GrAinS

Greening Agrifood in Social Economy

Capacity building on Greening Agrifood in Social Economy

Hands-On Biodiversity

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1. Introduction

What is biodiversity?

Biodiversity, or biological diversity, describes the variety of life on Earth. It includes the genetic diversity within species, the diversity of species themselves, and the diversity of the ecosystems in which they exist. This diversity is the basis for functioning ecosystems that sustain life on our planet (UNEP, 2021).

Global importance of biodiversity

Biodiversity plays a crucial role in the stability and resilience of ecosystems. It influences air quality, water supply, soil fertility and food production. Ecosystem services such as insect pollination, natural pest control and carbon storage are closely linked to intact biodiversity (IPBES, 2019).

Global threats to biodiversity

Biodiversity is under massive threat worldwide. The main factors are the destruction of natural habitats through agriculture and urbanisation, climate change, pollution and the overuse of natural resources. According to the report of the World Biodiversity Council (IPBES, 2019), more than a million species are threatened with extinction – with far-reaching consequences for humans and the environment.

Why is biodiversity important in Europe?

Biodiversity loss is also a serious problem in Europe. Intensive agriculture, soil sealing and climate change are affecting many species and habitats. According to the European Environment Agency (EEA, 2020), about 80% of habitats are in poor condition. Yet Europe's landscapes are rich in biodiversity, which is not only important for the environment, but also for the economy and society. The European Union has developed various strategies and protective measures to counteract this trend, including the Biodiversity Strategy 2030 (European Commission, 2020).

The aim of this document

This document provides an overview of the different levels of biodiversity, their importance and the main threats in Europe. It highlights the measures needed to conserve biodiversity and gives a specific example from European agriculture – the creation of flower strips – as a viable solution for promoting biodiversity.

This basis is used to illustrate why the protection of biodiversity is not only an ecological necessity, but also a social and economic one.

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2. Levels of biodiversity

Biodiversity exists at different levels, which influence each other and together contribute to the stability of ecosystems. The three main dimensions of biodiversity are genetic diversity, species diversity and ecosystem diversity.

Genetic diversity

Genetic diversity describes the variation within a species. This diversity enables populations to adapt to changing environmental conditions and to be resistant to diseases or other threats. For example, agricultural crops with high genetic diversity are more resistant to pests and climate change (FAO, 2019). However, the decline in genetic diversity due to monocultures or overbreeding endangers the adaptability of many species.

Species diversity

Species diversity refers to the number of different species in a given area. It is an essential factor for stable and resilient ecosystems, as different species perform different functions, such as pollination, nutrient cycling or pest control. According to the Global Biodiversity Outlook (UNEP, 2021), biodiversity is declining rapidly worldwide. Insects, which play a key role in ecosystems, are particularly affected.

Ecosystem diversity

Ecosystem diversity refers to the variety of different habitats on Earth, from tropical rainforests to deserts, marine ecosystems and temperate forests. Each ecosystem provides specific living conditions for the species living in it and contributes to global biodiversity. In Europe, many ecosystems are threatened by human intervention, such as the conversion of wetlands into agricultural land or the destruction of forests for urban development (EEA, 2020).
Maintaining biodiversity at all these levels is essential for the balance of nature and the well-being of humanity. The next chapters will discuss the importance of biodiversity, the threats to it, and the protective measures in place, particularly in Europe.

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3. The importance of biodiversity

Biodiversity is of fundamental importance for the ecological balance, economic development and social well-being of society. Its significance can be divided into three main areas:

Ecological functions

High biodiversity is essential for ecosystems to function properly. It influences processes such as pollination, water balance, soil fertility and climate. Species diversity within an ecosystem ensures greater resilience to environmental changes and helps to maintain ecological balances. According to IPBES (2019), up to 75% of the world's food crops depend on insect pollination. The decline in biodiversity thus directly affects food production and can endanger human food security.

Economic importance

Biodiversity plays a central role in many economic sectors. It is the basis for agriculture, fisheries and forestry. It also provides important resources for the pharmaceutical industry – around 70% of modern medicines are based on natural compounds (WHO, 2020). Tourism also benefits from an intact natural environment, as nature reserves, national parks and biodiversity hotspots are valued as tourist destinations. According to the EU Commission (2020), the nature tourism industry in Europe generates billions in revenue annually and creates numerous jobs.

Cultural and social aspects

Biodiversity is deeply rooted in the culture and history of many societies. It influences traditions, religions and ways of life. In many indigenous communities, the preservation of biodiversity is essential for survival and cultural identity. In addition, an intact environment contributes to mental and physical health by providing space for recreation. Studies show that spending time in natural surroundings reduces stress and increases well-being (EEA, 2020).
Biodiversity is thus not just an environmental factor, but an essential basis for human life and economic activity. Its protection is therefore a task for society, combining ecological, economic and social aspects.

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4. Ecosystem services

Ecosystem services are the direct and indirect contributions of ecosystems to human well-being. They include all the benefits that people derive from nature and are essential for the functioning of the environment, society and the economy. According to the Millennium Ecosystem Assessment (MEA, 2005), they can be divided into four main categories:

Provisioning services

These include material resources obtained directly from nature:

- **Food:** fruit, vegetables, fish and meat from natural and agricultural systems.
- **Raw materials:** wood for construction and paper, natural fibres for textiles.

Regulating services

These include natural processes that maintain ecological balance:

- **Carbon storage:** forests and oceans bind CO_2 and regulate the climate.
- **Water purification**: Wetlands and soil organisms filter pollutants from watercourses.

Cultural services

Non-material benefits that influence human well-being:

- **recreation and tourism**: National parks and nature reserves as places of recreation.
- **aesthetic values**: The beauty of natural landscapes inspires art, religion and spirituality.

Supporting services

Fundamental processes that enable all other ecosystem services:

- **Pollination**: wild bees and other insects pollinate plants and ensure crop yields.
- **Nutrient cycling**: microorganisms in the soil decompose organic material and provide nutrients.

These ecosystem services are essential for human well-being, economic activity and the stability of natural processes. Their preservation is therefore a key task for nature conservation and sustainable development (MEA, 2005).

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5. Threats to biodiversity

Biodiversity is exposed to numerous threats worldwide that endanger its stability (IPBES, 2019). Based on the International Union for Conservation of Nature (IUCN) Red List, it is estimated that 1 million species globally may be threatened with extinction (UN, 2023). The main threats to biodiversity are:

Habitat destruction

The conversion of natural areas into agricultural, residential or industrial areas results in the loss of habitats for numerous species. In Europe, wetlands, forests and species-rich meadows are particularly affected. According to the European Environment Agency (EEA, 2020), large areas of natural landscapes have been destroyed for agricultural and urban purposes in recent decades.

Climate change

Climate change is altering temperature and precipitation patterns worldwide, affecting habitats and species. Many animal and plant species are unable to adapt quickly enough and are being displaced into new areas or are dying out. Sensitive ecosystems such as mountain regions, wetlands and coastal areas are particularly affected (IPCC, 2021).

Overuse of resources

The intensive use of natural resources, for example through overfishing, intensive logging or overgrazing, endangers biodiversity. Many fish stocks are overfished due to unsustainable practices, which has a serious impact on marine ecosystems. Wildlife is also hunted excessively in many regions, leading to the decline of endangered species (FAO, 2020).

Environmental pollution

Pollutants such as pesticides, plastic waste and industrial wastewater have negative impacts on biodiversity. Pesticides contribute to the decline of pollinating insects, while plastic pollution is particularly threatening to marine life. Microplastics have already been detected in numerous species, including fish, birds and even mammals (UNEP, 2021).

These threats show that the protection of biodiversity is more urgent than ever. In the next section, we will look at measures for conserving biodiversity.

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6. Measures for protecting biodiversity

To stop the loss of biodiversity and preserve natural habitats, targeted protective measures are needed. The most important strategies include:

Nature reserves

The protection of ecosystems through national parks, biosphere reserves and Natura 2000 sites contributes significantly to the preservation of biodiversity. In Europe, there are over 27,000 protected areas, which together make up almost 18% of the land area (EEA, 2021). These areas provide safe havens for endangered species and protect valuable habitats from destruction.

Sustainable agriculture and forestry

Agriculture and forestry play a crucial role in maintaining biodiversity. The most important measures include:

- **Organic farming**: avoiding chemical pesticides and fertilisers and promoting crop rotation to increase soil fertility.
- **Agroforestry**: combining trees and agriculture to promote biodiversity.
- **Sustainable forestry**: management of forests with due regard for natural growth cycles and the protection of endangered species.

Legal regulations and international agreements

Various legal measures and international agreements are crucial for the preservation of biodiversity:

- **EU Biodiversity Strategy 2030**: The EU's goal is to protect at least 30% of land and sea by 2030.
- **Kunming-Montreal Global Biodiversity Framework (2022)**: This international agreement was adopted as the successor to the Convention on Biological Diversity (CBD). It includes ambitious targets to restore ecosystems, protect 30% of the world's land and sea areas, and reduce pollutants and invasive species.
- **Washington Convention on International Trade in Endangered Species (CITES)**: Regulates international trade in endangered species to curb poaching and illegal markets.

These exemplary strategies help to halt the loss of biodiversity and preserve sustainable habitats. The next section takes a closer look at the EU Biodiversity Strategy 2030.

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7. EU Biodiversity Strategy for 2030 - targets and implementation measures

The EU Biodiversity Strategy for 2030 is a key initiative of the European Green Deal and aims to halt the loss of biodiversity and restore natural ecosystems. It is based on four pillars and contains ambitious targets for the re-naturalisation, protection of habitats and sustainable use of natural resources.

Main objectives of the strategy

The following goals are to be achieved by 2030:

Protect nature in the EU (EU Nature Protection Plan)

- 30% of the EU's land and marine areas are to be placed under protection
- 10% of areas will be given strict protection status, including primeval forests, moors, seagrass meadows and other carbon storage ecosystems.
- Trans-European Nature Network: Creating a coherent network of protected areas through ecological corridors.
- improve the management of all protected areas through clear protection measures and regular monitoring.

Restoration of nature in the EU (EU Nature Restoration Plan)

- legally binding restoration targets for ecosystems by 2021 (already adopted as "Nature Restoration Law").
- at least 20 % of degraded ecosystems will be restored by 2030.
- comprehensive re-naturalisation measures:
- Restoration of 25,000 km of free-flowing rivers.
- Reforestation with 3 billion trees, taking ecological principles into account.
- Conversion of 10 % of agricultural land into biodiversity-rich landscapes (e.g. hedges, flower strips, wetlands).
- 50% less chemical pesticides and fertilisers to protect pollinators and soil quality.
- protect marine ecosystems, reduce overfishing and limit destructive fishing practices.

Transformation of the economy and society

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- sustainable financing: At least 20 billion euros per year from EU, national and private funds for biodiversity measures.
- Biodiversity criteria for investments and subsidies as part of the EU taxonomy for sustainable finance.
- green infrastructure in cities: Cities with over 20,000 inhabitants should develop "Urban Greening Plans".
- improve environmental education through new educational initiatives and vocational retraining for sustainable professions.

Global biodiversity agenda

- leading role for the EU in global biodiversity negotiations (including the UN Convention on Biological Diversity, CBD).
- curbing deforestation worldwide, including measures against the import of products from deforestation.
- strengthening the EU action plan against wildlife crime.

Detailed measures for implementation

EU Nature Protection Plan - protecting nature

The protection of biodiversity is of central importance, as 81% of protected habitats and 63% of species are in a poor conservation status (State of Nature Report, 2020). Important measures:

- expand protected areas: From the current 26 % of land and 11 % of marine areas to 30 % in both categories.
- designate strictly protected areas: At least 10 % of the EU area should be absolutely protected (e.g. primeval forests, moors, seaweed meadows).
- coherent network: Creation of a "Trans-European Nature Network" to connect isolated nature conservation areas.

EU Nature Restoration Plan - restoring nature

- Re-naturalisation measures for damaged ecosystems in agricultural, forestry and urban areas.
- Restoration of river landscapes: 25,000 km of free-flowing rivers.
- Promotion of sustainable agriculture with biodiversity-friendly measures (e.g. agroforestry, less pesticides).
- Reforestation with 3 billion trees - from an ecological point of view, not as monocultures.
- 50% reduction in the use of pesticides to save pollinators.
- Sustainable financing and management

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- Provision of at least 20 billion euros per year from various EU funds, national funds and private investment.
- focus EU funding on biodiversity: Introduction of environmental and social criteria in investment decisions ("biodiversity proofing").
- Introduction of an EU-wide indicator system to measure progress in biodiversity.

International measures

- support for the United Nations' global biodiversity framework (CBD).
- add biodiversity requirements to trade agreements to combat deforestation and environmental degradation in third countries.
- strengthening the EU action plan against wildlife trafficking.

With its comprehensive approach, binding targets and substantial financial resources, the strategy is a decisive step towards preserving Europe's natural environment for future generations.

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8. EU Financing Modalities for Agroecological Practices

Agroecological practices such as organic farming, agroforestry, crop diversification, and pest management through integrated management are central to the EU's transition towards sustainable agriculture. To promote their adoption, the EU funds them through a variety of financing instruments, including region-specific programmes:

Common Agricultural Policy (CAP)

The Common Agricultural Policy (CAP) is the EU's primary tool for supporting farmers. In its 2023–2027 setup, agroecological practices are prioritized through:

- Pillar 1 (Direct Payments):
  - Eco-schemes: Farmers are rewarded with payments for adopting measures like crop rotation, reduced pesticide use, or maintaining non-productive land (e.g., flower strips). In 2023, 25% of Pillar 1 funds (€20 billion annually) was funded by eco-schemes (EU Commission, 2023).

- Pillar 2 (Rural Development):
  - Agri-environment-climate actions (AECM): European Agricultural Fund for Rural Development (EAFRD) co-funded, AECM assists with long-term commitment to agroecology. Subsidies for example include organic certification, agroforestry regimes, or conservation of soil.
  - Young Farmers Scheme: Further grants to young farmers going agroecological.

Regional Implementation of Rural Development Programmes (RDPs)

Member states of the EU prepare Rural Development Programmes (RDPs) at regional level to address local environmental and agricultural challenges. RDPs are co-funded by the EU (via EAFRD) and national/regional authorities. Key features are:

- Tailored Agroecological Priorities, here some examples:
  - For Andalusia, Spain, RDPs fund water-saving agroecological interventions (e.g., drip irrigation and drought-resistant crops) to combat desertification.
  - Bavaria, Germany prioritizes agroforestry and hedgerow rehabilitation to enhance biodiversity in intensive farming.
  - Tuscany, Italy supports organic olive and vineyards to improve soil nutrient content and sequester carbon.

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- **Decentralized Management:**
    - Regional stakeholders (farmers' cooperatives, NGOs) coordinate with local administrations to create intervention measures that adhere to EU ambitions while addressing localized requirements.
    - Wales (UK), RDP funding is allocated to small agroecological farms under the Glastir scheme.
- **Funding Mechanisms:**
    - Grants and Subsidies: Agroecological infrastructure (greenhouses, composting systems, etc.) receiving 80% co-financing.
    - Technical Support: Capacity-building training for agroecological practices, typically delivered via local agricultural extension services.
    - Results-Based Payments: Compensation of farmers for measurable outputs like increased numbers of pollinators or decreased soil erosion.

LIFE Programme

The **LIFE Programme** is the European Union's central funding instrument for the environment and climate action. Since its launch in 1992, it has co-financed more than 5,500 projects and mobilised over € 12 billion for environmental and climate action. An important sub-programme is the **'Nature and Biodiversity'** sub-programme, which specifically supports the preservation and restoration of biodiversity in Europe (CINEA, 2023).

Objectives of the Nature and Biodiversity sub-programme

The sub-programme has the following main objectives:

- Supporting the implementation of the **EU Biodiversity Strategy for 2030** by protecting endangered species and ecosystems.
- Financing projects to **restore damaged habitats**, particularly in the Natura 2000 network.
- Promoting innovative **nature conservation solutions** and new management approaches for the preservation of biodiversity.

Financing and funding volume

For the **2021–2027** period, the LIFE programme has been allocated a total budget of **5.4 billion euros**. Of this, at least **2.1 billion euros** are earmarked for the sub-programme 'Nature and Biodiversity' (ZUG, 2023).

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Funding priorities

The LIFE sub-programme supports various measures, including:

- **Species and habitat conservation:** Funding of projects to stabilise endangered populations and protection measures for rare animal and plant species.
- **Ecosystem restoration:** Measures to restore rivers, wetlands, forests and marine ecosystems.
- **Nature conservation innovations:** Development of new monitoring methods, sustainable management strategies and innovative environmental protection measures.

Examples of funded projects

- **Reintroduction of endangered species:** funding of conservation programmes for European wildcats and brown bears.
- **Restoration of wetlands:** financing of projects to restore moors as carbon stores.
- **Biodiversity-friendly agriculture:** funding of agro-ecological approaches to reduce pesticide use and create biodiversity-friendly landscapes.

Implementation and advice

At the national level there are certain institutions who are taking care of the implementation and giving advice. For example, in Germany, the LIFE programme is managed by **Zukunft – Umwelt – Gesellschaft (ZUG) gGmbH**, which acts as the national contact point and provides support for applicants (ZUG, 2023) or in Italy it is mainly managed by the **Ministero de'll Ambiente e della Sicurezza Energetica** (MASE, 2024)

Significance of the LIFE sub-programme for nature conservation

The LIFE programme plays a crucial role in implementing EU environmental policy. With its substantial funding, it contributes to **the sustainable protection and improvement of biodiversity in Europe**. It is one of the few EU funding programmes that is directly geared to nature conservation and thus makes a significant contribution to achieving Europe's biodiversity targets.

Horizon Europe

Horizon Europe research program invests money to promote agroecology through:

- Cluster 6 (Food, Bioeconomy): Funding R&D on soil fertility, circular farming, and low-input farming (€8.95 billion for 2021–2027).
- Partnerships: Collective efforts like the European Partnership on Agroecology bring farmers, scientists, and policymakers together to upscale best practices.

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European Green Deal Initiatives

- Farm to Fork Strategy: Aims for a minimum 25% EU arable land dedicated to organic farming by 2030, based on CAP strategic national plans.
- Carbon Farming Initiative: Encourages agroecological approaches fixing carbon (agroforestry, cover cropping) via performance-based payment.

Challenges and Opportunities

EU finances are considerable but also some still lingering barriers:

- Perplexing bureaucracy: Tiny farmers will be incapable of engaging application processes.
    - Regional Solutions: Some regions, e.g., Wallonia (Belgium), simplify applications by single-stop online platforms for CAP and RDP funds.
- Regional disparities: Unequal access to funds in member states.
    - EU Support: The CAP Network helps with harmonising regional implementation and sharing of best practices (e.g., the Agroecology Living Labs initiative).

The next section looks at how humans can directly contribute to the preservation of biodiversity.

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9. Biodiversity and humans

Humans influence biodiversity in a variety of ways – both negative and positive (IPBES, 2019). While industrial development, agriculture and urbanisation often lead to the destruction of habitats, there are also numerous measures that can be taken to promote and preserve biodiversity.

Human impact on biodiversity

Humans interfere with ecosystems both directly and indirectly. Negative impacts include:

- **Habitat destruction:** Deforestation, urbanisation and infrastructure measures such as road construction lead to the loss of natural habitats.
- **Pollution:** Pollutants such as plastics, pesticides and heavy metals endanger many species and ecosystems.
- **Climate change:** Changes in temperatures and precipitation patterns threaten sensitive habitats.
- **Overuse of resources:** Overfishing, poaching and unsustainable agriculture are contributing to the extinction of species.

At the same time, however, there are many positive human influences that contribute to the preservation of biodiversity, including:

- **Restoration projects:** reforestation, protection of wetlands and restoration of riverine landscapes.
- **Conservation measures:** establishment of protected areas, sustainable management and species protection programmes.
- **Education and awareness:** raising awareness of biodiversity through environmental education, scientific research and political action.

Sustainable use of biodiversity

There are numerous ways in which societies and individuals can contribute to the conservation of biodiversity:

- **Sustainable consumption:** Buying organic products, FSC-certified wood and sustainably caught fish supports the conservation of biodiversity.
- **Promoting sustainable agriculture:** Programmes to promote flower strips, crop rotation and agro-ecological methods help to maintain species diversity in agricultural landscapes.
- **Reducing our ecological footprint:** By using fewer resources, reducing waste and choosing sustainable forms of transport, everyone can help to protect natural habitats.

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- **Involvement in environmental organisations:** Nature conservation organisations offer numerous opportunities for active participation in biodiversity projects.

A conscious and sustainable approach to biodiversity is crucial for the future of our planet. The next chapter is dedicated to an example for a specific measure in agriculture to promote biodiversity.

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10. Flower strips in agriculture – a practical example

Flower strips are purposefully created, perennial or annual plant strips, usually consisting of a mixture of native wild and cultivated plants. They are integrated into agricultural landscapes to promote species diversity and improve ecological functions.

Environmental benefits of flower strips

Flower strips offer numerous environmental and biodiversity benefits:

- **Promoting pollinators:** Flower strips provide habitat and food sources for wild bees, butterflies and other pollinators that are essential for agriculture.
- **Increasing soil fertility:** Through deep rooting, they improve the soil structure and promote microorganisms that contribute to humus formation.
- **Natural pest control:** Flower strips are home to beneficial insects such as ladybirds and lacewings, which control pests such as aphids.
- **Climate regulation:** They help to stabilise the water balance and counteract erosion.

Challenges and implementation in practice

Although flower strips offer numerous advantages, there are challenges to their implementation:

- **Availability of land:** Farmers must be willing to provide arable land for flower strips, which can mean economic losses.
- **Maintenance:** flower strips require regular maintenance to ensure optimal species composition and functionality.
- **Economic incentives:** many farmers depend on funding programmes to compensate for the loss of income.

Funding opportunities and political support

In Europe, there are various funding programmes to support the creation of flower strips:

- **EU agricultural policy (CAP):** Flower strips can be funded as part of agri-environmental measures.
- **National and regional programmes:** Many countries have special subsidies for biodiversity-promoting measures in agriculture.
- **Voluntary initiatives:** Nature conservation organisations and private companies support farmers in creating and maintaining flower strips.

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Flower strips are an effective example of a practical measure for promoting biodiversity. They show how nature conservation and agriculture can be successfully combined to create long-term sustainable solutions.

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11. Conclusion and outlook

The preservation of biodiversity is one of the greatest challenges of our time. The threats posed by habitat destruction, climate change, environmental pollution and the overuse of natural resources are serious, but there are promising approaches to counteract them.

Summary of the main findings

- Biodiversity is essential for stable ecosystems and human well-being.
- The greatest threats are human activities such as land-use changes, pollution and climate change.
- Protective measures such as nature reserves, sustainable agriculture and international agreements are crucial for maintaining biodiversity.
- Practical approaches such as flower strips in agriculture show how biodiversity promotion can be integrated into existing economic systems.

Future prospects

To conserve biodiversity in the long term, political, economic and social efforts must be intensified. The following measures could contribute to this:

- **Stronger political framework conditions**: Concrete implementation strategies for biodiversity agreements such as the Kunming-Montreal Global Biodiversity Framework must be developed and consistently enforced.
- **Economic incentives for biodiversity protection**: Financial support for sustainable agriculture and the protection of natural habitats must be further expanded.
- **Education and training**: Greater awareness of the value of biodiversity in schools, universities and society at large can help to promote more sustainable decisions.
- **Technological innovations**: The use of new technologies such as remote sensing and artificial intelligence can help to detect changes in ecosystems at an early stage and to take targeted countermeasures.

Biodiversity is a central foundation of life on earth. Its protection requires collaborative and long-term action to maintain a balanced relationship between humans and nature. Now is the time to act – for a future in which humans and nature can coexist in harmony.

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