NATIONAL BIODIVERSITY STRATEGY FOR 2030

approved by the Government of Hungary

published on 8 August 2023

National Biodiversity Strategy for 2030

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EXECUTIVE SUMMARY

Biodiversity refers to the variety of living organisms whose existence and preservation is vital for securing the conditions for human life and well-being. It provides essential ecosystem services, including food production, clean freshwater and air, habitat, medicine, and timber. It plays a crucial role in preventing and mitigating natural disasters, epidemics, and diseases, regulates the global and regional climate and contributes to recreation.

The loss of biodiversity is happening at an unprecedented rate, as confirmed by various international scientific surveys, assessments, and studies. The primary reasons for this loss are land-use change – which lead to the disappearance and transformation of habitats –, overexploitation of wildlife, climate change, environmental pollution, and the spread of invasive alien species.

The world has reached a tipping point. To sustain biodiversity and ecosystem services essential for human well-being in the long term, we need to fundamentally change the way we live and make decisions. People tend to consider biodiversity as a resource, but they are unaware that preserving biodiversity is essential for the very survival of humanity.

Hungary has a wealth of natural resources, and its diversity of species and habitats is exceptional in European comparison. However, biodiversity is declining at a faster rate than policy measures can be developed and implemented to address the issue, both globally and in our country too.

Hungary's 3rd National Biodiversity Strategy (NBS) is a comprehensive plan to preserve the biodiversity of Hungary. It was developed in accordance with international and European Union obligations. Parallel to the preparation of the national strategy, the Kunming-Montreal Global Biodiversity Framework was elaborated and adopted during the 15th meeting of the Conference of the Parties to the Convention on Biological Diversity (CBD COP 15) in December 2022, in Montreal. The European Union had already accepted its Biodiversity Strategy in 2020. The NBS reflects on the EU commitments undertaken in the EU Biodiversity Strategy for 2030.

In the course of elaborating the NBS, we aimed to adhere to the EU Biodiversity Strategy for 2030 while considering national characteristics. Additional objectives were to address the problems identified by the SWOT analysis and to highlight the main environmental and socio-economic characteristics of Hungary as well as the specificities of the most important relevant sectors. The NBS analyses the state of biodiversity and it identifies the following three strategic areas and 19 objectives to manage national problems, keeping the 2030 national vision in mind:

Strategic area I: Reducing threats to biodiversity

Objective 1: Establishing a coherent network of protected areas, improving the status of protected areas and Natura 2000 sites, and ensuring an appropriate conservation management.

Objective 2: Restoring degraded ecosystems, preserving and restoring their natural resources and service-providing capacity.

Objective 3: Improving the status of species in an unfavourable conservation status.

Objective 4: Reducing the populations and preventing the further spread of invasive alien species (IAS) damaging natural and near-natural ecosystems, and preventing the introduction and establishment of potentially dangerous invasive species in Hungary.

Objective 5: Protecting species threatened by commercial exploitation.

Objective 6: Reducing pollution threatening biodiversity.

Objective 7: The release of genetically modified organisms (GMO) into the environment does not threaten biodiversity.

Objective 8: Assessing the status of pollinators, halting their decline, and maintaining and restoring pollination as an ecosystem service.

Objective 9: Increasing understanding of the correlations between climate change and biodiversity conservation, improving the resilience of ecosystems, and conserving biodiversity to mitigate the effects of climate change and facilitate adaptation.

Strategic area II: Sustainable use of biodiversity and benefit-sharing

Objective 10: Promoting sustainable and mosaic farming, taking into account biodiversity conservation and the aspects of environmental and landscape protection, and mainstreaming biodiversity conservation in the Common Agricultural Policy.

Objective 11: Conserving and ensuring access to genetic resources and fair and equitable sharing of the benefits arising from their use.

Objective 12: Conserving existing natural and old-growth forests, expanding forest areas of high biodiversity value, and developing a forest structure favourable for biodiversity conservation and enhancement.

Objective 13: Ensuring sustainable game and fisheries management that does not compromise biodiversity regeneration.

Objective 14: Promoting sustainable water management, water retention, and the reasonable and economical use of water to conserve biodiversity and to sustain ecosystem services.

Objective 15: Coordinated development, maintenance, and improvement of the elements of green infrastructure.

Objective 16: Evaluating ecosystem services and integrating conservation and restoration considerations into relevant sectoral policy decision-making processes to better conserve and restore their service-providing capacity.

Strategic area III: Tools and solutions supporting implementation

Objective 17: Raising awareness on the conservation and sustainable use of biodiversity, ensuring that the conservation-related activities are evidence-based.

Objective 18: Shaping attitudes, creating and disseminating awareness of the importance of biodiversity and the conservation of Hungary's natural resources.

Objective 19: Strengthening international cooperation for biodiversity conservation.

These 19 objectives cover all topics from the previous NBS for 2015-2020, and address the new and emerging topics in the EU Biodiversity Strategy for 2030 as well. Each objective includes several targets with specific implementation measures and monitoring indicators.

In summary, the 3rd National Biodiversity Strategy contributes to conserving Hungary's natural assets and serving the well-being of its residents. To achieve this, it is essential to protect and wisely manage natural resources. These objectives ensure the long-term preservation of Hungary's valuable natural environment and biodiversity, which are crucial for the well-being and quality of life of Hungarian people.

1 INTRODUCTION

1.1 Antecedents and mandate

As a Contracting Party to the Convention on Biological Diversity (CBD), Hungary must develop a national strategy for the conservation and sustainable use of biodiversity.

Hungary's **first biodiversity conservation strategy** (2009-2014) was adopted by the National Assembly as an annex to the third National Environmental Programme. The **second national strategy for biodiversity conservation** (2015-2020) – adopted by the National Assembly as an independent strategy[1] – has expired, thus a new one had to be developed.

The **National Biodiversity Strategy for 2030** is **a comprehensive strategy** aligned with international and European Union (EU) obligations, aiming to preserve Hungary's biodiversity. The national strategy was formulated parallel to the elaboration of the Kunming-Montreal Global Biodiversity Framework (K-M GBF)[2] adopted at the fifteenth meeting of the Conference of the Parties to the CBD (COP 15) in December 2022, in Montreal. The 3rd National Biodiversity Strategy (NBS) shall reflect the EU commitments laid down in the EU Biodiversity Strategy for 2030 (COM/2020/380 final)[3]: which aim to ensure that Europe's biodiversity will be on the path to recovery by 2030, for the benefit of people, the planet, the climate and our economy, in line with the 2030 Agenda for Sustainable Development and with the objectives of the Paris Agreement on Climate Change. The NBS supports the achievements of the UN Sustainable Development Goals (SDG) for 2030, especially its Goal 15 on the protection of terrestrial ecosystems; Goal 6 on ensuring the availability and sustainable management of water and sanitation for all; Goal 11 on making cities and human settlements inclusive, safe, resilient, and sustainable; Goal 12 on ensuring sustainable consumption and production patterns; and Goal 13 on taking urgent action to combat climate change.

Furthermore, the NBS is aimed to be aligned with the National Framework Strategy on Sustainable Development, the 5th National Environmental Programme and the 5th National Conservation Plan, and that each one shall be mutually supportive in their implementation.

1.2 Planning process

The NBS, based on the Government Decree 38/2012. (III. 12.), was developed according to the strategic policy guidelines for drafting strategic planning documents.

In the course of the status assessment and evaluation, the key features of the areas of expertise affected by the objectives of the NBS and the key tendencies in connection with biodiversity are presented. Based on the detailed status assessment, the strengths, weaknesses, opportunities and threats of biodiversity conservation in Hungary were analysed (SWOT analysis). To this end, background information was provided among others by the SWOT analyses of the 5th National Environmental Programme (2021-2026), the National Landscape Strategy (2017-2026), and the Strategic Plan of the Common Agricultural Policy after 2020.

[1] Resolution 28/2015 (VI. 17.) of the National Assembly
[2] https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-04-en.docx
[3] Biodiversity strategy for 2030 - European Commission (europa.eu)

The NBS was aimed to align with the EU Biodiversity Strategy for 2030, address the problems identified by the SWOT analysis, and appropriately assert Hungary's main environmental and socio-economic characteristics, and those of the most important sectors from the perspective of biodiversity.

The NBS is also linked to the following legal regulations of the European Union, besides the EU Biodiversity Strategy for 2030:

- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora;
- Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds;
- Council Regulation (EC) No 338/97 of 9 December 1996 on the protection of species of wild fauna and flora by regulating trade therein;
- Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species;
- Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC;
- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy;

With the national vision for 2030 in mind, the strategy identifies 3 strategic areas with 19 objectives focusing on the management of national problems related to the protection of biodiversity. The 19 objectives cover all topics of the previous National Biodiversity Strategy for 2015-2020, and also seeks to respond to the new issues in the EU Biodiversity Strategy for 2030.

Each objective includes a number of targets with concrete implementation measures and monitoring indicators.

1.3 Basic terms and definitions

Biodiversity means the variability among living organisms whose existence and preservation is essential for securing the conditions for human life and well-being. It includes the diversity of terrestrial and aquatic ecosystems and the (genetic) diversity among and within species. Biodiversity provides **ecosystem services** that are vital for human life: it ensures among others the ecological basics for food production, clean fresh water and air, habitat, medicine, and timber. It also plays a pivotal role in preventing and mitigating the effects of natural disasters, epidemics, and diseases; in regulating the global and regional climate; and in contributing to recreation.

The temporal horizon of this political strategy covers the **period until 2030**, aligned with the main objectives of the K-M GBF and the EU Biodiversity Strategy for 2030.

2 STATUS ASSESSMENT

Based on international scientific assessments, evaluations and studies conducted on biodiversity and ecosystem services, it is evident that the world has reached a tipping point. The biodiversity of our planet is deteriorating faster than ever before, primarily due to land-

use change that result in the loss and transformation of habitats; direct overexploitation of fauna, flora, and other wild organisms; climate change; environmental pollution; and the spread of invasive alien species.

The **Global Assessment Report on Biodiversity and Ecosystem Services** by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) published in 2019[4] presents in detail the drastic changes that have taken place in natural systems over the past 50-100 years. Human activity is threatening the existence of around one million animal and plant species. Terrestrial habitats have been substantially altered by more than 75%, and over 85% of freshwater habitats have disappeared. The number of individuals of indigenous species has decreased by at least 20% on average in most terrestrial habitat types over the last 100 years. The global value of agricultural plant cultivation (2.6 trillion USD in 2016) has trebled since 1970; the annual logging has increased by 45% (4 billion m^3 by 2017), and soil degradation has reduced productivity on 23% of terrestrial areas globally. Local cultivars of crops and local breeds of domesticated animals are globally disappearing; 9% of domesticated mammal species have become extinct by 2016. Although 75% of our crops depend on pollinators, the drop in production due to their decreasing numbers or absence may already reach 577 billion USD. Observation data of invasive alien species have increased by 40% since 1980; more than one-fifth of our planet is threatened by plant and animal invasion. The area occupied by cities has doubled globally since 1992, which entails the transformation of natural habitats and the increase of urban population, resulting in increased consumption, environmental impact, and pollution.

The deterioration of biodiversity is observable on the European continent too, which may have economic consequences in the short and medium term, for example, as a result of the drastic decrease in the number of pollinator organisms. Preservation of biodiversity and healthy natural systems are essential for human well-being and the economy; for contributing to food security, the long-term sustainability of agricultural production, and to the fight against climate change and invasive alien species.

In the followings, key national features and tendencies related to biodiversity are presented in view of the objectives of the 3rd National Biodiversity Strategy.

2.1 Species and habitats protection; habitat management and restoration

Natural and near-natural areas

Although the extent of natural areas under legal protection continues to grow globally, landscape degradation, habitat deterioration, and biodiversity loss remain challenges. It is necessary to strengthen state regulatory systems and means to ensure practical enforcement of strict protection.

The total extent of areas of national importance under legal protection (9.1%) together with the Natura 2000 network (1.99 million hectares, 21.39%) represent 22.24% of the country's territory, of which 1.28% is strictly protected areas. In addition, the extent of protected areas of local importance is 42,142 hectares, making up 0.45% of the country's territory. In total, **22.6% of Hungary's territory was under legal protection** in 2021.

[4] IPBES Global Assessment Report on Biodiversity and Ecosystem Services 2019: https://ipbes.net/global-assessment

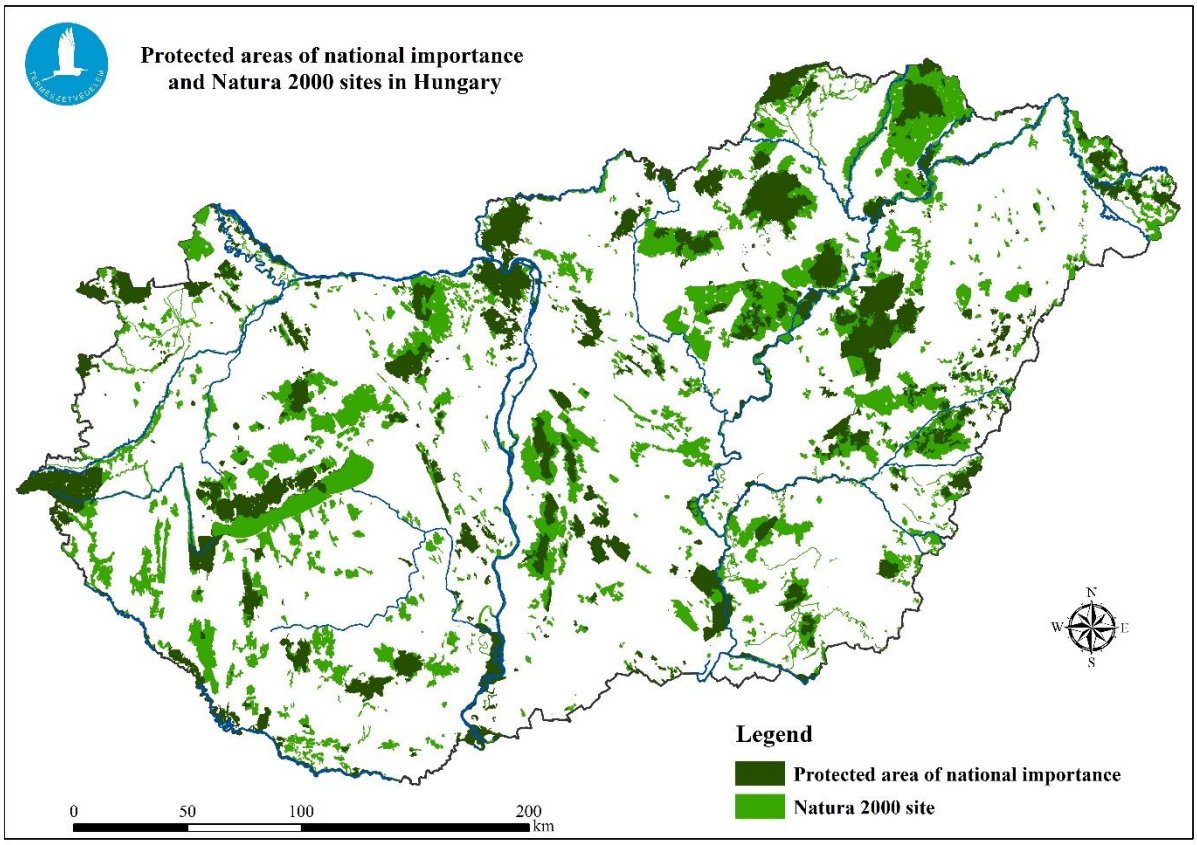

Figure 1. Protected areas of national importance and Natura 2000 sites in Hungary (2021). ***Source: Ministry of Agriculture.***

A general objective of the **classification** of our national parks into zones is to define the long-term strategic and spatial framework for their conservation management and use. This provides a means for more effective practical implementation of conservation, which is also a social expectation, and opens up the possibility for a sustainable, legitimate and predictable utilisation of natural resources, coherent with the strict protection status. The establishment and operation of a national park zoning system, as required by law, is therefore in the interest of all stakeholders. Currently, the Hortobágy National Park has a promulgated zoning classification, while draft zoning classifications for the other national parks are under consultation.

The protected areas cover diverse habitats nationwide. By type of cultivation 27% of the country's land is grassland (meadows and pastures), 46% is forest, 3% is fish pond and reed, while the remaining parts fall into other categories (e.g. removed from cultivation, part of which are also aquatic habitats). The share of grasslands in the Natura 2000 network is more than twice the EU average, extending over 500,000 hectares, similarly to the arable lands. The total forest area makes up 833,000 hectares. Strictly protected areas also include several different habitat types (e.g. certain alkaline lakes, steppes, and bogs).

The **National Ecological Network** covers 36% of the country's territory, and includes almost all protected areas and Natura 2000 sites. The ecological network consists of a system of "core areas" (natural and near-natural areas) interconnected by ecological corridors and

surrounded by buffer zones. Hungary's National Land Use Plan[5] defines land use rules at county and municipal planning levels for the different ecological network zones (core area, ecological corridor and buffer zone).

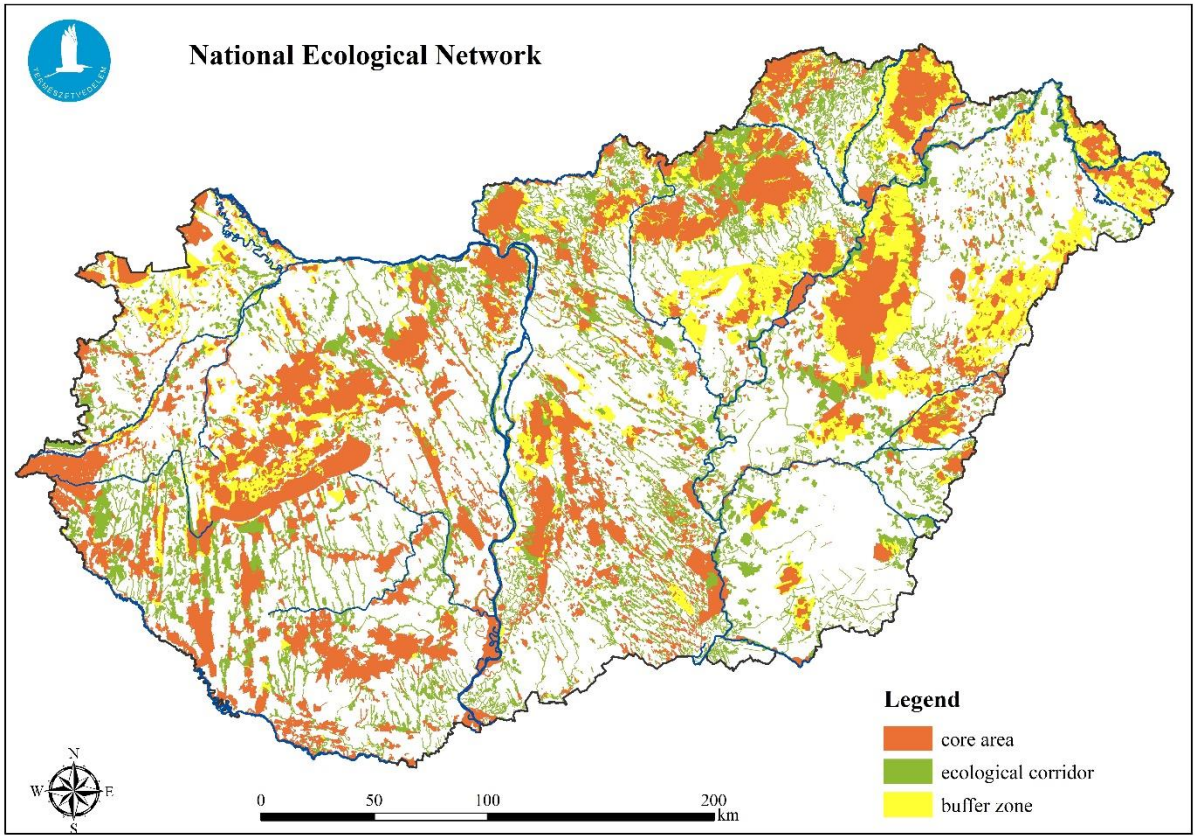

Figure 2. The National Ecological Network of Hungary (2020). ***Source: Ministry of Agriculture.***

Besides the ecological network, there are several regional zones (e.g. floodplains, landscape protection areas) that greatly contribute to biodiversity conservation. Landscape protection areas are intended, among others, to protect the integrity and the traditional use of the landscape in accordance with its natural characteristics.

In the framework of UNESCO's Man and the Biosphere (MAB) programme, **6 biosphere reserves** have been designated in Hungary: Aggtelek, Lake Fertő, Hortobágy, Kiskunság, Pilis and Mura-Dráva-Danube. The Hungarian-Croatian bilateral Mura-Dráva-Danube Transboundary Biosphere Reserve was designated in 2012, and in 2020 an initiative to expand the reserve was jointly submitted to UNESCO by the five countries concerned. The initiative was supported by UNESCO's International Advisory Committee for Biosphere Reserves, and it decided in favour during its session held 8-12 March 2021. The International Coordinating Council of UNESCO's Man and the Biosphere (MAB) Programme decided to approve the joint application at its 33rd session in Abuja (Nigeria) in September 2021, under the name of "Five-country Biosphere Reserve Mura-Drava-Danube" (Austria, Croatia, Hungary, Serbia, and Slovenia). The national park directorates managing the reserves and the

[5] Act CXXXIX of 2018 on the spatial planning of Hungary and Spatial Plans for Special Regions.

Hungarian National Committee for UNESCO MAB Programme continuously ensure the monitoring of the implementation of the goals defined in UNESCO's strategy.

In Hungary, **56 forest reserves** have been designated on 12,776 hectares. Forest reserves are protected forest areas with natural dynamics that serve the preservation of natural or near-natural forest ecosystems, and forest development research. The strictly protected core area of a forest reserve is under total management restriction, and in general no human interventions are permitted there (except some research activities). This allows natural forest ecosystems to thrive. In the buffer zone of the forest reserve, minor interventions are permitted. The only forest in the "virgin forest" category in Hungary is in the core area of Kékes Forest Reserve Hungary (42.9 hectares).

Status of habitats and species

Of the wild plant and animal species in Hungary, 733 plants and 1178 animals are protected, of which 87 plant and 185 animal species are under strict protection. In addition, 58 mushrooms, 17 lichens and nests of six nest-building ant species are under legal protection. There are several species of community interest in the Pannonian biogeographical region (covering Hungary's entire territory) that cannot be found in most EU member states at all. Although the Pannonian region hardly covers 3% of the EU's territory, it is home to 226 species (17%) of the 1301 animal and plant species listed in the annexes of the Habitats Directive, and to 278 species (36%) of the 768 bird species listed in the Birds Directive.

Owing to research conducted over the recent years and the comprehensive analysis carried out in the project titled "EEEOP-4.3.0-CCHOP-15-2016-00001 – Strategic Assessments supporting the long term conservation of natural values of community interest as well as the national implementation of the EU Biodiversity Strategy to 2020"[6] (hereinafter referred to as: EEEOP-4.3.0-CCHOP-15-2016-00001 national conservation project), an evaluation even more objective than those of the previous years has been conducted of the species and habitats of community interest. It is also an important achievement that the conservation status of all natural resources in Hungary are known by now. Based on the report on the conservation status of natural resources prepared in 2019 (for 2013-2018), **13.33% of habitats and 34.91% of plant and animal species of community interest** are in favourable conservation status. As regards the changes in the conservation status, no change occurred in case of 168 species (79.24%), while the status of 15 species (7.07%) improved, and that of 29 species (13.68%) deteriorated in comparison to the period of 2007-2012.

[6] http://www.termeszetem.hu/en/

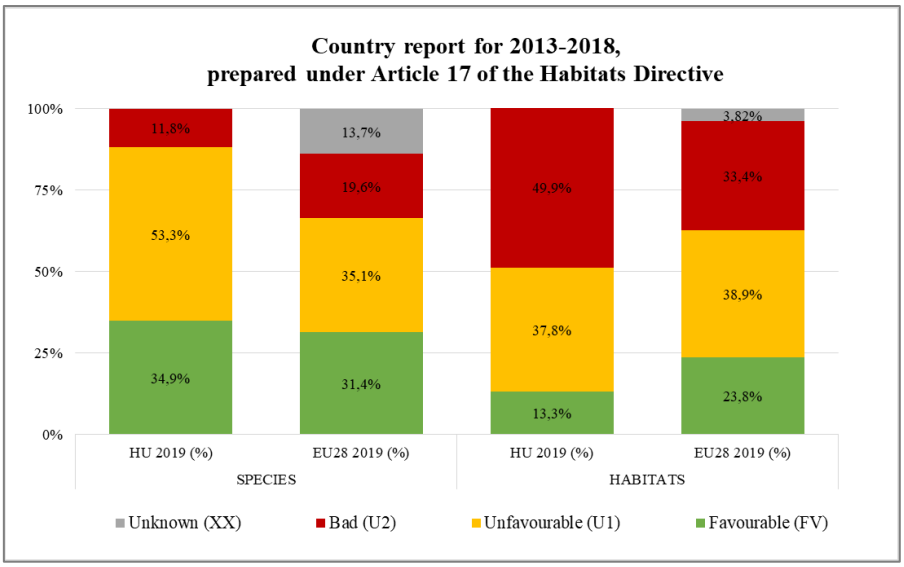

Figure 3. Conservation status of species and habitats of community interest in Hungary and the European Union. *Source: Ministry of Agriculture.*

Management planning of protected areas

Conservation objectives and priorities defined for all Natura 2000 sites in Hungary are listed in Standard Data Forms (SDF), and there is a non-binding management plan for 89% (470 out of 525) of Natura 2000 sites (470 out of 525). The content requirements for the management plans of protected areas are laid down in a ministerial decree, which specifies the conservation objectives and strategies, as well as the management methods, restrictions, and prohibitions as mandatory elements of these plans. Of the 322 protected areas of national interest established by individual legal regulations, around 200 sites have a management plan promulgated by specific legal regulations. Of those areas that do not have legally promulgated management plans (787,442 hectares), currently 461,728 hectares (54.4%) have management plan documentations. The management plans must be reviewed every 10 years and amended as necessary.

Habitat restoration

Interventions aiming to restore habitats and establish a long-term management were carried out on cca. 117,000 hectares, using EU funds for 2014-2020 (ERDF, LIFE). This affected 6% of the Natura 2000 sites, and cca. 14% of protected areas of national interest, as well as improved the habitats of several high priority species (e.g.: Great Bustard *Otis tarda*, Hungarian meadow viper *Vipera ursinii rakosiensis*, *Dianthus diutinus*).

Species threatened by commercial activity

One of the most important factors threatening ecological diversity globally is the trading of wild animals and plants, affecting tens of thousands of species, and pushing many to the brink of extinction. In order to prevent the threat posed by unregulated commercial activity to wild populations, most of the countries of the world signed the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1973.

The significant increase of illegal cross-border trading of wild animal and plant species over the recent years is a global phenomenon, as this has become one of the most profitable crimes on a global scale. Although the illegal trading of wild species is not a new phenomenon, its nature and effects have changed drastically in recent years. The UN defines illegal trade in

wildlife as a form of organised crime committed by organised criminal groups, comparable to those involved in trafficking of drugs, arms, or human beings.

The new nature and extent of illegal trading of wild animals and plants recently received greater political attention globally, among others as a result of initiatives originating from the European Union. Considering that the EU is one of the largest markets of wild animal and plant species, it plays a tremendous role in preventing illegal activities. Accordingly, the EU addresses this issue as a priority and has taken several measures, including financial ones, to help fight illegal trade worldwide.

Hungary joined CITES in 1985, and it has consistently adhered to its regulations ever since, while making considerable achievements in detecting illegal consignments. The country has a major role in preventing the entry of illegal transit shipments – whose destination is another member state – into the EU. Hungary's southern and eastern borders lie on the so-called 'Balkan Route' which plays an important role in the smuggling of illegal shipments from the Balkans to the EU. An increasing number of live animals captured in Africa and attempted to be smuggled into the EU via Turkey, along the Balkan Route, are intercepted. This confirms the organised and global nature of the illegal trade as well.

There are also animal and plant species (wolf, lynx, otter, birds of prey, owls, sturgeon species, medicinal leech, orchids, snowdrop, purple cyclamen, spring pheasant's eye, etc.) in Hungary, which are threatened by commercial activity, and whose protection is our priority. The majority of these species are protected, therefore their commercial exploitation is illegal.

Natural resources of Hungary

Conservation education and awareness-raising is primarily based on ecotourism and environmental education. Almost half of the ecotourism and environmental education facilities registered in Hungary are run by a national park directorate. The education and awareness-raising work is partly carried out through expert-led guided tour, and partly through the network of infrastructure that presents the natural and cultural values of protected areas.

People have a growing need to know and see our natural assets. Based on a poll run by Századvég Consortium in 2019, the vast majority of adult Hungarians consider the preservation of EU and national natural resources important (73.4% considered this "very important" and a further 19.9% "rather important"), and have a positive opinion concerning the Natura 2000 sites.

According to another poll conducted in 2021, 56.2% of the adult population believes that public education should focus more on environmental protection and nature conservation. In 2021, 93.9% of respondents had heard of Hungary's national parks, which represents 15% increase in comparison to 2018, that is, our national parks have become better known among Hungary's residents. The research finds that 95% of people are keen to spend their free time in nature, and 70% of them have already visited one of our national parks. In addition, 98% of the respondents consider knowledge of natural and landscape assets important. This strong social demand is matched by 65 showplaces, 33 visitor centres, 4 arboretums, 6 local museums, and 40 caves, as well as 194 educational trails that present the natural and cultural-historical values of protected areas on almost 1000 km in total.

In addition to the increased amount of free time in nature, national park directorates regularly organise "experience-based" educational activities (guided tours, open days, special events on public holidays, forest schools, conservation camps, etc.) for awareness-raising purposes. In 2019, the number of registered visitors to such programmes exceeded 335,000. The

environmental educational activities of national parks linked to forest schools and showplaces offer several "mobile" programmes in addition to the 3 to 5-day forest schools, aiming at school-age children. This age group often has difficulties getting out into nature without financial and logistical support in several regions of Hungary. There is a need to develop a 'Nature School' accreditation system within the framework of the national parks, to address current issues and challenges in the field of environmental education, to provide a consistent methodology, and to meet growing quality assurance expectations.

The success of investments contributing to regional economic development is demonstrated by the fact that the number of registered visitors to the national park facilities and programmes has increased by nearly 30% since 2010, and now exceeds 1.65 million annually. Although the pandemic emergency declared in 2020 has left its mark on most sectors, the number of visitors of ecotouristic facilities of the directorates decreased less than expected, albeit breaking a trend of stable growth. Spending quality time in nature has become more appreciated.

The predominantly ecotouristic and professional community sites under the Hungarian National Parks brand reach tens of thousands of people. The brand's Facebook page has nearly 30,000 likes, and some articles reach 70-80,000 people. Popular with the younger generation, Instagram is currently followed by more than 3000 people.

Launched in 2010, the aim of the "National Park Product" trademark is to contribute to the qualitative development of ecotourism in the region by promoting local products, exploiting local economic opportunities and developing rural self-employment, while preserving and protecting natural resources. As proof of the success of the scheme, the number of recognised producers has increased by 60% and the number of products has doubled over the past 5 years. Currently, more than 1000 products from 250 producers can be labelled as National Park Products.

Besides the national park directorates, the largest organisations managing national park areas are the forest authorities. State forests represent a significant part of Hungary's natural assets, making up nearly 60% of the country's forests, and are among the most visited tourist attractions. State forest companies invest several billions of HUF in touristic development annually; currently they jointly manage 93 observation towers, 164 forest accommodations, 36 forest schools, 31 visitor centres, and several other public welfare facilities (recreational points, monuments, educational trails, exercise courts, etc.). They operate 36 forest schools with a capacity of over 1600 persons, and they organise 12,000 forest pedagogy activities annually, providing learning and recreational opportunities for nearly 80,000 children.

2.2 Long-term conservation and restoration of ecosystem services

Ecosystems are the basis of human life and all human activities. The quantity and quality of ecosystem services that humans use during their lives directly or indirectly are vital to human health and well-being. Ecosystems provide essential goods to society such as food, clean water, timber, and basic services such as soil formation, photosynthesis, nutrient cycles, decomposition, or recreational possibilities. Furthermore, healthy habitats and ecosystems play a key role in global climate regulation (e.g. CO_2 sequestration, storage of sequestered carbon), and in microclimate regulation (e.g. filtration/cleaning, flood risk mitigation, water retention). These are fundamental for climate change prevention and adaptation as well. The disappearance and deterioration of natural and near-natural ecosystems entail the deterioration of the services they provide.

The existence and state of ecosystems determine their service-providing capabilities. Only healthy ecosystems are capable of providing services of adequate quantity and quality to mankind. The necessity of conservation, evaluation and, preferably, rehabilitation of ecosystem services is gaining significance in Hungary, too, and the concept of ecosystem services was included in the Nature Conservation Act in 2017.

The ecosystem services were also a focal issue of the EEEOP-4.3.0-CCHOP-15-2016-00001 national conservation project conducted between 2016 and 2021. In the framework of this project the following activities were implemented:

- In line with the European systems, the Ecosystem Map of Hungary[7] (Figure 4) was prepared in 2019, which has a full national coverage and shows the actual distribution, extent and frequency of our ecosystems. The base map is freely available and downloadable online. This provides a basis for assessing the state of ecosystems and mapping their services on a national scale, for evaluating the existing green infrastructure, and for planning improvements. The reference year of the 20x20 metre (display resolution) map created by the data integration method is 2015, and it classifies ecosystems into 56 categories at 3 levels, in line with international systems.

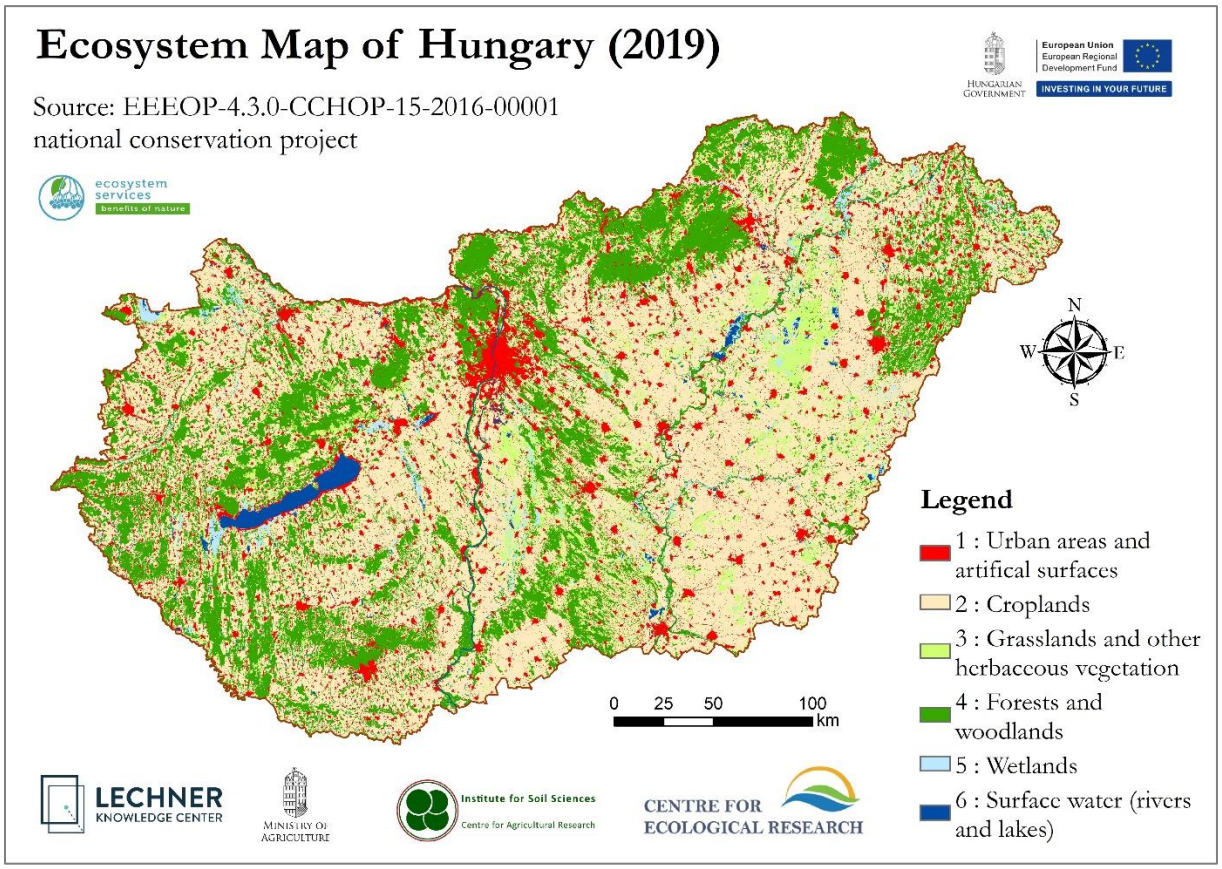

Figure 4. Ecosystem Map of Hungary (2019). ***Source: EEEOP-4.3.0-CCHOP-15-2016-00001 national conservation project.***

[7] http://alapterkep.termeszetem.hu/

- The analysis of the state of naturalness in Hungary – based on the Ecosystem Map – has highlighted the areas where natural habitat types have been preserved in a coherent way. The largest such areas are found primarily in the mid-mountain areas, but in the south-western Transdanubian and lowland areas there are also larger or even isolated patches of small contiguous areas which still retain at least part of their natural vegetation heritage. The largest such areas are primarily found in the north-eastern mountainous regions, but larger spots can also be found in south-western Transdanubia and in the Great Hungarian Plain (Hortobágy, Lake Tisza region, Szatmár-Bereg, etc.), and there are also small isolated patches (Hanság, Csanádi steppes, etc.) which still retain at least part of their natural vegetation heritage.
- The status assessment methodology for national ecosystems has been prepared through the development of several indicators. Within the main ecosystem types, the available data have been used to evaluate and map the state of nature along a number of indicators developed in the project. Among the indicators with national coverage coarser than patches, Figure 5 shows the proportion of (semi-)natural habitat types, highlighting Hungary's more natural and degraded regions.

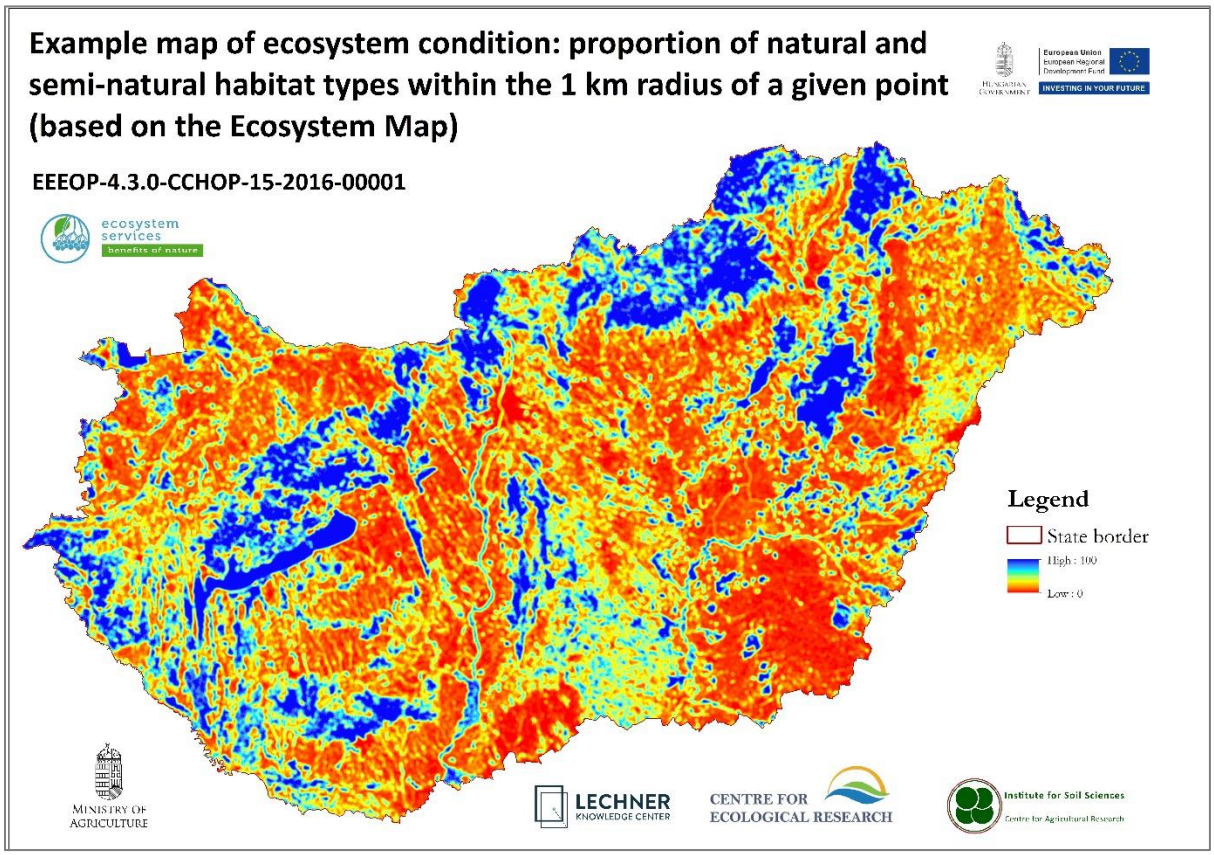

Figure 5. Example map of ecosystem condition: proportion of natural and near-natural habitat types within a 1 km radius of a given point (based on the Ecosystem Map). ***Source: EEEOP-4.3.0-CCHOP-15-2016-00001 national nature conservation project – E. Tanács and T. Standovár (2021): Mapping results for the indicators of the general ecosystem status. Study, Ministry of Agriculture.***

- The methodology of evaluating and mapping 12 selected ecosystem-services (e.g. pollination, climate regulation (CO_2 sequestration), microclimate regulation, flood risk mitigation, recreation) has been prepared. A four-tier cascade system (ecosystem state, potential service-delivering capacity, actual services, and well-being) was used to

assess ecosystems and their services using natural, social and, in some cases, economic indicators, indices, and their mapping.

- Some of the possible changes in our natural environment and the potential of our ecosystem services have been presented through foresight analyses.

Based on the many methodological innovations, analyses, maps, and syntheses that have emerged from this work, the definition of strategic frameworks, the planning of green infrastructure, restoration, and sectoral integration will continue, in line with the nature restoration objectives of the EU Biodiversity Strategy for 2030.

2.3 Green infrastructure network

Green infrastructure is defined as a network of natural and near-natural areas, as well as other vegetated, aquatic, and riparian ecosystems with ecological functions. Green infrastructure areas are multifunctional resources capable of providing diverse ecosystem services. Ecosystem services can be maintained and improved through the strategic planning, development, and management of green infrastructure.

The aim of the green infrastructure concept is to identify sites that can be protected or improved for ecological purposes to increase the quality of ecosystem services by examining the ecological condition of habitats and the spatial structure of green spaces. Green infrastructure plays a fundamental role in halting the fragmentation of areas in near-natural state. The green infrastructure concept is territory- and sector-neutral, not focusing on a single sector or area (e.g. urban or rural regions, outskirts or residential areas), but seeks to manage vegetated areas and aquatic ecosystems as a whole in a holistic approach.

The extensive research of green infrastructure conducted in the framework of the EEEOP-4.3.0-CCHOP-15-2016-00001 national conservation project contributed significantly to the professional foundation of the green infrastructure concept in Hungary and to the implementation of the green infrastructure-related measures planned in the National Biodiversity Strategy 2015-2020. As a result of the project, a methodological basis for defining green infrastructure, mapping the current elements of the Hungarian green infrastructure network and assessing their condition has been established (Figure 6).

It became clear that the assessment of green infrastructure at national and municipal scales requires different methodological steps and different inputs. According to the developed methodology, the assessment of the state of green infrastructure at the national level is based on the assessment of ecological condition, the complexity of ecosystem services and spatial relationships – together a so-called “triple composite”. This will also form the basis for detailed conservation and development proposals in the future. Habitats that are also valuable in terms of ecosystem services, located in urban areas in artificial environments, can be assessed on a different scale and using different methods.

The creation of green spaces in municipal areas is the task of urban planning under the scope of national construction regulations. The establishment of rules governing land-use and local construction regulations ensures the existence of necessary infrastructure for the functioning of the municipality. It is also responsible for the green infrastructure and for the protection of the characteristic and valuable structures, architecture, natural and landscape features of the municipality which are worth preserving. The planning and regulatory tools related to the task have been defined by regulations; the professional considerations of biodiversity conservation must be supported by guidelines adapted to the planning level.

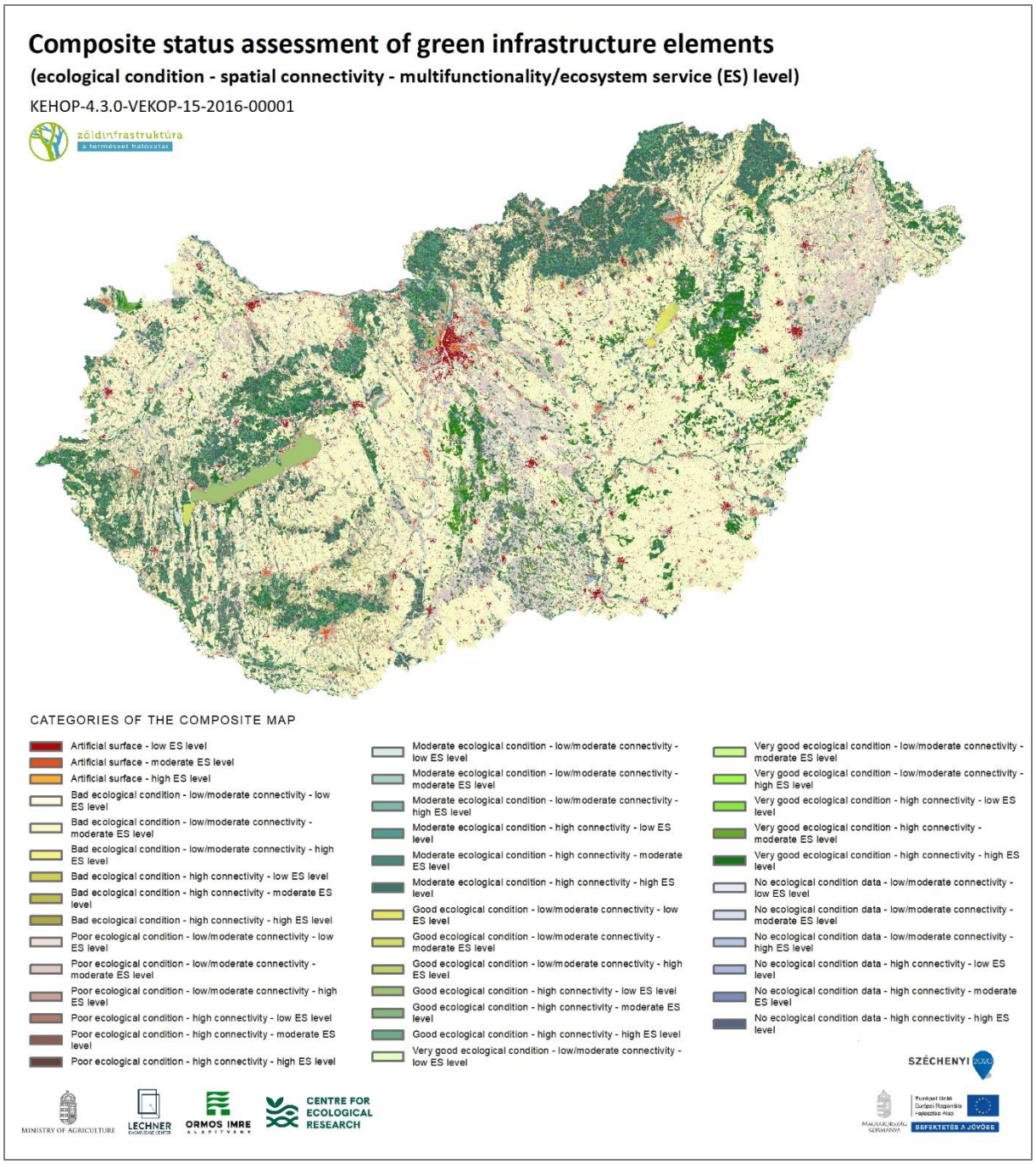

Figure 6. Status assessment of the elements of green infrastructure network based on the triple composite (ecological condition, spatial connectivity, and ecosystem services [multifuncionality]). *Source: EEEOP-4.3.0-CCHOP-15-2016-00001 national conservation project.*

2.4 Invasive alien species

Nowadays, one of the greatest dangers natural ecosystems face besides habitat loss and degradation, is the spread of invasive alien species. Invasive alien species (IAS) threaten not only biodiversity but human health as well, and can have negative economic effects as well.

Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 *on the prevention and management of the introduction and spread of*

invasive alien species became effective on 2 January 2015. Its objective is to enable Member States to take more effective action against invasive non-native animal and plant species. Of the 66 species listed in the EU inventory, 33 have been recorded in the wild in Hungary (17 plants, 5 arthropods, 4 mammals, 3 fish, 3 birds, and 1 reptile). A further 11 species are kept indoors.

In the framework of the harmonisation of domestic legislation, the powers to apply the EU Invasive Species Regulation have been incorporated into the legislation of the various sectors.

In the framework of national legal harmonisation, the power to apply the EU regulation on invasive alien species at legislative level (Act CXXXVII of 2016 *on the amendment of certain laws on the prevention and management of the intentional and unintentional introduction and spread of invasive alien species*) have been incorporated in the regulations of different sectors (conservation, food chain inspectorate, plant cultivation, game-, forest- and fisheries management). The designation of the authorities responsible for controlling invasive species and the duties of the controlling organisations are described in the Government Decree 408/2016 (XII. 13.) *on the prevention and management of the introduction and spread of invasive alien species*.

The financing conditions for implementing measures against invasive alien species have been established by the Government Resolution 1738/2016 (XII. 13.) *on providing the budgetary funding for the national implementation of Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species*.

According to Regulation (EU) No 1143/2014, in 2019, the first national report was completed. In 2020, a comprehensive analysis and assessment of the pathways of invasive alien species on the EU list and the pathway action plans were completed in Hungary, the implementation of which is mandatory for all sectors concerned.

The control of populations of invasive alien species is ongoing. National park directorates spend their central budget mainly on eradication and control of populations, focusing on widespread species that threaten biodiversity (e.g. common milkweed *Asclepias syriaca*), but also devote significant resources to eradicating newly introduced invasive species. A number of interventions, mainly in protected areas and Natura 2000 sites, are being carried out to control invasive species, typically funded by grants (LIFE, EEEOP). The proportion of areas cleared of invasive alien species in protected and Natura 2000 sites increased from 4768.2 hectares in 2015 to 5172.2 hectares in 2017. Continued control of invasive species requires significant additional investment by all sectors across the country.

More than one-third of the 212 animal and plant species listed in the Habitats Directive are endangered by invasive alien species.

2.5 Agriculture

In Hungary, the area under agricultural cultivation is significant, with a total cultivated area of more than 49,000 km^2 in 2020[8] (53% of the country's territory).Considering that the majority of the Pannonian biogeographical region's natural assets are located in areas currently under agricultural cultivation, the farming methods fundamentally determine the impact on biodiversity. On the one hand, agriculture has, in certain cases, maintained valuable near-

[8] https://www.ksh.hu/stadat_files/mez/hu/mez0008.html

natural habitats, but on the other hand, inappropriate use of available agricultural technologies and inappropriate farming practices pollute the air, the soil, and the surface- and groundwater, and it causes biodiversity loss and habitat fragmentation.

Agriculture has been characterised by intensification for decades. Intensive farming practices have a major impact on the environment, leading to soil depletion, poor water balance, acidification, and habitat and biodiversity loss.

Changes in **land use patterns** can be observed over a longer period of time. The extent of arable lands (4.3 million hectares) and orchards (94,000 hectare) has not changed substantially since 2010. The areas of vineyards (68,000 hectares), vegetable gardens, and reed beds have decreased significantly. Grasslands and areas removed from cultivation make up 790,000 and 2 million hectares respectively.

In the course of the EEEOP-4.3.0-CCHOP-15-2016-00001 national project, the **state of the national arable lands** was also assessed: higher scores (4 and 5) were given to fields with smaller plot sizes, a greater diversity of crops, and a higher proportion of (semi-)natural habitats (Figure 7). Based on these criteria, the condition of arable lands is slightly better in the areas east of the Danube (see figure below). Beyond the mountainous regions – where farming is less common – the arable lands of the sand ridges of the Danube-Tisza basin received higher scores, as well as the Bereg-Szatmár plain, Hortobágy, and Nyírség, the latter mainly in the southern part. Interestingly, the arable lands near settlements often received higher scores – presumably due to their smaller plot sizes and occasionally to the more diverse crops.

Given Hungary's natural geographic features, the natural and near-natural **grasslands,** formed by human intervention in the course of history, represent very important habitats from both a conservation and an economic perspective. In Hungary, grassland farming and grazing livestock played a dominant role in agricultural production until the first half of the 20th century, however, the total area of cultivated grasslands has decreased in Hungary in comparison to the period before the political transition in 1990. The extent of grasslands is decreasing, among others, due to set-aside, conversion into arable lands, shrub encroachment, and dehydration due to drainage.

Furthermore, the utilisation of grasslands have decreased, and expectations concerning productivity have changed. The conservation of grasslands in their favourable natural state is most threatened by under-utilisation, under-grazing, inappropriate practices, or inappropriately timed or performed interventions, and localised over-utilisation (over-grazing). The maintenance of grazing by small and large ruminants characteristic in Hungary is beneficial for the biodiversity of pastures and grasslands. The utilisation of grasslands by mowing and grazing is vital for protecting the associated natural assets, while at the same time increasing the number of people living from the sector, as livestock farming is a major source of employment. The key to conservation lies in the subsidisation of small and medium-sized enterprises. Despite these problems, the fact that the proportion of grasslands in the Natura 2000 network in Hungary is more than double the EU average shows the outstanding conservation value of these areas. This particularly highlights the need to protect associated species and to make the fullest possible use of available financial resources.

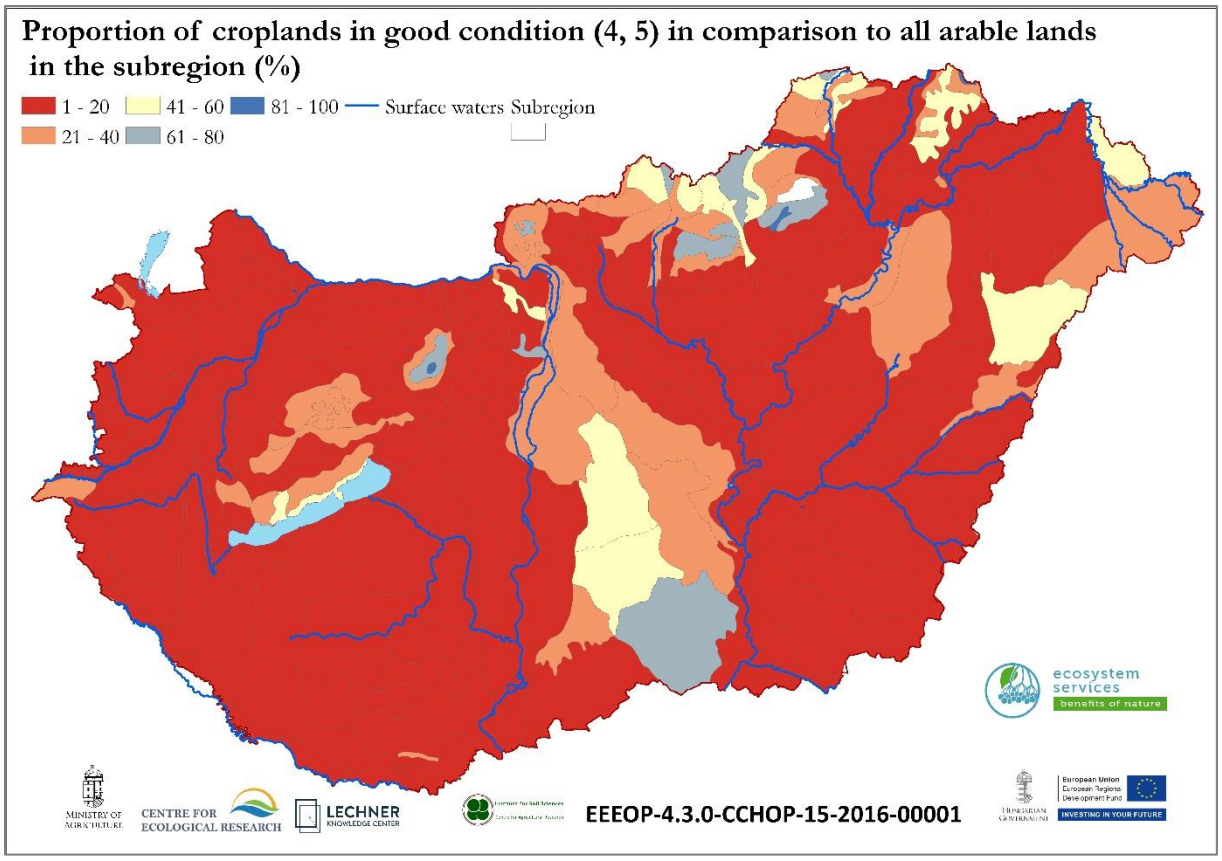

Figure 7. Proportion of croplands in good condition (4, 5) in comparison to all arable lands in the subregion. ***Source: EEEOP-4.3.0-CCHOP-15-2016-00001 national nature conservation project – E. Tanács and T. Standovár (2021): Mapping results for the indicators of the general ecosystem status. Study, Ministry of Agriculture.***

In accordance with the Habitats Directive on the conservation of natural habitats and wild fauna and flora, Hungary had to designate sites for the conservation of certain types of grasslands. Of the cca. 15 indicator grassland habitat types, the Pannonic salt steppes are the most extensive, but we also have relatively large areas of Pannonic sand steppes, lowland hay meadows, and alluvial meadows of river valleys. Pannonic loess steppic grasslands, Rupicolous pannonic grasslands, and mountain hay meadows on the other hand are of far lesser extent, occurring as enclaves. These habitats rank highly among our natural assets. They are the carriers of numerous endemic flora and fauna elements, the repositories of valuable relics in the Pannonian biogeographical region, and, due to their vast extent, they are the guarantors of the long-term survival of many plant and animal species.

The natural state of areas under agricultural cultivation is well reflected by the so-called Farmland Bird Index (FBI), which analyses changes in the abundance of **common bird species associated with agricultural habitats**. These bird populations show a continuously decreasing trend, but this decline has stopped in the last ten years (see Figure 8).

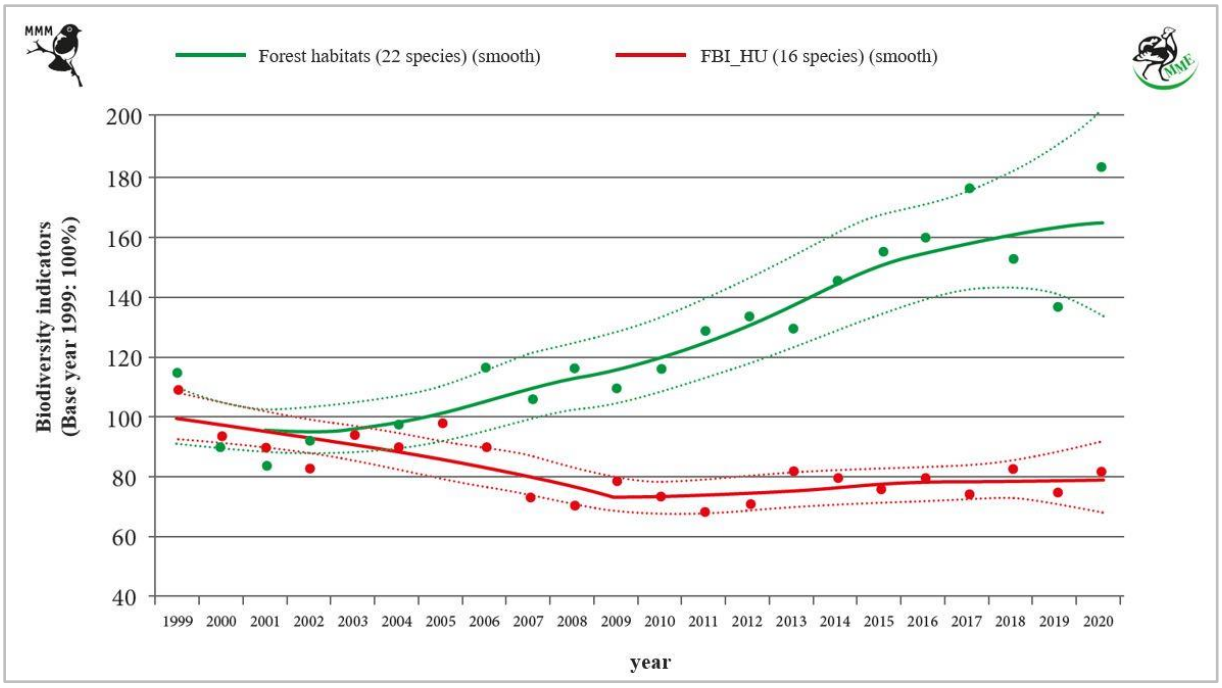

Figure 8. Change in the biodiversity indicators of agricultural and forest habitats between 1999-2019. ***Source: Hungarian Ornithological and Nature Conservation Society.***

Pollinators

Birds and insects associated with agricultural areas, particularly **pollinators,** are also key indicators of the health of agro-ecosystems and are essential for agricultural production and food security. About 80% of industrial crops and wild plants are at least partly dependent on animal pollination, with around €3.7 billion of annual EU agricultural production directly dependent on pollinating insects[9]. The ecological status, species richness, number of individuals, and ecological composition of wild pollinating insects depend largely on environmental parameters – the availability, quantity, and distribution of suitable feeding and resting areas. In an agricultural context, this has been shown to be closely linked to land use and farming methods. Significant landscape change, the loss of near-natural habitats, and intensive agricultural activities (homogenisation of habitats, chemical use, and intensive grazing) have had a number of negative impacts on wild pollinator communities.

In connection with pollination, it is necessary to emphasize that wild pollinators are essential for the pollination of our crops. In recent decades, the abundance and diversity of wild European pollinators (including bees, butterflies, hoverflies, and moths) have dramatically declined. Pollination is deficient on 50% of the land cultivated with pollinator-dependent crops in the EU.[10] In Hungary, 12 species of native bumblebees and 290 species of butterflies are protected.

[9] European Union, European Environment Agency, (2021): "Accounting for ecosystems and their services in the European Union (INCA)", The Publications Office of the European Union, Luxembourg.
[10] COM (2021)261 final: Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Progress in the implementation of the EU Pollinators Initiative.

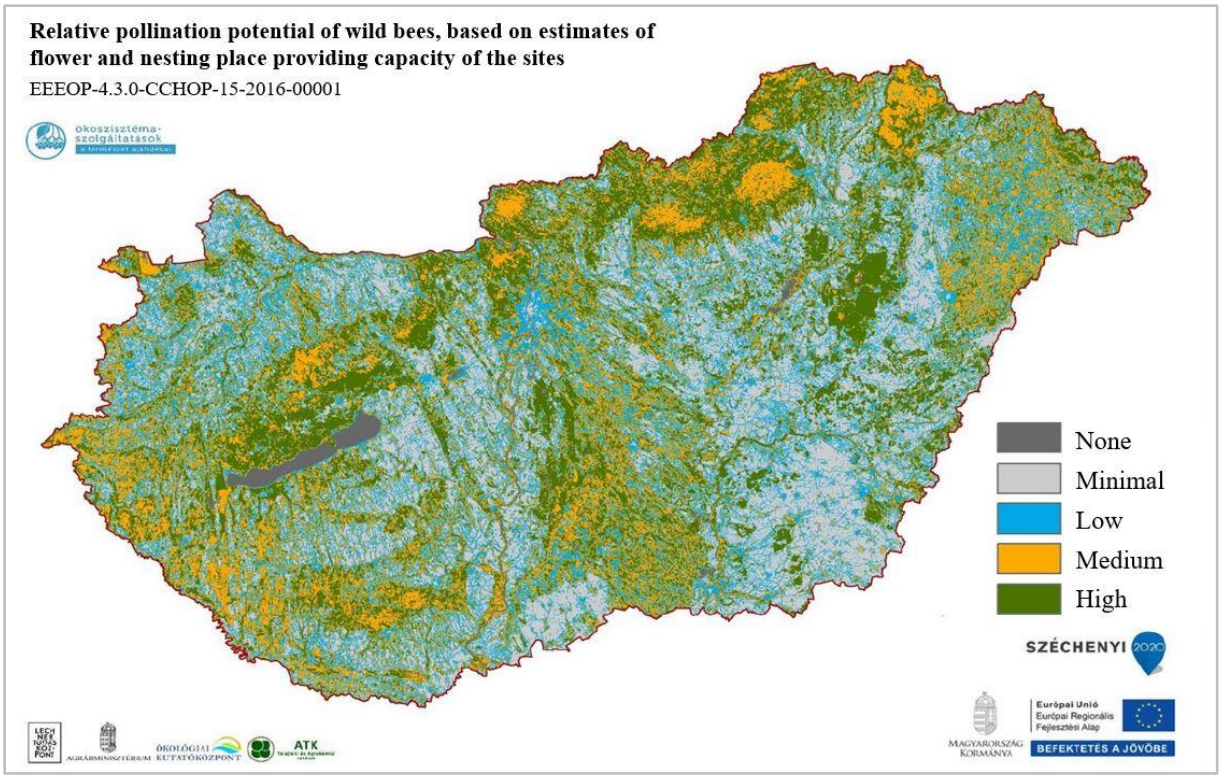

Figure 9. Relative pollination potential of wild bees, based on estimates of flower and nesting place providing capacity of the sites. ***Source: EEEOP-4.3.0-CCHOP-15-2016-00001 national conservation project – A. Kovács-Hostyánszki (edited) (2021): Evaluation of pollination as an ecosystem service. Study, Ministry of Agriculture.***

Pollination as an ecosystem service has been evaluated in the framework of the EEEOP-4.3.0-CCHOP-15-2016-00001 national conservation project. One outcome is a map of relative pollination potential of wild bees (Figure 9), based on an estimate of the capacity of areas to provide flowers and nesting sites for pollinators, according to the following categories: none (0), minimal (0-0.157), low (0.157-0.274), medium (0.274-0.399), and high (0.399-0.999).

Organic farming

Biodiversity in areas under organic farming is on average about a third higher than in conventionally managed areas. Organic farming maintains favourable living conditions for pollinators and other beneficial organisms, such as birds and small mammals, and creates greater species diversity in crop cultivation as well. In addition, it supports fundamental ecosystem services such as soil fertility or the proper water and nutrient cycling. The share of organic farming areas in 2020 was 6.12% (301,430 hectares) of the total agricultural area, showing a gradual increase after stagnation between 2005 and 2015.

Year	Organic farming areas (ha)
2015	129,735
2016	186,322
2017	199,683
2018	209,382
2019	303,190
2020	301,430

Figure 10. Size of organic farming areas in Hungary. ***Source: Hungarian Central Statistical Office.***

The **share of organic farming areas** was 6.12% (301,430 hectares) of the total agricultural area in 2020, showing a gradual increase after the stagnation between 2005 and 2015 (see Figure 10).

Soil conservation

Soil is one of Hungary's most important, conditionally renewable natural resources, whose protection and well preserved multi-functionality are in the long-term interests of society. In Hungary, soil conservation regulations are enforced through the application of specific land use categories, also stipulated in Act CXXIX of 2007 on the protection of arable land. Soil is an important medium for biodiversity, and contributes extensively to the provision of ecosystem services. At the same time, soil degradation processes, which in several cases result from inappropriate land use and neglect of soil protection considerations, prevent soil from functioning properly, including reducing its ecosystem services providing capability disrupting ecological and water cycles (increasing drought sensitivity) and causing water pollution. Good agricultural practices, including integrated nutrient management and erosion control, play an important role in achieving sustainable land use. The expansion of infrastructure, industry, and urbanisation has led to a significant withdrawal from cultivation and an increase in permanently sealed soil surfaces. Soil degradation is also caused by the removal of humus in the course of development projects, and by contamination from various sources. These activities also have a negative impact, among others, on soil life, soil structure, and water balance. Around 70% of Hungary's territory is nitrate sensitive, where the most serious problem is nitrate and ammonium pollution of groundwater. One source of nitrate and ammonium contamination is the inadequate collection, treatment, and storage of organic manure and slurry, which has improved recently thanks to modernisation of manure storage facilities. In Hungary, fertilisers are applied on a total area of about 3 million hectares. The amount of fertilisers sold increased by 20% between 2015 and 2020, and the volume of active ingredients per hectare was 119 kg in 2019. There is a predominance of nitrogen fertilisation, which can cause nitrate leaching into deeper layers of groundwater if used inappropriately. In addition to the increased use of fertilisers in nutrient replenishment, the use of organic manure has decreased, with negative effects on soil biology, soil biodiversity, and soil structure.

Soil erosion is a major problem in Hungary, with the upper, fertile humus layer gradually thinning, and material accumulating towards deeper regions and surface waters. Along with the soil particles, nutrients also make it to surface waters, with phosphorus in particular causing eutrophication. In order to prevent further deterioration of waters, erosion control measures are necessary. Farmers however, often lack the expertise or funds to implement environmentally sound, soil-friendly farming. Recognising this problem, a Soil Conservation Action Plan (SCAP) was drawn up, and the SCAP 4 shall ensure awareness-raising and training of farmers to achieve sustainable land use. Its key element is the Farmers' Soil Conservation Programme (FSCP), which will provide assistance with the daily work on the farm in question. Farmers are required to prepare their respective FSCPs by 31 December 2025, having the possibility to seek assistance from consultants and the soil conservation authority. The preparation of the FSCPs is facilitated by a centrally elaborated protocol (scheme), which helps identify and solve possible soil conservation issues based on the ecological conditions (climate, terrain, soil type, etc.) of the given locations.

A central soil conservation database ('Talajweb') will also be set up to assess soil conditions and monitor changes.

Pesticide use

The amount of pesticides sold in Hungary decreased by 60% between 1989 and 2009, while it has fluctuated slightly in recent years. In 2019, more than 26,000 tons (with an active ingredient content of 7,826 kg) were sold. The use of active ingredients per hectare peaked between 1985 and 1989, according to the relevant sales data (5.6 kg/ha), and after that, the amount used gradually declined to only 1.6 kg/ha by 2011. In 2019, this value was only 1.49 kg/ha.[11]

The EU Farm to Fork strategy and Biodiversity Strategy for 2030 both aim to reduce the use and risk of chemical pesticides by 50% by 2030, and the use of more hazardous chemical pesticides, also by 50% by 2030. They aim to achieve these targets relative to the 2015-2017 average (considered as 100%).

Concerning the use and risk of chemical pesticides, the Commission does not use two separate calculations, but treats the two as one. The calculation is essentially based on the sales of active ingredients (thus reflecting the use part of the target), with the more hazardous ingredients given a higher weighting (thus reflecting the risk part of the target).

Hungary reduced the use and risk of chemical pesticides by 16% by 2018, and by 25% by 2019, in comparison to the 2015-2017 average (see Figure 11).

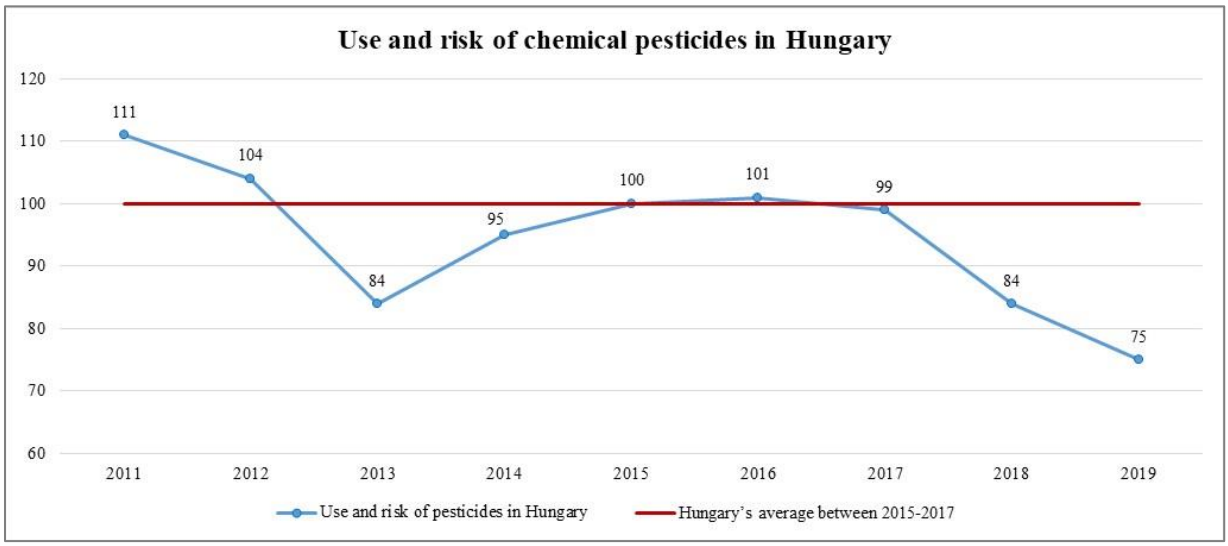

Figure 11. Use and risk of chemical pesticides in Hungary (2011-2019) in comparison to the national average of the years 2015-2017. *Source: Ministry of Agriculture*.

In Hungary, the use of more hazardous pesticides has decreased by 11% and 21% by 2018 and 2019 respectively, in comparison to the average of 2015-2017 (which can be considered as 100%). However, the graph also illustrates that in 2011-2013, the sales of the more dangerous active ingredients was lower than in 2019 (see Figure 12).

[11] Based on utilised agricultural area (UAA).

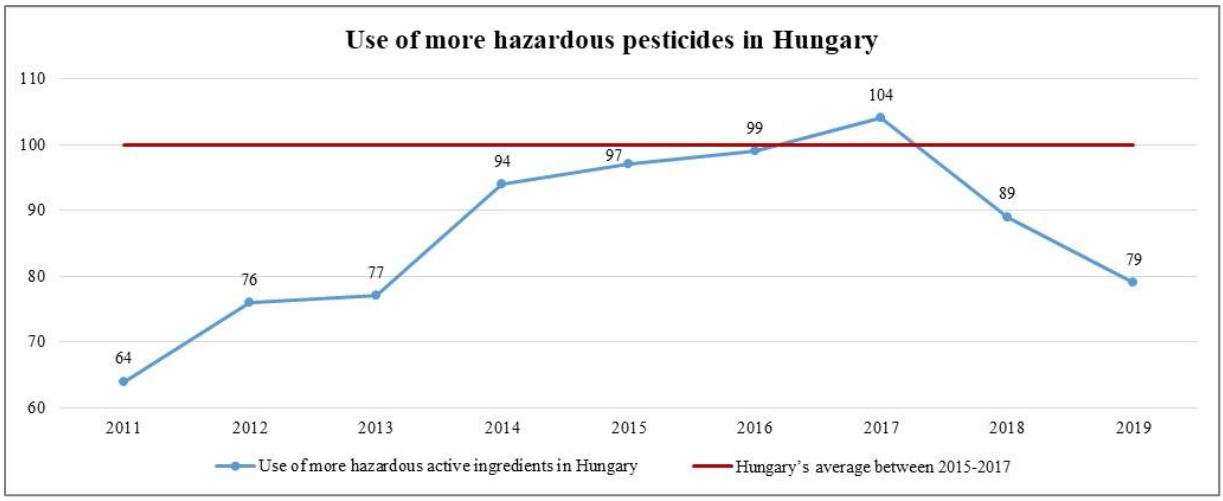

Figure 12. Use of more hazardous pesticides in Hungary (2011-2019) in comparison to the Hungarian average of 2015-2017. *Source: Ministry of Agriculture.*

Following EU obligations, the Ministry of Agriculture has prepared a new National Plant Protection Action Plan for 2019-2023, which establishes specific objectives, measures, and agenda to mitigate the risks and effects of pesticides on human health and the environment, and to promote integrated pest management as well as the development and introduction of alternative approaches and technologies to reduce the risks from pesticide use. The Action Plan is reviewed by the Plant Protection Committee every five years. The objective of the plan is to promote integrated pest management, and the elaboration and introduction of safer alternative crop protection technologies in Hungary.

Genetically modified organisms

The use and uncontrolled release of genetically modified organisms (GMOs) into the environment is a threat to biodiversity. The precautionary principle must be applied as strictly as possible in order to protect the environment and the living world from the potential adverse effects resulting from gene technology activities. Hungary considers the regulation of activities related to genetically modified plants and maintaining Hungary's GMO-free status as a strategic issue of utmost importance, also enshrined in the Fundamental Law of Hungary. As a result of our GMO-free agricultural policy, no genetically modified (GM) crops have ever become cultivated in Hungary, and there is a full prohibition on the cultivation of GM plants currently as well. In addition, seed production, export and import are likewise subject to strict control. The authorities focus also particularly on the strict GMO-testing of food and feed products imported, and the enforcement of mandatory labelling. Consequently, the number of products contaminated with GMO is decreasing every year. As a new element of the Hungarian GMO-free strategy the Ministry of Agriculture has introduced the GMO-free food trademark system in order to establish a GMO-free food chain. The owner of the trademark is the Ministry of Agriculture, which has entrusted the fully state-owned Food Chain Security Center Nonprofit Ltd. to perform the tasks with regard to certification. Since the introduction of the trademark, several companies have been certified and GMO-free labelled products have appeared on the Hungarian market.

Special attention needs to be paid to risks related to non-agricultural gene technology activities as well. On the one hand, there are currently around 100 facilities for contained uses in Hungary. The control of these facilities and the activities carried out in them needs to be

strengthened. On the other hand, illegal genetically modified animals, mostly ornamental fish or GM salmon, have been appearing in the EU markets, including Hungary, whose control requires more attention and stricter measures.

Recently, certain new genomic techniques (NGT) have been rapidly developing and gaining increasing attention due to their low tool requirement, cost efficiency, and simplicity. These methods are currently used in agricultural, human medical, and industrial research. The use of new technologies, however, also carries risks, whether environmental, health, economic, social or legal. Based on the ruling of the European Court of Justice of 25 July 2018, organisms obtained by targeted mutagenesis techniques are to be regarded as genetically modified organisms (GMOs). The ruling is clear concerning the legal status of the new techniques of mutagenesis, but also raised practical questions concerning its implementation. Consequently, the Council decided in autumn 2019 that a study was necessary to clarify the issues raised. On 29 April 2020, the European Commission published the requested study in light of the Court of Justice's judgment in Case C-528/16 regarding the status of NGTs under Union law. It covers the use of NGTs in plants, animals, and microorganisms, for agri-food, industrial, and pharmaceutical applications. Currently, there is only one NGT plant in the market, a higher oleic-acid soybean of Calyxt in the US. The number of varieties expected to be on the market within five years is very low, and on a global scale only about 16 plant varieties are concerned. In Hungary, currently more than 130 NGT-related contained used activities are conducted in about 100 facilities, most of which are basic research (see Figures 13a-b). The increased control of these activities is by all means necessary, as no information is available on the impact of their release into the environment. As a result of the EU process, the European Commission has published a proposal for the regulation of plants obtained by NGTs, and negotiations have started.

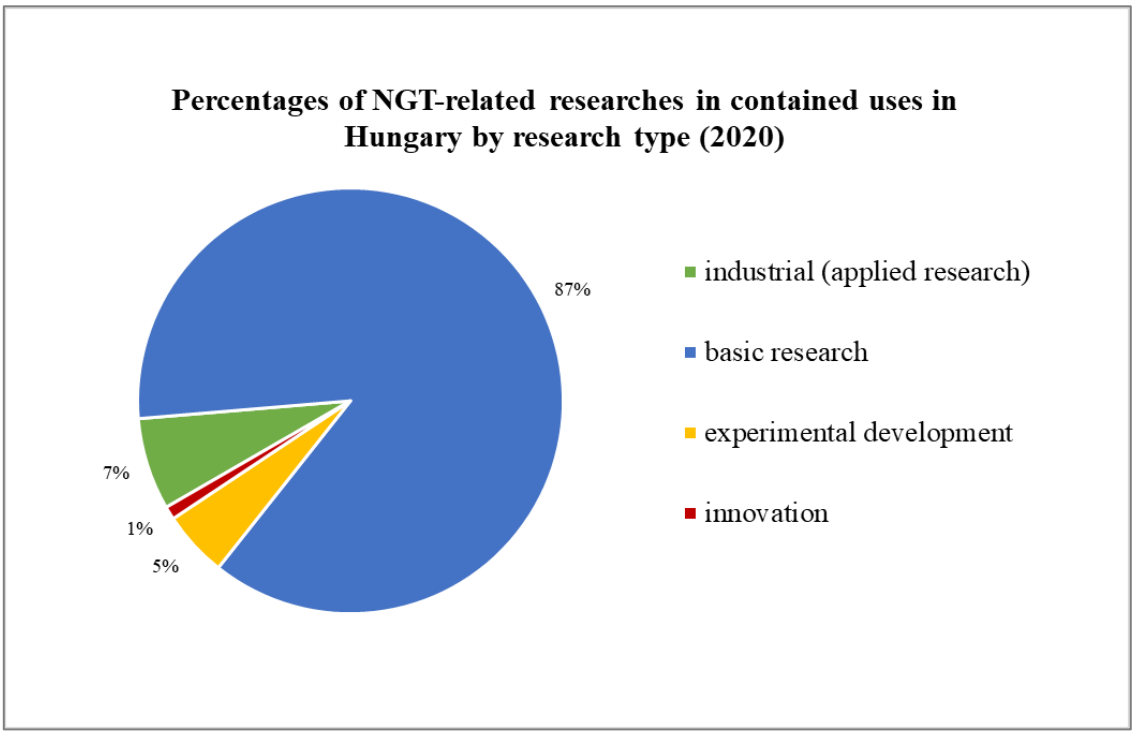

Figure 13a. Percentages of NGT-related research activities in contained uses in Hungary by research type (2020). ***Source: Ministry of Agriculture.***

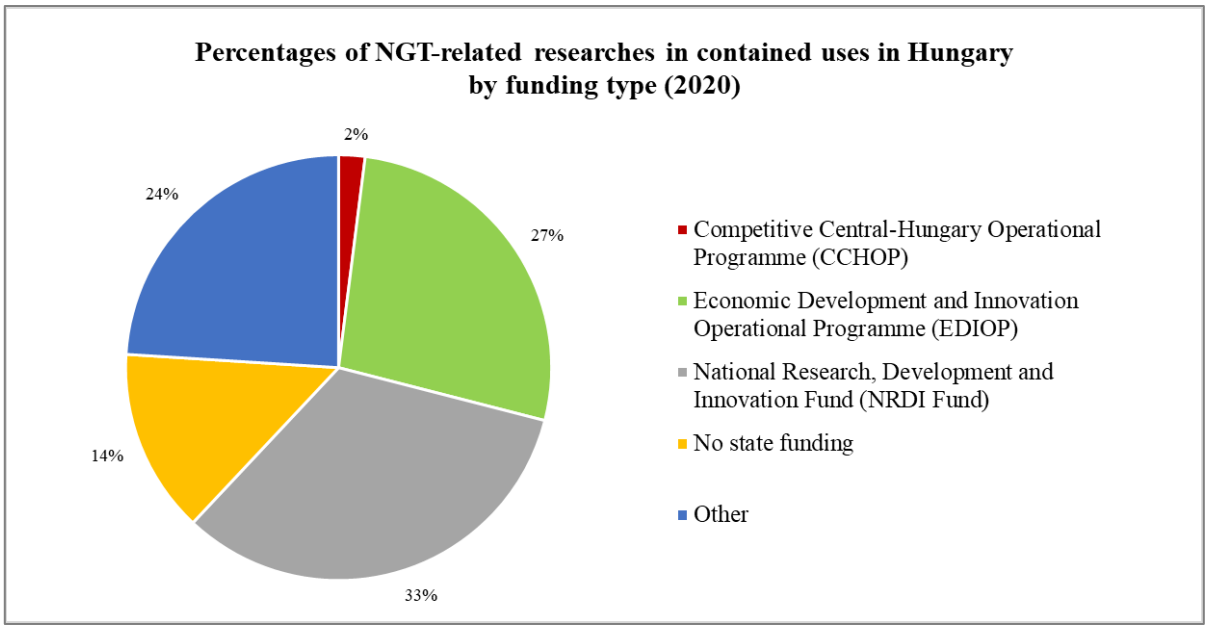

Figure 13b. NGT-related research activities in contained uses according to the type of funding in Hungary (2020). ***Source: Ministry of Agriculture.***

Genetic resources, agrobiodiversity

Old Hungarian plant varieties and indigenous domestic animals are part of our national heritage, public treasure and national identity, and are Hungary's symbols as well. The conservation and maintenance of genetic resources representing agrobiodiversity, the long-term heritability of the good qualities of our plant and animal species, varieties and breeds that have evolved under natural geographic conditions, and their adaptability to environmental changes, are vital for future generations to be able to respond appropriately to natural and economic challenges, especially climate change. These varieties and breeds also offer the possibility of using and maintaining traditional, extensive farming methods that create and preserve agricultural habitats of high biodiversity value. In addition, our domestic livestock also play a key role in managing valuable grasslands.

Hungary was one of the first countries in the world to recognise the importance of gene conservation, and as a result, the conservation of genetic resources in both wildlife and agricultural livestock and plants has been a priority in the government's programme. The support and development of national gene conservation activities has been a key government objective since 2010.

In order to implement the government's intention to increase the state's role in gene conservation activities and tasks, the Ministry prepared a Gene conservation strategy in 2017, which was approved by the Government with Government Resolution 1049/2018 (II. 20.) on the support for the development and key programmes of certain gene conservation institutions. The Gene conservation strategy was launched in 2019, which provides the development of gene conservation institutions and their support for five years. This is a tremendous opportunity to preserve and develop genetic resources forming the basis of agriculture and food production, to strengthen the State's role in gene conservation, and to establish a real state gene bank network.

The national-scale coordination of gene conservation tasks and the organisation of gene banks into a network is the duty of the National Centre for Biodiversity and Gene Conservation

(NCBGC), whose two pillars are the Plant Genetic Resources Institute (PGRI)[12] at Tápiószele and the Institute for Farm Animal Conservation (IFAC)[13] at Gödöllő.

PGRI – which celebrated its 60th anniversary in 2019 − is Hungary's largest and most important plant gene bank. Its invaluable collection of outstanding national strategic significance is listed as the 17th largest such gene bank in the world and the 8th largest in Europe. Half of the plant genetic resources in Hungary can be found here. Since 1959, it has been the only one in the country to carry out full-scale gene bank activities, its primary and fundamental task being gene conservation, as well as the conservation of cultivars and species. Its activity covers the entire flora spectrum, which is unique in Hungary, and even in Central Europe. In 2020, nearly 133,000 gene bank samples of crops, fodder crops, vegetables, ornamental plants, fruits, vines, their wild relatives, as well as wild plants were conserved, representing 57,003 unique plant gene bank items.

Landraces have naturally adapted to the natural conditions of a smaller region, representing an important basis for the biological foundations of the future. Owing to their adaptability, landraces play an important role in organic farming and the production of local regional products. Currently, 68 fruit and 13 vegetable landraces are officially recognised in the National Register of Varieties.

IFAC is a leading institution in animal gene conservation. Building on its unique *in vivo* poultry gene bank, it has extended its conservation, research, and educational activities to all farm animals, from honeybees to cattle. This has turned IFAC into an unparalleled institution on a global scale, worthy of representing Hungary's former outstanding international reputation in farm animal gene conservation. Of the currently protected native Hungarian farm animal species, the institute manages 14 poultry breeds as *in vivo* and *in vitro*, and the Hungarian giant rabbit, as *in vivo* national gene bank. The *in vivo* and *in vitro* gene banks of tench (*Tinca* spp.), crucian carp *Carassius carassius*, and the Pannonian honey bee *Apis mellifera carnica pannonica*, and the *in vitro* gene bank of the nine Hungarian dog breeds are under development. The continuously expanding DNA bank of farm animals include around 11,200 samples from poultry, sheep, cattle, horse, rabbit, and dog breeds.

Apart from the NCBGC, several institutions, associations, and private individuals are engaged in gene conservation activities, including national park directorates, the national stud farms, higher education institutions, various breeding associations, ministerial background institutes, research institutes, and NGOs.

The role of national park directorates is key in preserving domestic livestock species and breeds, including the ones that have long-established populations, such as the Hungarian water buffalo and Hungarian grey cattle, different breeds of sheep (Racka, Cigája, and Cikta), and horse (Hucul, Furioso North Star, and Muraközi), which are nationally important, and which represent significant gene reserves in terms of number and genetic value, and they also play a role in preserving certain dog breeds (Pumi, Puli, etc.). In case of livestock kept by the directorates, the tasks of gene conservation and conservation management (by grazing) are fulfilled together. It is important that management by grazing is carried out in an ecologically sound manner, keeping in mind the diversity of pastures, and that the regeneration of the grazed area is ensured without the risk of overgrazing.

[12] https://www.nbgk.hu/01about-us/
[13] https://www.nbgk.hu/02about-us/

2.6 Forest management

The number of animal and plant species associated with Hungary's forests indicates that forests play a key role in biodiversity conservation. Besides sustaining biodiversity, forests provide essential ecosystem services to society, such as clean drinking water, clean air, climate regulation, timber, or recreational possibilities. As society has become more environmentally aware, expectations of forests have changed over the recent years. In addition to the recognition of the economic role of forests, their environmental, nature conservation, public welfare, and landscape shaping functions are also getting increased attention.

Hungary's forest cover currently stands at 20.8%, which has not changed over the past years. The extent of forest cover shows significant differences within the country, with the central mountains and south-western Transdanubia being the most forested regions, while the share of forests in the plains is low. About 45% of native flora, and an important proportion of the fauna live in natural and close-to-nature forests. About half of Hungary's protected areas and about 45% of Natura 2000 sites are forests.

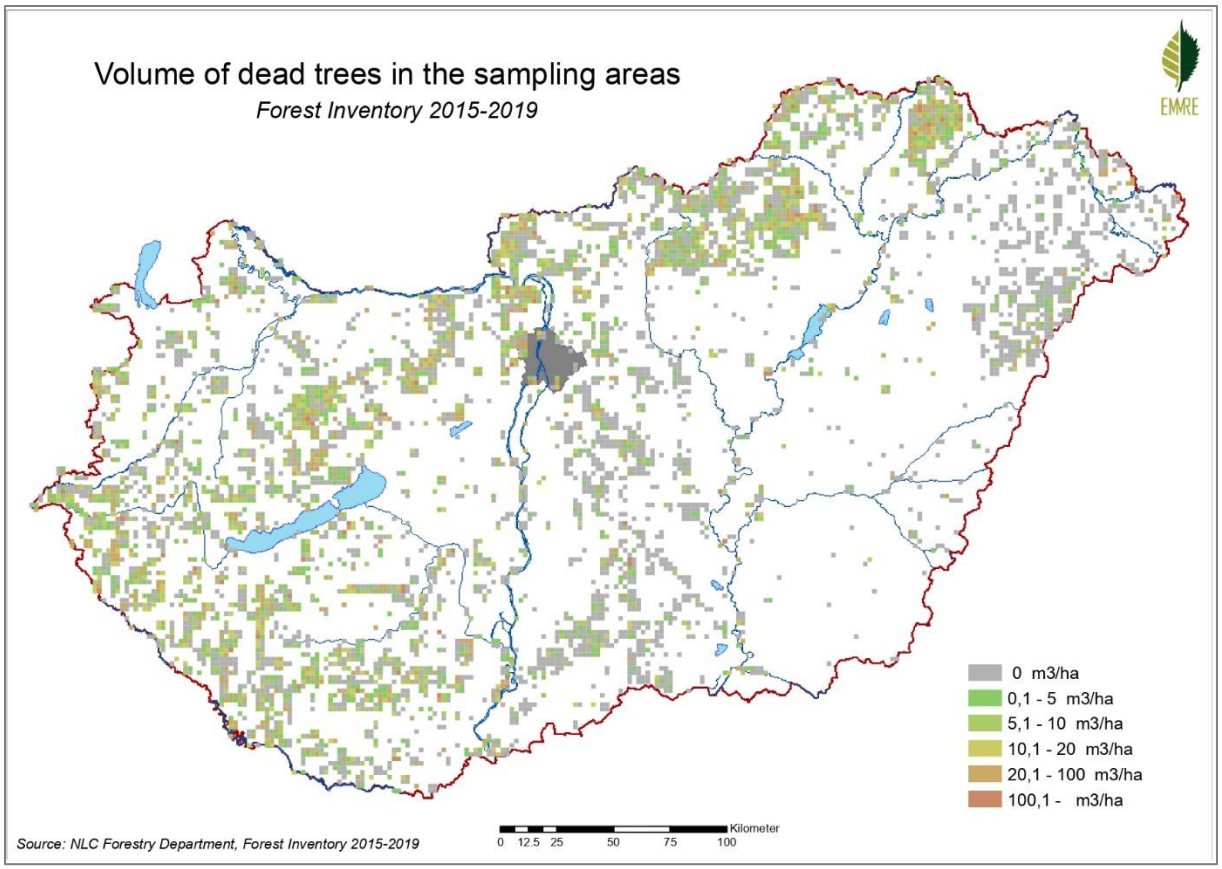

Figure 14. Assessment of dead trees in the National Forest Inventory. ***Source: NLC Forestry Department.***

The total area of forests managed in forestry operation systems ensuring continuous forest cover (selection cutting system/permanent forest, converter/transitional system, and forests serving non-timber production) was 151,507 hectares in 2014, which increased to 183,288 hectares by 2020.

National park directorates manage about a total of 50,417 hectares of forest, and they are also registered trustees of 97% of these areas. Only a small share (8%) of forests managed by

national park directorates is not under protection or not part of the Natura 2000 network (7%), with a significant territorial overlap between the two.

As natural assets are closely linked to forests and forest ecosystems, continuous monitoring and assessment of forest resources are vital. Such information is not only available in the Hungarian National Forest Database (NFD) – which is primarily necessary for forest management monitoring and planning – but also through the Forest Protection Measuring and Observation System (FMOS). The FMOS includes the followings: health assessment covering large areas, an intensive monitoring network of health status change, national light trap network, forest protection forecasting, climate change monitoring, game-caused habitat change monitoring, systematic national forest inventory, national forest damage register, national forest fire database, forest fire risk assessment system, and forest fire early detection.

Pursuant to Act XXXVII of 2009 on the Forest, Forest Protection and Forest Management (Forest Act), the NFD contains official public records of the current and expected state of naturalness of Hungarian forests, broken down to individual subcompartments. The national forest inventory includes data among others on the distribution and abundance of rare associate tree species, and the presence of standing and fallen dead trees. The proportion of dead trees in close-to-nature forests in hilly and mountainous regions, which is more favourable for biodiversity and also increases the resilience of forests (Figure 14).

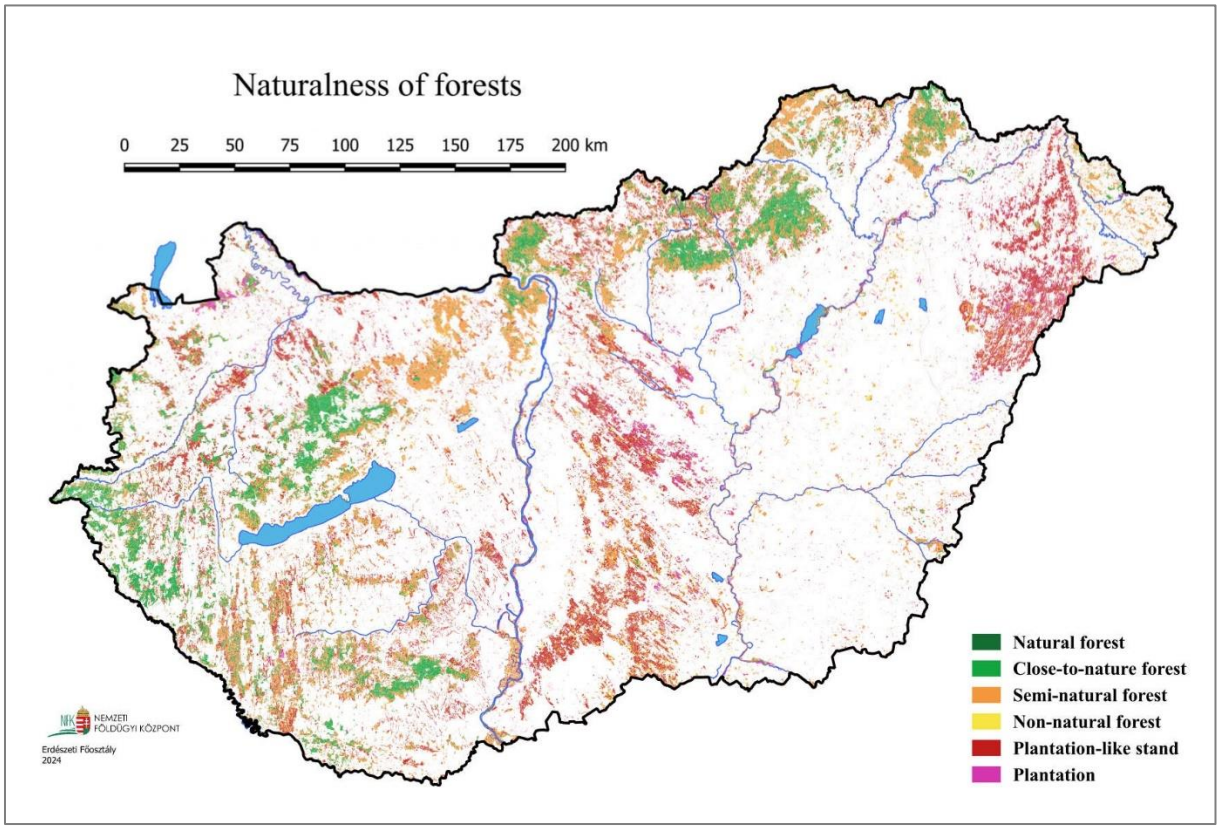

Figure 15. Naturalness of forests registered in the National Forest Database. ***Source: National Land Centre.***

Although the state of naturalness defined in the NFD for each respective subcompartment (Figure 15) cannot take many habitat protection factors into consideration, it is of great importance because it allows to distinguish forests with very different conditions and purposes and thus to define expectations, rules and options for forest management. Pursuant

to the Forest Act, the classification into naturalness categories is based on how close the current condition of the forest, as a result of natural processes and past forest management, is to the natural forest ecosystem corresponding to the site. To determine this, the composition of species (especially the proportion of invasive alien species), the origin (seed or sprout) and the structure must be taken into consideration. However, the law only sets specific limits for the proportion of invasive alien species.

Naturalness is now a basic expectation and one of the main factors of forest management. Afforestation in the past 70-80 years typically meant artificial forest plantations primarily, or solely, for timber production, or to serve some protection or community purposes, e.g. fixing peaty meadow soil ('kotu') or stabilising quicksand, protection against erosion or deflation, protection of weak sites, noise protection, and rapid recultivation. Suburban recreational forests were also planted, deliberately using fast-growing species, where biodiversity conservation was not an important consideration. In cultivated forests and tree plantations, biodiversity can increase to a lesser extent.

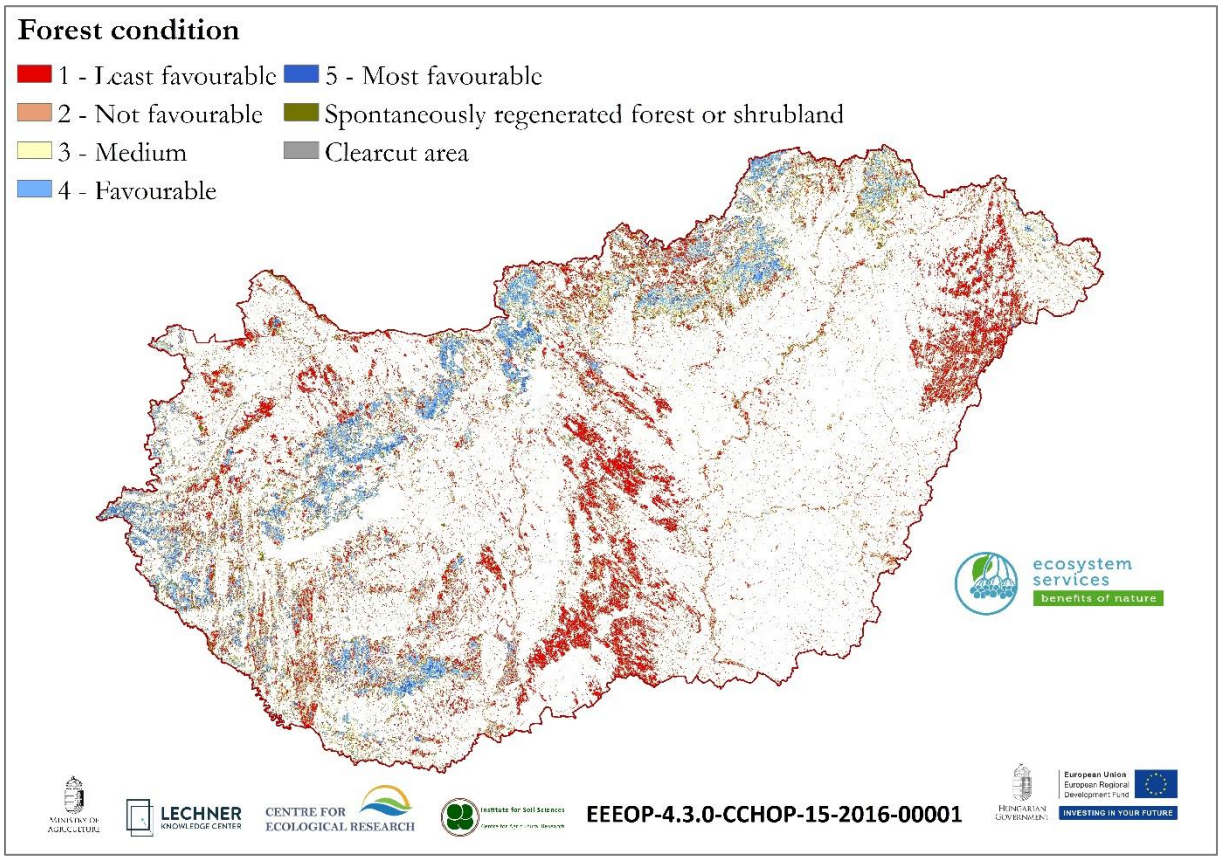

Figure 16. Assessment of forest ecological condition, rated on a 5-point scale. ***Source: EEEOP-4.3.0-CCHOP-15-2016-00001 national nature conservation project – E. Tanács and T. Standovár (2021): Mapping results for the indicators of the general ecosystem status. Study, Ministry of Agriculture.***

The structure of forests and their species composition are greatly influenced by the fact that 40% of Hungarian forests have been planted over the past 70 years, mainly on agricultural land and primarily for timber production, soil protection (e.g. stabilising quicksand), or to serve human health-related objectives. The share of native tree species in the forest stands is almost 70%, while the rest is dominated by alien, introduced, or cloned species, with 23.53% of the forest being covered by Black locust and 5.4% by hybrid poplar. The forests are composed of 89% deciduous species typically forming mixed stands. There has been a

steady decrease in afforestation since 2016, but it has been increasing again since 2019. Efforts to preserve the type of cultivation of Natura 2000 sites – particularly grasslands – are well reflected in the fact that 93% of afforestation from 2019 to 2021 took place outside Natura 2000 sites. 45% of afforestation was carried out with native tree species, which is more favourable for biodiversity conservation, especially if several species are used instead of a single one. Outside Natura 2000 and protected areas, and at an appropriate distance from them, afforestation especially for timber production has continued, often with alien species or resistant varieties that are most suited to the site (e.g. Black locust or hybrid poplars). To re-incentivise afforestation, a number of measures (e.g. legal regulations, significant increase of the subsidy) have been introduced. Afforestation and the establishment of agroforestry systems (tree planting, forest strips to protect agricultural plots, increasing the areas of woody pastures) have been supported by the Rural Development Programme (RDP).

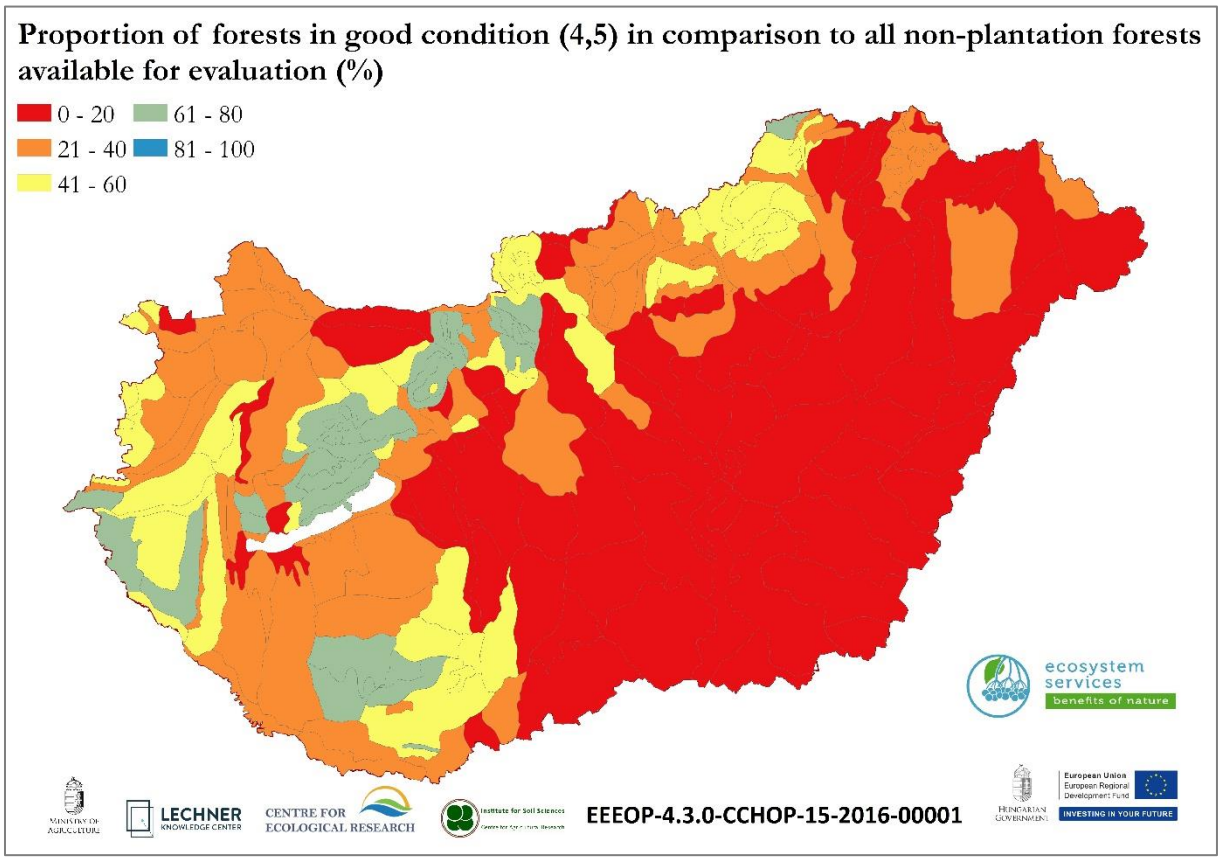

Figure 17. Proportion of forests in good condition (4,5) in comparison to all non-plantation forests available for evaluation. ***Source: EEEOP-4.3.0-CCHOP-15-2016-00001 national nature conservation project – E. Tanács and T. Standovár (2021): Mapping results for the indicators of the general ecosystem status. Study, Ministry of Agriculture.***

The state of Hungarian forests has also been assessed in the course of the EEEOP-4.3.0-CCHOP-15-2016-00001 national conservation project, based on data from the National Forestry Data Repository of the Forestry Administration Information System (ESZIR OEA) (base year: 2015). Forest condition was characterised by analysing tree species composition (proportion of native, alien, invasive, and aggressively spreading species) and structure (e.g.

age composition, diameter classes, shrub cover).[14] Forests in good condition were considered to have high proportion of native species, a diverse species composition, a mix of species with the expected ratio and several age classes, whereas stands with a mono-age mix of unmixed non-native species were considered to be in poor condition (Figure 16).

Aggregated analyses of the project show that lowland areas are not only less forested, but forest condition is typically worse there than in the mountainous regions. When looking at the condition of all other forests, excluding plantations, we can see that there are no subregions in Hungary where the proportion of forests in good condition (4.5) exceeds 80% (Figure 17). On the Great Hungarian Plain, poor condition of forests from the perspective of biodiversity is not solely due to the high share of plantations. In addition, the condition of small remaining forest patches, such as the lowland steppic oak woodlands of the Great Plain and the riparian gallery forests, are not satisfactory either.

Climate change and the spread of invasive alien species are also increasingly threatening the survival of forests. As a result, preserving and improving the naturalness of our forests requires ever increasing efforts.

2.7 Game management

The population of some game species has increased sharply in Hungary, while that of others has decreased. The populations of **big game** species (red deer, fallow deer, roe deer, mouflon, and wild boar) have been increasing almost exponentially since the 1960s, currently estimated at 600,000-650,000 individuals. This growth is continuous in spite of the expansion of man-made environment and urbanisation, and the likewise expanding road network and enclosures that cause large-scale fragmentation of natural habitats. At the same time, the country's forest other woodland cover is also increasing, with which big game species, especially red deer and wild boar, are closely associated. Increasingly mild winters in recent years have resulted in high survival rates of the offspring, as winters without proper cold and prolonged snow cover increase the survival chances of young animals. High nutritional value crops, cultivated in abundance on large agricultural plots, provide food for big game, and also help their survival and spread. The numbers of big game greatly exceed the density sustainable without larger conflicts. Game damage is problematic, and further population growth need to be brought to a halt, and the numbers of big game must be reduced. The length of permanent fences in agriculture, forest management and livestock farming remains be significant, which, in addition to contributing to habitat fragmentation even to weed encroachment, creates barriers to the migration routes of game and other species, concentrating populations, and intensifying game damage in particular areas.

Fenced **game parks** show extreme examples of the impact caused by big game, but at the same time – thanks to the fences – some of them have preserved patches of natural vegetation, which can only be protected from trampling and chewing damage by maintaining fencing.

In addition to the big game population, the numbers of some furry predators are also growing. The population of golden jackal has trebled over the past ten years or so, currently estimated at 15,000-20,000 individuals. Unlike the red fox (estimated around 70,000 individuals recently), the golden jackal also hunts big game besides rodents and small game species. Parallel to its spread, according to recent years' estimates, local populations of red deer and

[14] EEEOP-4.3.0-CCHOP-15-2016-00001 national conservation project – Tanács *et al.* (2020): Mapping methodology for the indicators of the general ecosystem status. Study, Ministry of Agriculture.

roe deer decreased in the south of the country, mostly due to failing to rear their offspring, but there is no direct evidence that this is solely due to the spread of the jackal. Even in this region, the red deer and roe deer populations have not yet decreased to levels that habitats could sustain in the long term. Effective population control of small and medium-sized predators can be achieved through trapping, but improperly placed killing traps pose a danger for protected and strictly protected species as well.

As for **large predators**, wolves were first detected in northern Hungary in the early 2000s. Back then, only wandering individuals were spotted, but since 2010, wolf sightings have become more common and more frequent. Its persistent presence has a significant local impact on the wildlife population, mainly manifested in the social behaviour of red deer (hectic rutting, increased herd size of 50-150 individuals). The changes in big game habitat use due to the presence of the wolf as an apex predator contribute to the redistribution and mitigation of agricultural and forestry game damage. It also plays an important role in influencing the size of game population, because its food base is mainly composed of the most easily obtainable prey. Its impact on significantly reducing the number of prey animals in the future depends on the extent to which it can spread in the country. Its presence as a native large predator is a positive development for the biodiversity of Hungary.

Over the recent decades, the reduction of the markedly overpopulated big game population has not been achieved even with a continuous increase in the hunting quotas. Based on national estimates, the numbers of red deer and roe deer continue to increase. Only the wild boar population started to decline at a rate desirable from a farming, forestry, and conservation point of view, due to the African swine fever.

In the case of the **small game**, however, the opposite processes are observed. European hare and pheasant populations have been steadily declining since the 1970s, and the grey partridge *Perdix perdix* is on the verge of extinction, with hardly any viable populations remaining in the country. The primary cause of the decline in small game populations is the loss of habitat edges due to intensive monoculture agriculture, spatial and temporal restriction of food availability, excessive chemical use, and inappropriate haymaking. The solution lies in restoring small- or medium-scale farming, increasing the spatial diversity of crops, significantly increasing the extent of habitat edges, abandoning haymaking on the existing habitat edges, and adopting “bird-friendly” harvesting methods.

The conservation of **waterfowl** is unimaginable in Hungary without international cooperation, as the majority of them are migratory species. Although the breeding population of greylag goose *Anser anser* is growing, that of almost all native duck species is decreasing, and the global population of strictly protected geese species (red-breasted goose *Branta ruficollis*, and lesser white-fronted goose *Anser erythropus*) are also endangered. The key to protecting flocks arriving in Hungary is a network of tranquil, near-natural wetlands. This is why, in addition to the network of protected areas and Natura 2000 sites, the maintenance of a wetland reserve system is vital for the conservation of these species. In addition, international cooperation to protect waterfowl from overexploitation and habitat loss must be strengthened, in which Hungary can play a key role.

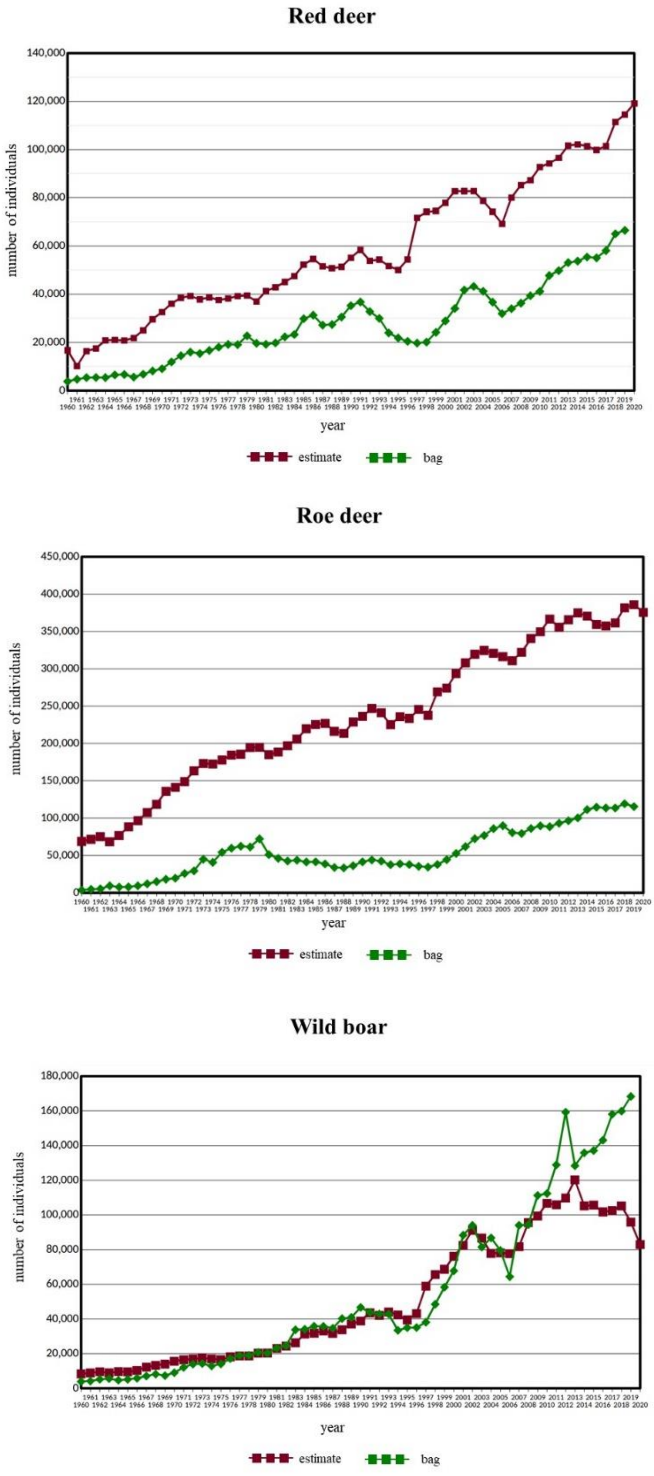

Figure 18. Population estimates and hunting data of red deer, roe deer and wild boar. ***Source: National Game Management Database.***

Ecological, sustainable, and systematic management is important for wild game populations, where the management strategy flexibly adapts to the habitat, as well as to the conservation and other sectoral objectives, and the population dynamics of the species in question. One of the tools to achieve this is the regional game management, which has been in operation since 2017 and coordinates game management in geographical areas of the country with

similar habitat conditions, based on the guidelines laid down in the ministerial decrees containing the regional game management plans.

2.8 Fisheries management

Hungary's fish stock consists of around 90 fish species, but the proportion of native species hardly makes up two-thirds of this. In many of our natural and near-natural waters, a significant share of fish are non-native, introduced earlier for fish farming, including many invasive species.

Of our nearly 60 native species, six have now completely disappeared from our waters (beluga sturgeon *Huso huso*, starry sturgeon *Acipenser stellatus*, Russian sturgeon *Acipenser gueldenstaedtii*, bastard sturgeon *Acipenser nudiventris*, Pontic shad *Alosa immaculate*, and non-introduced individuals of eels) as naturally occurring species. These, without exception, are unable to reach our waters due to habitat conversion south of Hungary (primarily the construction of the Iron Gate I Hydroelectric Power Plant), and past overfishing. The effective conservation of these species is unimaginable without international cooperation. Another threatened group is the one forming the fauna of mountain creeks (e.g. *Barbus peloponnesius petenyi*, Eurasian minnow *Phoxinus phoxinus*, stone loach *Barbatula barbatula*), facing significant, periodic water shortages in the longer term due to climate change. This impact can only be mitigated or counteracted through appropriate habitat development measures and water supply, and, if applicable, by cautious reintroduction programmes. However, much can be done on a national scale for the conservation of the third endangered group, the marsh habitat species (e.g. crucian carp *Carassius carassius*, tench *Tinca tinca*, European mudminnow *Umbra krameri*, weatherfish *Misgurnus fossilis*), by protecting their habitats, preventing the introduction of non-native fish species into these waters, and reducing the number of invasive aquatic plants.

In our **natural waters**, fishing has been almost completely marginalised, and angling has taken over. However, angling in certain waters is not always compatible with conservation management, and in these cases a well-regulated fisheries management might be justified. Even where the exploitation of fish stocks is compatible with the conservation objectives, it is essential to implement measures to increase fish populations by promoting natural reproduction and, if not possible, by stocking fish. An important task, however, is to change the structure of stocks released, optimising the species and age composition. On the one hand, non-native species on no account should be released, on the other hand, the diversity of stocked fish species must be as high as possible in addition to carp – the preferred fish of the Hungarian angling community – to include species whose populations can be increased this way, and whose conservation status is unfavourable, but can be fished. Practically, this mainly concerns the Volga pikeperch *Sander volgensis*, tench *Tinca tinca*, sterlet *Acipenser ruthenus* and crucian carp *Carassius carassius* species. In addition to fish stocking, the conservation, restoration, and, where appropriate, artificial creation of habitats, especially spawning grounds, is key to protecting self-sustaining populations of native fish species. Finally, activities to reduce illegal fishing should be supported.

Aquaculture plays an important role in sustaining biodiversity and strengthening natural fish populations through stocking and conventional semi-intensive fishpond management. The importance of fishponds for nature conservation is best illustrated by the fact that about 50% of the fishponds in Hungary are in protected areas of national interest and 70% are in Natura 2000 sites, which are largely designated due to the habitats and species diversity (especially bird species) linked to these ponds. The intensity of fisheries management plays an important role in sustaining these functions as well. Extensive management provides rather

undisturbed conditions for birds, but the lack of nutrient input leads to the depletion of the ponds' nutrient reserves and, in a short time, to a drastic reduction in the number of individuals and species of waterfowl, and the disappearance of breeding populations. In case of well-managed semi-intensive production, fishponds can maintain natural assets far greater than the value of fish production itself.

The positive impact of **intensive fish farming** is primarily the concentration of production, but the pollutants from flow-through systems can be significant. This problem can be mitigated by recirculation systems. Furthermore, combining intensive and extensive aquaculture into a single system can have positive effects without jeopardising the biodiversity-preserving capability of fishponds. In 2019, there were six fish farms in Hungary that had both intensive and extensive production units, but in most cases these operated separately instead of an integrated way.

2.9 Water management

Numerous actions have been taken to improve the state of our waters, but nutrient and pollutant loads in natural waters and the degradation of riverbeds are still considered to be a major pressure on our waters and water-related ecosystems. As a result of climate change, summers are hotter, with heat waves often causing droughts over large areas, leading to severe damage and weakening the resilience of ecosystems. Periods of water scarcity, extreme low water levels, and the depletion of the available water resources are increasingly frequent, which results in biodiversity loss and thus in a major negative impact on ecosystem services on the long term. In the meantime, wetlands also play a role in climate change mitigation and adaptation thanks to their carbon storage and microclimate regulation functions. Straightened riverbeds and shrinking floodplains, often used for alternative purposes, contribute to the loss of natural habitats, while they may also increase the spread of invasive alien species.

As a characteristic feature of the country's hydrology, 95% of surface waters come from beyond the borders, so the effects of those countries cannot be ignored. Similarly, the surface waters leaving Hungary affect the biodiversity of downstream countries. In case of water bodies with large catchment areas and regulated rivers (in Hungary, primarily the Danube), a major problem is that the previously dynamic balance of sediment transport processes has been lost – not the least due to transversal blockages upstream –, and the river's sediment transport capacity has markedly increased. Since the 1960s, a sediment deficit has developed along the entire length of the Danube. Along the riverbed reaches in loose alluvial layers, a dramatic rate of incision occurs. As a result of this and the often excessive dredging, the entire riverbed has started to deepen, accelerating the separation of the side branches and oxbows from the main riverbed. Riverbed incision causes the lowering of water levels, which in turn lowers the groundwater level as well. This means that the continuous deepening of the riverbed has a direct impact on the gradual drying of the river's islands and riparian areas, the conversion of natural habitats, and in the long term, the drying of side branches and oxbows or the transformation of these areas into stagnant wetlands.

The 2000/60/EC Water Framework Directive (WFD) establishes the legal framework for the protection of inland surface waters and groundwaters. The importance of the WFD lies primarily in the fact that it provides a coherent basis for regulating the quantitative and qualitative protection of surface and groundwaters, for addressing anthropogenic hydro-morphological pressures, and different sources of pollution, and for coordinating measures at river basin level to achieve good water status. The provisions of the WFD should be implemented in an integrated manner, using river basin management planning tools, with

broad stakeholder involvement. The assessment of the ecological status of surface waters should be reported under the WFD.

Implementation of the measures in the River Basin Management Plan (RBMP) will contribute greatly to the conservation of natural assets. Wetlands also make a significant contribution to mitigating the effects of climate change by reducing the warming of the area in question. In Hungary, 71.5% of all wetlands are part of the Natura 2000 network. Based on the objectives of the conservation directives and the WFD, Hungary's obligations include maintaining healthy aquatic ecosystems and achieving a balance between water management, conservation and sustainable use of nature, and the use of natural resources.

In rivers, the main impediments of longitudinal connectivity are dams, whose collateral effects (not enough variability in velocity and water regime; unfavourable water level and sediment conditions) affect the health and regenerative capacity of aquatic and water-related ecosystems. The concept of connectivity was clarified in the RBMP, and a restoration priority was established for transversal structures and for restoring longitudinal connectivity of watercourses, taking into account the ecological prioritisation process applicable to each river basin.

The EEEOP-4.3.0-CCHOP-15-2016-00001 national conservation project also evaluated the status of wetlands. The wetlands assessed are highly diverse areas under permanent or periodic water influence, classified according to the Ecosystem Map, including reed beds, wet meadows, and swamp woodlands. Due to the lack of national databases, the project relied mainly on the characteristics describing anthropogenic pressures, which indirectly indicate the condition, and based on this, they rated the areas on a 5-point scale (higher scores were given to areas with better condition and less exposed to anthropogenic pressures according to the sub-indicators examined). These areas are more frequently covered by water, and are surrounded by more and more diverse aquatic habitats mostly of near-natural habitat types.

The conservation status of most natural wetlands in Hungary still needs improvement. These habitat types are subject to continuous pressures from diverse agricultural pollution affecting both surface and groundwater. Another major threat is water scarcity, which can also be attributed to human activity, and changes in natural water regimes. Wetlands are also more vulnerable to the effects of climate change.

Hungary has 29 Ramsar sites under the Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat, covering 243,000 hectares in total. It is our priority to develop existing Ramsar sites in a way that conserves biodiversity. In the case of wetland restoration, the aim is to design and maintain water management best suited to each habitat type, with particular attention to waterfowl nesting, feeding, and resting sites, and to improve the naturalness of alkaline lakes and their wise management.

Improving the lateral connectivity of side branches and oxbows as well as floodplains blocked by embankments remains an important task. Hungary is a country rich in surface waters, and as such, 19% of its potential vegetation would be alluvial forest, but the river regulations and flood prevention during the recent centuries has reduced this area to 0.8%.

2.10 SWOT-analysis

Based on a detailed assessment, the SWOT analysis summarises the state of Hungary's biodiversity to identify those features that can be considered strengths or potential opportunities, those that are lacking or not evolving in a satisfactory manner, and those that are explicitly considered risks.

Strengths	Weaknesses
• diverse ecological conditions • the uniqueness of the Pannonian biogeographical region • outstanding value of natural resources even by European standards • diverse habitats and landscapes • high diversity of species and wetlands by European standards • Ecosystem Map of Hungary published • a comprehensive analysis and assessment of the distribution pathways of IAS and action plans published • climate change monitoring system • game-caused habitat change monitoring system • systematic national forest inventory • national forest fire database, forest fire risk assessment and early detection system • an outstanding gene bank by European standard (unique agricultural and food genetic resources in Hungary and the Carpathian Basin, and diverse local varieties and breeds) • constitutional protection for a GMO-free agriculture • legal and institutional framework to conserve biodiversity • the majority of Hungarian residents consider nature an important part of their lives • Soil Conservation Action Plan published • the overwhelming majority of residents consider preservation of natural resources	• excessive exploitation of environmental systems • the decline, fragmentation, degradation and loss of natural and near-natural habitats (e.g. extensive grasslands, wetlands, lowland forests) • management practices that often ignore ecological conditions and requirements • ecological and landscape ecological links between protected areas are not maintained • a high ratio of habitats and species are in unfavourable conservation status • the majority of natural habitat-types are in unfavourable condition • in protected areas that are not managed by national park directorates, conservation objectives often conflict with the proprietary or managerial objectives (financial gain) • low ratio of protected areas with published management plans • the conservation status of species associated with agroecosystems in the Pannonian biogeographical region is mostly unfavourable • plot sizes that are too large to maintain biodiversity; large areas of contiguous, intensive crops with no forest or shrub patches to shelter biodiversity • the landscape is less mosaic, and there are less and less habitat edges, dirt roads, and protective forest patches • deterioration of habitats linked to agriculture • decline of farmland bird populations • lack of farmers' knowledge about the environmental impact of farming, low

important and the majority is concerned about the destruction of nature	motivation to practise nature-friendly farming, lack of expert technical advice • low exploitation of the environmental, social and economic potential of organic farming and low consumer demand • proliferation invasive alien species • the proportion of land covered by natural forests is low by European standards • the share of structurally rich forest stands of native species and high naturalness is insufficient • degradation of soil life • the importance of biodiversity and ecosystem services is not or not sufficiently understood, the planning timeframe is too short and the approach of representatives of the environmental resource management sectors and decision-makers is not holistic enough
Opportunities	**Threats**
• economic recognition of the value of biodiversity and ecosystem services • mainstreaming the conservation of biodiversity and ecosystem services into the design of subsidy schemes • introduction of conditionality and agro-ecological subsidies for biodiversity conservation under the Common Agricultural Policy • increase in the areas under organic farming • farmers' and expert technical advisors' increased knowledge, and increased social awareness about climate change, biodiversity, and ecosystem services • promoting sustainable forest management to support biodiversity conservation to ensure the survival of forests • taking into account the biodiversity potential of waterlogged areas in order to preserve the long-term water balance (conversion of extreme waterlogged areas into wetlands) • increasing social demand for an environmentally conscious lifestyle that takes biodiversity conservation into account	• the dominance of short-term economic interests over medium- and long-term environmental, social, and economic needs • globally, the goal is the competitive growth based on natural capital, and the current consumer society is not prepared for the change of mind-sets required for the long-term conservation of biodiversity • biodiversity conservation is not or not sufficiently integrated into sectoral policies • pressures from socio-economic growth exceed the carrying capacity and resilience of environmental systems • light pollution • increase in climatic extremities • large-scale spread of invasive alien species and introduction of new ones • increasing land requirements of infrastructure and investment at the expense of natural and near-natural areas • adverse land use trends • natural resources of protected areas and Natura 2000 sites may be significantly

• easier mobilisation of companies to support specific biodiversity conservation projects in order to strengthen their environmental/green image • increasing forest cover and afforestation in appropriate habitats and with appropriate tree species • further promotion of close-to-nature forest management • promoting conservation through greater use of environmental education and ecotourism • the largely untapped awareness-raising potential of the national park directorates, state forestry companies, arboretums, nature parks, geoparks and public collections for education and awareness-raising • catching up underdeveloped regions by promoting nature-friendly farming • developing a common regional policy with neighbouring countries following a GMO-free strategy • teaching a climate-conscious approach to farming that conserves natural resources at all levels of vocational education, starting at secondary level • incorporating knowledge of the importance and conservation of biodiversity as a basic competence in agricultural vocational education • prioritising brown fields and rust belts for investments and industrial site selection • better use of synergies with climate protection and biodiversity conservation	threatened by direct and indirect impacts linked to inappropriate management • further degradation of habitats, especially in terms of ecosystem transitions (e.g. loss of forest edges, tree groups, small water bodies) • the pace and extent of climate change is challenging the resiliency of forests • further intensification of agricultural production, and an increased share of large-scale monoculture farming • in the absence of compensation for lost revenue, less biodiversity-friendly but more profitable forms of farming will prevail on private property • more intensive use of low productivity but biodiversity- rich areas • a further decline in pollinator populations • an unsustainable increase in the use of biomass for energy purposes • the loss of natural genetic recombination due to the isolation of habitats • the presence of GMO-contaminated seeds on the Hungarian seed market • loss of Hungary's GMO-free status • the lack of environmental education in public education • the lack of support for forest schools • the quantity and quality of arable land is declining at a dangerous rate

Hungary has natural assets of outstanding value in European comparison, with a diverse range of species and habitats. However, the global trend that drivers of biodiversity loss and degradation are expanding and worsening faster than the development and implementation of policy measures to address biodiversity loss is also evident in Hungary.

3 THE STRATEGY

3.1 The vision

The 3rd National Biodiversity Strategy aims to **restore Hungary's biodiversity by 2030**, promoting the well-being of people and the long-term sustainability of nature and the economy. This will ensure the survival of our country's diverse biodiversity, which is significant even on a European scale.

The key objective of the strategy is to ensure that biodiversity conservation considerations are properly integrated into cross-sectoral policies, strategies, programmes and their implementation, so that short-term economic interests do not compromise the long-term conservation of biodiversity. To this end, the 3rd National Biodiversity Strategy identifies the following objectives, targets, and measures to achieve them.

3.2 The strategy

Strategic area I: Reducing threats to biodiversity

Measurable targets	Measures directly related to targets	Indicators
Objective 1: Establishing a coherent network of protected areas, improving the status of protected areas and Natura 2000 sites, and ensuring an appropriate conservation management.		
Target 1.1 Increasing the size of area under protection[16].	▫ The inventory of sites suitable for achieving the target for the extent of protected areas, in consultation with stakeholders, and based on the criteria set out in the European Commission (EC)[15] guidelines, taking into account the need to ensure an appropriate level of protection for native species and their habitats. ▫ Based on the result of the inventory, ensuring the level of protection as set out in the EC guidelines as appropriate: o by extending the areas included in the conservation area categories under national law (e.g. by designation), o by supplementing or improving existing legislation on areas already included in the conservation area categories under national law (e.g. core areas of ecological network, and the ecological corridor). ▫ Adapting the two main sets of measures under the point above for areas under strict protection[17] according to the EC guidelines (e.g. the zoning classification of national parks).	Size of protected areas[16] (ha) Size of strictly protected areas[17] (ha)

[15] SWD(2022) 23 final (*Commission staff working document - Criteria and guidance for protected areas designations*)
[16] "Protected areas" are understood as the areas classified as protected by the EU Biodiversity Strategy for 2030.
[17] "*Strict protection*" is understood as the term in the EU Biodiversity Strategy for 2030, for which the respective criteria can be found in the European Commission's guidelines (SWD(2022) 23 final).

Target 1.2 Improving the connectivity of protected areas.	◻ Identifying development objectives and intervention areas to improve the condition, ecosystem services, and connectivity of green infrastructure, taking into account the criteria set out in Objective 15. ◻ Enhancing the ecological network through the development of existing and potential green infrastructure elements based on the evaluation of ecological condition, ecosystem services, and spatial connectivity. ◻ Ensuring in regulatory instruments that green corridors and ecological connectivity are fully ensured during construction or development projects.	Size of areas of potential green infrastructure elements (ha)
Target 1.3 Effectively maintaining and improving the condition of habitats and natural resources in protected areas.	◻ Enforcing and, where necessary, supplementing the relevant national regulation for areas under EU protection and strict protection. ◻ In case of protected areas of national importance, designating buffer zones for the conservation of biodiversity where necessary, as mandated by the Nature Conservation Act. ◻ Promulgating conservation management plans for protected areas of national importance with management plan documentation. ◻ Preparing the management plans for protected areas of national importance without such a document. ◻ Developing the conditions for conservation management of protected forest stands under conservation asset management. ◻ Preparing management plans for all Natura 2000 sites, and defining site-specific objectives and measures. ◻ Increasing attention in the framework of the agricultural subsidy scheme to the protection of micro-habitats and refuges (e.g. habitat edges, shrubs, tree groups, and ancient	Number of Natura 2000 sites with management plan and target documentation (pcs) Percentage of habitat types with a favourable or improving conservation status based on the current evaluation of the conservation status of habitat types of community interest (%) Percentage of protected areas of national importance with conservation management plans prepared in accordance with the legislation in force (%)

	burial mounds protected *ex lege* – by force of law), which are key for biodiversity conservation.	
Objective 2: Restoring degraded ecosystems, preserving and restoring their natural resources and service-providing capacity.		
Target 2.1 Restoring at least 34,000 hectares of **wetlands** and preventing their further degradation.	▫ Investments to ensure the water balance necessary for the conservation of the habitat (renovation and construction of water retention structures; filling of drainage channels; demolition of embankments, dykes and landfills; removal of accumulated sediment). ▫ Dismantling artificial embankments where necessary, and removing illegally dumped waste for treatment (other habitat restoration). ▫ Creating a grassland buffer zone around wetlands. ▫ Creating new wetlands. ▫ A one-time, large-scale reduction of other woody vegetation that threatens habitats outside forests, providing the basis for long-term management. ▫ Controlling invasive plant species and reducing invasive fish, crustacean, and reptile populations. ▫ Interventions to control big game and huntable predatory mammal populations.	Extent of wetlands affected by habitat restoration and the development of management infrastructure (ha)
Target 2.2 Interventions and restoration activities on at least 35,000 hectares of **permanent grasslands** to prevent further deterioration, in order to conserve their natural values in the long term, and to establish the necessary ecological conditions.	▫ Collecting good practices for grassland restoration, developing a regulatory framework for implementation (e.g. to ensure availability of seed mix for grassland restoration). ▫ Using nature-friendly management practices on permanent grasslands. ▫ Investments to ensure the water balance necessary for the conservation of water-dependent grassland habitats (renovation and construction of water retention structures; filling of drainage channels; demolition of embankments, dykes and landfills; removal of accumulated sediment). ▫ Controlling succession by one-time, large-scale control of	Extent of permanent grassland affected by habitat restoration and the development of management infrastructure (ha)

	woody vegetation as a basis for long-term management. - Interventions to control big game and huntable predatory mammal populations. - Measures to control invasive plant species. - Restoring derelict enclaves, demolishing disused buildings, removing inert waste for appropriate treatment. - Establishing grassland or scrub buffer zones adjacent to high nature value grassland habitats, by abandoning ploughing or creating hedgerows. - Reintroducing or translocating species characteristic of a given habitat type to improve its naturalness.	
Target 2.3 Interventions and restoration activities on at least 135,000 hectares of **forest ecosystems** to prevent further deterioration of forest habitats, in order to conserve the natural resources in the long term, and to establish the necessary ecological conditions.	- Providing the administrative tools (e.g. management plan, forest planning specifications) for the management of forests under conservation asset management during forest management planning. - Ensuring the management and the site-specific, active restoration of degraded steppic woods and their buffer zones in accordance with their conservation objectives. - Investments to ensure the water balance necessary for the conservation of water-dependent forest habitats (renovation and construction of water retention structures; filling of drainage channels; demolition of embankments, dykes and landfills; removal of accumulated sediment). - Implementing habitat restoration measures to improve the naturalness of forests. - Promoting forest management practices among private forest managers that lead to enriched forest structures. - Interventions to control big game and huntable predatory mammal populations. - Measures to control invasive plant species.	Size of forests affected by habitat restoration developments and the development of management infrastructure (ha)

Objective 3: Improving the status of species in an unfavourable conservation status.		
Target 3.1 The conservation status and population trends of **species of community interest** currently in an unfavourable or poor conservation status will not deteriorate, with at least 30% of them reaching favourable conservation status or showing at least signs of recovery.	▫ Promoting research on population changes and their ecological impact on species of community interest, and increasing funding. ▫ Establishing and operating an agricultural subsidy scheme (zonal targeting, species-specific agri-environmental payments, compensations) for the conservation of species of community interest associated with arable lands. ▫ Maintaining and creating habitat edges, hedgerows, and other micro-habitats in natural and near-natural habitats and urban environment. ▫ Assessing the medium-voltage grid from a bird conservation perspective, monitoring the grid's operation, maintaining and continuously updating the database of conflict maps identifying the most problematic sections, replacing overhead power lines causing significant bird mortality by bird-friendly underground cables, and installing other equipment preventing bird collisions and electric shock. ▫ Installing equipment to facilitate the establishment and successful breeding of birds of community interest (e.g. nest boxes, artificial nests, nesting platforms). ▫ Ensuring the operation, and where necessary, the development of rescue centres providing proper conditions for the temporary accommodation of injured and rescued bird and mammal species of community interest. ▫ Creating the necessary ecological conditions for the conservation of native bat species, including bat-friendly closure of caves used for roosting and breeding, cleaning and stabilisation of the affected passages, and specific measures to conserve bat colonies living in buildings.	Number of species of community interest with conservation plan (pcs) Percentage of species with a favourable or improving conservation status based on the current evaluation of the conservation status of the species of community interest (%)

	◻ Investments to mitigate the impact of linear structures (roads) that isolate native amphibian and reptile populations (e.g. installation of guide walls and amphibian passages) at critical locations with the highest mortality. ◻ Ex-situ conservation measures for plant and animal species of community interest, including artificial propagation and breeding, reintroduction and translocation to potential habitats. ◻ Joint operations with the police against illegal actions against protected wild flora and fauna, such as illegal poisoning, deliberate destruction of nests, and illegal collection. ◻ Supporting voluntary public/farmer involvement initiatives to conserve native species (e.g. bird-friendly and butterfly-friendly gardens, butterfly-friendly vineyards). ◻ Promoting extensive forest management with retention of dead trees, and old hollow trees in adequate quantities. ◻ Promoting the development and use of (nocturnal) insect-friendly outdoor lighting techniques to reduce light pollution. ◻ Creating artificial wetlands (e.g. feeding ponds, standing waters) or spawning places linked to natural waters to conserve species of community importance. ◻ Ensuring the longitudinal connectivity of natural watercourses (e.g. construction and renovation of fish ladders and bypass channels, inspection the efficiency of existing fish ladders).	
Target 3.2 Improving the conservation status of **other protected species** not listed in the Habitats Directive.	◻ Promoting research on population changes and their ecological impact on protected species not listed in the Habitats Directive, and increasing funding. ◻ Updating the legislation granting protection based on the	Number of protected species not listed in the Habitats Directive with a conservation plan (pcs)

	current threat status of the species and new scientific findings (taxonomic changes). ▫ Implementing the measures defined in the adopted conservation plans, elaboration of conservation plans for endangered species and groups of species. ▫ Extending the monitoring system to track the conservation status of protected species not listed in the Habitats Directive. ▫ Measures for the most endangered protected species not listed in the Habitats Directive.	
Target 3.3 Identifying and improving the conservation status of certain **non-protected key species**.	▫ Selecting and prioritising key species with small numbers but significant ecological function based on their ecological characteristics. ▫ Assessing the baseline status of certain key species and including them in the monitoring. ▫ Evaluating certain non-protected indicator species from a conservation perspective. ▫ Urgent interventions for the most endangered non-protected indicator species.	Number of non-protected key species included in monitoring (pcs)
Objective 4: Reducing the populations and preventing the further spread of invasive alien species (IAS) damaging natural and near-natural ecosystems, and preventing the introduction and establishment of potentially dangerous invasive species in Hungary.		
Target 4.1 Controlling and preventing the **spread of invasive alien species** that damage natural and near-natural ecosystems.	▫ Increasing the areas managed against invasive plant and animal species by 50%. ▫ Active participation of all relevant sectors (agriculture, forestry, game and fisheries management, food chain inspectorate, water management, nature conservation) in the implementation of action plans for each pathways of spread. ▫ Promulgating a national list of IAS and measures to control their spread. ▫ Implementing action plans for the pathways of spread. ▫ Regular inspection of plant and animal shops, active	Size of managed areas covered with invasive alien plant species on the EU list widespread in Hungary (ha) Number of shot individuals of invasive alien animal species on the EU list and huntable in Hungary (pcs)

	investigation of illegal action. ▫ Developing species-level management plans to control IAS of potential conservation concern. ▫ Targeted interventions for the management and control of invasive alien plant and animal species based on management plans. ▫ Targeted capture of alien fish species from natural waters. ▫ Raising national awareness concerning the problems caused by IAS in outskirts or residential areas.	Number of invasive alien species with management plans (pcs) Number of inspected plant and animal shops, and the percentage of illegal activities detected, i.e. where a species on the EU list was illegally traded (%) Catch of alien fish (tons/year)
Target 4.2 Preventing the **introduction of newly emerging IAS** that pose a potential threat to biodiversity.	▫ Strengthening international and regional cooperation. ▫ Detecting pathways of spread for IAS newly included in the EU list. ▫ Developing a knowledge base for the early detection of IAS. ▫ In case of species to be newly introduced, the assessment of invasiveness and its results are publicly available from the sectors concerned (agriculture, forestry, game and fisheries management, food chain inspectorate, water management). ▫ Prohibition of commercial circulation of 'ornamental' species with invasive properties. ▫ Prohibition of the planting of 'ornamental' species with unknown characteristics outside residential areas.	Number of invasive species introduced and settled in Hungary between 2020 and 2030 (pcs) Number of identification sheets created for species newly introduced to the European Union's schedule (pcs) Number of invasive alien species of known pathways of spread with elaborated action plans (pcs)
Objective 5: Protecting species threatened by commercial exploitation.		
Target 5.1 Reducing **illegal trade** of wild animal and plant species.	▫ Strengthening border controls, providing adequate staff and infrastructure to carry out their tasks and investigate detected infringements for effective enforcement of EU and national legislation. ▫ Intensifying systematic prioritised control within the national borders, ensuring adequate staffing and infrastructure to carry out the tasks.	The proportion of inspections carried out and offences detected (%) Number of training activities organised (pcs)

	◻ Launching the National Environmental Security Taskforce and ensuring regular information exchange and cooperation between authorities. Elaborating a strategy to increase enforcement efficiency. ◻ Regular training of CITES enforcement authorities. Raising public awareness of the impact of trade in endangered species on biodiversity loss. ◻ Implementing the EU Action Plan to curb illegal trade in wild fauna and flora.	
Target 5.2 Ensuring the **sustainability of trade** in wild animal and plant species.	◻ Assessing wild populations of species in Hungary listed in the CITES register, and determining the amount that can be exploited. ◻ Improving the IT support for the CITES register. ◻ Transitioning to electronic licensing for the export, import, and re-export permits, and EU certificates.	The proportion of paper and electronic licences issued (%)
Objective 6: Reducing pollution threatening biodiversity.		
Target 6.1 Measures to reduce the use and risk of **chemical pesticides**, and to reduce the use of more hazardous pesticides[18].	◻ Using integrated pest management to increasingly replace chemical pesticides with agrotechnical and biological processes. ◻ Encouraging resistance breeding using traditional breeding methods. ◻ Reviewing desiccation practices. ◻ Regular controlling the use of banned chemicals – which often cause the poisoning of birds of prey – and the illegal	Use and risk of chemical pesticides based on the methodology of the "Farm to Fork" strategy[19] Area affected by emergency authorisation (ha)

[18] These are pesticides containing active ingredients that meet the exclusion criteria determined in Sections 3.6.2–3.6.5. and 3.8.2. of Annex II of Regulation (EC) No 1107/2009, or are identified as materials indicated for substitution in coherence with the criteria listed in Section 4 of the said annex.

[19] https://ec.europa.eu/food/plants/pesticides/sustainable-use-pesticides/farm-fork-targets-progress/member-states-trends (calculation based on the harmonised risk index according to sales data as per Directive (EU) 2019/789, without microbiological plant protecting agents and using base values for the years 2015-2017)

	or sub-standard use of legal pesticides. ▫ Finding alternative solutions to prevent emergency authorisations of unauthorised active ingredients. ▫ Promoting the collection of pesticide wastes and products withdrawn from commercial circulation, and their mandatory disposal at collection points. ▫ Full prohibition on the use of neonicotinoids in crops attracting pollinators. ▫ Monitoring the effects of chitin synthesis inhibitors on non-target organisms. ▫ Promoting sustainable use of pesticides, minimising risks, following good practice; encouraging the use of alternative technologies and developing technical advice service. ▫ Promoting and developing moderate, conscious and responsible behaviour of the industry, farmers and other pesticide users. ▫ Encouraging the environmentally friendly application of pesticides and biostimulants in agriculture according to the technological specifications.	Quantity of pesticides applied per unit area (kg/ha) Number of protected and huntable vertebrates per species killed by poisoning (pcs) Quantity of products withdrawn from circulation, disposed as hazardous waste (litres, pcs) Number of inspections on the application and use of pesticides and percentage of irregularities detected (%)
Target 6.2 Improving the spectrum and species-specificity of **external and internal parasiticides**, and reducing their use.	▫ Supporting research to reduce pollution from antiparasitic products (external and internal parasiticides) in intensive livestock farming. Practical application of research results in livestock farming. ▫ Increasing and promoting mosquito-selective biological control methods (e.g. *Bacillus thuringiensis*) to control mosquito populations. ▫ Introducing restrictive measures (e.g. buffer zone designation) for chemical mosquito control (deltamethrin) in organic farming areas and in green urban areas.	Areas affected by mosquito-selective biological control (ha)
Target 6.3 Significantly reduce the adverse	▫ Promoting integrated nutrient management. ▫ The Common Agricultural Policy includes provisions on	Number of soil and land

environmental impacts of **crop yield and performance enhancers** used in agriculture.	the use of appropriate cultivation techniques, the restriction of row crops on slopes above 12%, the use of cover crops and the establishment of buffer strips, in order to reduce fertiliser use and thereby the resulting nutrient leaching by 50%. ▫ Promoting the use of organic manure and green manure from extensive farming to restore soil organic matter. ▫ Improving the legislation on and defining the strategic issues of soil protection, strengthening the legal guarantees and economic instruments for the protection of arable land. ▫ Supporting measures to protect soil life. ▫ Promoting prolonged waterlogging to prevent nutrients leaching from soil into surface waters. ▫ Reducing diffuse pollution of agricultural origin to reduce water pollution. ▫ Monitoring compliance with arable land and soil conservation regulations. ▫ Training, educating, and raising awareness to promote a change in farmers' attitudes towards soil conservation and sustainable soil use. ▫ Providing farmers with information on good practices and methods to reduce negative environmental impacts of agricultural origin.	conservation compliance checks, and the share of non-compliance (pcs, %)
Objective 7: The release of genetically modified organisms (GMO) into the environment does not threaten biodiversity.		
Target 7.1 Keeping the **GMO-free status** of agriculture.	▫ Total prohibition of the cultivation of genetically modified crops. ▫ Increasing monitoring of seeds, feed, and food products to detect GMO contaminated lots. ▫ Immediate and safe destruction of contaminated lots and any sprouted crops. ▫ Promoting the 'GMO-free food trademark' of the Ministry	Extent of GMO-free areas (ha) Proportion of GM crops authorised for cultivation at EU level and of GM crops banned in Hungary under the opt-out possibilities provided by EU

	of Agriculture to establish a GMO-free product chain. ▫ Increasing the capacity of the Certification Body to be able to deliver the necessary quantity and quality of certifications. ▫ Systematic and regular monitoring of compliance with the legislation on GMO-free labelling on products on the market, withdrawing products unlawfully bearing 'GMO-free' labels or trademarks.	legislation (%) Number of businesses/companies selling products with the 'GMO-free food trademark' of the Ministry of Agriculture (pcs) Number of checks of products with unlawfully used 'GMO-free' label/trademark (pcs/year)
Target 7.2 Minimising environmental risks from the **non-agricultural use** of GMOs.	▫ Strengthening risk assessment of gene technology activities (in particular contained use of GMOs) and annual control of risk assessments of such uses. ▫ Strengthening and monitoring of relevant waste management rules and other precautionary approaches for contained uses of GMOs. ▫ Inspecting at least 30% of authorised gene technology activities annually. ▫ Develop inspection protocols for different types of gene technology activities. ▫ Regular training of the authorities responsible for the control of gene technology activities. ▫ Developing control protocols and detection methods for illegal gene technology activities. ▫ Detecting, withdrawing, and destroying GMOs illegally released on the market.	Number of official controls on the contained use of GMOs (pcs) Number of control protocols (pcs)
Target 7.3 Improving knowledge of detection methods and environmental impacts on organisms obtained by **new genomic techniques** (NGT) in order to ensure	▫ Promoting research and providing resources for the development of detection methods for NGTs and the environmental impact of organisms obtained by such techniques. ▫ Establishing cooperation between the control authorities,	Number of studies on the detection of NGTs (pcs)

proper monitoring and prevent adverse impacts on biodiversity.	research institutes and education institutions, in particular to conduct research on NGTs and organisms obtained by such techniques.	
Objective 8: Assessing the status of pollinators, halting their decline, and maintaining and restoring pollination as an ecosystem service.		
Target 8.1 Increasing knowledge of the native populations of **pollinating insects**, trends in population changes, their causes and consequences, and the ecological needs of these species.	◻ Identifying and facilitating collaboration between relevant sectors to address data gaps in pollinator status assessment. ◻ Elaborating, launching, maintaining and long-supporting on the long term a national monitoring programme for wild pollinators in the framework of the National Biodiversity Monitoring System, harmonised with the EU pollinator monitoring methodology, in cooperation with the sectors concerned. In particular: ○ developing a national methodology protocol by adapting the EU methodology; ○ developing a sampling network; ○ running a pollinator monitoring programme involving professional and public stakeholders. ◻ Promoting and funding research on the conservation of pollinators and their habitats (e.g. understanding the impact of IAS, pesticides, or climate change). ◻ Improving and refining the assessment and mapping of pollination as an ecosystem service.	Established wild pollinator monitoring protocols (pcs) Number of wild pollinator sampling locations (pcs) Change of populations of wild pollinators involved in the national monitoring programme, at selected locations
Target 8.2 Eliminating the **underlying causes** of pollinator decline.	◻ Assessing the national factors threatening pollinators and pollination, based on the impact on pollinators and pollination. ◻ Eliminating habitat loss and restoring habitats providing nesting and feeding sites/sources for pollinators in agricultural and municipal environment. ◻ Using light fixtures that provide appropriate direction and colour temperature when designing and constructing artificial outdoor lighting (especially public street lighting)	Number of reported bee mortality (pcs/year) Population changes of wild pollinators in selected sites included in the national monitoring programme

	to reduce light pollution.	
Target 8.3 Improving **living conditions** of pollinators.	▫ Exploring the conservation status of wild pollinators and, if necessary, raising the level of protection of certain species. ▫ Delineating areas with low pollination potential in terms of wild pollinators, and identifying options and elaborating guidelines for pollinator-friendly development of these areas, elaboration of guidelines. ▫ Protecting and restoring natural pollinator habitats, with a special focus on endangered species and their habitats. ▫ Developing intersectoral partnerships to maintain and restore pollination as an ecosystem service. ▫ Incorporating results and recommendations from the assessment and mapping of ecosystem services related to pollinators into the activities and decision-making processes of relevant sectors. ▫ Developing pollinator-friendly habitat management practices and promoting their use in agricultural and municipal environments. ▫ Promoting the creation of habitats favourable for pollinators (e.g. areas with permanent flower cover in the growing season, mosaic landscapes, crop diversification on farm-level) in agricultural areas. Ensuring this through the agricultural subsidy scheme and by encouraging and raising awareness of the production, marketing, and use of bee plant seed mixes (‘bee forage’) of preferably native, multi-species seed mixtures, with appropriate state funding. ▫ Encouraging the creation of pollinator-friendly areas and bee pastures, and their pollinator-friendly management. Ensuring this through land-use planning and relevant projects, and by encouraging and raising awareness of the production, marketing, and use of bee plant seed mixes.	Assessment of pollination potential and pollination demand at a national level Area affected by habitat restoration supporting pollinators (ha)

	▫ Strengthening professional communication and awareness-raising between sectors on pollinator conservation, and the dissemination of pollinator-friendly measures (e.g. development and dissemination of common guidelines through the network of farming consultants and other advisors). ▫ Broad public awareness raising on pollinators through thematic communication actions, guides, and educational materials.	
Objective 9: Increasing understanding of the correlations between climate change and biodiversity conservation, improving the resilience of ecosystems, and conserving biodiversity to mitigate the effects of climate change and facilitate adaptation.		
Target 9.1 Regarding the understanding and research of the **correlations between climate change and biodiversity**: o Exploring, assessing, and estimating the current and future impacts and risks of climate change on native biodiversity. o Exploring the role of biodiversity in climate regulation and adaptation to climate change.	▫ Increasing knowledge about the impacts of climate change on native species, natural and near-natural habitats. ▫ Increasing knowledge about the impact of climate change on newly emerging species in Hungary. ▫ Assessing future risks of climate change to native ecology. Exploring the correlations between the loss of near-natural ecosystems, the quantitative and qualitative degradation of their state and services (e.g. carbon sequestration, carbon storage, water retention) and climate change. ▫ Assessing the impacts of climate change on the quantity and quality of ecosystem services. ▫ Encouraging studies to compare the carbon sequestration and storage capacity of different habitat types (e.g. grassland, forest).	Number of research studies on the link between climate change and wildlife and their translation into sectoral strategies (pcs) Number of ecosystem service assessments on climate change and adaptation (pcs)
Target 9.2 Preserving and enhancing the **role of ecosystems in climate regulation**, and improving their resilience.	▫ Strengthening connectivity between natural and near-natural ecosystems ▫ Exploring possible solutions for the conservation and restoration of near-natural ecosystems in the context of adaptation to climate change. ▫ Conserving close-to-nature and restoring degraded forest	Coverage of forests, wetlands and grasslands affected by habitat restoration and management infrastructure developments (ha)

	ecosystems to strengthen the resilience of society and the economy to climate change and its impacts. ▫ Promoting afforestation for climate protection purposes, in full consideration of ecological principles. ▫ Conserving Pannonic grasslands and associated habitats on the long term. ▫ Conserving near-natural aquatic and water-dependent ecosystems (wetlands), restoring degraded aquatic ecosystems and wetlands. ▫ Encouraging the restoration of peatlands, their removal from agricultural use and conversion to other land use types considering their vulnerability and their role in climate change mitigation (carbon storage). ▫ Promote the use of climate-friendly solutions in the agriculture and forest management (e.g. technologies and practices that help reduce emissions). ▫ Encouraging the use of *nature-based solutions*[20] that promote biodiversity and ecosystem conservation for a more climate resilient society and economy.	

[20] The UNEA-5 resolution formally adopted the definition of NbS 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.' (Source: Decision of the 5th session of the UN Environment Assembly).

Strategic area II: Sustainable use of biodiversity and benefit-sharing

Measurable targets	Measures directly related to targets	Indicators
Objective 10: Promoting sustainable and mosaic farming, taking into account biodiversity conservation and the aspects of environmental and landscape protection, and mainstreaming biodiversity conservation in the Common Agricultural Policy.		
Target 10.1 Ensuring a coherent network of **landscape elements with high biodiversity** on at least 10% of the country's territory.	◻ Establishing, restoring and conserving green infrastructure elements associated with agricultural areas, and creating a habitat structure more favourable to species diversity. ◻ Extending areas eligible for direct payments under the CAP to include elements important for biodiversity conservation (e.g. protective forest strips, tree plantations, woody/shrub strips, hedge rows, uncultivated field margins, riparian zones, areas with intermittent water cover, wetlands). ◻ Establishing landscape features important for biodiversity conservation on 10% of arable land (e.g. protective forest strips, tree plantations, woody/shrub strips, hedge rows, uncultivated field margins, riparian zones, areas with intermittent water cover, wetlands). This aspect should be taken into account when setting the conditionality requirements for farmers, in line with the expectations set out in the CAP. ◻ For other protected landscape features (e.g. ancient burial mounds), supporting the restoration of ecological function, e.g. through grassland restoration. ◻ Supporting the conservation of extensive orchards. ◻ Delineating areas with a typical Hungarian landscape heritage, suitable for maintaining traditional landscape use. ◻ Encouraging the establishment of agro-forestry	Proportion of high biodiversity landscape elements in arable land (%) Extent of non-cultivated areas eligible for subsidies under the CAP (field edges, protective forest strips, etc.) (ha)

	systems, with particular attention to the use of native tree species and fruit landraces.	
Target 10.2 Increasing the area under **organic farming** to 15%.	▫ Expanding the possibilities of organic farming by broadening the research background, plant breeding, and providing alternatives for crop protection. ▫ Providing significant incentives for conversion to organic farming and supporting the promotion of organic products under the CAP subsidy scheme. ▫ Increasing the knowledge of agricultural consultants/advisors about organic farming. ▫ Increasing farmers' knowledge of agroecology through national and small-scale awareness-raising campaigns and through agricultural consultants/advisors. ▫ Promoting organic farming and the consumption of organic food, including by raising consumer awareness among Hungarian farmers and the general public. ▫ Encouraging and promoting the use of organic products in public catering, including by increasing the share of locally produced organic products in 'school milk', 'school vegetable' and 'school fruit' programmes. ▫ Ensuring the possibility of organic farming training in higher education. ▫ Ensuring that the theoretical and practical aspects of organic farming are clearly presented in secondary agricultural vocational education.	Share of organic farming areas in comparison to the total cultivated area (%)
Target 10.3 Promoting and supporting **sustainable farming practices** adapted to agro-ecological	▫ Mainstreaming biodiversity conservation and sustainable management of natural resources into CAP measures (e.g. integrated pest management,	Agricultural biodiversity indicator (indicator for birds associated

conditions.	environmentally friendly and soil-conserving farming, regenerative agriculture). ▫ Maintaining and operating payment schemes for the conservation of agricultural biodiversity under the CAP. ▫ Establishing and operating a network of 'green advisors' to ensure the most effective implementation and use of biodiversity conservation measures under the CAP Strategic Plan. ▫ Under the CAP, introducing and operating a basic agro-ecological scheme (eco-scheme) to promote agricultural practices that support biodiversity conservation and encourage farmers to participate in the programme. ▫ Promoting and supporting the conversion to land uses more favourable to biodiversity conservation (e.g. conversion of low quality arable lands to grasslands) in areas unsuitable for agriculture, especially in areas prone to erosion, drought, or waterlogging, in order to switch to a land use better suited to natural conditions. ▫ Preventing extensive soil degradation. ▫ Developing specific land use standards for grassland and arable land in the Natura 2000 areas to protect the wildlife associated with these areas. ▫ Providing compensatory allowances for Natura 2000 grassland and arable land under the CAP. ▫ Increasing the extent of High Nature Value Areas (HNVA) supporting conservation farming practices to 400,000 hectares. ▫ Conserving permanent grasslands, halting the loss of grassland areas, and ensuring the preservation of their favourable state, in particular by promoting extensive,	with agricultural habitats) Percentage of agricultural land covered by payments for biodiversity and/or landscape conservation (%) Extent of HNVA (ha) Areas eligible for agri-environmental subsidies in HNVA (ha) Extent of permanent grassland (ha)

	grass-based grazing, taking into account ecological aspects. ▫ Developing "wildlife friendly" irrigation projects, including the construction of wildlife crossings and wildlife rescue structures on irrigation canals. ▫ Operating harvesting machinery in a "wildlife friendly" way, and defining technical standards for wildlife protection equipment. Controlling the proper use of such equipment and penalising their absence.	
Objective 11: Conserving and ensuring access to genetic resources and fair and equitable sharing of the benefits arising from their use.		
Target 11.1 Ensuring the long-term conservation of **plant genetic resources** for food and agriculture: ○ maintaining and expanding the collections kept in plant gene banks and other gene conservation institutes in the frame of *ex situ* conservation; ○ making plant genetic resources conserved in *ex situ* collections available, and encouraging their *in situ* and *on farm* conservation.	▫ Ensuring continued financial resources for the conservation and development of genetic resources for food and agriculture. ▫ Designating gene bank collections of high genetic value as National Gene Bank Collections. ▫ Increasing the number of plant genetic resources conserved in public gene banks by 10% through collection, exchange of propagating material and seeds. ▫ Making available at least 50% of plant genetic resource collections, and increasing distribution among the public by at least 10%. ▫ Producing 15% more on a 15% larger area of gene bank lots designated to meet a wider range of user demands. ▫ Developing new pilot programmes for the species and breeds/cultivars most sought after by the general public and most affected by the impacts of climate change. ▫ Establishing and maintaining at least 50 new demonstration gardens in the framework of the	Number of collections and items held in plant gene banks (pcs) Amount of budgetary and other support used for the maintenance and development of gene bank collections (HUF/year) Number of gene bank collection samples made available for the public (pcs/year) Number of newly established demonstration gardens (pcs/year) Number of registered landraces (pcs)

	agreement on the cooperation for the conservation of old fruit varieties adapted to the landscape of the Carpathian Basin. - Increasing the number of registered landraces by 30% by facilitating their registration and the access to them, to increase their use. - Raising public awareness of genetic resources held in gene banks by collecting and disseminating users' experiences of cultivation, use, and market.	
Target 11.2 Ensuring the long-term conservation of **animal genetic resources** for food and agriculture, and increasing the number of specimens and populations conserved: - *in vitro*; and - *in vivo*.	- Ensuring continued financial resources for the conservation and development of agricultural genetic resources. - Establishing a national, state operated in vitro gene bank and *in vitro* conservation of genetic material samples of all domestic and endangered farm animal species and breeds. - Developing safety *in vitro* duplicates of farm animal species in various institutions and increase the number of duplicates by 30%. - Creating safety *in vivo* duplicate populations of the following breeds: Carpathian Brown cattle, Cikta sheep and Hungarian Yellow chicken. - Establishing a Black Mangalica nucleus population and its maintenance by the state. - *In vivo* conservation of nucleus populations of protected domestic and endangered farm animal breeds at properties maintained by the State. - State recognition of Polled Zackel (Suta Racka) sheep, the Yellow-headed Tsigai from Covasna and the Transylvanian spotted turkey as native farm animal breeds.	Number of nucleus populations of protected domestic breeds conserved (number/animal species) Number of duplicate samples per species (pcs) Number of specimens and breeds/cultivars kept *in vitro* (pcs)

	◻ In the framework of the development of fish gene banks, expanding the *in vivo* gene bank stocks of carp breeds, sturgeon species, tench, and crucian carp, and increasing their *in vitro* gene bank samples by 25%. ◻ Conserving Pannonian honeybee genetic material in *in vitro* gene banks and increasing the number of samples by 50%, and developing an *in vivo* gene bank. ◻ Launching new programmes for endangered domestic breeds.	
Target 11.3 **Access to genetic resources** takes place in a regulated manner without endangering native biodiversity; ensuring that users of genetic resources are informed about access and benefit-sharing.	◻ Ensuring compliance with the international and EU obligations in relation to the Nagoya Protocol. ◻ Informing users of genetic resources and raise their awareness of the rules governing access to genetic resources and the fair and equitable sharing of the benefits arising from their use. ◻ Developing legislation on access to genetic resources. ◻ Long-term operation and expansion of the Pannonian Seed Bank in order to preserve the gene bank stocks of wild native plant species.	Number of requests for access to national genetic resources (pcs/year) Number of proceedings against Hungarian users illegally accessing genetic resources (pcs/year) Adoption of the regulation on access to genetic resources
Objective 12: Conserving existing natural and old-growth forests, expanding forest areas of high biodiversity value, and developing a forest structure favourable for biodiversity conservation and enhancement.		
Target 12.1 **Afforestation** considering ecological principles.	◻ Supporting afforestation – including forests for climate protection – in protected areas and Natura 2000 sites only in accordance with the site conditions and the predicted climatic conditions, using native species suited to the site, with a mixed species composition, ensuring the development of a diverse forest community and not threatening other natural values (e.g. grasslands). ◻ For afforestation in areas not under protection, giving	Afforestation with mixed, native species as a percentage of total afforestation (%)

	preference to and encouraging the establishment of resilient mixed forests of local, native species that suit the site and the predicted climatic conditions, and that not threaten grasslands habitats of protected natural values.	
Target 12.2 Ensuring the survival of **old growth forests**[21] and rare forest habitat types.	◻ Delimiting and maintaining stands with the highest conservation value (mature trees of different age, diverse species and spatial structure, resilient, resistant to biotic and abiotic stresses caused by climate change), and stands representing rare habitat types and high biodiversity. Ensuring the maintenance of these stands based on natural forest dynamics, and preferably converting the forest to a non-timber production system, in line with relevant requirements. ◻ Delimiting and designating steppic woods with *Quercus* spp. currently not under protection. ◻ Investigating the possibility of designating additional forest reserves. ◻ Classifying national park areas into protection zones. ◻ Abandoning management for timber in forest stands in strictly protected areas under the Nature Conservation Act. ◻ Developing a targeted strategy to prevent the spread of invasive species in forest stands of high conservation value, in cooperation with the sectors concerned, including the identification of immediate	Extent of old-growth forests (ha) Extent of rare forest habitat types (ha) Habitat types becoming rare due to climate change (ha) Forest area under IAS control (ha/year) Subsidy and compensation paid for conservation management forests (HUF)

[21] "Old growth forest" is understood as the term in the EU Biodiversity Strategy for 2030.

	intervention options and their financial support requirements. ▫ Replacing non-native forest stands with native species through forest composition change, in particular around Natura 2000 habitats which are in a critical ecological state, by creating buffer zones on a voluntary basis, ensuring appropriate financial incentives.	
Target 12.3 Increasing the area of **structurally complex, high biodiversity value** forests.	▫ Initiating intersectoral, professional consultations to allow the formation of a spatial network of older stands of native species in every forest management planning districts to ensure habitat connectivity. ▫ Increasing the area occupied by native tree species in protected areas and Natura 2000 sites through species replacement. ▫ Replacing non-native stands with native, mixed stands adapted to the site exposed to climate change, and to the predicted climatic conditions, and developing a related subsidy scheme. ▫ In areas under the management of national park directorates – in addition to continuous forest cover –, passively (abandonment) or actively promoting the establishment of stands rich in standing and lying dead trees of at least 30 cm in diameter, with a diverse horizontal and vertical structure of mixed native woody species of diverse age classes and with diverse microhabitats. ▫ Organising workshops by national park managers, state forestry companies and private forest managers to raise awareness of good conservation management practices.	Extent of structurally rich forest stands of high biodiversity value (ha) National average volume of standing and lying dead trees by stand type according to the forest inventory (m^3/ha) Monitoring the impact of large game on herbaceous and woody vegetation, forest regeneration, and site. Evaluation of the structural characteristics of the forest stands managed by the national park directorates, in comparison with national averages for similar habitat types, based on data from the National Forest Inventory.

	▫ Establishing and maintaining shrub-rich forest edges adjacent to non-forest habitats, and developing an incentive scheme to promote this. ▫ Promoting management in protected and Natura 2000 forest stands to encourage a more diverse forest stand structure (e.g. in case of shelterwood system, by creating a non-schematic spatial order for openings and regeneration, as well as extensive networks of retention tree groups, and by shifting to continuous forest cover systems). ▫ In case of clearcutting system – concerning natural, close-to-nature and transitional forest stands – continuing discussions between sectors to further reduce the size of felling sites (clearcutting, gradual regenerative cutting). ▫ Implementing and supporting habitat restoration to improve the close to natural status of forests. ▫ Promoting scientific research on the ecological impacts and assessing the conservation benefits of the permanent forest management (continuous forest cover forest management system) in Hungary. Developing the related regulatory environment in the light of practical experiences. ▫ Supplementing the forest planning regulation with a technical supplement to the Forest Act implementing regulation, with general conservation guidelines for every forest region. ▫ Implementing immediate actions to clarify the methods of controlling invasive and intensively spreading woody species and to control their spread in natural and close-to-nature forest stands. ▫ Enriching the structure of most common zonal forest	

	types covering large areas and achieving a more diverse structure within the framework of forest management. ▫ Clarifying the definition and primary functions of protected and Natura 2000 forest stands; developing methodological guidelines, and, as a result, formulating more straightforward regulations and requirements in the framework of cross-sectoral consultations. ▫ Reviewing the regulatory and incentive system to increase the amount of standing and lying thick dead tree stock, ensuring the maintenance of retention tree groups, regulating timber harvesting over time, and promoting implementation by informing affected stakeholders. Further developing the dead tree stock assessment methodology to evaluate impacts. ▫ Start monitoring the impact of big game on herbaceous and woody vegetation, and on forest regeneration ability, and, based on the results of the monitoring, reduce the number of big game (roe deer, wild boar, red deer, fallow deer, mouflon) until the undesirable impacts are eliminated ▫ Reducing populations of non-native big game species (fallow deer, mouflon) in protected and Natura 2000 areas.	
Objective 13: Ensuring sustainable game and fisheries management that does not compromise biodiversity regeneration.		
Target 13.1 Ensuring **sustainable game and fisheries management** in natural and near-natural areas.	▫ Implementing the management objectives for big game at a regional level and to provide the necessary legal and administrative conditions. ▫ Halting the decline of native small game species through habitat management and restoration	Population estimation and utilisation data (pcs/species) Length of field margins (km)

	interventions. ▫ Keeping populations of huntable furry predators under control. ▫ Operating a subsidy system to reduce the size of plots and to maintain and increase the length of field margins under the CAP. ▫ Considering waterfowl when designing and maintaining fish ponds and reservoirs for flood protection. ▫ Establishing a waterfowl sanctuary in key resting and feeding areas for lesser white-fronted *Anser erythropus* and red-breasted geese *Branta ruficollis*, as outlined in the species conservation plan for the lesser white-fronted goose. ▫ Developing legislation on traps used to catch or kill game. ▫ Preventing the establishment of non-native game species not yet present in our country with a permanent population, and, if necessary, taking active measures to eradicate such populations. ▫ Continuous monitoring of obligations to reduce the number of big game in game management regions and monitoring the impact of game populations to ensure successful regeneration of forests not surrounded by fences, to conserve grassland ecosystems sensitive to trampling and disturbance, and to ensure the long-term survival of protected and strictly protected plant species. ▫ Investigating the uptake, spatial accumulation and effects of lead shot and fishing lead paraphernalia in wetlands on wild and farmed species (e.g. pond fish). ▫ Raising awareness to reduce organic matter load in	Number and extent of waterfowl sanctuaries (pcs, ha) Length of forest regeneration protective fences (km) Percentage of fisheries designated as special purpose areas (%) Number of sterlet, crucian carp, tench, and Volga pikeperch stocks released (pcs), and number, extent and range of developments made to improve breeding sites (ha on standing water, rkm on running water) Habitat development, fish pass constructions (pcs), extent (ha), impact range (rkm) Percentage and number of controlled fish stockings (%, pcs) Number (pcs) and extent (ha, rkm) of sanctuaries

	popular angling waters, especially those in poor condition due to pollution. ▫ Designating and maintaining fish farming water areas as special water areas (pursuant to Article 16 of Act No. CII of 2013 concerning fisheries and the protection of fish) to conserve fish and other aquatic or water-related species as natural assets. ▫ Strengthening the populations of exploited but endangered fish species (sterlet, crucian carp, tench and Volga pikeperch). ▫ Controlling the populations of invasive fish species through active intervention. ▫ Detecting alien fish species accidentally introduced. ▫ Developing habitats, constructing fish passes and compliance testing of existing ones. ▫ Establishing and maintaining sanctuaries at the wintering and breeding areas of native fish species.	
Target 13.2 Increasing the share of **biodiversity-friendly hunting preserves** and **aquacultures.**	▫ Prohibiting the establishment of hunting reserves in protected areas, Natura 2000 sites and other areas under protection[22]. ▫ Protecting near-natural habitat patches from the impacts of wildlife in hunting reserves in protected areas, Natura 2000 sites and other protected areas by internal fencing. ▫ Developing support schemes for infrastructure and service development, and awareness-raising for ecotourism services.	Number of hunting reserves in protected areas, Natura 2000 sites and other areas under protection (pcs) Increase in the number of intensive fisheries combined with extensive systems (pcs)

[22] "Protected areas, Natura 2000 sites and other areas under protection" are understood as the areas classified as protected by the EU Biodiversity Strategy for 2030.

	▫ Establishing combined intensive-extensive aquaculture systems and wetlands for the purification of run-off water from aquaculture facilities. ▫ Supporting infrastructure developments in fish farms to reduce bird-caused damage.	
Objective 14: Promoting sustainable water management, water retention, and the reasonable and economical use of water to conserve biodiversity and to sustain ecosystem services.		
Target 14.1 Ensuring the ecological functions of **natural watercourses** to sustain aquatic and water-dependent ecosystems[23].	▫ Managing floodplains and riparian areas in a sustainable manner, restoring their natural functions, designating them as 'nature areas' in the case of priority values under the Nature Conservation Act. ▫ Revitalising traditional floodplain management (*'fokgazdálkodás'*): restoring lateral discharge to ensure a more even water regime and a more balanced water supply of floodplains, combined with the restoration of the associated natural habitats and the revitalisation and modernisation of floodplain management. ▫ Creating and restoring wetlands, sustainable water management in regularly flooded areas to provide opportunities for wetland restoration. ▫ Restoring oxbow lakes and creating potential for surface water supply. ▫ Restoring natural river functions in the Mura-Drava-Danube Biosphere Reserve. ▫ Promoting the restoration of natural state in urban, periurban and suburban reaches of (especially	Length of watercourses affected by restoration of natural functions (km) Number and extent of new or restored wetlands and oxbow lakes (pcs, ha)

[23] The target is to be interpreted according to the relevant guidelines of the European Commission.

	smaller) watercourses. ▫ Developing water management and conservation conditions for storage in low elevation floodplains and flood risk reduction.	
Target 14.2 Protecting **surface waters and groundwater** according to the WFD, including the achievement of favourable conservation status of wetlands dependent on and connected to surface waters and groundwater. Preventing the deterioration of surface waters and groundwater for hydromorphological and quantitative reasons, ensuring their good status and increasing habitat availability for native species.	▫ Implementing measures to achieve favourable conservation status of water-dependent habitats in Natura 2000 sites as defined in the Hungarian River Basin Management Plan. ▫ Extending the areas eligible for direct payments under the CAP to include temporarily flooded areas, erosion protection and riverbank zones to encourage the withdrawal of these areas from cultivation. ▫ Reviewing the management of small watercourses from a nature conservation perspective, and introducing measures to achieve, maintain and restore their favourable conservation status. ▫ Developing a modernised approach to manage inland excess water based on nature conservation considerations. Comprehensive, system-wide review of the operation of irrigation and dual function (drainage and irrigation) canal systems. ▫ Promoting a shift to land uses adapted to climate change and natural conditions (close to nature, dynamic approach, based on water retention). ▫ Implementing water retention measures in Natura 2000 wetlands. ▫ Reviewing water rights permits in case of subsurface water bodies in poor condition due to water-dependent ecosystems. ▫ Encouraging the cultivation of low water demand crops and landraces in water-scarce areas, and	Size of aquatic habitats of favourable nature conservation status (ha) Number of reviewed small watercourses or channel systems (pcs) Number of measures required for switching to farming suitable for the landscape (pcs) Number of reviewed water rights operation permits in case of subsurface water bodies in poor condition (pcs)

	promoting a change in cultivation type. ▫ Conservation, development where necessary, monitoring and wise use of wetlands of international importance (Ramsar sites). ▫ Developing and launching a sediment management design system to improve the sediment conditions of our large rivers and to reduce riverbed incision. ▫ Reviewing the international navigation categories of our navigable rivers, removing certain categories or placing them in a less demanding category to reduce unnecessary dredging. ▫ Prohibiting the use of sewage sludge, river sludge, river bed material and activated sludge as soil amendment in protected and Natura 2000 sites.	
Objective 15: Coordinated development, maintenance, and improvement of the elements of green infrastructure.		
Target 15.1 Developing the **green infrastructure network**, taking into account the ecological condition, connectivity and ecosystem service-providing capacity of its elements.	▫ Developing a methodology and data provision for the delineation and conservation management options of green infrastructure elements that are not protected but valuable or in need of development in terms of ecological status, connectivity, and ecosystem services complexity. ▫ Developing a methodology and data provision to identify agricultural areas where farmers and land managers can implement green infrastructure developments that take landscape character into account. ▫ Updating and clarifying the methodology to defining restoration objectives. ▫ Implementing pilot site developments to integrate the results of ecosystem services assessments at local and regional level (e.g. development of ecosystem service-	Number of green infrastructure development plans prepared on the basis of the methodology for the delineation of valuable green infrastructure elements or those that are in need for improvement in terms of ecological status, ecosystem services and spatial connectivity, and the data provision system for planning and development (pcs)

	based green infrastructure development plans at the level of a group of municipalities). ▫ Incorporating the results of ecosystem services assessments into green infrastructure development plans. ▫ Identifying development objectives and intervention areas to improve the condition of green infrastructure. ▫ Elaborating a green infrastructure development plan based on renewables and databases at national and regional scale. ▫ Preparing green infrastructure condition assessments based on updated databases. ▫ Improving the connectivity of green infrastructure at regional and local scales. ▫ In the case of investments and site selection, prioritising brownfield sites and rust belts to avoid loss of natural and near-natural habitats. ▫ Defining the roles of sectors in the preservation and development of green infrastructure.	
Target 15.2 Developing the **urban elements** of the green infrastructure network.	▫ Developing and regularly updating a technical guide for the development of green infrastructure in municipalities to promote biodiversity conservation. ▫ Incorporating the coordinated development of green infrastructure in urban and suburban areas into municipal plans to improve ecological status, connectivity and ecosystem services. For towns and cities, incorporate green infrastructure development into the local building regulations. ▫ Aligning integrated municipal water management plans with regional green infrastructure concepts. ▫ Prohibiting fireworks and racing of internal	Number of municipalities with municipal plans containing elements of green infrastructure development (pcs) Green infrastructure planning guidelines that take biodiversity conservation into account

	combustion engine vehicles in near-natural urban areas that are categorised as wetlands and/or resting and feeding areas for migratory bird species. ▫ Developing and implementing municipal plans that include green infrastructure development. ▫ Defining and implementing quality objectives for green space in all municipalities, including waterfront areas. ▫ Clarifying and regulating state and municipal responsibilities for green space. ▫ Uniform data provision describing the state of green infrastructure and helping to identify development opportunities for the urban greening plans of Hungarian cities with a population of more than 20,000 inhabitants (uniform dataset per municipality). ▫ Utilisation of brownfield sites and rust belts through the creation, enhancement and restoration of green spaces. ▫ Restoring urban protected natural areas and Natura 2000 sites. ▫ Promotion of ecological rainwater management in municipalities.	
Target 15.3 Raising **social awareness** of the value, importance, and conservation of green infrastructure.	▫ Communicating the importance of green infrastructure to society. ▫ Strengthening professional communication on the importance of green infrastructure with stakeholders in the sectors concerned through thematic communication programmes, publications, and guides. ▫ Encouraging the promotion of habitats of good ecological status in the municipal environment.	Number of awareness raising actions related to green infrastructure (pcs) Number of sector-specific methodological guides to support the preservation and development of green infrastructure translated into practical application (pcs)

Objective 16: Evaluating ecosystem services and integrating conservation and restoration considerations into relevant sectoral policy decision-making processes to better conserve and restore their service-providing capacity.		
Target 16.1 Evaluating and mapping the **extent, condition, and services of ecosystems**, and monitoring changes to ensure their long-term conservation and restoration.	◻ Recording and analysing changes in ecosystem status and the temporal and spatial changes of ecosystem services. ◻ Validating the assessments and service analyses based on expert opinions; clarifying and updating assessments and mapping. ◻ Developing sectoral collaborations (e.g. on grassland management) to address systemic data gaps in ecosystem condition and service assessments. ◻ Mutual provision of data between relevant sectors for the assessment of ecosystem conditions and services, including sharing of the results. ◻ Producing further analyses and maps following the selection of ecosystem services not yet assessed in Hungary. ◻ Extending the developed National Ecosystem Map, ecosystem status maps, ecosystem services maps and green infrastructure map thematically, implementing a change analysis based on renewable (national and regional) data.	Number of available ecosystem service assessments and maps (pcs)
Target 16.2 Incorporating the results of **ecosystem service assessments**, as well as the conservation and restoration of ecosystem services into decision-making systems, and sectoral policies.	◻ Designing and developing decision support tools that take into account the value and status of ecosystem services. ◻ Mapping the planning and decision-making processes in key sectors that directly affect the state of natural and near-natural ecosystems: conservation, environment, spatial planning and development, urban development, transport, construction, agriculture, forestry, water protection, water management.	Natural capital index Number of strategic and other planning documents using ecosystem services assessment (pcs)

	▫ Integrating the results of ecosystem services assessments into the strategic and other planning processes of the sectors concerned, and creating the conditions for their application in everyday sectoral practice. ▫ Reviewing the necessary legal and economic regulations and develop cross-sectoral cooperation to ensure the long-term conservation and restoration of ecosystem services. ▫ Integrating results on ecosystem extent, status, and evaluation of ecosystem services into ecosystem accounts.	
Target 16.3 Increasing **social awareness** concerning the value, importance, and conservation of ecosystem services.	▫ Raising social awareness through thematic communication programmes and campaigns, publications, guides, and educational materials. This includes raising awareness of the links between the status of ecosystems and their services, the importance of ecosystem services and their role in sustaining human well-being, and the valuation of ecosystem services. ▫ Strengthening professional communication with stakeholders in the sectors concerned. This includes disseminating the results of EU and national research on ecosystem services, and determining the necessary tasks for the future.	Number of awareness raising campaigns related to the significance of ecosystem services (pcs) Number of sector-specific methodological guides to support the conservation and enhancement of ecosystem services translated into practical application (pcs) Number of active users of published map databases and other interactive tools for ecosystem services valuation (pcs)

Strategic area III: Tools and solutions supporting implementation

Measurable targets	Measures directly related to targets	Indicators
Objective 17: Raising awareness on the conservation and sustainable use of biodiversity, ensuring that the conservation-related activities are evidence-based.		
Target 17.1 Strengthening **research** on conservation and sustainable use of biodiversity.	▫ Setting research priorities. ▫ Prioritising support for research to help implement EU legislation. ▫ Collecting and sharing good practices on the sustainable use of biodiversity. ▫ Investigating the drivers affecting natural and near-natural ecosystems.	Number of successful (funded) research projects (pcs) Number of species of community interest with improving data quality (pcs)
Target 17.2 Maintaining and improving **monitoring for conservation purposes** to ensure continuity of long-term biodiversity data sets.	▫ Reviewing the National Biodiversity Monitoring System (NBMS), in line with EU and international monitoring and reporting obligations. ▫ Increasing involvement of a broader section of society in data collection (*citizen science*), thereby also supporting awareness raising on biodiversity conservation. ▫ Ensuring that monitoring data are systematically stored and made available in an appropriately regulated framework.	Number of components monitored in under the National Biodiversity Monitoring System (pcs) Number of sampling protocols reviewed (pcs) Number of data/reports collected and approved in citizen science programmes (pcs/year)
Target 17.3 Analysing and **publishing** research and monitoring results to ensure that policy decisions are evidence-based.	▫ Making available and using the scientific (research and monitoring) results on native biodiversity in the development and implementation of biodiversity conservation and sustainable management practices to ensure that policy decisions are science based. ▫ Dissemination of scientific results in a straightforward form (*popular science*).	Number of tools and guides supporting policy decisions (pcs)

Objective 18: Shaping attitudes, creating and disseminating awareness of the importance of biodiversity and the conservation of Hungary's natural resources.		
Target 18.1 Raising **social awareness** on the conservation and sustainable use of biodiversity.	◻ Assessing the knowledge of target groups in Hungarian society with different demographic characteristics and interests about the diversity and conservation importance of the Hungarian wildlife. ◻ Strengthening communication on current biodiversity conservation issues for broad societal outreach to raise awareness of the drivers of biodiversity loss. ◻ Developing digital infrastructure for biodiversity knowledge transfer. ◻ Increasing the presentation of the diverse natural values of Hungary by increasing the number of permanent and temporary exhibitions, the availability of nature trails and demonstration sites, and the development and publication of related online information materials. Strengthening the range of experience-based programmes in natural settings. ◻ Improving visitor management and the spatial and temporal distribution of visitors, reducing seasonality in some areas, in order to alleviate (eco)touristic pressure and raise awareness of the importance of biodiversity. ◻ Launching targeted programmes to develop social responsibility required for biodiversity conservation. Organising national communication actions for owners and farmers affected by protected areas or those of community importance. ◻ Maintaining and developing the National Park Product trademark system to strengthen consumer awareness of local products, and to raise the profile and recognition of locally produced products and producers. ◻ Strengthening volunteer research and data collection (*citizen*	Number of operational nature demonstration facilities (visitor centres, nature trails, accredited nature schools and kindergartens) (pcs) Number of visitors registered in national park directorates (persons/year) Number of visitors to professional websites and community sites related to biodiversity (visitors/year) Number of data collected and validated in community data collection programmes (pcs/year) Number of nature competitions (pcs) and number of students participating (pcs) Number of National Park Product trademarked producers and products (pcs)

	science) programmes, developing the technical background and involving the widest possible range of society. ▫ In the framework of environmental education, promoting the so-called nature school accreditation, as well as further expanding and promoting the forest kindergarten and forest school programmes. ▫ Further expanding and promoting the Eco-School and Green Kindergarten networks, producing and sharing educational materials, and institution-wide implementing of sustainability education in a growing number of institutions. ▫ Strengthening cooperation among social actors involved in raising awareness on biodiversity conservation, such as governmental and non-governmental organisations, educational institutions (including higher education institutions), research institutions, churches, art institutions, municipalities.	
Target 18.2 Strengthening **professional communication** on biodiversity conservation and its sustainable use with stakeholders in relevant sectors.	▫ Making the results of scientific research available for practitioners in nature conservation and management. ▫ Enhancing the transfer of information through the sharing of the latest spatial data and information between scientists and professionals involved in conservation administration, management and other relevant sectors. ▫ Preparing guidelines and communication materials on the focal topics of biodiversity conservation. ▫ Placing more emphasis on biodiversity conservation in education and its professional underpinning. Developing and introducing a green education package for students and teachers of all ages. ▫ Launching teacher training and professional development courses on the incorporation of biodiversity conservation into the curriculum and teaching methods.	Number of professional training courses, events (pcs) Number of conservation experts reached at national conservation events for professional audiences (persons) Number of participants in conservation training (persons/year)

Objective 19: Strengthening international cooperation for biodiversity conservation.		
Target 19.1 Strengthening bilateral and multilateral **cross-border cooperation**.	▫ Maintaining and developing active and good cooperation with the neighbouring countries for the appropriate conservation of biodiversity. ▫ Establishing the Mura-Drava-Danube Transboundary Biosphere Reserve. ▫ Developing and implementing joint proposals for bilateral and multilateral cooperation in areas such as conservation management, species conservation, presentation and research. ▫ Maintaining and strengthening expert consultation with the Visegrád Four and other neighbouring countries in order to exchange experiences and develop a common professional position on biodiversity conservation issues.	Number of bilateral and multilateral cooperation on biodiversity conservation (pcs)
Target 19.2 Strengthening **Hungary's international role** in biodiversity conservation.	▫ Ensuring the participation of Hungarian researchers and experts in the work of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). ▫ Involving Hungary in the European Biodiversity Partnership, encouraging the participation of Hungarian research institutions in partnership tenders. ▫ Promoting sustainable forms of investment in line with biodiversity conservation; continuing Hungary's Green Bond issuance. ▫ Integrating biodiversity conservation considerations and activities into international development cooperation projects.	Number of projects funded by Hungary involving biodiversity conservation activities (pcs) Green Bond issuance (amount/year)

4 THE TOOLS FOR ACHIEVING THE STRATEGIC OBJECTIVES

To implement the strategy, it is important to provide sufficient financial resources and establish a supportive regulatory environment for biodiversity conservation at the central and regional administrative levels. The strategy does not impose legislative obligations, but the objectives must be supported by the legislative process. The strategy can only be implemented if future legislation and sectoral measures consider its objectives for biodiversity conservation.

When using international, EU, and national financial resources for environmental protection, nature conservation, agricultural, rural, water, and infrastructure development, it is crucial to consider and contribute to the objectives outlined in the 3rd National Biodiversity Strategy.

The table below lists the sources of funding available to achieve the objectives.

Funding types	Specific Hungarian fund[24]	European Union source						Other (e.g. international or private funding)
Number and topic of objectives		**ERDF/ Budgetary fund**	**EMFF**	**CAP**	**LIFE**	**Horizon Europe**	**RRF**	
1. Protected areas	×	×	×	×	×			
2. Ecosystems restoration	×	×	×	×	×		×	
3. Improving the status of species	×	×	×	×	×			
4. Invasive alien species	×	×	×	×	×			
5. Species endangered by exploitation	×							
6. Decreasing pollutions	×	×		×	×			
7. Genetically modified organisms	×							×
8. Pollinators	×	×		×	×			×
9. Climate change and biodiversity		×		×				
10. Agriculture	×			×				
11. Genetic resources	×			×				

[24] Specific Hungarian funds include concrete sources available for the realisation of any action within the objective (e.g. chapter-managed budget allocation).

12. Forests		×		×	×			×
13. Game and fisheries management	×		×	×				
14. Water management and water use		×		×				
15. Green infrastructure	×	×		×	×			
16. Ecosystem services		×		×	×			
17. Scientific basis	×	×						×
18. Awareness-raising	×	×		×	×			
19. International cooperation	×							

5 TRACKING THE IMPLEMENTATION OF THE STRATEGY

The implementation of the Strategy, the effectiveness of the objectives and measures, and professional performance should be continuously evaluated, and the adequacy of the measures should be reviewed where necessary. Monitoring of the implementation of the Strategy will be carried out by means of the indicators provided for each objective, which will require the collection and analysis of data and information.

In 2025, an interim evaluation of the implementation will be carried out, followed by an **ex-post evaluation in 2031**, one year after the end of the implementation period.

These reports should be made publicly available on the national website of the Convention on Biological Diversity (http://www.biodiv.hu/).

6 LIST OF FIGURES