerophyllous scrubs, dune and coastal<sup>2</sup> habitats, and most grassland and forest habitats are in an unfavourable state. Of the freshwater habitats, 60% are in a poor state and just 27% are in a good state. Information is lacking on the conservation status of 13% of freshwater habitats. Rocky habitats and heath and scrub habitats, fare relatively well, with 93% and 86% in a good condition, respectively.

More than two-thirds of vascular plant species and almost three-quarters of non-vascular plants have an unfavourable conservation status. All reptiles, 86% of fish and 84% of amphibian species have an

unfavourable status. Most molluscs, arthropods and other invertebrates also have an unfavourable status. In contrast, most mammals have a favourable conservation status.

**Figure 2.1. A significant share of habitats and species are in an unfavourable state**



Note: The new report for 2013-18 is based primarily on data from the Complex Information and Monitoring System (KIMS). While the number of habitats and species with unfavourable conservation status increased between 2007-12 and 2013-18, this may be due to data improvements. Sclerophyllous scrubs: *Juniperus communis* formations on heaths or calcareous grasslands; Coastal habitats: Inland salt meadows and pannonic salt steppes and salt marshes; Dune habitats: Pannonic inland dunes.

Source: EEA (2021), Conservation status of habitat types and species: Datasets from Article 17, Habitats Directive 92/43/EEC reporting.

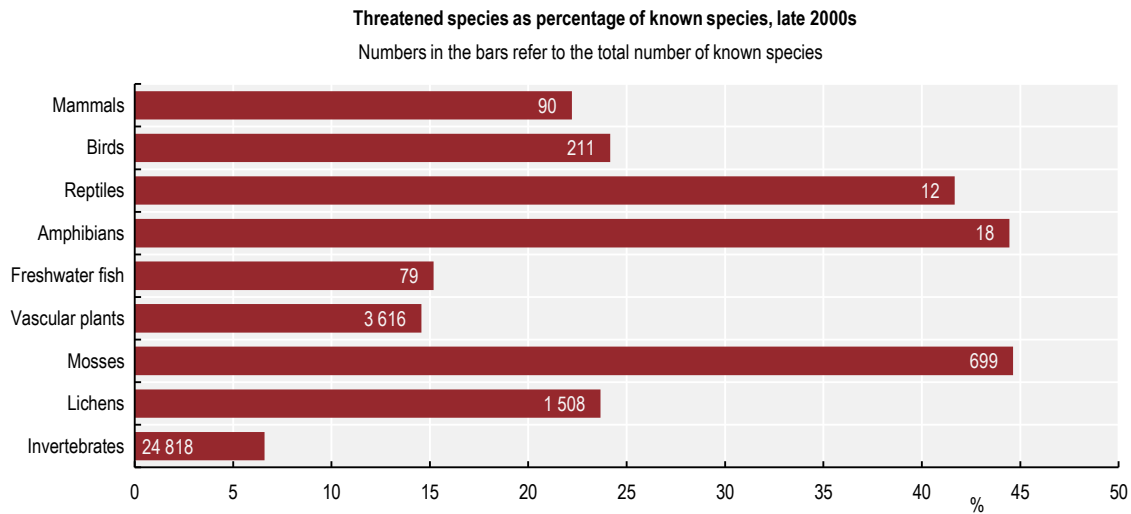
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The population sizes of some species have increased over the past decade, owing in part to targeted conservation measures. Examples include the Tatra chamois (*Rupicapra rupicapra tatrica*), maned bison (*Bison bonasus*), sea eagle (*Haliaeetus albicilla*) and great bustard (*Otis tarda*) (EEA, 2021). The wintering population of the great bustard, which is Slovakia's most threatened bird species, increased by 50-200 individuals between the 2007-12 and 2013-18 reporting periods (Černecký and et al., 2020). In 2022, Slovakia reported its first great bustard nest in 12 years (The Slovak Spectator, 2022).

However, the populations of many other species have declined. Examples include the European ground squirrel (*Spermophilus citellus*), steppe polecat (*Mustela eversmanii*), European pond turtle (*Emys orbicularis*) and western capercaillie (*Tetrao urogallus*) (EEA, 2021). An evaluation of 227 bird species in Slovakia found that the populations of 42 bird species (18%) were smaller in 2013-18 than in 2007-12, while the populations of 32 bird species (14%) were larger (EEA, 2021). Declines affected predominantly farmland birds but also some wetland and forest species. During 2013-18, 32% of bird populations declined, while only 13% increased.

Numerous plant and animal species are threatened with extinction. According to the Red List, almost one-quarter of Slovakia's vertebrates are threatened, including 44% of amphibians, 42% of reptiles and 24% of birds (Figure 2.2). Approximately 7% of the country's almost 25 000 known invertebrate species face extinction (OECD, 2023a). The most threatened invertebrates include cockroaches (44%), mayflies (34%), dragonflies (33%), and molluscs and spiders (up to 30%) (MoE/SEA, 2023). Almost 12% of non-vascular plants and 15% of vascular plants are threatened with extinction. Among plants, mosses stand out with 45% of the 699 known species in Slovakia under threat (OECD, 2023a).

**Figure 2.2. More than a quarter of amphibian, reptile and moss species are threatened**



Note: Threatened refers to the sum of “endangered”, “critically endangered” and “vulnerable” species, i.e. species that are at greatest risk of extinction.

Source: OECD (2023), OECD Environment Statistics (database).

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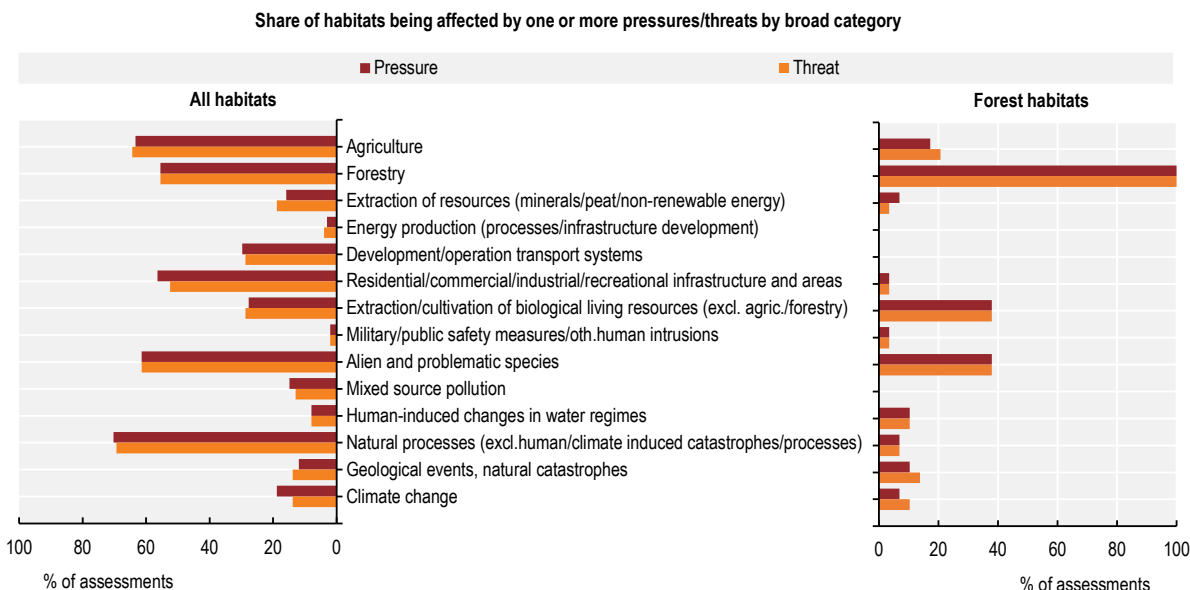
### 2.2.2. Pressures on biodiversity

The dominant pressures on biodiversity include unsustainable agricultural practices (Section 2.4.2), IAS and other problematic species, forestry (e.g. high volume of incidental logging in some forest areas) (Figure 2.3), infrastructure development (Section 2.4.4), which contributes to habitat fragmentation and soil sealing, and natural processes such as erosion and secondary succession.<sup>3</sup> Secondary succession affects grasslands, peatlands and moors (EEA, 2021).

Agricultural activities and problematic species, including IAS, put pressure on approximately 60% of habitats. Forestry activities and the development of residential, industrial and recreational infrastructure negatively affect more than 50% of habitats. Infrastructure development is the main driver of land-use change, affecting primarily agri-ecosystems (Figure 2.3). The built-up area of Slovakia as a share of total land is higher than the EU and the OECD averages. The built-up ratio continues to increase, growing 4% from 2010-21 to reach 5% of total land use (OECD, 2023a).

Slovakia’s biodiversity also faces pressure from climate change. Average annual air temperature has increased by 1.7°C since 1881. Precipitation has decreased in the south and increased in the north, while the risk of droughts and floods is increasing (MoE, 2022a). Observed or expected impacts on biodiversity include shifts in vegetation zones and species distributions, phenological changes, extinction risk to species with a narrow ecological niche and increased risk of IAS and pest outbreaks (e.g. increased range or intensity of bark beetle outbreaks). Montane pine forests, swamps in the foothills and mountains and other aquatic systems are among the most vulnerable ecosystems (MoE, 2022a).

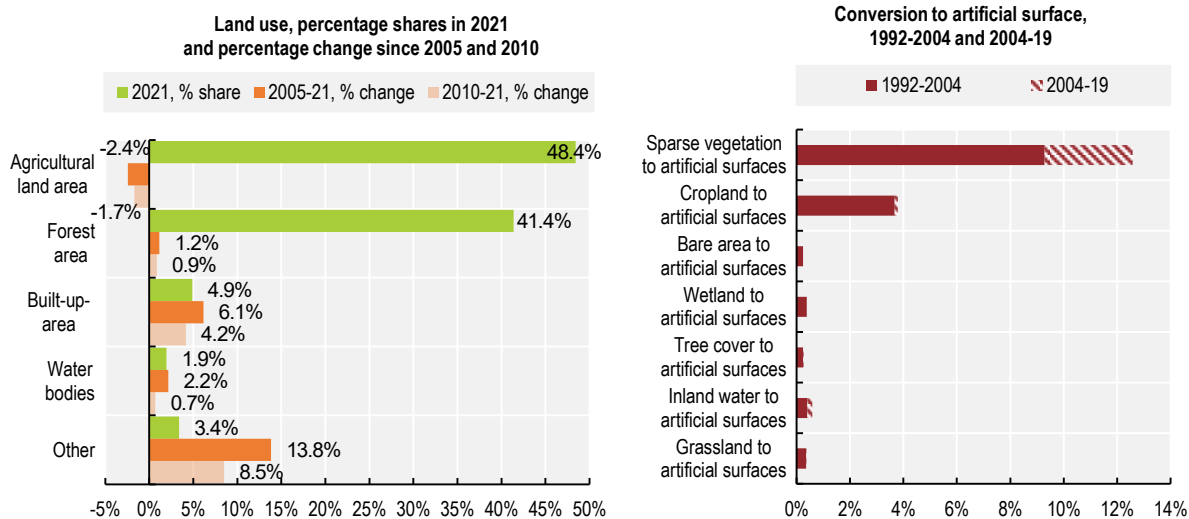
**Figure 2.3. Agriculture, natural processes, infrastructure development, invasive species and forestry exert pressures on a large number of habitats**



Note: Pressures refer to factors or actions currently impacting a habitat or species while threats refer to potential or future risks.  
 Source: EEA (2023), Article 17 Habitats Directive 92/43/EEC, National Summary Dashboard.

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**Figure 2.4. Agricultural land continues to decline in favour of built-up areas, while forest and water areas have increased slightly**



Note: Forest area: including forests on agricultural and other lands. Agricultural land area: including non-utilised agricultural area.  
 Source: MoE (2023), Enviroportal (database).

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### 2.2.3. Monitoring information and data

Knowledge and data on biodiversity improved significantly over the past decade. Monitoring focuses on Slovakia's species and habitats of European interest. Between the 2007-13 and 2013-18 reporting periods, the share of habitats with unknown status declined from 6% to 2%, while the share of species with unknown status declined from 19% to 1.8% (Figure 2.1) (EEA, 2021). The data are recorded and approved through Slovakia's Complex Information and Monitoring System (KIMS), which is accessible to the public (ŠOP, 2013). In 2021, Slovakia conducted 2 237 field visits to permanent monitoring sites (MoE/SEA, 2023).

Knowledge and data gaps remain for freshwater habitats, fish and to a lesser degree amphibians and small mammals of European interest (EEA, 2021). Furthermore, monitoring and data are lacking for most species and habitats not of European interest. While data collection is systematised through the KIMS, monitoring for biodiversity tends to be project-based and dependent on project finance, rather than programmatic with dedicated long-term resources.

## 2.3. Strategic, legislative and institutional framework

Slovakia has continued to strengthen its strategic, legislative and institutional framework for biodiversity. In addition to addressing national priorities, changes to the framework promote alignment with EU requirements and strategies (e.g. EU Habitats and Birds Directive, EU Strategy for Biodiversity for 2020), as well as international commitments (ŠOP, 2023a). The priority for Slovakia now is to translate the EU Strategy on Biodiversity for 2030; the EU Strategy on Forests 2030 and the Kunming-Montreal Global Biodiversity Framework domestically. The ongoing development of the NBSAP 2030 and the draft National Forestry Strategy 2022-30, which is yet to be adopted, are key instruments for achieving this. This section summarises and examines the current state and recent developments in Slovakia's strategic, legislative and institutional framework.

### 2.3.1. Strategic framework: National goals, strategies and action plans for biodiversity

The protection and sustainable management of nature is a key pillar of Slovakia's Long-Term Strategy for Sustainable Development 2030 and EnviroStrategy 2030 (MoE, 2019). These overarching strategies set both qualitative and quantitative objectives for biodiversity. The Ministry of Environment (MoE) developed an internal implementation plan outlining measures to achieve the objectives of EnviroStrategy 2030. A web platform provides a snapshot of progress towards these objectives (SEA, 2023).

**Table 2.1. Biodiversity commitments and measures are integrated into EnviroStrategy 2030**

Priority area	Examples of commitments and measures
<b>Effective protection of nature and landscape</b>	
1. Stopping the loss of biodiversity	<ul style="list-style-type: none"> <li>The zoning of national parks, along with their reassessment, will be implemented by 2025</li> <li>By 2030, at least 15% of degraded ecosystems will be restored</li> </ul>
2. Reform of the state nature conservation institutions	<ul style="list-style-type: none"> <li>A comprehensive and sustainable system of funding for nature conservation organisations will be in place by 2030</li> <li>The organisational structure of governmental authorities for nature conservation will be more efficient</li> </ul>
3. Simplification of the system and the maintenance of non-interference in the area with the highest level of protection	<ul style="list-style-type: none"> <li>By 2030, the entire framework of protected areas will be reviewed with the participation of all concerned parties</li> <li>Areas without human intervention will reach 50% of the total land areas of each national park by 2025 and 75% by 2030</li> </ul>

Priority area	Examples of commitments and measures
<b>Effective protection of nature and landscape</b>	
4. Evaluation and sustainable use of ecosystem services	<ul style="list-style-type: none"> <li>By 2030, all ecosystem services will be taken into account equally and included in the national accounting system</li> <li>The creation of a comprehensive system for assessing ecosystem services and their monetisation will be supported</li> </ul>
5. Development and implementation of an integrated concept for nature protection	<ul style="list-style-type: none"> <li>An integrated concept of nature protection will be developed based on the European Landscape Convention</li> </ul>
<b>Sustainable land management</b>	
1. Supporting more environmentally friendly practices in agriculture	<ul style="list-style-type: none"> <li>Organic farming will account for at least 13.5% of land in 2030</li> <li>In nitrate vulnerable areas, compliance control will be reinforced</li> </ul>
2. Protection and restoration of landscape elements on agricultural land	<ul style="list-style-type: none"> <li>By 2030, a gradual restoration of landscape elements will take place on agricultural land</li> <li>Woody windbreaks and vegetation of domestic species will be planted to reduce water and wind erosion and soil drying</li> </ul>
3. Addressing the status of white areas	<ul style="list-style-type: none"> <li>By 2030, land register status will be harmonised with the actual state of the land</li> </ul>
<b>Production of forest environmental services</b>	
1. Sustainable timber harvesting	<ul style="list-style-type: none"> <li>Processing of timber due to damage caused by harmful factors will be subject to reporting obligations and may be stopped or restricted</li> </ul>
2. Maintaining the prohibition of the logging in the area with the highest level of protection and near rivers	<ul style="list-style-type: none"> <li>In the no-interference zones, prohibition of harvesting and processing of timber will be maintained</li> <li>Logging in protected areas where active management is applied will be implemented in accordance with conservation requirements</li> </ul>
3. Effective control of timber harvesting	<ul style="list-style-type: none"> <li>The integrated guard will be set up to monitor the implementation of the harvest in individual locations</li> <li>Transparency and public control in forestry management field will increase</li> </ul>

Source: MoE (2019), Strategy of the Environmental Policy of the Slovak Republic until 2030.

The previous NBSAP to 2020 (updated in 2014) included a vision, 9 goals for 2020 and 167 tasks and actions to achieve these goals. The NBSAP was designed to reflect the Convention on Biological Diversity (CBD) Strategic Plan 2011-20 and the EU Biodiversity Strategy 2020. Progress towards the nine goals was evaluated in Slovakia's Sixth National Report submitted to the CBD in 2019 (Table 2.2). An evaluation published in 2020 and officially adopted by the government in 2022 concluded that 99 of the 167 tasks (59%) were fully implemented, 42 (25%) partially implemented and 26 (16%) unimplemented (MoE, 2020b).

In 2021, Slovakia initiated drafting of a new NBSAP for the period to 2030, which aims to align with the Kunming-Montreal Global Biodiversity Framework and the EU 2030 Biodiversity Strategy. The MoE shared the draft strategy in 2023 for comment by relevant stakeholders and intends to seek its adoption by government in 2024. Legally, Slovakia is required to have a Nature Protection Concept; the most recent one was prepared for 2007-15. A new concept to 2030 was drafted for adoption in 2019 but was never finalised. Instead, Slovakia plans to integrate the Nature Protection Concept into the NBSAP to avoid having two largely duplicative strategies.

Table 2.2. NBSAP to 2020 and progress as of 2018

Vision	
By 2050, the natural capital of the Slovak Republic – biodiversity, ecosystem services and goods – is adequately protected, regularly evaluated, wisely used and restored as appropriate, because of its intrinsic value and for its considerable contribution to the well-being and economic prosperity of the Slovak Republic. Measures and policies adopted at a national level prevent unfavourable changes brought on by loss of natural capital.	
Goal	Country self-evaluation of progress by end of 2018
1. Stop the deterioration of the status of all species and habitats, especially those covered by EU legislation and achieve a significant and measurable improvement in their condition	Progress, but insufficient rate to achieve target
2. Ensure that both general public and professionals are aware of the importance of biodiversity and the steps towards its protection and sustainable use	On track
3. By 2020, ensure the preservation of ecosystems and the enhancement of ecosystem services by means of green infrastructure and the restoration of at least 15% of degraded ecosystems	No significant change
4. By 2020, implement the measures of the Common Agricultural Policy that have positive effects on biodiversity at all cultivated areas so as to measurably improve the condition of species and habitat	Progress, but insufficient rate to achieve target
5. Implement national programmes of forest management so as to achieve a measurable improvement in the condition of species and habitats dependent on suitable forest environment and those, which are significantly affected by forestry practices, and to ensure a measurable improvement in the provision of ecosystem services in accordance with sustainable forestry practices as compared to the EU reference condition (2010)	No significant change
6. Ensure adequate protection of water and water-dependent habitats and species to achieve a good condition of aquatic ecosystems by 2020, and ensure that the development of aquaculture does not have adverse effects on aquatic species and ecosystems	No significant change
7. Ensure the reduction of negative effects of invasive species on biodiversity and ecosystems in Slovakia by 2020	On track
8. Reduce the intensity of negative factors affecting biodiversity; finalise, for this purpose, an effective legal framework and tools ensuring compliance with relevant legislation, and ensure fair and equitable sharing of benefits arising from the utilisation of genetic resources	On track
9. Engage a wide range of stakeholders and establish or re-establish partnerships to support the implementation of the national strategy for biodiversity; promote education, training, research and participation	Progress, but insufficient rate to achieve target

Source: MoE (2020), Sixth National Report to the Convention on Biological Diversity.

Another key strategy document for biodiversity is the Slovak Wetlands Management Programme 2024, which guides national implementation of the Ramsar Convention. The Wetlands Management Programme contains 4 overarching objectives and 18 goals. It is accompanied by an action plan. The action plan for 2019-22 included 65 measures, of which 43 (66%) were implemented or are continuously implemented, 15 (23%) partially implemented and 7 (11%) not implemented (MoE, 2022b). The action plan for 2022-24 includes 63 measures, estimated costs for some measures, potential sources of funding and responsible institutions (MoE, 2022b).

The Priority Action Framework (PAF) for the Natura 2000 System, which is mandatory under EU law, guides protection of Natura 2000 sites. Slovakia has developed a PAF for 2014-20 and 2021-27, which were approved by the European Commission. The document determines the goals, measures and activities necessary to ensure by 2030: i) no deterioration in trends and status in the case of species and



habitats of European interest; and ii) at least 30% of species and habitats whose status is currently unfavourable have reached a favourable status or have shown a significant positive trend. The PAF also outlines finance needs for implementing priority measures.

The European Union also requires an action plan to address pathways of unintentional introduction and spread of IAS (Article 13 of Regulation no 1143/2014). In 2021, Slovakia assessed the entry pathways of IAS of concern to the European Union and to the Slovak Republic and developed an action plan that was adopted in 2022 (Government of the Slovak Republic, 2022a).

Biodiversity is also addressed through sectoral strategies and programmes. These include the National Forestry Programme of the Slovak Republic (Section 2.4.1) and the Water Policy Concept of the Slovak Republic until 2030 with a view to 2050, which was adopted in 2022 (Government of the Slovak Republic, 2022b).

### **2.3.2. Legislative framework**

Law no. 543/2002 Coll. on Nature and Landscape Protection (hereafter Nature Act) is the primary national legislation governing the conservation and sustainable use of biodiversity. The purpose of the Act is:

*to ensure the long-term preservation of the natural balance and diversity of conditions and forms of life, natural values and beauties, and to create conditions for sustainable use of natural resources and provision of ecosystem services, taking into account economic, social and cultural needs, as well as regional and local conditions.*

Slovakia has amended the Nature Act several times since OECD's previous review. The most significant amendments are a 2022 reform of national park governance and management and strengthening of sustainable forestry practices (Section 2.5.1). The Nature Act is complemented by Law no. 15/2005 Coll. on the protection of species of wild animals and plants by regulating their trade. This translates commitments of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) domestically.

Slovakia strengthened the legal basis for addressing IAS in 2019 through the adoption of Law no. 150/2019 Coll. on the prevention and management of the introduction and spread of invasive non-native (i.e. alien) species. The law on IAS is supported by Regulation no. 449/2019 Coll., which issues a list of IAS of concern to the Slovak Republic and Decree no. 450/2019 Coll., which establishes the conditions and methods of removing IAS.

Other relevant legislation includes Law no. 151/2002 Coll. governing the use of genetic technologies and genetically modified organisms, Law no. 263/2015 Coll. on the scope for the area of access to genetic resources and the use of benefits resulting from their use, and various sectoral legislations (e.g. the Forest Act; Section 2.4.1).

### **2.3.3. Institutional framework**

#### *Government*

The Directorate of Nature and Biodiversity Protection (SOPB) of the MoE has overall responsibility for nature, biodiversity and landscape protection. SOPB co-ordinates biodiversity working groups to support implementation of nature-related international agreements such as the CBD in Slovakia, the Ramsar Convention (Slovak Ramsar Committee) and the Carpathian Convention.

The State Nature Conservancy (ŠOP) under the MoE implements biodiversity measures, conducts research and monitors biodiversity. The ŠOP is responsible for 14 protected landscape areas and used to oversee management of the nine national parks. Since March 2022, national parks have independent administrations co-ordinated through a new department in the MoE (Section 2.5.1). ŠOP continues to

support national parks by overseeing EU and international commitments and developing management guidance. The Slovak Environment Agency also works on biodiversity, including development of indicators, foresight studies and models.

Other key ministries for biodiversity include the Ministry of Interior, which plays a key role in environmental regulation and enforcement, and the Ministry of Agriculture and Rural Development (MoA). The MoA and its subordinate organisations (e.g. Slovak Land Fund), own and govern much of Slovakia's state-owned forest and agricultural land.

### *Non-governmental organisations and the private sector*

Since the 1990s, non-governmental organisations (NGOs) have played a key role in nature management in Slovakia. NGO activities include advocacy and policy formulation, project implementation, awareness raising and education. In recent years, the MoE, ŠOP and the MoA have worked more closely with NGOs (e.g. Daphne – Institute of Applied Ecology, WWF Slovakia, SOS/Birdlife Slovakia, NGO Vlč/Wolf, Prales) in the formulation and implementation of biodiversity-related policy (MoE, 2020a).

Recent examples of successful collaboration between government and NGOs include the development of the Water Policy Concept and Plan 2030 and the Common Agricultural Policy (CAP) Strategic Plan 2023-27. Slovakia intends to co-operate with NGOs and other non-state actors through its Biodiversity Working Group to formulate the new NBSAP. The working group, which was established to help prepare the NBSAP 2014-20, comprises ministries, academic institutions, NGOs and private landholders, but not private companies.

Co-operation between the government and private sector on biodiversity issues is relatively weak. A notable exception is the fruitful collaboration among the MoE, environmental NGOs and power companies to mitigate biodiversity risks from powerlines (MoE, 2020a) (Section 2.4.3). No platform exists to facilitate collaboration across the government and private sector. Furthermore, Slovakia is not represented in the EU Business and Biodiversity Platform. Participating in this platform and establishing a national business and biodiversity initiative, drawing on other countries' experience, could help strengthen private sector engagement.

### *International co-operation*

The ŠOP co-operates closely with conservation organisations and agencies of the five bordering countries (Austria, Czechia, Hungary, Poland, Ukraine) and three other European countries (the Netherlands, Germany and the Flanders region of Belgium). Co-operation entails preparing and implementing joint projects, co-ordinating monitoring, sharing data and information, organising meetings and field trips, bilateral research activities and environmental education programmes. Areas of focus include management and monitoring of PAs (particularly transboundary areas), the conservation of large carnivores and avian monitoring. International co-operation and exchange could be beneficial as Slovakia pursues nature restoration. Czechia for example, has more than two decades of experience in restoring (revitalising) river systems. Additionally, it boasts a successful restoration project in the White Carpathians (Bilé Karpaty), where orchid meadows have been restored at scale. The project was financed by a state fund for environment programme called the "Programme of Landscape Care" (*Program péče o krajinu*).

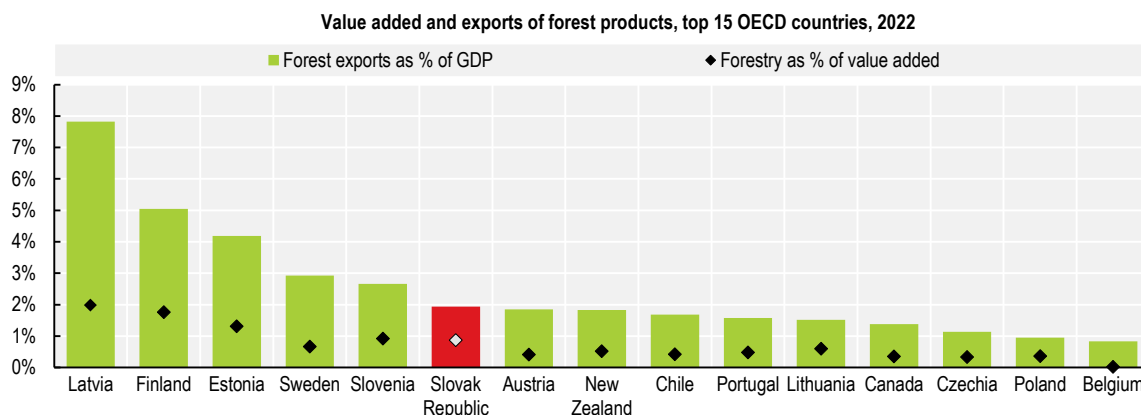
## **2.4. Mainstreaming biodiversity into sectoral policies**

### **2.4.1. Forestry**

Slovakia is among the most forested countries in Europe. Forest area, which covers about 40% of its territory, increased slightly from 2010-21 (Figure 2.4). Forestry has contributed between 0.7-0.9% of

annual GDP since 2010, which is more than in most OECD countries (Figure 2.5). The sector employs 73 000 people (FISE, 2022).

**Figure 2.5. Forestry provides a relatively large contribution to Slovakia's economy**



Note: Forestry as a percentage of value added: 2022 or latest available year.

Source OECD (2023), OECD National Accounts Statistics (database); FAO (2023), FAOSTAT (database).

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The government owns approximately 40% (779 863 ha) of forest land, but state enterprises manage more than half of Slovakia's forests (MoA, 2023a). Non-state forestry entities own and manage private, community, church, municipal and agricultural co-operative forests. The arrangement of ownership and use of forests in accordance with restitution laws is ongoing. Approximately 21% of forest area has unclear ownership status (MoA, 2023a).

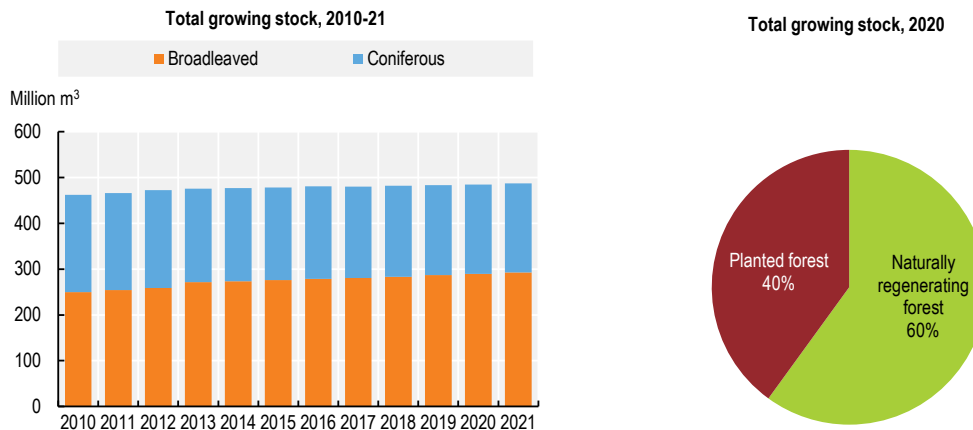
The principal regulation and strategies governing forestry and forest management are the Forest Act (2005) and the National Forestry Programme (2022-30), which is yet to be adopted. All forests are under valid ten-year forest management plans, which are prepared by third party certified experts and funded by the government. Plans are registered with an official body and publicly available.

Although monoculture plantations exist (mainly Norwegian spruce), overall Slovakia's forests are diverse and their species composition can be classified as predominantly natural. Introduced species cover 3% of forest area and remain stable. The most abundant tree species are European beech (35%), Norway spruce (21%), English/sessile oak (13%) and pine (7%) (MoA, 2023a). The share of deciduous trees compared to conifers is increasing, which is positive as it more closely reflects Slovakian forests' natural state. Furthermore, deciduous broadleaved forests tend to be more resilient to disturbances (e.g. bark beetle outbreaks) (MoE/SEA, 2023). Of the total growing stock, 60% is naturally regenerating forest and 40% planted forest (Figure 2.6). The share of naturally regenerating forests has been marginally increasing over the previous decade (FAO, 2023).

Nonetheless, Slovakia's forests face challenges. The current age structure of forests is skewed. Mature forest stands over 70 years old and young trees under 20 years old are disproportionately represented. Due to the age structure of forests, the volume of growing stock and carbon stocks has been increasing but is peaking. Both are projected to decline in the coming years (Section 2.7.1). Furthermore, almost half of trees have a high degree of defoliation (i.e. more than a quarter of leaves damaged), which is higher than the European average. This includes about 40% of deciduous trees and 58% of coniferous trees (MoA, 2023a) The quantity of deadwood is approximately 87 million m<sup>3</sup> (MoA, 2023a), which is among the

highest in Europe (Forest Europe, 2020). The high amount of deadwood provides habitat for biodiversity and is an important part of forest ecosystems. However, in some parts of Slovakia's forests, it reflects the impact of increasing abiotic and biotic disturbances and declining forest health (MoA, 2023a).

**Figure 2.6. The share of broadleaved species and naturally regenerating forests is increasing**



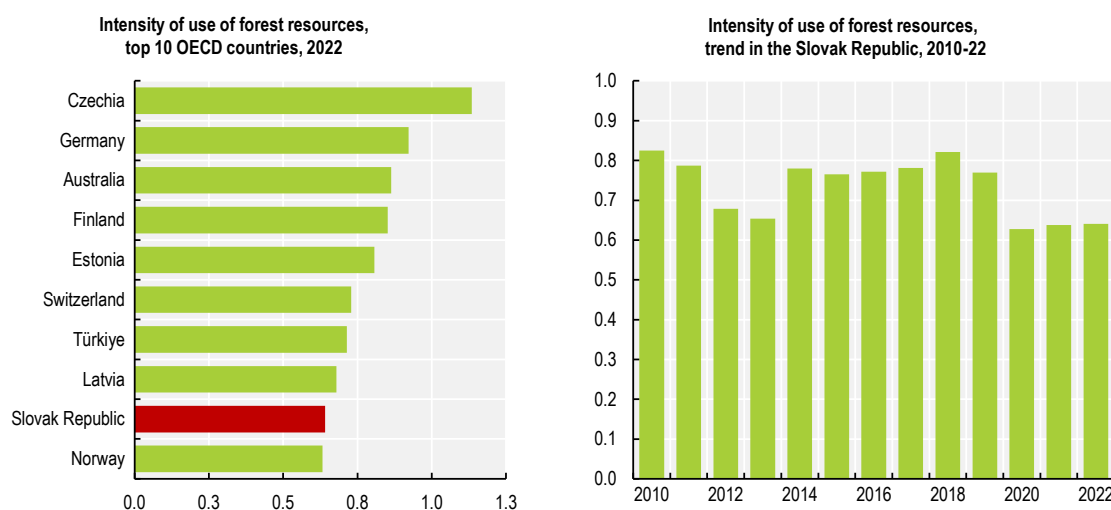
Note: Over bark volumes. Percentages in the right panel are based on 2017 data.

Source: MoE (2023), Sustainable forest management, Enviroportal (database); FAO (2023), FAOSTAT (database).


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Slovakia's logging intensity (ratio of fellings to gross increment) is higher than in most OECD countries, sitting consistently above 60% of gross increment since 2010 (Figure 2.7). Logging intensity has a long-term increasing trend but declined from 2020-21 owing to COVID-19 restrictions. The high intensity is mainly due to two factors. First, owing to the skewed age structure of Slovakia's forests, many tree stands are reaching the end of their rotation. Second, levels of incidental logging (salvage logging and sanitary felling) are high as a result of climate-related damage (e.g. drought and wind) and pest infestations (particularly bark beetles). Incidental logging accounted for 51% of total felling on average since 2010 and 36% of felling in 2022, among the highest shares in the European Union (OECD, 2023a). The high intensity of logging has contributed to the unfavourable conservation status of two-thirds of forest habitats of European interest (EEA, 2021).

Figure 2.7. Slovakia has a high intensity of logging



Note: Data refer to the ratio of fellings to productive capacity (gross increment).  
Source: OECD (2023), OECD Environment Statistics (database).

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Notably, high levels of incidental logging have driven the loss of western capercaillie (*Tetrao urogallus*) habitat. Since Slovakia joined the European Union, the capercaillie population has declined by 49% in the 12 Special Protection Areas classified for its protection under the Birds Directive. The EU Commission referred Slovakia to the Court of Justice in 2020 for failure to assess the impact of forest management plans and sanitary logging on Natura 2000 sites (EC, 2020). Slovakia has taken steps to resolve this issue. Amendments to the Forestry Code and the Nature Act, in 2020, stipulate that environmental authorities can restrict salvage or sanitary logging in certain areas. Furthermore, new provisions require forest management plans covering Natura 2000 sites to undergo an environmental assessment.

Independent of the infringement process, Slovakia has started adapting its forestry approach to better support the long-term resilience of its forests and the provision of multiple ecosystem services such as habitat provision, water flow, erosion regulation and carbon sequestration. Through 2019 amendments to the Forest Act and Nature Act, Slovakia promotes close-to-nature<sup>4</sup> management as the preferable forest management approach. This includes use of environmentally suitable and nature-friendly technologies and natural forest regeneration. The “production of forest environmental services” is also a priority of EnviroStrategy 2030.

These legislative changes combined with changes to PA legislation (Section 2.5.1) are positive developments for Slovakia’s forests. However, Slovakia could take additional steps to support and balance the multiple functions of forests. For example, forest management plans could better integrate biodiversity, ecosystem services and climate change considerations. Guidance and training for foresters could be developed to help them implement close-to-nature and climate-smart forestry practices, as well as to promote the multiple functions of forests.

Furthermore, Slovakia could further leverage economic incentives to support the transition to close-to-nature forest management and incentivise biodiversity protection and restoration. Foresters have little incentive to promote the full range of public goods that forests can provide because these goods are not reflected in market prices. Slovakia introduced the Forestry Support for Non-Productive Forest Functions in 2017 to help support foresters who adopt certain sustainable forestry practices. While this is an encouraging development, the instrument could be refined (Section 2.5.3) and supplemented with other financial mechanisms and economic instruments.

Voluntary forest certification also has a role in promoting the multiple societal values of forests. As of 2020, over 66% of forest area was certified under the Forest Stewardship Council (FSC) or Programme for the Endorsement of Forest Certification (PEFC). The area of certified forests fluctuates across years but has been declining since 2009 (SEA, 2021). From 2019 to 2020, certified forest area declined by 3 000 ha, despite FSC and PEFC reporting an increase in certified area. This is due to the overlap of the two schemes (i.e. forests certified under both FSC and PEFC). Renewed efforts are needed to increase the uptake of forest certification.

### **2.4.2. Agriculture**

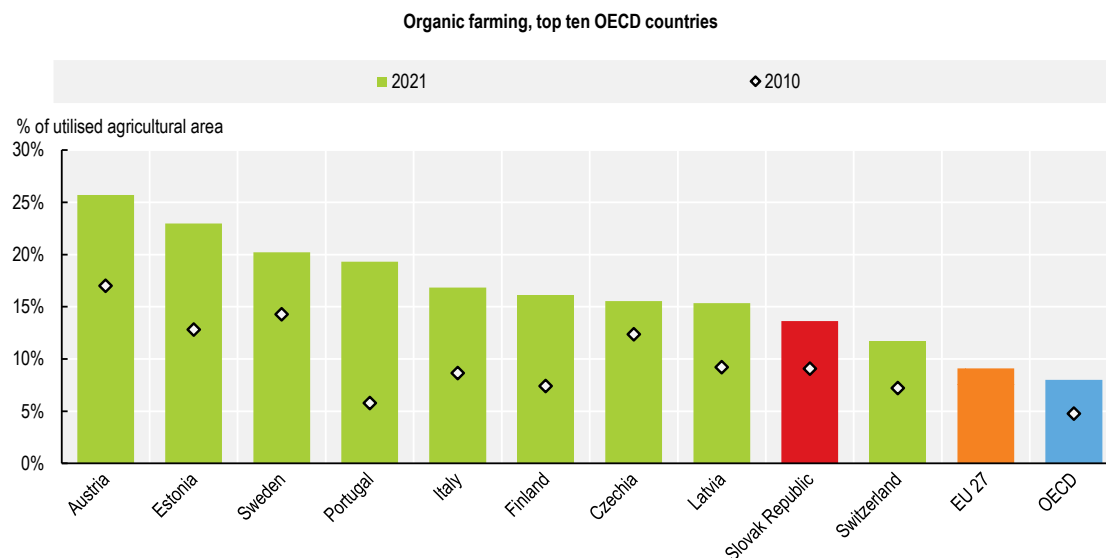
Agricultural land covers nearly half of the Slovak territory (Figure 2.4). Most agricultural land is arable land (59.2%) and permanent grassland (35.8%) (MoE/SEA, 2023). The remaining area is gardens (3.2%), vineyards (1.1%), fruit orchards (0.7%) and hop farms (0.02%). The average farm size in Slovakia is 95 ha, which is much larger than the EU average of 17 ha (EC, 2023a). During 2010-21, agricultural land declined slightly, while agriculture's contribution to GDP fluctuated between 2-3% (OECD, 2023b).

Promoting sustainable management of agriculture is critical for halting and reversing declines in Slovakia's biodiversity. More than 60% of habitats and 70% of species assessed are under pressure from agriculture (EEA, 2021). The Common Farmland Birds index declined by 28% in Slovakia over 2010-21 and by 16% in the European Union (EC, 2023a). The diversity of crops and farm animal breeds has also declined.

Key challenges include lack of landscape elements that provide habitat for species (e.g. field groves, hedgerows, dense strips of wooded area, solitary trees), the cultivation of monocultures (e.g. oilseed rape, maize), soil compaction due to agricultural machinery, and the excess or incorrect use of industrial fertilisers and pesticides. As a result of collectivisation and land consolidation, following the Second World War, Slovakia's average field size (10.6 ha) is the largest in Europe and significantly higher than the average (3.5 ha) (OneSoil, 2020). This contributes to the low landscape diversity and lack of landscape elements. Grassland habitats and species face the additional threats of woody succession and invasive alien plant species, owing to the abandonment of land and reductions in low-intensity grazing (EEA, 2021).

Consumption of nitrogen-based inorganic fertilisers increased by 24% from 2010-21, reaching 70 kg/ha of agricultural land (above the EU average). Pesticide application increased by 30% from 2011-21 reaching 1.2 kg/ha in 2021. While the rate of increase is faster than in most European Union countries, the overall volume remains lower (Eurostat, 2023). The expansion of organic farming may dampen further increases in industrial fertiliser and pesticides. In 2022, 13.6% of agricultural land was farmed organically, which is more than the EU average and surpasses the 2030 target of 13.5% set in *EnviroStrategy 2030*. The National Action Plan for the Development of Organic Agricultural Production 2023-27 sets a target of 14% by 2030 (MoA, 2023b). Considering the EU target of 25% of agricultural land organically farmed by 2030 and the current share, this seems unambitious.

**Figure 2.8. Organic farming as a share of total agricultural area is relatively high in the Slovak Republic**



Note: 2021 or latest available year. Data for the Slovak Republic refer to 2022.

Source: OECD (2023), OECD Agriculture Statistics (database); ÚKSÚP (2023), Register of agricultural area under organic farming (database).

StatLink  <https://stat.link/mgy2h>

The key legislation for the agriculture sector is the Act on the Protection and Use of Agricultural Land 220/2004 Coll., as amended. The Act stipulates that owners, lessees and managers of agricultural land must ensure that “the ecological stability of the territory is not threatened and the functional connectivity of natural processes in the landscape environment is preserved”. Since Slovakia’s accession to the European Union, the EU’s CAP has formed the backbone of the country’s agricultural policy.

The performance of the CAP 2014-20 has been mixed for Slovakia’s biodiversity (Alliance Environnement, 2020) (MoE, 2020b). A previous co-operation agreement between MoA and MoE was not renewed in the run-up to 2014-20 because the ministries disagreed on the extent to which the CAP should fund environmental actions. While environmental NGOs helped shape the CAP, they considered their participation to be restricted (Alliance Environnement, 2020).

Large monoculture fields persist under the CAP and little progress has been made to restore landscape features (Gális, 2020). Furthermore, the implementation of agri-environmental-climate measures (AECMs) has been patchy. From 2015-18, Slovakia received 11 applications covering about 750 ha to protect ground squirrels (Alliance Environnement, 2020), 5 applications for multifunctional field edges/biostrips covering 25 ha (MoE, 2020b) and a single application to protect the great bustard (Alliance Environnement, 2020). A key issue was the unattractively low payment rate (Alliance Environnement, 2020). In contrast, support measures for the protection of grassland habitats were widely adopted, with 1 156 applicants covering an area of 153 889 ha (MoE, 2020b). Payments for ecological (organic) agriculture were also well subscribed.

The adopted 2023-27 CAP Strategic Plan provides an opportunity to improve outcomes for biodiversity in agricultural land. Following EU negotiations, the EU CAP has been revised for 2023-27 to better support the environment. Additionally, Slovakia has taken steps to ensure the CAP is translated effectively nationally. The CAP Strategic Plan was developed through a participatory process involving different ministries, environmental NGOs, hunters and landowners.

While it is too early to assess its impact, the Strategic Plan includes several features to promote biodiversity. First, eligibility criteria for direct payments allow for more landscape features (unproductive land) within the hectares eligible for payments than under the previous CAP. Second, baseline environmental requirements for beneficiaries of area- and animal-based CAP payments (i.e. the good agricultural and environmental conditions – GAECs) have been strengthened, although some stakeholders consider them still too lax (EEB and BirdLife International, 2022). Third, Slovakia's CAP Strategic Plan allocates EUR 560 million (28% of pillar 1) to farmers that voluntarily commit to more environmentally ambitious actions as part of a new Whole-Farm Eco-Scheme. This initiative aims to support biodiversity by dividing large parcels of land by biobelts of a minimum of 12 m in width and setting aside non-productive landscape elements beyond mandatory requirements. Fourth, the plan encompasses AECMs (pillar 2) for protecting great bustard, ground squirrel, grassland habitat and Natura 2000 sites, and support for adopting and maintaining organic farming on 14% of agricultural land. Payment levels for the Eco-Scheme and AECMs were calculated carefully and certified by an independent body (MoA, 2023c).

To further promote positive biodiversity outcomes from the CAP, Slovakia could continue to build and disseminate knowledge about biodiversity-friendly and climate-smart farming practices, including through the European Innovation Partnership for Agricultural Productivity and Sustainability. Additionally, it could examine the potential benefits of using the flexibility mechanism to increase the share of pillar 1 going to the Whole-Farm Eco-Scheme and to transfer funding from pillar 1 to pillar 2 AECMs. Piloting results-based with larger compensation rates or hybrid results-based and management-based AECMs could also be beneficial. Results-based payments have several advantages such as increased cost effectiveness, although they can present challenges such as an increased monitoring burden (OECD, forthcoming) (OECD, 2022). Slovakia could also explore the potential for spatially co-ordinated, collective action from farmers, which can improve the performance and efficiency of AECMs (OECD, forthcoming).

Beyond CAP payments, Slovakia could consider other policy measures to promote biodiversity in the agriculture sector. For example, the Slovak Land Fund could introduce terms into agricultural leases requiring specific biodiversity measures in key areas such as PAs. It could also consider favourable lease rates where additional demands are placed on farmers. Additionally, to manage increased pesticide use, Slovakia could work through the farm advisory services to establish and apply economic thresholds to inform decisions on pesticide application (Keasar et al., 2023) (Pecenka et al., 2021), or consider risk-based pesticide taxes (OECD, 2023c). To manage the adverse effects of fertilisers, strengthened nitrate testing and compliance control in areas threatened by nitrates (as indicated in the EnviroStrategy), would be beneficial.

### **2.4.3. Energy**

#### *Energy production*

Most of Slovakia's primary sources of energy are imported. Domestic sources are mainly renewable energy (primarily hydropower and bioenergy, but also geothermal and increasingly wind and solar power) (Chapter 1). Slovakia has faced challenges managing the impacts of hydropower and bioenergy but is taking steps to address these. As a late mover on solar and wind, Slovakia has an opportunity to learn from other countries' experiences in harnessing synergies and minimising trade-offs between climate-energy and biodiversity objectives when scaling up these technologies (OECD, 2024).

Slovakia's large hydropower schemes installed last century dramatically altered the landscape, fragmenting freshwater habitats and altering hydrology. Slovakia committed to remove barriers and improve the connectivity of freshwater ecosystems in its EnviroStrategy 2030 and has initiated work (e.g. Norway Grant Project ACC04P06). Recent hydropower developments are smaller scale. While typically less harmful than traditional schemes, small-scale developments can also negatively affect biodiversity and therefore demand caution. Slovakia received formal notice from the European



Commission for failing to conduct an SEA of the national plan on the usage of hydropower (EC, 2022a). Only 4 of 37 small hydropower plants listed in the plan were subject to an SEA. Furthermore, at the project level, authorities did not conduct the necessary environmental impact assessments (EIAs) for several already constructed hydropower plans in line with the EIA and Water Framework Directives (EC, 2022a).

In the last decade, demand for bioenergy increased owing in part to renewable energy subsidies in the state budget and EU structural funds. In 2017, the total consumption of solid fuelwood biomass in Slovakia (fuelwood, wood chips, woody residue, briquettes and pellets) reached over 3 million tonnes (ENRD, 2020). The increased bioenergy demand contributed to logging beyond the volumes specified in management plans, removal of forest logging residues for bioenergy production and cutting of wood vegetation outside of forest areas (windbreaks, trees along the rivers and roads, for example). The Slovak Regulatory Office for Network Industries confirmed that several power stations were producing electricity using forest wood of high quality (ENRD, 2020).

Slovakia has taken important steps to address the negative impact of bioenergy. Notably, the government amended Act no. 309/2018 on the Promotion of Renewable Energy Sources and High-efficiency Cogeneration. This legislation forbids state subsidies for all wood burned in biomass energy facilities, except for wood originating from energy crops and waste from the wood processing industry. Power stations may only burn chips made from low-grade timber not suitable for other industrial purposes. Only wood of the lowest quality can be used for energy purposes. Furthermore, the government has adopted criteria for the sustainable energy use of wood biomass in two EU-funded programmes: the Operational Programme Quality of Environment and the Rural Development Programme in 2017. The criteria focus on i) the proof of origin of fuel dendromass; ii) its transportation and distribution; and iii) the effectiveness of wood biomass energy conversion (ENRD, 2020).

The EnviroStrategy 2030 sets an objective of binding sustainability criteria and rules for every renewable energy resource that accounts for impacts on PAs and protected species of plants and animals. Criteria are yet to be developed for solar PV and geothermal. Criteria for wind were developed more than a decade ago and would benefit from a review to ensure they reflect the latest knowledge and are fit-for-purpose. Industry reports the criteria as overly burdensome (WindEurope, 2022).

In addition to sustainability criteria, the EnviroStrategy 2030 states that all projects should undergo EIAs and must prove they will not have significant adverse impacts on the environment. Direct, indirect and cumulative biodiversity impacts should be considered as part of these environmental assessments and mitigated effectively in accordance with the mitigation hierarchy.

Upstream planning will be essential for maximising synergies and minimising trade-offs across renewable power, climate and biodiversity objectives. Identifying renewable energy zones where risk to biodiversity is low (e.g. abandoned agricultural land, brownfield sites) can help reduce biodiversity impacts and project delays, while allowing for accelerated permitting (OECD, 2024). For solar energy, policy should promote integration of solar PV into the built environment, including roofs and car parks as highlighted by the EnviroStrategy 2030.

### *Energy transmission*

Slovakia has taken effective steps to mitigate the risks of powerlines to biodiversity (electrocution, collision, and habitat fragmentation or disturbance), particularly to birds. An EIA is required for the construction of power lines. Furthermore, under Law no. 543/2002 Coll., the construction or repair of electric power lines requires the use of technologies that prevent bird electrocution. If the death of birds on power lines is documented, electricity companies must adopt measures to prevent this recurring (Raptor Protection of Slovakia, 2021).

Electric companies, the ŠOP, Raptor Protection of Slovakia and other environmental interests have established a strong working relationship and mutual trust. Electric companies generally consider avian

protection at early stages of planning, and some have internal guidelines (e.g. the Eastern Slovakia Electricity Company issued an internal technical norm called: “Construction and amendment of aerial 22kV power lines with respect to bird protection”) (Raptor Protection of Slovakia, 2021). The Raptor Protection of Slovakia co-ordinates field surveys and preparation of mitigation solutions. The combination of clear policy and co-operation has led to development of mitigation solutions (e.g. low-risk siting; new “Antibird” construction design; new types of insulation; bird diverters). A methodology for monitoring of high-risk powerlines has also been developed.

#### **2.4.4. Infrastructure – transport, residential and industrial**

The construction and operation of infrastructure for transport, residential and industrial purposes in Slovakia are linked to habitat loss and fragmentation, IAS spread and direct species mortality (e.g. collision with vehicles). They are the main cause of land-use change in grassland and cropland areas (Section 2.2.2). Integration of biodiversity into infrastructure decisions is improving but not systematic.

Positive developments include monitoring of transport impacts on land-use change; strengthened governance of IAS; improved knowledge on migratory routes of large mammals that could be affected by infrastructure development in the Carpathian Mountains; and integration of biodiversity considerations into Transport Strategy 2030. Transport Strategy 2030 was itself subject to an SEA and most transport projects also require EIA by law. Clear targets and indicators for biodiversity within the transport sector are needed to ensure effective implementation of the strategy. Slovakia could draw lessons from the recently completed EU Biodiversity and Infrastructure Synergies and Opportunities for European Transport Networks (BISON) project.

#### **2.4.5. Tourism**

Poorly regulated tourism has put pressure on Slovakia’s ecosystems. This is apparent in national parks, with notable examples including the development of the ski resorts and associated infrastructure at Donovaly and Jasná in the High Tatras (Gális et al., 2022). The potential benefits of sustainable ecotourism for biodiversity, local economies and people have not been fully realised. Slovakia is starting to address these concerns through EnviroStrategy 2030 and development of its Strategic Plan for the Development of Green Tourism. Tourism and biodiversity links have also been promoted through projects under the Interreg Centralparks initiative and the Slovak Republic-Hungary Cross-Border Cooperation Program. The EEA Norway Grants is also supporting work by NGOs under its Active Citizens Fund. These aim to provide recommendations and lessons learnt from other parts of the world on how to improve conditions for ecotourism for the benefit of national parks and tourism businesses.

#### **2.4.6. Other sectors**

Co-operation between the health and environment sectors improved over the last decade, although mainstreaming is at an early stage. Further efforts are needed to translate guidance from the CBD and the World Health Organization on health and biodiversity into national policies and projects.

Little to no progress has been made on mainstreaming biodiversity into manufacturing and processing sectors, cosmetics and pharmaceuticals. A new NBSAP provides a key opportunity to address this gap. Stakeholders from these sectors should be involved in its development and implementation; concrete measures for mainstreaming biodiversity should be identified and implemented.

## 2.5. Instruments for biodiversity conservation and sustainable use

Slovakia deploys various regulatory, economic and other instruments that may contribute directly or indirectly to the conservation, sustainable use and restoration of biodiversity (Table 2.3). PAs form the cornerstone of biodiversity policy. The PA network is extensive but faces shortcomings that the government seeks to address through ongoing reform. Effective delivery of this reform is fundamental for achieving Slovakia's biodiversity objectives. While Slovakia has some biodiversity-relevant economic instruments, considerable scope exists to scale up their use and effectiveness.

**Table 2.3. Policy instruments supporting the conservation, sustainable use and restoration of biodiversity in Slovakia**

Regulatory Approaches	Economic Instruments	Information and Other Instruments
Spatial and landscape planning	Financial compensation for limitations placed on land management	Ecolabelling (sustainability certification): FSC and PEFC for forests; organic farming certification
Protected areas and associated restrictions on access and economic activities	Levy on the withdrawal of land from agriculture or forest use	Conservation and recovery programmes
Restrictions or prohibitions on use (e.g. trade in endangered species and CITES; hunting bans)	Fee for hunting rights	Complex Information and Monitoring System (KIMS)
Environmental assessment requirements (SEA, EIA, Appropriate Assessment)	Environmentally-motivated subsidies in the agriculture and forestry sectors (under the Common Agricultural Policy)	State of Environment Reports; public website with environmental indicators and information
Permits and quotas (e.g. timber harvesting permit; hunting quotas)	Tax credits on expenditure on environmental protection activities (e.g. forest cultivation, restoration of land affected by mining, landfill closure and remediation)	Forest management plans
	Exemption of property tax for forest cultivation, restoration of land affected by mining, landfill closure and remediation	
	Charges addressing water quality and quantity (water tariffs; groundwater abstraction and surface water abstraction charges)	

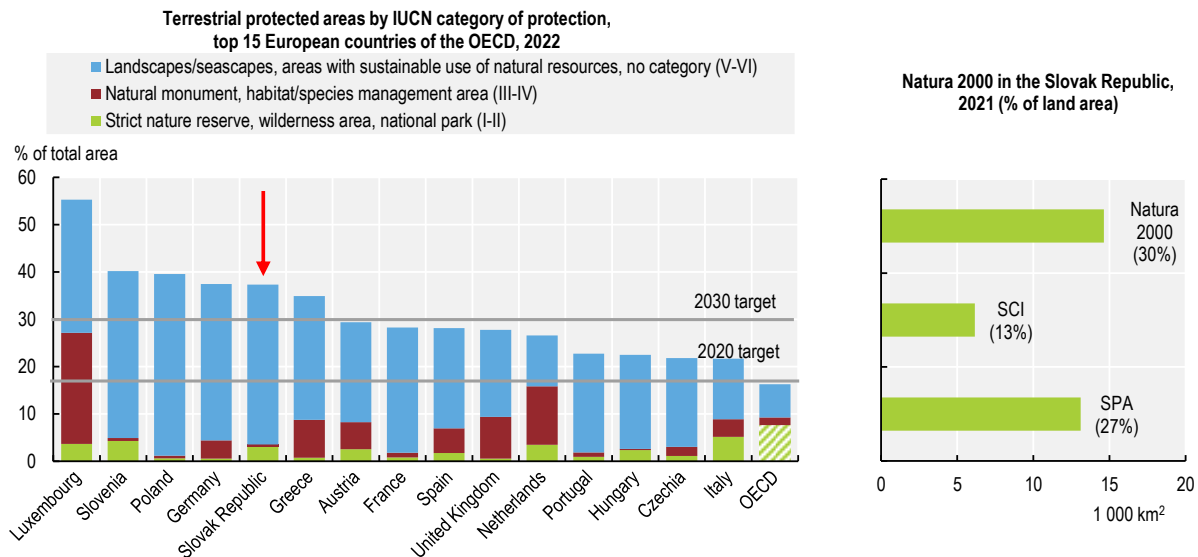
Source: Author based on multiple references.

### 2.5.1. Protected areas

#### *Extent of protected areas*

Slovakia has an extensive PA network. With over 37% of its territory designated for protection, it has exceeded the 2020 target for PA coverage of 17% (Aichi Target 11) and the 2030 target of 30% under the Kunming-Montreal Global Biodiversity Framework (Target 3). Slovakia's PA coverage is significantly higher than the OECD average (Figure 2.9).

**Figure 2.9. The share of protected land is high in Slovakia in international comparison**



Note: Natura 2000 sites cover 30% of total land area and partially overlap with the national system of protected areas.

Source: OECD (2023), OECD Environment Statistics (database); EC (2022), "New EU Proposal for Nature Restoration", Nature and Biodiversity Newsletter Natura 2000, N. 52, August.

StatLink  <https://stat.link/39rwt>

The PA network comprises domestic, European (i.e. Natura 2000) and international (Box 2.1) PAs. Domestic PAs cover almost a quarter of the territory. They consist of 9 national parks, 14 protected landscape areas and 1 166 small-size PAs (ŠOP, 2022a). The national parks form the backbone of the PA system, covering 3 157 km<sup>2</sup>. They vary considerably in size from under 40 km<sup>2</sup> (Pieniny National Park) to greater than 760 km<sup>2</sup> (Low Tatras National Park) (Gális et al., 2022).

While the number of national parks and protected landscape areas has remained constant, Slovakia has extended the number and area of small-size protected areas. Notably in 2021, the country declared 76 new nature reserves to protect 65 km<sup>2</sup> of old growth forest – some of the last remaining primary forest in Europe (MoE/SEA, 2023).

Natura 2000 sites cover 30% of Slovakia's territory, which is approximately 80% of the area under protection.<sup>5</sup> Natura 2000 sites comprise 642 Sites of Community Importance (SCI), collectively covering 13% of the territory, and 41 Special Protection Areas (SPA), which cover 27% of the territory. Natura 2000 sites cover 230 species and 66 habitats protected under the EU's Nature Directives. The designation of SCI as Special Conservation Areas (SCA), which is required by EU law, has been slow in Slovakia but is accelerating. According to EC (2022b), 446 SCIs are yet to be designated as SCA. In 2022, Slovakia published "Conservation principles for habitats of European interest, and habitats of species of European interest, in sites of European importance" (ŠOP, 2022b).

### Box 2.1. Protected areas of international significance

**UNESCO:** The Slovak Republic has two natural sites on the World Heritage List: 1) Slovak Karst, which forms a bilateral Slovak-Hungarian World Heritage Site with Aggtelek Karst. The Slovak Caves Administration of the ŠOP manages and protects the Slovak Karst and co-operates with Hungary on monitoring and research, exchange of data and information, implementation of projects, conferences, publications and reporting. 2) The “Ancient and Primeval Beech Forests of the Carpathians and Other Regions of Europe”, which is a transnational serial property comprising 94 component parts across 18 countries. Slovakia co-operates with other UNESCO members to harmonise management in the property and the buffer zone, raise awareness, and conduct research and fundraising.

**UNESCO Man and the Biosphere Programme:** Within the UNESCO Man and the Biosphere Programme, the Slovak Republic has one bilateral Tatry Biosphere Reserve (Slovakia-Poland) and one trilateral Východné Karpaty Biosphere Reserve (Slovakia-Poland-Ukraine). In both reserves, co-ordination boards comprise representatives of partner-protected areas in Poland and Ukraine, relevant institutions and stakeholders. The boards handle co-operation and communication at national and international levels with partners and stakeholders. They also implement projects, exchange data and information, publish materials and prepare reporting questionnaires, among other activities.

**Ramsar sites:** Slovakia has 14 sites designated as Wetlands of International Importance (Ramsar sites). Together, the sites have a surface area of 407 km<sup>2</sup>, including marshes, lakes, fishponds, rivers, caves, floodplains, peatbogs and swamps. The Management Plan of Wetlands in Slovakia and its Action Plan are updated every three years. Austria, Czechia and Slovakia have co-operated since 2001 on the Trilateral Ramsar Platform for the Transboundary Trilateral Ramsar Site “Floodplains of the Morava-Dyje-Danube Confluence”. Through the platform, the partners exchange information, and prepare joint projects and joint management approaches. They also co-operate on biodiversity protection, forestry, water-borne transport, water management and environmental education. Carpathian countries are co-operating within the Carpathian Wetland Initiative.

**European Diploma for protected areas:** Two sites in Slovakia received the European Diploma for protected areas: 1) Dobročský prales Primeval Forest, an undisturbed ecosystem of the Carpathian forests where species such as fir and spruce are of exceptional size and volume; 2) Poloniny National Park, which has a high degree of preserved primary forest dating to the glacial period.

Source: Country submission.

### *Effectiveness of protected areas*

While Slovakia has a large PA network, it is not functioning optimally (Gális, 2017) (Gális et al., 2022). For example, a satellite-based analysis of forest cover found that Slovakia lost 12.2% of forest cover across the nine national parks from 2000-16, compared to just 6.4% outside of national parks (Gális, 2017). Several shortcomings undermine the performance of protected areas.

First, the PA system is complex, with different systems of protection. National, EU and international sites of importance often overlap but do not have identical borders and protection levels. This creates confusion among stakeholders and challenges in harmonising objectives.

Second, most of the area of Slovakia’s PAs is under low levels of protection. Slovakia’s land is divided into five protection levels. The territory of national PAs falls within protection levels 2-5, with each level imposing increasing restrictions on land use. Two-thirds of Slovakia’s national PAs are at the second level of protection, while only 10% are in the highest two levels of protection (4 and 5) (Gális et al., 2022). More

than three-quarters of the area of the nine national parks is in the third level of protection, while less than 20% of the area is in the highest level of protection and these areas are fragmented. The situation varies across national parks, for example, 42% of the Tatra National Park is under strict protection compared to just 4% of the Slovak Karst National Park (Gális et al., 2022). None of the national parks meet the condition of the predominance of areas undisturbed by human activity under International Union for Conservation of Nature (IUCN) category II – National Parks.

**Table 2.4. Slovakia's protected areas by degree of protection**

Protection level	Category of protected areas	Area (hectares)	% coverage of Slovakia's PAs
1st level	SPAs=Special protection areas (Natura 2000 sites) and "free country" (outside from the other protected areas)	3 764 578	76.8
2nd level	Protected landscape areas, buffer zones of national parks and (D zones/parts of) other categories of protected areas	731 983	14.9
3rd level	C zones of national parks and other categories of protected areas	274 531	5.6
4th level	B zones of national park and (B zones/parts of) other categories of protected areas	32 750	0.7
5th level	A zones of national park and other categories of, protected areas	99 658	2.0
<b>Levels 2-5</b>	<b>Protected areas in the national system</b>	<b>1 138 922</b>	<b>23.2</b>

Source: ŠOP (2022), Overview of Protected Areas.

Third, zoning of PAs is yet to be completed. Zoning is necessary for consolidating areas of the same protection level and clarifying management objectives across the multiple systems of protection. However, zoning is complete for just three of the nine national parks (Slovenský Raj [2016], Pieniny [2022] and Muránska planina [2022]), and one protected landscape area (Horná Orava). Zoning for a further three national parks began in December 2022.

Fourth, management plans are lacking for most PAs. For example, management plans have been approved for fewer than 100 PAs in the national system (ŠOP, 2023b) and 23 of the 41 SPA (MoE, 2023a). Most national parks do not have approved management plans for their entire territory. For some PAs, management plans exist on paper but are not implemented effectively.

A fifth reason, which is linked to the lack of implementation of management plans, is the low capacity of the state to manage protected areas. For example, the number of employees and the budget per 100 km<sup>2</sup> of Slovakia's national parks has been consistently below the average for the region for national parks of similar size (Gális et al., 2022). Funding has been largely dependent on EU funds and has fluctuated. Despite an increase since 2018, state funding is insufficient (Gális et al., 2022).

### *Protected area reform*

Recognising the challenges facing its PA system, Slovakia has launched a reform. EnviroStrategy 2030 outlines commitments and actions to simplify and strengthen the PA network, promoting alignment with the IUCN PA categories and EU commitments. It sets an ambitious target of expanding no-intervention zones in national parks to 50% by 2025 and 75% by 2030. Due to the degraded state of parks, this target will not be attainable for all parks. Active management will first be required to restore degraded ecosystems to a more natural state. The EnviroStrategy therefore notes that in national parks where human intervention will be required to achieve biodiversity protection objectives, the non-interference zone can be less than 50%.

A 2021 amendment to the Nature Act established nine independent national park administrations under the MoE, which are responsible for park management, administration and strategic planning. State land in national parks in the two highest protection levels was transferred from the MoA to the MoE. However, the transfer of the remaining state land is conditional upon completion of national park zoning. Prior to this amendment, the management of state lands in national parks was carried out almost exclusively by organisations subordinate to the MoA.

The amended Nature Act also strengthens the legal basis for zoning of national parks in line with international standards. It recognises four categories within national parks: A zones (equivalent to national protection level 5), which are mainly unaltered natural ecosystems where no-intervention management is applied; B zones (protection level 4), which are partially altered ecosystems that seek to gradually restore the site to a natural state; zones C (protection level 3) and D (protection level 2), which are significantly altered and where the objective is to conserve, sustainably use and restore biodiversity to ensure the integrity of the PA.

Slovakia's priority is to complete national park zoning. However, zoning is complex due to longstanding tensions between landowners and the state, conflicts between economic interests (predominantly forestry) and biodiversity interests, lack of information (or misinformation) and the large share of national parks under private ownership. Fragmentation of land ownership, which is yet to be fully resolved by the unfinished land reform, makes it difficult to reach consensus and agreement. Furthermore, the requirement for zoning to be completed before state land in lower levels of protection is transferred to the MoE provides an instrument for opponents to the national park reform to undermine zoning to maintain the status quo.

Stakeholders need clear information about the zoning process, its objectives and implications. National park zoning may restrict some activities, while creating new business and employment opportunities in the region. The potential socio-economic benefits of zoning need to be clearly communicated and trade-offs carefully managed. Strengthening participatory approaches in protected area zoning, governance and management is fundamental. Such approaches should ensure meaningful engagement of landholders, forestry interests, biodiversity experts and other stakeholders. The national park councils required by the amended Nature Act is one tool through which Slovakia could promote wide stakeholder participation, including from local communities and landholders, as is done in Estonia's national park development boards.

The development strategies required for each national park provide an important opportunity for clearly articulating the park's vision, mission and strategic goals. These strategies should consider not only environmental, but also social and economic concerns. National park development strategies and regional economic and social development plans should be consistent. Both should support a transition to sustainable local economies that benefit from, and contribute to, the protection of national parks. Slovakia could draw on its experience developing the post-mining transition plan for the Nitra region.

Slovakia must address the high share of private land in national parks. The EnviroStrategy recognises several options, including exchange of private and state land, purchase or lease of land, and contractual care arrangements. The government should seek cost-effective approaches that are also socially and politically viable. The appropriate solution may differ across national parks and landholders. To support these efforts, RRP component 5 dedicates EUR 77.5 million to financing property settlements with private landowners in national parks.

National parks require sufficient, predictable and long-term funding to hire more staff (e.g. foresters/land managers, guards, tourism service providers) and invest in park infrastructure (e.g. visitor centres, trail development or maintenance). An effective financing strategy would draw on state funding, EU and international funds, and national parks' own revenues. In 2023 an amendment to Act 414/2012 allows earmarking of auction revenues from ETS to support carbon sequestration measures in PAs. This could provide a new source of financing. However, the criteria for these projects and modalities for disbursing funds are yet to be defined. It will be critical to ensure that such funds are used efficiently and support both

climate and biodiversity objectives. Additional funding has also been secured through component 5 of the RRP, which earmarks EUR 16 million for sustainable tourism projects for NP Poloniny and NP Muránska plainina.

To complement state and EU funding, national parks could secure additional funding through revenue-generating mechanisms such as entrance fees, accommodation tax, issuance of concessions and payments for ecosystem services (Table 2.5), but these are yet to be leveraged. An exception is the use of PA entrance fees at Slovenský Raj National Park. However, these fees are set lower than the willingness-to-pay (Gális et al., 2022).

**Table 2.5 Potential revenues from innovative forms of financing national parks**

	Amount (EUR)	Explanation	National Parks
Entrance fee	6.6-11.1 million	Charging entry for most visited sections and places of national parks	Most visited national parks
Accommodation tax	1.5-3.2 million	Tax in municipalities in national parks and their protection zones	Most visited national parks
Issuance of concessions	A few million	Business fee for catering services, parking lots, ski resorts, other services	Most visited national parks
Tourist services of administration parks	Hundreds of thousands	Guide, attractions and more	All national parks
Voluntary contributions	Hundreds of thousands		All national parks
Charging ecosystem services	3.7 million	Payments for limiting management in protective zones of water resources	Poloniny andotehrs
Forestry	8.4-10.5 million	Close-to-nature forestry in state lands	Larger parks with high share of state land
Common agricultural policy	A few million	Payments for close-to-nature forestry and management of permanent grasslands in Natura 2000 sites	Any national park. More suitable for parks with high proportion of permanent grasslands

Source: MoE (2022), National Parks for the 21<sup>st</sup> Century: The economic potential of national parks and the possibilities of their alternative financing.

### **2.5.2. Spatial and landscape planning**

Slovakia has four tiers of spatial planning to determine and regulate the use of its territory, with an objective of sustainable development. Its basic spatial planning document is the Slovak Land Development Concept 2001, which was updated in 2010. At the regional level, all self-governing regions have valid land-use plans, which they continuously update. Municipalities of more than 2 000 inhabitants and small municipalities planning extensive developments must develop local land-use plans. More detailed zoning plans are developed if required by local land-use plans (OECD, 2017). The spatial plans consider nature and landscape protection. They are also subject to SEAs.

To better integrate nature, biodiversity and landscape protection into spatial planning, Slovakia developed the Territorial System of Ecological Stability (ÚSES in Slovak) concept and methodology. The ÚSES, adopted in the 1990s, is underpinned by landscape ecology and the landscape-ecological planning (LANDEP) methodology (Izakovicova and Laszlo, 2010). ÚSES, which is supported by the Nature Act and other legislation, delineates “green infrastructure” such as biocentres, biocorridors and interactive landscape elements. Biocentres are habitats providing food, shelter and sites for reproduction, while biocorridors and interactive elements ensure ecological connectivity and stability. The ÚSES outcome is a



set of maps with a projection of green infrastructure, eco-stabilising measure, potential conflicts of interests and hazards (Izakovicova and Laszlo, 2010).

In practice, landscape planning is not systematically applied. Challenges identified include misunderstanding the importance of landscape-ecological documentation within spatial planning processes; complexity of the methodology; lack of capacity to implement the methodologies, low quality control; and lack of willingness to integrate landscape-ecological documentation into territorial planning and land consolidation projects (Izakovičová et al., 2019).

Nonetheless, Slovakia has continued to advance landscape planning during the review period, developing 50 regional and local ÚSES projects under the Operational Programme Quality of the Environment: "Processing projects of regional territorial systems of ecological stability for the needs of creating a basic starting point for the regulation of the proposal for building green infrastructure RÚSES II" (MoE, 2020b). Automation of the generation of local ÚSES documents also progressed.

Moreover, landscape planning is identified as a priority in the EnviroStrategy and the RPP dedicates funding for a landscape planning reform. The reform intends to strengthen the link and co-ordination between spatial and landscape planning. A new law on landscape planning, which has been drafted but not yet adopted, is a key pillar of this reform (MoE, 2020b).

Slovakia should pursue its efforts to promote integrated landscape planning to improve species' habitat, water retention and carbon stocks through biological corridors, vegetation belts and other green infrastructure. Effectively implemented landscape planning could provide multiple benefits to biodiversity, climate change adaptation and climate mitigation. As part of these efforts, it would be beneficial to review and refine the LANDEP and ÚSES methodologies and how they are applied in practice.

### **2.5.3. Economic instruments**

#### *Compensatory payments for restrictions on management*

Under the Nature Act (§ 61), landowners who face restrictions on normal management due to prohibitions and other conditions of nature and landscape protection are eligible for financial compensation. In 2021, more than EUR 10 million was paid in compensation (MoE/SEA, 2023). As aforementioned, the government is exploring purchase, exchange, lease of land, contractual care, or payments in the form of a simple annual annuity as a sustainable alternative (MoE/SEA, 2023) (MoE, 2022c).

#### *Forestry support for non-productive forest functions*

Forest managers with more than 5 ha of forest can apply for a subsidy under the MoA's Forestry Support for Non-Productive Forest Functions<sup>6</sup> programme. The payments aim to promote the non-timber ecosystem services by supporting sustainable silviculture measures and close-to-nature forest management<sup>7</sup> (Sarvašová et al., 2019) (Báliková and Šálka, 2022). The scheme is management-based (i.e. based on adoption of specific practices) rather than results-based (i.e. based on change of ecosystem services).

The subsidy is closely linked to the mandated forest management plans. Forest managers can apply for the payments after the first five years of the plan and again after ten years when the plan terminates. As the payments are made retroactively for management actions agreed when the plan was adopted, they are unlikely to have driven behavioural change. However, forest managers may be motivated to emphasise sustainability and close-to-nature forest management when preparing new forest management plans (Báliková and Šálka, 2022).

Support is calculated based on legislation (Decree no. 226/2017 Coll., Annex 1). The per hectare rate of the subsidy is 50% higher for areas under close-to-nature management, providing an additional reward to

foresters that promote resilient, multifunctional forests. Total payments per recipient are capped at EUR 200 000 over three years, in line with the EU's *de minimis* regulation. However, the demand for payments consistently outweighs supply. A shortening ratio is applied to all applications to account for the limited budget. In the fourth call for applications, for example, recipients requested EUR 10.8 million in total. Payments were subsequently reduced by a ratio of 0.28.

While the instrument fills a gap in Slovakia's policy mix, it has several limitations beyond the limited availability of funds (Báliková and Šálka, 2022). First, subsidies have been provided to all applicants who thinned forest stands according to their forest management plans, including some applicants who did not fulfil some of the pre-defined criteria (e.g. tree species composition). Second, in the absence of information on the costs of close-to-nature measures and the public benefits provided by ecosystem services, the subsidy level may not be optimal. Third, while the Forest Act defines "close-to-nature" (since a 2019 amendment), commonly agreed measures for close-to-nature forestry are missing. Finally, random controls of forest management practices are insufficient due to staff shortages. Furthermore, ecosystem service changes are not systematically monitored and evaluated to understand the impact of this scheme (Báliková and Šálka, 2022).

### *Forest land tax relief*

Land tax requirements differ depending on the forest category. Land tax must be paid on economic or production forests but not on protective forests, special purpose forests and forests in national parks. In addition to these obligatory tax exemptions, optional tax exemptions can be granted for some other types of land, including swamps, salt marshes and forests in water sanitation zones.

Protective forests and special purpose forests are primarily managed to provide non-timber ecosystem services (e.g. watershed and habitat protection, recreation). By reducing land tax for these forests, the government essentially subsidises a bundle of ecosystem services provided by these forests. However, landholders and beneficiaries tend not to associate the tax relief with the provision of these services (Sarvašová et al., 2019).

The advantage of the instrument is its low administration burden, transparency and political feasibility (Sarvašová et al., 2019). However, its effectiveness in promoting biodiversity protection and restoration is unclear. Forest owners must already respect the restrictions on the different forest categories. Furthermore, the economic incentive from the land tax relief is unlikely to be sufficient to stimulate a change of categories from production to protection forests, given the opportunity costs associated with timber harvesting. However, in certain cases it may help incentivise reclassification of production forest to special purpose forests, which allow some degree of production (Sarvašová et al., 2019). It also serves to strengthen and help compensate for regulatory requirements. In the absence of the tax relief, forest owners may be incentivised to recuperate their costs through more intensive economic activities elsewhere (e.g. increased harvesting in their production forests) (Sarvašová et al., 2019).

### *Protected area entrance fees and tourism taxes*

PA fees could help finance national park management and address tourism pressure but are underused in Slovakia. Only one of the nine national parks in Slovakia – Slovenský Raj – has PA fees. The entrance fee is set at EUR 1.5 per adult for a day and EUR 0.5 per child (6-15) and pensioner (over 64 years). Citizens of local municipalities are exempt. The fees generate tens of thousands of euros in annual revenue for the municipality, some of which supports efforts to run and operate the national park.

Scope exists to increase the fee at Slovenský Raj, which is lower than the willingness-to-pay. Additionally, Slovakia could introduce PA entrance fees at other heavily visited national parks such as TANAP, NAPANT and Mala Fatra. A 2021 survey in Mala Fatra National Park found that people would be willing to pay EUR 4 to enter (Gális et al., 2022). By one estimate, appropriately priced PA fees would generate

EUR 6.6-11.1 million per year in revenue for national parks (Gális et al., 2022). PA fees could be tiered as in NP Slovenský to provide favourable rates (or exemptions) to local communities compared to other domestic and international visitors.

Scope exists to use tourism taxes to raise revenues for national parks. The average annual revenue of accommodation facilities in national parks in 2020 was more than four times the Slovakian average. Local accommodation tax already exists in Slovakia, but revenues are not earmarked for nature protection. Slovakia could consider linking this tax to national park protection. For example, Spain's Balearic Islands levies an accommodation tax of EUR 0.13-4, depending on the type of accommodation and the season. The revenue from the tax is used for ecosystem restoration, land acquisition, infrastructure improvements and similar purposes (Gális et al., 2022).

#### *Levies on removing land from forest use or agricultural use*

Slovakia places levies on the removal of land from forest or agricultural uses. While neither instrument explicitly targets biodiversity, by preventing land-use change in forests and agri-ecosystems the levies can contribute to nature protection. Forest owners are required to manage forests for their defined function (e.g. production or protection). However, district authorities may grant exemptions in exchange for a fee. The fee aims to incentivise maintenance and sustainable management of forests, and to generate revenue for the state budget. In 2021, fees for the removal for forest land amounted to EUR 1.22 million (MoE/SEA, 2023). Levies for the exclusion of forest land declined over the past decade, mainly due to fewer exclusions (MoE, 2022c).

Similarly, agricultural land can be used for other purposes if justified and deemed necessary (Act 220/2004 Coll.). However, the applicant must pay a fee for the permanent or temporary withdrawal of agricultural land (Regulation 58/2013 Coll.). The fee aims to protect high quality agricultural land. As such, the rate of the fee depends on the quality of the agricultural land. Annual fees for the removal of agricultural land for non-agricultural purposes fluctuated during 2010-20. In 2021, fees totalled EUR 2.5 million (MoE/SEA, 2023). Several activities are exempt from the levy. These include constructions to support agricultural land access and protection; construction of water reservoirs, wastewater treatment plants, road and railways; public buildings whose investor is the municipality; defence; and land under family houses of certain sizes.

#### *Biodiversity offsets*

Biodiversity offset schemes are based on the polluter pays principle. Designed effectively, they can incentivise developers to avoid and minimise their impacts on biodiversity. At the same time, they can provide a source of funding to compensate for any residual adverse impacts on biodiversity and ecosystem services. They can also be designed to deliver net-positive outcomes for biodiversity.

Slovakia does not have an active biodiversity offset scheme. However, the Nature Act stipulates, in line with EU legislation, that compensatory measures must be taken for projects that have adverse impacts on Natura 2000 sites but are authorised for imperative reasons of overriding public interest. In this situation, the compensatory measure shall be targeted, to a comparable extent, at the species and habitats adversely affected. It shall provide functions comparable to those performed by the area affected by the plan or project.

Given the ongoing and projected expansion of infrastructure in Slovakia, scope exists to develop a biodiversity offset scheme. Such a scheme should draw on other countries' experiences and follow best practices such as in OECD (2016). The mitigation hierarchy should emphasise avoidance of impacts. Slovakia could also consider a no-net loss or net-positive gain requirement for future developments and a suitable metric for determining net impacts. In the United Kingdom, the 2021 Environment Act requires new developments in England seeking a planning permit to demonstrate a 10% increase in biodiversity at or near the project site, measured using Defra's Biodiversity Metric (UK, 2021).

#### **2.5.4. Reform of harmful subsidies**

Slovakia aims to phase out environmentally harmful subsidies by 2030 (Chapter 1). It is focusing its efforts on harmful subsidies in the energy and transport sector, covering fossil fuels and unsustainably sourced biomass. As climate change and pollution contribute to biodiversity loss, reforming these harmful subsidies will benefit global biodiversity. Harmful subsidies to biomass have already been reformed and helped to reduce logging intensity in Slovakia (Section 2.4.3).

Slovakia has also taken steps to reduce environmentally harmful subsidies in the agricultural sector by including better targeted and environmentally more rigorous measures in the CAP Strategic Plan 2021-27 (Section 2.4.2). Slovakia should closely monitor implementation of the new CAP and assess its impact on environmental values.

Slovakia is yet to systematically evaluate all harmful subsidies and other incentives that could potentially impact biodiversity. This is a key step for aligning with Target 18 of the Kunming-Montreal Global Biodiversity Framework.

#### **2.5.5. Rescue and management programmes for endangered and protected species**

Slovakia implements rescue and management programmes for selected threatened and protected species. These programmes are developed in compliance with the Nature Act. Their goal is to stabilise and increase target species' populations by identifying and addressing main pressures.

Rescue and management programmes are continuously adopted and implemented. However, they depend on funding and the number of active programmes declined over the past decade. Since 2010, rescue programmes have been approved and implemented for eight threatened animal species. No new programmes have been approved for plant species. Management programmes have been established for three large mammals. These aim to amend legislation, implement practical management measures (e.g. quotas and hunting conditions, applying compensation for damages, implementing measures to eliminate damage to livestock caused by these animals), monitoring, educating the public and research.

Table 2.6 summarises active rescue and management programmes in 2022.

Various species targeted by rescue and management programmes have seen positive population trends. For example, the populations of golden eagle, maned bison and beaver increased during the last decade following implementation of rescue programmes in the late 2000s (EEA, 2021). The three mammals for which dedicated management programmes were established during the last decade have also seen positive population trends.

**Table 2.6. Rescue and management programmes**

Overview of programmes active in 2022

Species	Implementation period
<b>Rescue programmes</b>	
<i>Falco vespertinus</i>	2018-22
<i>Tetrao urogallus</i>	2018-22
<i>Botaurus stellaris</i> and <i>Aythya nyroca</i>	2019-23
<i>Tetrao tetrix</i>	2018-22
<i>Colias myrmidone</i>	2021-25
<i>Parnassius apollo</i>	2022-26
<b>Management programmes</b>	
<i>Ursus arctos</i>	2016-25
<i>Lynx lynx</i>	2017-26
<i>Canis lupus</i>	2016-25

Source: ŠOP (2022), Rescue and Management Programmes for Protected Animals.

### 2.5.6. Ecosystem service valuation and natural capital accounting

As an EU member, Slovakia must evaluate its ecosystems and the services they provide. In EnviroStrategy 2030, Slovakia commits to "evaluate and sustainably use ecosystem services". By 2030, it aims for all ecosystems to be treated equally and reflected in the national accounting system. Ecosystems are to be evaluated and quantified, and options for monetising ecosystem services considered.

Evaluation of ecosystem services in Slovakia has progressed, although these assessments do not yet inform decisions. At the site level, ecosystem services have been evaluated at the national parks of Vel'ká, Slovenský Raj and Muránska planina. Additionally, as part of Interreg Central Europe, Slovak experts led the development of the Carpathian Ecosystem Services Toolkit. This aims to guide nature protection authorities and organisations in the Carpathian countries to account for ecosystem service values in their decision making. In the scope of the LIFE 2020-30 IP project, an evaluation of socio-economic benefits and ecosystem services in the Natura 2000 framework is ongoing.

At the national level, notable achievements include publication of the *Catalogue of Ecosystem Services of Slovakia* (Mederly and Černecký, 2019) and *Value of Ecosystems and their Services in Slovakia in 2020* (Černecký et al., 2021). The former contains a pilot evaluation of 18 ecosystem services (5 production, 10 regulatory/support and 3 cultural). The latter constitutes the first monetary evaluation of selected ecosystem services for individual ecosystems in Slovakia, and the first overall economic evaluation of services provided at the national level. It examines the capacity of Slovak ecosystems to deliver 11 regulatory, 10 provisioning and 2 cultural services (Box 2.2). The establishment of ecosystem pilot accounts (extent, condition, capacity) and their monetisation are planned but not under way.

## Box 2.2 The value of ecosystems and their services in Slovakia

The *Value of Ecosystems and their Services in Slovakia* mapped ecosystems across Slovakia's entire territory. The map integrates various data sources, including global information systems and field surveys. It comprises 1 033 905 unique polygons with an average size of 4.9 ha. The report estimated supply of ecosystem services from nine ecosystem types. For each ecosystem service, a score from 0-5 was ascribed depending on the ecosystem, following the methodology of Burkhard et al. (2014). These scores were then adjusted to reflect ecosystem degradation. The monetary value of each ecosystem service per ha/year was ascertained mainly using the value transfer methodology. The report estimates ecosystem service values to be at least EUR 187-225 billion/year, which is more than twice Slovakia's GDP. However, due to ecosystem degradation, Slovakia loses about EUR 20 billion/year per year in potential ecosystem service value. Table 2.7 provides an overview of a subset of the ecosystem services assessed and their values for the ecosystem category "woodland, forest and other wooded land".

**Table 2.7. Slovakia's forests contribute a variety of economic benefits to society**

Selected ecosystem services and estimated values for the ecosystem category "woodland, forest and other wooded land"

	Selected ecosystem services	Potential value (EUR)	Supply value (EUR)	Forgone value (EUR)
Regulatory services	Global climate regulation	12 876 396 746	10 580 324 938	2 296 071 808
	Water flow regulation	2 659 570 003	1 874 455 754	785 114 249
	Water purification	3 862 299 479	3 170 085 443	692 214 036
	Erosion regulation	18 490 207 681	15 193 085 990	3 297 121 691
	Flood control	21 746 352 925	16 911 401 217	4 834 951 708
	Pollination	3 612 798 190	2 824 472 910	788 325 280
Provisioning services	Biomass for energy	274 336 904	9 697 213	264 639 691
	Fodder (feed for cattle)	110 236 147	83 861 474	26 374 673
	Fibre	7 738 758 708	5 207 808 994	2 530 949 714
	Timber	22 163 258 160	18 211 168 466	3 952 089 694
	Wood fuel	38 637 693 738	31 747 929 149	6 889 764 589
	Wild food and resources	181 641 415	148 930 376	32 711 039
Cultural services	Recreation and tourism	7 059 339 311	5 806 875 957	1 252 463 354
	Landscape aesthetics and inspiration	19 148 709 524	15 734 165 641	3 414 543 883

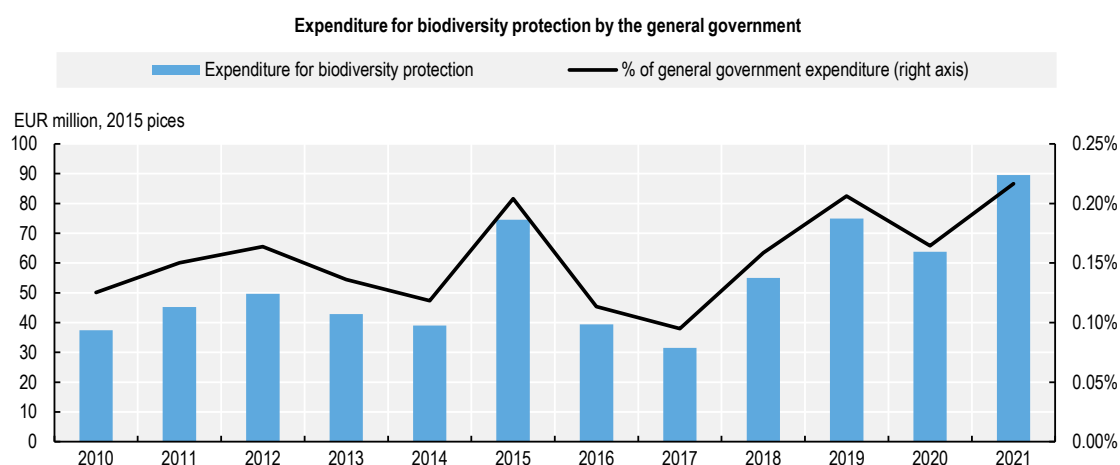
Source: Černecký et al. (2021), Value of Ecosystems and their Services in Slovakia.

## 2.6. Biodiversity financing and innovation


### 2.6.1. Domestic financing

For the CBD Strategic Plan 2011-20 period, annual general government expenditure on biodiversity averaged EUR 52 million per year (2015 prices), or 0.15% of annual general government expenditure. Government expenditure on biodiversity protection fluctuated considerably from 2010-21 (Figure 2.10). It dropped to EUR 31.5 million in 2017 (0.09% of government spending) and peaked at EUR 89.5 million in 2021 (0.22% of government spending).

**Figure 2.10. Government expenditure on biodiversity protection has fluctuated**



Source: OECD (2023), OECD National Accounts Statistics (database).

StatLink  <https://stat.link/4gceyd>

The European Union is an important source of funding for nature and biodiversity in the Slovak Republic. Investment priority 1.3 of the Operational Programme Quality of Environment (2014-20), which is the programme document for drawing environmental aid from EU structural funds and the Cohesion Fund, is on “Protecting and restoring biodiversity and soil and promoting ecosystem services, including through Natura 2000, and green infrastructure”. Projects on biodiversity have also been supported through the Interregional cooperation programme (Interreg Europe) and LIFE funding. For the period 2010-21, for example, LIFE co-financed 15 biodiversity projects in Slovakia (EC, 2021). The EEA and Norway grants have supported climate projects in Slovakia that promote ecosystem-based approaches.

Slovakia recognises a shortfall in financial resources, and lack of a systematic approach to mobilise and allocate finance (MoE, 2020a). EU funds too often substitute for, rather than complement, state funding (Gáliš et al., 2022). At the same time, Slovakia does not harness the full potential of EU and other international funds for biodiversity and other environmental objectives (Chapter 1).

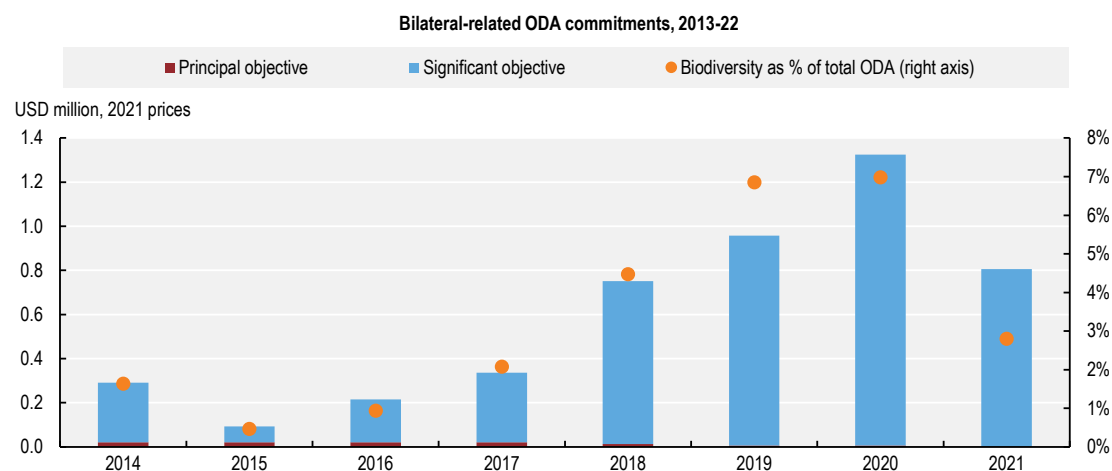
### **2.6.2. International biodiversity finance (development aid)**

Slovakia has made progress in integrating biodiversity into its official development assistance (ODA) and prepared an ODA strategy for 2019-23. Biodiversity-related ODA increased both in real terms and as a percentage of overall ODA from 2013 to 2021 (Figure 2.11). On average, Slovakia committed USD 1.3 million in biodiversity-related ODA per year from 2019-21. This is equivalent to 7% of its overall ODA contribution for this period, which is in line with other Development Assistance Committee members. However, only 0.4% of this USD 1.3 million had biodiversity as a principal objective.

Efforts to consider biodiversity in ODA allocations have been facilitated by enhanced co-operation between the MoE, Ministry of Foreign Affairs and the Ministry of Finance. However, work is needed to identify biodiversity priorities in Slovakia’s bilateral aid and increase biodiversity-related ODA, particularly in activities where biodiversity is a principal objective.



**Figure 2.11. Slovakia is better integrating biodiversity into ODA commitments but is yet to identify biodiversity priorities**



Note: Data refer to screened bilateral allocable commitments of ODA; three-year moving average data.

Source: OECD (2023), "Aid activities targeting Global Environmental Objectives", Creditor Reporting System (database).

StatLink  <https://stat.link/r2ndow>

### 2.6.3. Research, development and innovation

Slovakia ranks 21st in the EU-27 on the EU's eco-innovation index,<sup>8</sup> which looks at environment-related innovations beyond biodiversity (EC, 2023b). While Slovakia addresses biodiversity in research, development and innovation agendas, it does so in an ad hoc way. Short- and long-term priorities and research goals have not been clearly defined, making it difficult to secure finance for biodiversity research and development (R&D). While the MoE joined the Horizon Europe and Biodiversa+ partnership in 2020, Slovakia is yet to harness the full potential of the partnership to promote research and innovation.

Co-operation between the MoE and the Slovak Academy of Sciences has improved, but co-operation between the MoE and Ministry of Education remains limited. A key challenge to improving integration is reported to be the lack of capacity to engage effectively. Lack of engagement with the private sector on biodiversity issues also makes it challenging to identify priorities and to ensure R&D is connected with companies that can then apply the results (Malega et al., 2021).

## 2.7. The links between biodiversity, climate mitigation and climate adaptation policies

Climate change is increasingly threatening Slovakia's biodiversity and exacerbating existing pressures. At the same time, the loss of biodiversity contributes to greenhouse gas (GHG) emission and has increased the vulnerability of Slovakia's ecosystems to climate impacts. For example, forest stands with unnatural species composition are disproportionately affected by drought, intense storms and increased bark beetle infestation. The lack of landscape elements in agricultural land, contributes to the agriculture sector's vulnerability to extreme rainfall events and drought.

Slovakia needs to scale up action to reduce GHG emissions and increase carbon removals from LULUCF and to adapt to climate change. Opportunities exist to harness synergies across biodiversity protection/restoration, climate change mitigation and climate change adaptation through nature-based

solutions<sup>9</sup> (ecosystem-based approaches to mitigation and adaptation). The following section examines LULUCF emissions/removals and Slovakia's policy response. It then examines adaptation policy and its links to biodiversity.

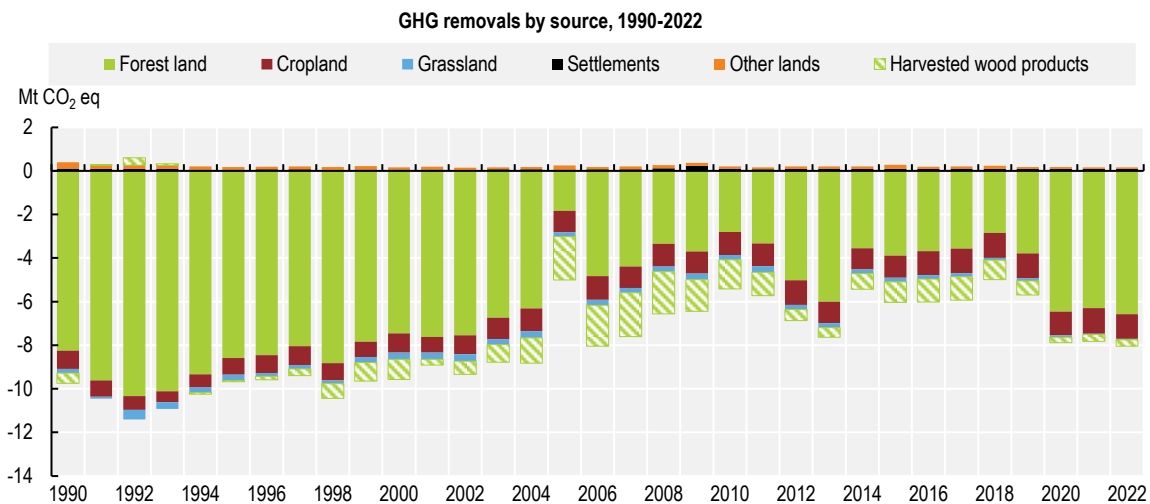
### 2.7.1. Climate mitigation and biodiversity – LULUCF

#### State of LULUCF emissions

Net carbon removals from LULUCF averaged 7 774 gigagrammes of carbon dioxide equivalent per year (Gg CO<sub>2</sub>e/year) during 1990-2022 and 6 223 Gg CO<sub>2</sub>e/year during 2010-22. Forests account for 78% of removals since 1990 and 71% of removals since 2010 (MoE, 2023b). Changes in carbon removals from forests largely explain the annual fluctuations and declining trend in LULUCF removals. Other net sinks are cropland, permanent grassland and harvested wood products. The categories “settlements” and “other lands” are net sources of GHG emissions, mostly due to the construction of transport infrastructure, industrial sites and municipal development.

The skewed age structure of Slovakia's forests (Section 2.4.1) has three important implications for carbon removals. First, while mature stands store more carbon than younger stands, they have lower annual wood mass growth and hence sequester less carbon. Second, planned and actual felling has increased as stands mature and reach the end of their rotation. During 2000-20, the volume of planned felling increased by 85% to reach 9.8 million m<sup>3</sup> in 2020 (MoE, 2023b). Third, mature trees, particularly those in monoculture stands, may be more susceptible to disturbance from bark beetles and wind throw. Average removals from forests dropped to 1 831 Gg CO<sub>2</sub>e in 2005 (MoE, 2023b). This was due to a large loss of trees (predominantly spruce) from wind damage at the end of 2004 in the High Tatras, effectively halving annual LULUCF removals. In 2020 and 2021, LULUCF removals increased, presumably due to COVID-19 restrictions, which resulted in less forestry activity.

Figure 2.12. GHG removals from land use, land-use change and forestry have declined



Note: Removals dropped by half in 2005 due to wind damage to forests in the High Tatras. Increased removals in 2020/21 likely reflected reduced forestry activity owing to COVID-19. Settlements and other lands are net sources of GHG emissions, mostly due to the construction of transport infrastructure, industrial sites and municipal development.

Source: MoE (2023), National Inventory Report 2022; EEA (2023), Member States' greenhouse gas (GHG) emission projections, 24 October.

### *LULUCF targets, measures and projections*

In 2023, the European Union adopted a more ambitious EU-wide target for net GHG removals in the LULUCF sector. The revised LULUCF Regulation (EU 2023/839) requires Slovakia to increase net GHG removals in the LULUCF sector by 504 kilotonnes (kt) of CO<sub>2</sub>e by 2030 compared to the 2016-18 average. The draft Law on Climate Change and Low Carbon Transformation of the Slovak Republic sets a binding commitment to increase LULUCF net removals of GHG emissions in 2030 by 25% compared to 2005. The commitment in the draft law is consistent with the LULUCF Regulation target.

Slovakia has developed two scenarios for the LULUCF sector. The first scenario – “with existing measures” (WEM) – is based on policies and measures adopted by the end of 2020 and how they will affect emissions/removals after 2020. These measures are derived from the Programme of Rural Development 2013-20 and extended to 2022, the National Forestry Programme and Slovakia’s Low-Carbon Strategy (Table 2.8). The second scenario – “with additional measures” (WAM) – also includes application of policies or measures planned after 2020. The additional measures are derived from the draft National Forestry Programme of the Slovak Republic 2022-30, the Strategic Plan of the Common Agricultural Policy 2023-27 and the Act on the Protection of Nature and Landscape amended in 2022.

According to the WEM scenario, in 2030 LULUCF removals will be 2 277 kt CO<sub>2</sub>e (48%) lower than in 2005. Removals will continue to decline to 2042 before gradually increasing to 2050, when annual removals will be 75% lower than in 2005 (MoE, 2023c). In the WAM scenario, LULUCF net removals in 2030 are 314 kt CO<sub>2</sub>e (7%) higher than in 2005. However, they fall short of Slovakia’s draft law target and commitment under the EU LULUCF Regulation (MoE, 2023c).

To fulfil its commitment under the EU LULUCF Regulation, Slovakia will need to ensure the effective implementation of the identified measures, while also identifying and adopting new measures to reduce emissions and/or increase removals across all land-use sectors. Work is underway to enhance modelling and methodologies to estimate the impact of measures across the different land-use categories and inform their prioritisation.

**Table 2.8. Policies and measures in different LULUCF scenarios**

<b>Policies and measures</b>	<b>Scenario</b>	<b>Category</b>	<b>Measure</b>
National Forestry Programme/ Rural Development Programme/ Low carbon strategy	WEM	CO <sub>2</sub> /forest land, cropland, permanent grassland	Afforestation of unused cropland, establishment of stands of fast-growing trees on cropland, measures to reduce fires
National Forestry Programme	WEM	CO <sub>2</sub> /forest land	Prevention of deforestation (as an integrated part of sustainable forest management)
National Forestry Programme/ Rural Development Programme	WEM	CO <sub>2</sub> /forest land	Protection of existing forests against natural disturbances (as an integrated part of sustainable forest management)
National Forestry Programme/ Adaptation strategy	WAM	CO <sub>2</sub> /forest land	Promotion of measures to increase carbon sinks as part of sustainable forest management. Adjustment of tree species composition to increase the resilience of stands to drought and reduce vulnerability to biotic and abiotic agents.
Low carbon strategy/Envirostrategy	WAM	CO <sub>2</sub> /forest land	Increased forest cover through afforestation of agriculturally unused land while maintaining the diversity of non-forest habitats. Creation of conditions for the settlement of the status of the so-called white areas.
Low carbon strategy	WAM	CO <sub>2</sub> /forest land	Maintenance of vital forests by limiting the negative impacts of climate change on forests through measures aimed at forest adaptation (support for the use of alternative management models to adjust tree species composition, use of suitable provenances).
Low carbon strategy	WAM	CO <sub>2</sub> /harvested wood products	Increased share of long-life wood products, including for construction purposes.
Low carbon strategy	WAM	CO <sub>2</sub> /cropland	Implementation of measures to increase carbon sequestration in

Policies and measures	Scenario	Category	Measure
			agricultural soils and maintain high levels of organic carbon in carbon-rich soils.
Low carbon strategy	WAM	CO <sub>2</sub> /permanent grassland	Maintenance and restoration of grasslands.

Source: MoE (2023), Report on GHG Emission Projections 2023 Under the Regulation 2018/1999.

### *Mitigation in the land-use sector: addressing synergies and trade-offs*

Many of the additional LULUCF measures involve the conservation, sustainable use and restoration of forest and agri-ecosystems, with the potential to harness synergies for biodiversity. For example, the National Forestry Programme is promoting close-to-nature approaches of forest management that are expected to lead to high biomass stocks. The Low-Carbon Development Strategy promotes conservation and restoration of grasslands. Furthermore, increasing no-intervention management in national parks where ecosystems are in a good state, in accordance with the Nature Act amendment, will help maintain carbon sinks while supporting biodiversity. However, some LULUCF measures could pose a risk to biodiversity if not carefully managed. For example, afforestation of non-forest land, including agricultural land, could come at the expense of habitat important for species of conservation concern. It is therefore critical that such practices are adopted judiciously, accounting for and managing potential impacts on biodiversity.

Prioritising a diverse mix of native species in afforestation, reforestation and restoration projects could help to maximise benefits of LULUCF measures for biodiversity and minimise trade-offs. Additionally, it could increase the long-term viability of climate interventions. This is because the contribution of forests, grasslands and other ecosystems to GHG removals and adaptation in the long term will depend on their resilience to climate-related impacts (drought, higher temperatures, wind, fires, pathogens, etc.). Maintaining and enhancing the species diversity of ecosystems can enhance their resilience to such disturbances (Seddon, 2022).

In the context of carbon removals in the forestry sector, potential trade-offs exist between short-term and long-term mitigation goals that need to be further assessed and managed. On the one hand, studies indicate that adjusting harvest volume (e.g. by decreasing harvesting rates or modifying rotation periods) may be the most effective measure for increasing removals in the short-run (Barka, Priwitzer and Pavlenda, 2020). On the other hand, reducing harvest rates and modifying rotation periods could slow the transition from even-aged stands (particularly monocultures) to close-to-nature forestry, which is necessary for ensuring forest resilience and therefore longer-term mitigation objectives (MoE, 2023b). Slovakia should further assess these potential trade-offs with a view to striking a balance between short- and long-term objectives at the national level and at the level of individual forest stands.

### **2.7.2. Climate change adaptation and biodiversity**

In addition to mitigating climate change, Slovakia faces the challenge of adapting to the increasing impacts of climate change (Table 2.9). The country's key strategies and policies for adaptation recognise the need to help biodiversity adapt to climate change and to promote ecosystem-based approaches to support societal adaptation. The EnviroStrategy promotes development of green infrastructure, such as greening of public spaces, promotion of biodiversity and green spaces in urban areas, and greening agricultural land to help adapt to climate change. It underscores the need to protect ecosystems and ecosystem services to mitigate and adapt to climate change impacts. Furthermore, it identifies the need to reconcile strategies that address climate change and ecosystem conservation to remove inconsistencies.

**Table 2.9. Brief overview of climate vulnerability in Slovakia for biodiversity, agriculture, forestry and water management**

Policy area	Potential impacts (vulnerabilities)
Biodiversity	<ul style="list-style-type: none"> <li>• Invasions of certain insects as agricultural pests.</li> <li>• Invasions of vector-borne diseases threatening human health.</li> <li>• Vulnerable ecosystems such as pine forests in the mountains, swamp ecosystems in the foothills and mountains, as well as aquatic systems are most at risk.</li> </ul>
Agriculture	<ul style="list-style-type: none"> <li>• Gradual increase in aridity of maize-growing areas</li> <li>• Increased water, wind and soil erosion, as well as deterioration of soil structure, poorer water availability in the soil profile and intensified salinisation and sodification processes are expected.</li> <li>• Occurrence and spread of pests and diseases of agricultural plants, trees and animals.</li> </ul>
Forestry	<ul style="list-style-type: none"> <li>• Increased frequency and severity of droughts and heat waves with impacts on forest health, productivity and susceptibility to secondary biotic damage. It threatens particularly at low and medium altitudes.</li> <li>• Occurrence of new pests and diseases, development of several generations of spruce bark beetle. It threatens throughout the forest area.</li> <li>• Continued decline of secondary stands of Norway spruce, potentially exacerbated by climate change, particularly in mid-altitudes.</li> <li>• Moderate increased severity of storms affecting mountain forests in particular.</li> <li>• Moderate increased risk of forest fires, particularly at low and medium altitudes</li> </ul>
Water management	<ul style="list-style-type: none"> <li>• Threat to water resources for water supply and power generation.</li> <li>• Decline of water sources in the south and east of the Slovak Republic.</li> <li>• Decline in electricity generation at large hydraulic power plants.</li> <li>• Increase in the incidence of droughts and floods.</li> <li>• Change in the hydrological cycle.</li> </ul>

Source: MoE (2022), The Eight National Communication of the Slovak Republic on Climate Change under the United Nations Framework Convention on Climate Change and the Kyoto Protocol.

The National Adaptation Strategy (NAS) establishes an institutional framework and co-ordination mechanism to ensure effective implementation of adaptation measures at all levels and in all areas. It aims at reducing vulnerability and increasing the adaptive capacity of natural and artificial systems to the present and future impacts of climate change. At the same time, it strengthens societal resilience by fostering public awareness to climate change and building knowledge towards more efficient adaptation. The NAS recognises that the conceptual and legislative frameworks for adaptation must integrate all areas considered relevant for adaptation, including the natural environment and biodiversity. The NAS outlines 12 adaptation measures for the natural environment and biodiversity outside protected areas, 8 measures targeting protected areas and 4 additional legislative and regulatory measures.

The National Adaptation Plan (NAP) has short- and medium-term adaptation measures for 2021-23 and 2024-27. It outlines seven priority domains with objectives and measures to achieve them.<sup>10</sup> The domain of natural environment and biodiversity, for example, aims to increase the adaptive capacity and ecological stability of the country. To that end, it targets better management of water for biodiversity and improved adaptive management of all types of land, considering the dynamics of ecosystem development.

Table 2.10. Priority measures for the natural environment and biodiversity under the NAP

Specific measures	Examples of tasks
<b>Priority Area 3: Natural environment and biodiversity</b>	
<b>Objective:</b> To increase the adaptive capacity and ecological stability of the country through better management of water for biodiversity and improvement of adaptive management of all types of land, taking into account the dynamics of ecosystem development	
Ensuring water for nature, biodiversity and landscape	Protecting, restoring and managing wetlands
Protecting and adapting biodiversity in the agricultural landscape	Diversifying cultivated crops on smaller land blocks and integrating woody plants into land management systems (agroforestry)
Protecting and adapting of forests in protected areas	Conserving or enhancing biodiversity, resilience, productive and regenerative capacity of forests to fulfil all their functions Supporting water retention and slowing runoff
Ensuring stability of ecological networks and strengthening adaptation of the management of protected areas	Optimising and streamlining the system of protected areas in Slovakia and their proper management with the inclusion of adaptation measures that will contribute to their increased stability and resilience
Supporting rehabilitation of ecosystems and the natural development of biotopes using spatial planning and land management	Processing of the conceptual document and the implementation plan for the revitalisation of ecosystems, together with attention to improving or maintaining the status of species (including migratory species) and habitats in changing conditions Supporting basic and applied research in the field of biodiversity adaptation, improving knowledge and introducing innovations into practice
Supporting adaptive management by strengthening monitoring and systems evaluations	Assessing ecosystems and their services in Slovakia for assessing contributions to adaptive capacity and the need to connect different monitoring systems, including monitoring of climate impacts on biodiversity
Consistent and systemic removal and management of the spread of non-native invasive species	Implementing EU regulation that faces barriers that can be solved by developing a strategic approach and implementing measures for preventing, controlling and removing IAS, including effective tools (finance) assistance to owners, land users and municipalities and an early warning system

Source: MoE (2021), Action Plan for the Implementation of the Updated National Adaptation Strategy.

The sustainable management and restoration of ecosystems is also integrated into other priority areas. For example, the domain of water protection, management and use includes restoration of floodplains and wetlands, planting of riparian vegetation, support of natural measures to retain water and rehabilitation of hydrological regimes of habitats. The sustainable agriculture domain includes measures such as crop diversification, promotion of organic farming, mosaic agricultural land and establishing suitable habitats for pollinators. Adapted forestry includes conservation and sustainable use of genetic resources of forest trees threatened by climate change, protection, research and monitoring of primeval forests, forest protection against biotic and abiotic agents, tending to young forest stands and transitioning to close-to-nature forestry, particularly in monoculture forests. These and other measures in the NAP could also contribute to climate change mitigation.

Slovakia's RRP outlines a comprehensive package of reforms to promote adaptation, with a focus on ecosystem-based approaches. The goal is to increase the resilience of both ecosystems and human settlements to the impacts of climate change. Component 5 of the RRP allocates EUR 159 million to adaptation measures to finance reforms in water management, including restoration of watercourses and wetlands, landscape planning (Section 2.5.2) and national parks (Section 2.5.1).

The MoE co-ordinates development and implementation of adaptation policies, and their monitoring and evaluation. It promotes and mainstreams adaptation across other ministries and levels of governance. While adaptation measures have tended to be implemented on an ad hoc and project basis, there is a shift towards more integrated strategies, with increased multi-scalar co-operation across government levels and policy domains (OECD, 2023d).

OECD work highlights the opportunity for scaling up local adaptation and proposes a methodology for assessing climate risks (OECD, 2023d). As local governments look to address these risks, they should explore the potential of ecosystem-based approaches, including hybrid grey-green approaches, that deliver on multiple environmental and social objectives simultaneously.

Implementing ecosystem-based approaches may require the government to leverage various regulatory, economic and information instruments. In addition to the instruments discussed in Section 2.5, the MoA is developing a new concept for land protection that aims to improve water and soil quality to increase resilience, support biodiversity and contribute to carbon neutrality objectives. The MoA intends to implement the concept through three key instruments: a climate fund for soils, an information and monitoring system for soils, and a carbon and water bank. The approach could provide an innovative and additional incentive for land owners and users to contribute to multiple environmental objectives. However, it will be critical that appropriate safeguards and criteria are in place to ensure environmental integrity.

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## Notes

<sup>1</sup> The Habitats Directive (92/43/EEC) protects habitats and species of Community interest, i.e. which are threatened to disappear in the European Union, have a small natural range, or present outstanding examples of typical characteristics of Europe's biogeographical regions.

<sup>2</sup> Coastal habitats include inland salt meadows and pannonic salt steppes and salt marshes of which small isolated patches remain in Slovakia (ŠOP, 2015).

<sup>3</sup> Secondary succession refers to growth or change in an ecological community following a disturbance that does not remove all existing vegetation from a site (e.g. growth of woody vegetation in grasslands following farmland abandonment).

<sup>4</sup> Close-to-nature forest management refers to a spectrum of cultivation practices aimed at forming a differentiated structure of natural forest ecosystems, while optimally using their economic, ecological and environmental potential. These procedures use the natural processes of forest ecosystems, their regenerative capacity, individual height and thickness. The total area of stands that meet the conditions of close-to-nature forest management was 64 992 ha in 2020 and 112 394 ha in 2021 (year-on-year increase of 72.9%).

<sup>5</sup> Natura 2000 sites overlap with domestic and international protected areas in places.

<sup>6</sup> Decree of the Ministry of Agriculture and Rural Development of the Slovak Republic dated 20 September 2017 no. 226/2017 on the provision of support.

<sup>7</sup> Close-to-nature management was not defined during the initial years of the scheme but is now enshrined in the amended Act on Forests no. 355/2019 coll.: “silvicultural and restoration practices focused on creating more resilient forests with diverse age, species, genetic and spatial structure as close as possible to natural characteristics of forests related to specific conditions of the locality. Close-to-nature forest management relies on natural processes, especially on natural tree restoration, natural regeneration of forest ecosystem, individual height and diameter growth, the ability of auto-reduction and variation of tree species”.

<sup>8</sup> A composite indicator based on five dimensions: eco-innovation inputs, eco-innovation activities, eco-innovation outputs, resource efficiency outcomes and socio-economic outcomes.

<sup>9</sup> Defined at UNEA 5.2 under Resolution 5 as: “actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services and resilience and biodiversity benefits”.

<sup>10</sup> Water protection, management and use; Sustainable agriculture; Adapted forestry; Natural environment and biodiversity; Health and healthy population; Residential environment; Technical, economic and social measures.



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