

ANALYSIS OF SUFFICIENCY OF THE CURRENT MONITORING, MAPPING, AND DATA MANAGEMENT PRACTICE

REPORT

in the frame of Project “Conservation of Natural Heritage
for Life in Ukraine”, acronym ConNaturLIFE Ukraine,
(101148569 — LIFE23-PRE-CZ-ConNaturLIFE Ukraine)

Authors:

Alona Varukha, Yulia Spinova

Work Package number:

WP2

Work Package name:

Common legislative space for Ukraine and the EU
for nature protection

Action number
and name:

T.2.4 Effective monitoring, reporting,
and data management

Deliverable number
and name:

D2.11 Document of analysis of sufficiency
of the current monitoring, mapping,
and data management practice

Date:

January 2026

Prepared within the framework of the project Conservation of Natural Heritage for LIFE in Ukraine (LIFE23-PRE-CZ-ConNaturLIFE Ukraine), co-financed by the European Union and the Ministry of the Environment of the Czech Republic.

Co-funded by the European Union. Views and opinions expressed are however those of the author only and do not necessarily reflect those of the European Union or CINEA (the European Climate, Infrastructure and Environment Executive Agency – LIFE projects granting authority). Neither the European Union nor the granting authority can be held responsible for them.

CONTENT

Introduction	4
1. Biodiversity Monitoring in the European Union	5
1.1. Legislation.....	5
1.2. Programs.....	5
1.3. Practices	5
1.4. Biodiversity Monitoring in Germany in a Nutshell.....	7
1.5. Biodiversity Monitoring in France in a Nutshell.....	8
1.6. Biodiversity Monitoring in the Czech Republic in a Nutshell	9
2. Evaluation of the National Biodiversity Monitoring Systems in the Czech Republic and in Ukraine	11
2.1. Framework for the evaluation of NBMS	11
2.2. Evaluation of a Legal Dimension of NBMS of Czechia and Ukraine	12
2.2.1. Biodiversity Monitoring in Czechia: evaluation	13
2.2.2. Biodiversity Monitoring within Ukraine's Legal System and its evaluation	15
2.3. Evaluation of a Governance dimension of the NBMS of Czechia and Ukraine	19
2.3.1. Governance of the NBMS in Czechia	19
2.3.2. Governance of the NBMS in Ukraine	20
2.4. Evaluation of the Methods and Management dimension of the NBMS of Czechia and Ukraine	21
2.4.1. Methods and Management of the NBMS in Czechia.....	22
2.4.2. Methods and Management of the NBMS in Ukraine	24
2.5. Evaluation of the Capacity of the NBMS of Czechia and Ukraine	25
2.5.1. Capacity of the NBMS in Czechia	26
2.5.2. Capacity of the NBMS in Ukraine.....	28
3. Results.....	30
4. Conclusions	31
Annex 1. A framework developed for countries' NBMS characterization.....	32

INTRODUCTION

Information on the state of biodiversity is crucial for decision-making by government authorities. This information must be current and standardized, and it is obtained through biodiversity monitoring.

Biodiversity monitoring is an essential tool for ensuring effective natural resource management and fulfilling international obligations, such as the Convention on Biological Diversity, the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention), the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention), as well as aligning the national nature protection system with European Union standards. This includes the implementation of Council Directive 92/43/EEC of May 21, 1992, on the conservation of natural habitats and wild fauna and flora (Habitats Directive) and the European Parliament and Council Directive 2009/147/EC of November 30, 2009, on the conservation of wild birds (Birds Directive). Monitoring enables the detection of ecosystem change dynamics, the assessment of species populations, and the identification of threats to biodiversity, including human activity, climate change, and invasive species. The results of this monitoring are used to develop strategic and planning documents related to nature conservation and restoration, licensing, Environmental Impact Assessments (EIAs), restrictions on economic activities, and land conservation status, as well as to assess the effectiveness of the measures taken. Furthermore, monitoring provides a scientific foundation for the legal protection of natural sites, enhancing the alignment of national environmental laws with international standards.

Over time, Ukraine has launched a considerable number of biodiversity monitoring programs, which varied in duration and were initiated at different levels – ranging from legislative requirements and state programs to projects by non-governmental organizations. For instance, as of 2008, there were 95 biodiversity monitoring programs in Ukraine¹. However, at present, there is no active effort to update the list of existing monitoring programs nor review the essence and the structure of the monitoring system.

A comprehensive framework for evaluating the National Biodiversity Monitoring System (NBMS) was developed, synthesizing international guidelines, scientific best practices, and recent policy developments. The framework encompasses critical dimensions: legal and institutional (governance); data collection methodologies and management; and capacity (funding, human resources, infrastructure, and partnership). Applying the detailed criteria developed under this framework, a comparative evaluation was conducted on the NBMS of Czechia and Ukraine, two countries at different stages of NBMS maturity and integration with European Union laws and global biodiversity strategies.

¹ Kostyushin V. A., Andriienko T. L., Melnychuk V. P. (2008). Overview of Biodiversity Monitoring Programs in Ukraine. [In Ukrainian and English.] National Ecological Center of Ukraine, Kyiv, 2008. – 80 p.

1 BIODIVERSITY MONITORING IN THE EUROPEAN UNION

1.1. LEGISLATION

European Union Member States (hereinafter – EU) have adopted the EU Biodiversity Strategy for 2030, which aims to initiate the process of biodiversity restoration in Europe by 2030. Additionally, the countries that are Parties to the Convention on Biological Diversity reached a consensus on the goals and objectives within the Kunming-Montreal Global Framework Agreement on Biodiversity Conservation. This framework provides for concrete actions to halt biodiversity loss, including the protection of 30% of the planet's land and marine areas and the restoration of 30% of degraded ecosystems by 2030. Furthermore, the Parties agreed on a monitoring system. They emphasized the importance of national, regional, and global biodiversity monitoring systems, as well as transboundary cooperation and capacity-building in this area.

1.2. PROGRAMS

Currently, 274 biodiversity monitoring programmes are being implemented across European countries and agencies².

However, many of these biodiversity monitoring programs are fragmented, with significant gaps in spatial, temporal, and taxonomic coverage. Many of these initiatives have been established to achieve diverse objectives, applying varied methodologies across countries, as well as different sampling mechanisms and monitoring frequencies³.

In many countries, biodiversity monitoring programs are absent. As a result, there is a need to update and partially develop transnational biodiversity monitoring initiatives in regions where they are missing. Furthermore, these initiatives must be carefully harmonized to ensure data comparability, interoperability, and relevance for addressing the growing demands of society. This requires extensive cooperation among all biodiversity monitoring bodies and networks.

1.3. PRACTICES

The process of biodiversity monitoring is organized differently across European countries. It is difficult to determine which country in Europe has the «best» biodiversity monitoring system, as each has its own unique characteristics. Many EU countries have robust biodiversity monitoring systems that include specialized programs and initiatives aimed at assessing and protecting their natural heritage.

For example, Germany has several well-established biodiversity monitoring centres

² Moersberger H, Valdez J, Martin JC, Junker J, Georgieva I, Bauer S, Beja P, Breeze T, Fernandez M, Fernández N, Brotons L, Jandt U, Bruelheide H, Kissling WD, Langer C, Liqueste C, Lumbierres M, Solheim AL, Maes J, Morán-Ordóñez A, Moreira F, Pe'er G, Santana J, Shamoun-Baranes J, Smets B, Capinha C, McCallum I, Pereira H, Bonn A (2024) [Biodiversity monitoring in Europe: User and policy needs](#). Conservation Letters 17 (5).

³ Morán-Ordóñez A, Beja P, Fraixedas S, Herrando S, Junker J, Kissling WD, Lumbierres M, Lyche Solheim A, Miret G, Moe J, Moreira F, Pereira H, Santana J, Villero D, Brotons L (2023) D3.3 [Identification of current monitoring workflows and bottlenecks](#). ARPHA Preprints.

focusing on long-term monitoring of species diversity and ecosystem health. In the United Kingdom, a reliable biodiversity monitoring system is managed by the Centre for Ecology and Hydrology and the government organization Natural England. Other countries, such as Finland, Sweden, Italy, and Luxembourg, also have comprehensive national biodiversity monitoring systems that contribute to a better understanding of ecological trends and to the development of effective conservation strategies for biodiversity.

A key initiative worth highlighting is the European Biodiversity Partnership, [Biodiversa+](#), developed by BiodivERsA in collaboration with the European Commission as part of the [EU Biodiversity Strategy for 2030](#). It acts as a bridge between science, policy, and practice, uniting 83 research programmes, sponsors, and stakeholders from 41 European and associated countries. This partnership is instrumental in achieving the ambitious goal that *«by 2030, nature in Europe is back on a path of recovery, and that by 2050 people are living in harmony with Nature»*.

The approach to implementing monitoring measures within each country varies depending on its unique ecological characteristics, political priorities, available resources, and specific conservation issues. However, the following best practices for biodiversity monitoring in Europe can generally be identified:

1. Long-term monitoring programs: These allow for tracking biodiversity changes over time, making it possible to identify trends and patterns.
2. Standardization of data collection: Implementing standardized data collection protocols to ensure consistency across different territories, subjects, and monitoring projects.
3. Citizen science initiatives: Engaging the public in biodiversity monitoring through citizen science programs and apps, which help collect large volumes of data across broad areas.
4. Geospatial information methods (GIS): Utilizing remote sensing technologies, such as satellite imagery and aerial photography, to monitor changes in land cover, landscape fragmentation, and habitats.
5. DNA barcoding and molecular methods: Using DNA barcoding and molecular techniques for species identification and genetic diversity assessments within populations.
6. Indicator species monitoring: Focusing on key indicator species or groups (e.g., birds, butterflies) that are sensitive to specific environmental changes, as a way to assess the overall health of ecosystems.
7. Data sharing and integration: Promoting data exchange between different organizations and institutions to enable comprehensive analysis across larger spatial scales.
8. Adaptive management systems: Applying adaptive management approaches that use monitoring results to inform conservation actions, allowing for adjustments based on new information over time.

These practices help improve the understanding of biodiversity status in Europe, support conservation strategies based on factual data, and provide valuable information for policymaking processes aimed at ecosystem protection.

1.4. BIODIVERSITY MONITORING IN GERMANY IN A NUTSHELL

Germany (area – 357,592 km²), as a federal state, consists of 16 partially sovereign federal lands (Länder). The main body responsible for coordinating biodiversity monitoring is the Nature Conservation Division of the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety, and Consumer Protection of Germany (Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz, BMUV). Two other relevant bodies are the German Federal Agency for Nature Conservation (Bundesamt für Naturschutz, BfN) and the German Environment Agency (Umweltbundesamt, UBA). The authorities of the federal lands are responsible for implementing biodiversity monitoring at the subnational level. The recently established National Monitoring Center for Biodiversity (Nationale Monitoringzentrum zur Biodiversität, NMZB), with a secretariat at the BfN, is tasked with developing a general concept for nationwide biodiversity monitoring and coordinating activities within national programs.

Monitoring on Land Areas. Monitoring of terrestrial natural habitats and species (such as birds, insects, higher plants) is coordinated by the Federal Agency for Nature Conservation (BfN). Standards and monitoring concepts for terrestrial habitats/species have been developed and implemented by the BfN in close cooperation with the federal states of Germany, environmental organizations, and experts.

The BfN coordinates the monitoring of terrestrial protected areas in the case of nationally important areas.

For terrestrial monitoring, collaboration has been organized between government authorities and the authorities of the federal states, specifically for various monitoring programs.

Working groups led by the BfN exist for:

1. Monitoring according to the Habitats Directive
2. National bird monitoring
3. National ecosystem monitoring
4. Monitoring of high nature value farmland
5. National insect monitoring
6. Monitoring of national natural heritage

The Federal Ministry of Food and Agriculture developed additional monitoring measures.

Marine Monitoring. Federal states are responsible for monitoring on land and within the 12-mile territorial waters zone. In the exclusive economic zone, responsibility is on the federal government, as Germany has only limited sovereign rights here according to the United Nations Convention on the Law of the Sea (UNCLOS).

Marine biodiversity monitoring focuses not only on marine mammals, fish, and seabirds but also on benthic species and habitats. Unlike terrestrial areas, marine monitoring involves substantial material, technical, and financial costs. All collected and unprocessed data from multiple organizations are transmitted to the BfN in agreed formats for reporting obligations and public access.

One of the biggest challenges in organizing trans-European marine biodiversity monitoring systems is the significant costs of monitoring the sea and the requirements for cross-border coordination.

Budget. There is no comprehensive review of the funding spent on biodiversity monitoring programs in Germany, as many different participants are involved, making it difficult to estimate the total costs.

Additionally, the role of volunteers in biodiversity monitoring in Germany is extremely important, and their substantial contributions are difficult to express in monetary terms. A significant share of monitoring activities is funded on a project basis. The activities for the National Monitoring Centre for Biodiversity is funded by the federal government (Bundesregierung), and the overall budget ranges from 4.3 to 6.2 million euros per year⁴.

The [Living Atlas of Nature in Germany](#) (Der Lebendige Atlas der Natur Deutschlands, LAND) compiles species observations from across Germany to make them available for specialist applications and the general public. Currently, it displays species occurrences from selected datasets that are publicly available via the Global Biodiversity Information Facility (GBIF) portal.

1.5. BIODIVERSITY MONITORING IN FRANCE IN A NUTSHELL

Although smaller in size, France is the EU country most comparable to Ukraine in terms of area.

The Ministry of Ecological Transition and Territorial Cohesion of France is responsible for reporting to the Convention on Biological Diversity. However, it is not deeply involved in biodiversity monitoring, except for funding and overall coordination.

The French Biodiversity Agency (L'Office français de la biodiversité, OFB) is tasked with coordinating three national monitoring schemes (marine, terrestrial, and freshwater biodiversity) and three corresponding national information systems. Its responsibilities include coordinating information, making it accessible, raising public awareness, and establishing connections between available data/information.

One of the departments of this agency is partially integrated with the National Museum of Natural History (Muséum national d'histoire naturelle, MNHN) through the Patrimoine division and specializes in monitoring reporting and data management. This department operates across three domains (freshwater, marine, and terrestrial) and provides the full range of services related to monitoring:

1. (Observation): Development of a national monitoring scheme and coordination of national observation systems, development and publication of monitoring methodologies;

⁴ Report on the Mapping of national and sub-national organisations that fund and steer biodiversity monitoring schemes. [URL](#)

2. (Data): Coordination of data management infrastructure and information systems, reference list of habitats and ecosystems, visualization of information/data, synthesis and development of indicators for both general and specialized public;
3. (Assessment): Reporting in accordance with European directives, supporting the IUCN Red List assessment, assisting ministries, and supporting other sectors for local assessments.

This department does not carry out monitoring activities directly. The French Biodiversity Observation Network (BON) is part of the global biodiversity observation network (Group on Earth Observations Biodiversity Observation Network, GEO BON⁵), It brings together experts from the French Biodiversity Agency (OFB), the French National Museum of Natural History (MNHN), and the research community, and is also part of the Patrimoine division. The French BON focuses on implementing key biodiversity variables (Essential Biodiversity Variables, EBV⁶) and was recently integrated.

Budget. The total cost of freshwater monitoring (which exceeds the total for biodiversity monitoring) is approximately 130 million euros per year. The total yearly cost of marine monitoring is approximately 60 million euros. The cost of terrestrial monitoring and biodiversity data collection is estimated at between 30 and 65 million euros per year [4]. Estimating the costs of terrestrial monitoring is challenging, as a significant share of the work is carried out by associations (e.g., NGOs) and citizens ⁷.

The presented budgets also include research programs, meaning that the expenses of the Ministry of Ecological Transition and Territorial Cohesion of France do not cover the costs of fundamental research conducted by another ministry –the Ministry of Higher Education, Research and Innovation.

Despite significant national funding, even France heavily relies on EU funds, such as those from the LIFE program, which is a crucial source of funding specifically for biodiversity monitoring (excluding the freshwater sector).

France has the [National Inventory of Natural Heritage](#) (L'Inventaire national du patrimoine naturel, INPN), which is the portal for French biodiversity and geodiversity, both in metropolitan France and overseas territories.

1.6. BIODIVERSITY MONITORING IN THE CZECH REPUBLIC IN A NUTSHELL

In the Czech Republic (area – 78,871 km²), the coordination of biodiversity monitoring and conservation efforts is overseen by the Nature Conservation Agency (hereafter referred to as the Agency). The Agency has established a comprehensive network of protected areas and conducts regular monitoring of species and natural habitats. The Czech Republic is also actively involved in international and regional initiatives, such as

⁵ GEO BON is a global biodiversity observation network that contributes to effective policies for managing global biodiversity and ecosystem services. [More information can be found here](#).

⁶ [EBVs \(Essential Biodiversity Variables\)](#). Initially, 21 variables were identified, but after reviews and discussions at the EU level, the proposal now is to define 73 variables.

⁷ Levrel, H., Fontaine, B., Henry, P.-Y., Jiguet, F., Julliard, R., Kerbiriou, C., & Couvet, D. (2010). [Balancing state and volunteer investment in biodiversity monitoring for the implementation of CBD indicators: A French example](#). Ecological Economics, 69(7), 1580–1586.

the European Commission's periodic reports on the state of nature in the EU.

A key component of biodiversity monitoring consists of activities related to data collection on species and their communities. The largest share of work in this area is devoted to the monitoring of particularly valuable species and habitat types. This has led to the establishment of a data infrastructure and expert network within the Agency, allowing for biodiversity assessments at various levels and across different geographical contexts through the centralization of data sources. A substantial proportion of biodiversity monitoring activities is implemented through specific projects. For example, these include the inventory of protected areas and the assessment of species status within the EU Natura 2000 network of protected areas.

Monitoring and assessment of species and natural habitats, from a conservation perspective, are based on the provisions of the Habitats Directive and Birds Directive, which have been incorporated into the Czech National Council Act No. 114/92 on the Protection of Nature and the Landscape, particularly Section 45f. This section mandates that conservation authorities monitor the status of birds, habitats, and especially valuable species of flora and fauna. The Ministry of the Environment of the Czech Republic has assigned the Nature Conservation Agency the responsibility of fulfilling these obligations.

In the context of Czech nature protection, the mapping and long-term monitoring of species population dynamics are integral components of species protection.

Biodiversity monitoring in the Czech Republic includes procedures that vary in intensity, complexity, and purpose. It typically involves a methodologically standardized collection of data (such as population numbers, environmental factors, etc.) from the same territories over time, allowing for the tracking of changes in biodiversity. In addition, within protected areas, broader mapping and standardized inventory studies are also used for their assessment. These approaches are applied both to species and to natural habitats.

From the perspective of territory and organization, the largest-scale monitoring is the mapping of natural habitats (biotopes) across the entire territory of the Czech Republic. The result is a cartographic layer of biotopes, which is planned to be updated every 12 years. Habitat monitoring is carried out using phytocenological snapshots on a representative sample of territories.

Species monitoring is also conducted on permanent plots (locations). However, for many species, the implementation of extensive systematic mapping is more effective. In the case of specific species, mapping with public participation is also used. All species data is stored in a unified format in the [Nature Conservation Discovery Database](#), NCDD, which is currently an indispensable source of data on species diversity.

Species maps are the public result of the content of the NCDD database, managed by the Agency. In the form of network distribution maps in the Czech Republic, their content is not only summarized but also compared with other sources through the processing of other published maps. [Red Lists of endangered species](#) are also maintained here.

2 EVALUATION OF THE NATIONAL BIODIVERSITY MONITORING SYSTEMS IN THE CZECH REPUBLIC AND IN UKRAINE

2.1. FRAMEWORK FOR THE EVALUATION OF NBMS

Evaluation of the National Biodiversity Monitoring System (NBMS) requires a comprehensive, holistic approach. Therefore, a synthesis of international technical guidelines, scientific literature, project reports, recent policy developments, expertise of authors involved, and experts guided the development of the NBMS evaluation framework. The comparative evaluation, based on criteria developed, drew on a wide range of sources [8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18].

The developed framework (Annex 1) encompasses the different dimensions, each operationalized through specific criteria.

Four dimensions: Legal, Governance, Methods and Management, Capacity, and ten criteria within dimensions were identified for NBMS characterization. Each criterion used within the framework was described.

Legal dimension consists of three criteria (1-3). The governance dimension was operationalized through one criterion (4). Methods and Management dimension consists of two criteria (5-6). Capacity dimension reflected via four criteria (7-10).

The main criteria for the national biodiversity monitoring systems evaluation are as follows:

-
- 8 Guidelines for developing national biodiversity monitoring systems as an environmental policy tool for countries of Eastern Europe, the Caucasus and Central Asia, as well as interested South-Eastern European countries. [URL](#)
 - 9 Wright, E. F., Bellingham, P. J., Richardson, S. J., McKay, M., MacLeod, C. J., & McGlone, M. S. (2020). [How to get a national biodiversity monitoring programme off the ground: lessons from New Zealand](#). PARKS, 26.2, 67–78.
 - 10 FAO. 2017. [Voluntary guidelines on national forest monitoring](#). Rome, FAO.
 - 11 Kostushyn, V.A., Gubar, S.I., Domashlinets, V.G. Strategy for developing the monitoring of biodiversity in Ukraine. — Kyiv, 2009. — 60 pp.
 - 12 Santana, J., Porto, M., Morán-Ordóñez, A., Brotons, L., Junker, J., Kissling, W. D., Lumbierres, M., Moe, S. J., Solheim, A. L., Villero, D., Breeze, T. D., Carvalho, L., Fernández, N., Herrando, S., López-Baucells, A., Shamoun-Baranes, J., Silero, N., Pereira, H. M., Moreira, F., & Beja, P. (2025). [Large Biodiversity Monitoring Gaps Remain Across Europe](#). *Conservation Letters*, 18(5).
 - 13 UNEP-WCMC (2024) Guidance for developing plans for national monitoring systems in support of the Kunming-Montreal Global Biodiversity Framework. 26pp. Cambridge, UK
 - 14 Jungmeier, M. and Yenilmez Arpa, N. 2022. [Guidelines for biodiversity monitoring](#). Ankara, FAO and MAF.
 - 15 Genovart, M., Salguero-Gomez, R., Colchero, F., Guil, F., Rabassa-Juveny, J., Uriach-Dasca, J., Conde, D. A., Gaillard, J. M., & Coulson, T. (2025). [Call for new criteria for monitoring and registering Natura 2000 species data](#). *Conservation Biology*, e70064.
 - 16 Burns, E. L., Tennant, P., Dickman, C. R., Gillespie, G., Green, P. T., Hoffmann, A., Keith, D. A., Lindenmayer, D. B., Metcalfe, D. J., Morgan, J. W., Russell-Smith, J., & Wardle, G. M. (2018). [Making monitoring work: insights and lessons from Australia's Long Term Ecological Research Network](#). *Australian Zoologist*, 39(4), 755–768.
 - 17 Michelle Silva del Pozo, Guillaume Body, Gaby Rerig, Mathieu Basille. (2023). Guide on harmonising biodiversity monitoring protocols across scales. Biodiversa+ report. 60 pp.
 - 18 Guidelines for developing national biodiversity monitoring systems. UNECE.2023. [URL](#)

- (1) Monitoring purpose,
- (2) Targeted selection of monitoring objects
- (3) Systematicity and continuity with mandatory reporting
- (4) Structure and executive body(s)
- (5) Methods (data collection and data analysis)
- (6) Data management system and data analysis
- (7) Funding
- (8) Human resources
- (9) Infrastructure
- (10) Partners and stakeholder engagement.

Considering the aforementioned criteria, to get a general understanding of the current state of biodiversity monitoring processes, the NBMS of Czechia and Ukraine were described based on the most recent available evidence.

Further, for each criterion of the NBMSs of the respective countries, taking into account the completeness of compliance with the essence of the criterion, a score was assigned (from 0 to 5, where 0 means the criterion is completely absent, and 5 means the criterion is fully met; the maximum possible score is 50 points). The assignment of scores enables a comparative analysis that summarizes the performance of Czechia and Ukraine and ' across all framework criteria, and provides a clear visual synthesis of their respective strengths and weaknesses.

2.2. EVALUATION OF A LEGAL DIMENSION OF NBMS OF CZECHIA AND UKRAINE

(1) Certainty with the main purpose of monitoring: defining specific and measurable goals for the monitoring system.

(2) Targeted selection of monitoring objects: inclusion of the species and habitats of the international (Annexe I, II, IV and V Habitat Directive, Annexe I Birds Directive, Resolutions 4 and 6 of the Berne Convention) and national (Red Data Book of Ukraine, RDBU) level, as well as deviations (Article 16 HD). Monitoring priorities should be established and accepted, with the obligations set by the EU membership given the highest priority.

(3) Systematicity and continuity with mandatory reporting. Includes implementation of systematic long-term biodiversity monitoring programs that ensure compliance with the requirements of the Habitats and Birds Directives to identify patterns/trends, as well as determination of intervals between monitoring activities. The existence of a plan and the minimum required volume of data and analytical outputs for monitoring; a definition of responsibility for the absence of monitoring, and a system of incentives for providing data and analytic materials.

No	Criteria	Czechia NBMS	Ukraine NBMS
		points (0-5)	
1.	Certainty with the main purpose of monitoring	5	2
2.	Targeted selection of monitoring objects	5	3
3.	Systematicity and continuity with mandatory reporting	5	1

2.2.1. BIODIVERSITY MONITORING IN CZECHIA: EVALUATION

Below is the short rationale behind the assessment of the criteria of Legal dimension.

(1) Certainty with the main purpose of monitoring.

In the Czech Republic, the principal legal framework implementing the Habitats Directive (92/43/EEC) and the Birds Directive (2009/147/EC) is [Act No. 114/1992 Coll., on Nature and Landscape Protection](#).

Purpose of the Act (§ 1–2). Sections 1 and 2 explicitly state that the Act aims to maintain and restore natural balance, to protect species and habitats, and to establish and manage the Natura 2000 network in line with EU law.

Transposition of the EU Directives (§ 45a–i). As a result of a series of amendments, the Act introduces §§ 45a–i, which transpose key obligations from both directives. In particular, § 45f requires systematic, long-term monitoring of the conservation status of EU-listed species and habitats using a unified national methodology. Section 45f thus constitutes the key legal provision defining the frequency and scope of monitoring..

Mandate of the Nature Conservation Agency (NCA ČR) Under § 45f, the Nature Conservation Agency of the Czech Republic is charged with collecting data, evaluating trends, and preparing regular reports for the European Commission. This institutional assignment ensures both clarity of responsibility and continuity of effort.

Data Management and International Cooperation (§ 72d, § 78 (8)). Section 72d establishes the role of the Nature Conservation Information System and obliges the competent nature conservation authorities to maintain detailed records of all monitoring activities, while § 78 (8) secures the exchange of data and collaboration with all relevant stakeholders listed within the provision.

Reporting Obligations. The Act concretely defines the schedule and content of reports on the status of Natura 2000 sites and on species and habitats of Community interest, fully mirroring the requirements laid down in Articles 17 and 19 of the Habitats Directive and Article 12 of the Birds Directive.

Owing to these provisions, the legal system of the Czech Republic clearly defines the objectives of monitoring, embeds them in national legislation, allocates institutional responsibilities, and ensures alignment with EU reporting cycles.

Considering mentioned above, the score for this criterion is 5.

(2) Targeted selection of monitoring objects.

The Act No. 114/1992 Coll., on Nature and Landscape Protection, defines the selection of monitoring objects in § 45f. The provision contains links to other paragraphs (eg. § 5a Protection of wild birds), ensuring alignment with the relevant Annexes of the Birds Directive and Habitats Directive.

Monitoring of the Annex I habitats is slightly more complex. In the year 2000, the Habitat Mapping of the Czech Republic project was launched. Its main purpose was to create an expert basis for the designation of Sites of Community Importance within the Natura 2000 network for individual types of natural habitats. Mapping and the subsequent resolution of specific issues continued until 2005. The outcome is the fundamental layer of habitat mapping of the Czech Republic, which provides the initial nationwide information on the occurrence and condition of natural habitats within the territory of our country. Among the principal goals of the mapping process was the preparation of data for designation of the Natura 2000 sites. In 2006, the original mapping was followed by the project of updating the habitat mapping layer. Its goal is to maintain the layer in an up-to-date form in twelve-year cycles. Field data collection is carried out according to the mapping methodology – using the current working version for the season – and the spatial unit of updating is a clearly defined update district.

Nature conservation authorities are responsible for reporting to the Ministry of Environment.

Considering mentioned above, the score for this criterion is 5.

(3) Systematicity and continuity with mandatory reporting.

The systematic nature, continuity and frequency of biodiversity monitoring are determined by reporting obligations. The NCA ČR plays a coordinating role at the national level as a government body under the authority of the Ministry of Environment, which is responsible for reporting to the EU bodies. The mapping and monitoring frequencies are hence given by the obligations. The execution of the monitoring actions is coordinated primarily by the Department of Biodiversity Monitoring at the NCA headquarters.

Each January and February, biodiversity monitoring experts at the NCA headquarters draft a year plan to contribute towards the fulfilment of 1) reporting obligations under the Habitats Directive and Birds Directive; 2) conservation status of species and habitats within the Natura 2000 Network and small-scale protected areas; 3) various local and regional needs. The plan is then shared with the employees at the regional branches of the NCA, and after revisions, it is confirmed and fulfilled.

The individual employees are mainly zoologists and botanists working at either the NCA (headquarters and regional branches, including the protected landscape areas staff) or the national parks administrations (PA staff). Naturally, when there is a forester, a landscape architect, or even an accountant with relevant expertise, they can join the monitoring efforts if their supervisor gives them the task. However, most of the monitoring is done by the botanists and zoologists. The biodiversity monitoring is a significant part of their work, but they usually also write the management plans, administer and manage the PAs, and participate in events for the public.

The main actors of the monitoring and reporting systems are hence 1) the NCA headquarters maintaining the databases, data collection forms, coordinating the monitoring, evaluating the data, and reporting the results; and 2) the biodiversity monitoring experts (mainly zoologists and botanists) at the regional branches of the NCA (incl. PLA administrations) and NP administrations, who collect the data and send it to the central databases.

The implementation of the annual plan is monitored and evaluated after each year. The results are subsequently reviewed at the annual meetings of the NCA board, and if identified, the inadequate performance of the regional branches failing to achieve the expected outcomes is reported to the managerial level. Hence, there is a clear chain of command and transfer of responsibilities from the top levels (Ministry of Environment tasking the NCA top management) across mid-management (NCA Department of monitoring presenting the monitoring plan to regional branch Heads) to the base-level (individual employees are responsible for the planned monitoring actions and report directly to their supervisors).

Considering mentioned above, the score for this criterion is 5.

2.2.2. BIODIVERSITY MONITORING WITHIN UKRAINE'S LEGAL SYSTEM AND ITS EVALUATION

In Ukrainian environmental legislation, the definition of the state system of environmental monitoring has been in existence since 1991 ([Law of Ukraine «On Environmental Protection» No. 1264-XII, dated June 25, 1991](#)). However, until 2023, it only referred to ecological monitoring data (sometimes including chemical, quantitative, biological, hydromorphological, and physicochemical indicators). This involved the collection, processing, and subsequent analysis of data regarding the quality of atmospheric air (Article 32 of the Law of Ukraine «[On the Protection of Atmospheric Air](#)»), water (Article 21 of the [Water Code of Ukraine](#), Article 39 of the Law of Ukraine «[On Drinking Water and Drinking Water Supply](#)» No. 2887-IX dated January 12, 2023), and land resources (Articles 191-192 of the [Land Code of Ukraine](#), Article 54 of the Law of Ukraine «[On the Protection of Land](#)» No. 962-IV, dated June 19, 2003). There was also a separate concept of forest monitoring (Item 6, Article 35 of the [Forest Code of Ukraine](#)).

In paragraph 1 of the Law of Ukraine «[On the State Program for the Formation of the National Ecological Network of Ukraine for 2000-2015](#)» No. 1989-III dated September 21, 2000, the definition of the term «monitoring of the ecological network's status» is provided: *«monitoring of the ecological network's status is a system of observations of changes in environmental components within the ecological network, aimed at the timely identification of negative trends in their condition, assessing the potential consequences of such changes, forecasting, preventing negative processes, and eliminating their consequences»*.

The concept of biodiversity monitoring was not previously defined at the legislative level. In 2023, the Law of Ukraine «[On Amendments to Certain Legislative Acts of Ukraine Regarding the State System of Environmental Monitoring, Information on the State of the Environment \(Environmental Information\), and Information Support for Environmental](#)

[Management](#)» was adopted. This law introduced many changes to Ukraine's existing environmental protection legislation, particularly in the area of monitoring. Specifically, it defined the concept of biodiversity monitoring as part of the state environmental monitoring system (Clause «r» of Article 22 of the Law of Ukraine «[On Environmental Protection](#)» 1264-XII dated June 25, 1991):

«Biodiversity and landscape diversity monitoring is a system of observations of biological and landscape diversity, collecting, processing, and exchanging information on the condition of its components, which is used to assess and forecast changes in their condition and to develop scientifically grounded recommendations for making effective management decisions.

Biodiversity and landscape diversity monitoring is a component of the state environmental monitoring system and is carried out in the manner established by the Cabinet of Ministers of Ukraine».

This definition now serves as the foundation for shaping Ukraine's state policy in the field of biodiversity monitoring. In 2023, similar amendments were made to the legislation concerning fauna, flora, and the ecological network, all of which specify that «*monitoring of biological and landscape diversity is a component of the state environmental monitoring system*».

In line with this law, the Cabinet of Ministers of Ukraine approved Resolution No. 684 on June 13, 2024, «[On the Procedure for the Functioning of the State Environmental Monitoring System and Its Subsystems](#)». This resolution, like the law, enters into force six months after the end of martial law in Ukraine.

On January 17, 2025, the Government approved the Cabinet of Ministers of Ukraine Resolution No. 45 «[On Approving the Procedure for Biodiversity and Landscape Diversity Monitoring](#)», which became the most specialized regulatory legal act in the field of biodiversity monitoring in Ukraine. The Procedure for Biodiversity and Landscape Diversity Monitoring (hereinafter referred to as the «Procedure») defines the list of subjects (central executive authorities, state enterprises, institutions, organizations, as well as the National Academy of Sciences of Ukraine and the National Academy of Agrarian Sciences of Ukraine) and the objects of biodiversity monitoring in Ukraine.

The objective of biodiversity monitoring, as defined in the Procedure, is: «*to ensure the organization of continuous or periodic observations of monitoring objects; the collection, processing, storage, generalization, and analysis of information on the state of biological and landscape diversity and its components, as well as the exchange of such information; the assessment and forecasting of changes, and the development of scientifically grounded plans and programs for the improvement, conservation, and restoration of biological and landscape diversity, including forests; the prevention, containment of losses, and sustainable use of components of biological and landscape diversity in accordance with biodiversity and landscape diversity monitoring programs at the national, regional, local, and site-specific levels.*»

The Procedure outlines that the biodiversity monitoring system shall operate on the basis of the National Biodiversity and Landscape Diversity Monitoring Program, which the

Ministry of Environmental Protection and Natural Resources (hereinafter - the Ministry of Environment) (not operating at the moment) must develop within one year from the date the Resolution No. 45 comes into force. Additionally, monitoring entities are obliged to submit their monitoring results to the Ministry of Environment free of charge, in the format and within the timeframe specified by the National Biodiversity and Landscape Diversity Monitoring Program.

However, the Resolution will take effect simultaneously with the enactment of the Law of Ukraine No. 2973-IX «On Amendments to Certain Legislative Acts of Ukraine Regarding the State System of Environmental Monitoring, Information on the State of the Environment (Environmental Information), and Information Support for Environmental Management in the Environmental Sector,» dated March 20, 2023, meaning it will come into force six months after the cancellation or termination of martial law. Moreover, the Ministry of Environment was abolished as an independent Ministry and became part of the Ministry of Economy, Environment, and Agriculture of Ukraine in September 2025.

Below is a short rationale for assessing the criteria of the Legal dimension.

(1) Certainty with the main purpose of monitoring.

The goal of biodiversity and landscape diversity monitoring, according to paragraph 3 of the Resolution of the Cabinet of Ministers of Ukraine «[On Approving the Procedure for Biodiversity and Landscape Diversity Monitoring](#)» is to:

«Ensure the organization of permanent or periodic observations of monitoring objects; the collection, processing, storage, generalization, analysis of information on the state of biological and landscape diversity and its components, as well as the exchange of such information; assess and predict changes and develop scientifically grounded plans and programs for the improvement, preservation, and restoration of biological and landscape diversity, including forests; prevent, limit losses, and ensure the sustainable use of components of biological and landscape diversity according to biodiversity and landscape diversity monitoring programs at the national, regional, local, and object levels».

The broader goal of biodiversity monitoring, specifically «ensuring the achievement of the Sustainable Development Goals,» is stated in paragraph 3 of the Cabinet of Ministers of Ukraine Resolution No. 684 dated June 13, 2024, «[On the Procedure for the Functioning of the State Environmental Monitoring System and Its Subsystems](#)».

The goal of creating the overall state environmental monitoring system, according to Article 22 of the Law of Ukraine «[On Environmental Protection](#)» No. 1264-XII dated June 25, 1991, is: «ensuring the collection, processing, storage, and analysis of information about the state of the environment, forecasting its changes, and developing scientifically grounded recommendations for making effective management decisions in Ukraine».

As all the legal acts related to biodiversity monitoring have not yet come into effect, an assessment is 2.

(2) Targeted selection of monitoring objects.

Article 61 of the Law of Ukraine «[On Environmental Protection](#)» No. 1264-XII dated June 25, 1991, indicates that the territories for biodiversity monitoring are the objects

of the Nature Reserve Fund of Ukraine: «*Land and water areas, natural complexes and objects that have particular ecological, scientific, aesthetic, and economic value and are designated for the preservation of natural diversity, gene pool of animal and plant species, maintenance of the general ecological balance, and background environmental monitoring. These areas are fully or partially removed from economic use and declared as territories or objects of the Nature Reserve Fund of Ukraine*».

This is also confirmed by Articles 9 and 17 of the Law of Ukraine «[On the Nature Reserve Fund of Ukraine](#)».

According to Article 11 of the Law of Ukraine «[On the Red Data Book of Ukraine](#)», the monitoring of objects in the Red Data Book of Ukraine is ensured through: «*systematic work on identifying the locations of their habitats (growth areas), conducting constant observation (monitoring) of the status of their populations*».

The state monitoring system of the environment includes the monitoring of plants (Article 39 of the Law of Ukraine «[On the Plant World](#)» No. 591-XIV dated April 9, 1999) and animal life objects (Article 55 of the Law of Ukraine «[On the Animal World](#)» No. 2894-III dated December 13, 2001), as well as the monitoring of the ecological network (Article 20 of the Law of Ukraine «[On the Ecological Network of Ukraine](#)» No. 1864-IV dated June 24, 2004).

The most complete list of monitoring objects is provided in paragraph 5 of the Resolution of the Cabinet of Ministers of Ukraine «[On Approving the Procedure for Biodiversity and Landscape Diversity Monitoring](#)» adopted on January 17, 2025. Yet it will come into force later.

Since biodiversity monitoring in Ukraine is conducted in a fragmented and short-term manner, only for specifically identified objects, for which programs are created, our provided evaluation is 3.

(3) Systematicity and continuity with mandatory reporting.

Despite Ukraine having some reporting obligations towards species and habitats according to the Bern Convention, there are no regulated requirements for clear reporting deadlines (with the exception of certain species during specific periods) in Ukraine. As a result, monitoring lacks a systematic and continuous character, and is rather episodic and fragmented.

Systematic and continuous monitoring with annual reporting (Chronicle of Nature) is conducted only within protected areas (PAs) with administrations (e.g. nature reserves, biosphere reserves, national parks, regional landscape parks). Regular, comprehensive biodiversity monitoring on forested lands is absent, although certain game species and plant species are monitored to a limited extent. In Ukraine, there is no liability (responsibility) for the lack of monitoring data, and there is no incentive system.

Considering mentioned above, the score for this criterion is 1.

2.3. EVALUATION OF A GOVERNANCE DIMENSION OF THE NBMS OF CZECHIA AND UKRAINE

(04) Structure and executive body(s).

There are central executive body(s) (and possibly regional) responsible for biodiversity monitoring and reporting to the EU. It develops the relevant policy in the country. Ensures: Data Management and Interoperability (Standardization of protocols and data; Data interoperability; Data accessibility and sharing); Resource Allocation and Sustainability (Funding stability and adequacy; Resource allocation across realms); Utilization of Monitoring Results (Integration into policy and decision-making); Stakeholder engagement and feedback mechanisms. It is multi-level, transparent, collaborative, independent, science-intensive, sustainable, and adaptable.

№	Criteria	Czechia NBMS	Ukraine NBMS
		points (0-5)	
4.	Structure and executive body(s)	4	0

2.3.1. GOVERNANCE OF THE NBMS IN CZECHIA

(4) Structure and executive body(s).

The Nature Conservation Agency of the Czech Republic is the central executive body responsible for biodiversity monitoring and reporting to the EU (on behalf of the Ministry of Environment). This means that it is the institution that centralises all available data and ensures the operation of the necessary data management infrastructure. Despite this responsibility, the NCA has no direct control over the other nature conservation authorities (national park administrations, regional governments, military training grounds), and thus cannot enforce the methodologies and guidelines. That is the role of the Ministry of Environment. Despite this gap, the current system of governance is fully fit to achieve its main goal, timely and detailed reporting to the EU bodies.

Furthermore, the system so far lacked transparency beyond the staff of the NCA. This is recently changing with the update of the Nature Conservation Information System, as the annual biodiversity monitoring plan is becoming available to all the other nature conservation authorities. At the first stage, the regional governments, national park administrations, and the Ministry of Defence will be able to view the monitoring activities planned by the NCA. At the second stage they will be given the opportunity to plan their own activities

Concerning biodiversity data, as the body responsible for governance and maintenance of species and habitats' databases, the Nature Conservation Agency ensures data management and interoperability. This concerns the obligations stemming from both the Habitats and the Birds Directives. Data concerning the reporting on other various environmental directives (e.g. the Water Framework Directive) is managed by multiple different institutions.

The information provided above relates to the Habitats directive and Birds Directive. The complex nature of the Nature Restoration Regulation and reporting burden regarding

the many articles will increase the demand on the Nature Conservation Agency's data management and interoperability capacities. In this regard, the exact responsibilities of the Ministry of Environment and the Ministry of Agriculture (including their organisations) will be determined in the coming months.)

The integration of biodiversity monitoring results into policy and decision-making functions effectively at multiple levels. At the most basic level, the databases are well-known by the practitioners who access them daily. A more detailed assessment is completed with each update of the management plan for each protected area, or an appropriate assessment with IT tools integrating multiple databases and resources to help conservation officers make a better-informed decision. Similarly, the summarised data is used to inform policy-makers through strategic documents, including the Czech Strategy for Biodiversity Conservation.

While there are campaigns to engage stakeholders and make state biodiversity monitoring more collaborative, these are irregular and infrequent. The main bulk of such initiatives is carried out by either national NGOs or international platforms. The Czech Ornithological Society (Birdlife partner) has built a large faunistic database on birds, which is constantly growing thanks to the activity of both professionals and amateurs. The Czech Botanical Society is running a successful project on iNaturalist, although mainly focused on its members.

The iNaturalist is also used by many NGOs and educational institutions during short-term campaigns like BioBlitz (focused on mapping the occurrence of invasive alien species) and City Nature Challenge. Such activities had played a key role in growing the community in Czechia. Despite its support, the Nature Conservation Agency is still not a major actor in these, but is utilising the citizen science data through its uptake into the Species Occurrence Database.

Considering mentioned above, the score for this criterion is 4.

2.3.2. GOVERNANCE OF THE NBMS OF UKRAINE

(4) Structure and executive body(s).

Unlike in Czechia, in Ukraine, there is no central level structure or executive body responsible for policy and its implementation (action). The Ministry of Environmental Protection and Natural Resources was abolished in September 2025 in Ukraine. The former Ministry of Environment was not able properly perform its duties at the local level because regional environmental protection divisions were abolished as part of an earlier reform. The management, monitoring, and supervision system is not functioning properly. The regime of protected areas is being violated on a massive scale, and compliance with international obligations is not being monitored.

Ukrainian NGO emphasise¹⁹ the urgent need to restore the territorial bodies of the former Ministry of Environment, as well as to reform the monitoring, control, and supervision subsystems; a separate Agency for Nature Conservation or a full-fledged

¹⁹ Compliance of the state policy of Ukraine in the area of biodiversity conservation with priorities and targets of the European Green Deal. [URL](#)

Department should be established to implement state policy in the field of development and management of the national protected areas network, the Emerald Network sites, and biodiversity conservation.

As of January 2026, the draft resolution of the Cabinet of Ministers of Ukraine “[On Approval of the Strategy for the Conservation of Biological Diversity in Ukraine for the Period until 2035 and Approval of the Operational Plan of Measures for its Implementation in 2026-2028](#)” is under discussion. Clause 3.2.9. of the Operational plan of measures for implementation in 2026-2028 provides for “the creation of a central executive body to ensure the implementation of state policy in the areas of organization of protection and use of the natural reserve fund, formation, conservation, and use of the ecological network, conservation, restoration, and sustainable use of biological and landscape diversity”. Though, the time of the adoption of the corresponding resolution of the Cabinet of Ministers of Ukraine that will allow the establishment of the mentioned central executive body is “blurred”: “the 2026 – one year after the termination or cancellation of martial law in Ukraine”.

Considering mentioned above, the score for this criterion is 0.

2.4. EVALUATION OF THE METHODS AND MANAGEMENT DIMENSION OF THE NBMS OF CZECHIA AND UKRAINE

(5) Methods (data collection and data analysis)

Should be based on the following principles:

Uniformity (using unified, internationally compatible methodologies/protocols (appropriate for different taxa) for data collecting and analysis to ensure their compatibility and comparability (e.g., from different regions and time periods), which are approved at the state level and updated in accordance with the current level of scientific development).

Technological (GIS, UAVs, etc.) that allow to increase precision and efficiency.

Use of advanced scientific methods (e.g., molecular methods like barcoding) that ensures a deeper level of taxonomic accuracy and biological insight than traditional observation alone.

Robust Data analysis methods: rigorous analytical frameworks to process data, ensuring that findings are statistically significant and capable of being integrated into broader scientific databases.

(6) Data management system and data policy

Existence of a sound data policy, a reliable and adaptable database management system (DBMS), and a single platform (core repository) for biodiversity data that aligns with the following requirements.

Verification Protocols in place. The system must include a robust mechanism for data verification to ensure accuracy and scientific validity.

Centralized Infrastructure. DBMS and core repository infrastructure must be centralized and governed accordingly.

Integrity and Interoperability: The system must support cross-platform data exchange and be fully compatible with major international databases such as GBIF, iNaturalist, sPlot, and EVA, allowing for integration into the European database(s).

Geospatial Capabilities. A built-in GIS (Geoinformation System) component is required to manage and visualize spatial data.

Data analysis capacity in place. The system should provide automated analytical tools capable of identifying (species population) trends, calculating biodiversity indices, generating semi-automatic reports and data visualizations, etc.

Transparent terms-of-use. Conditions for data use must be clearly defined and transparent for both contributors (authors) and end-users.

Easy to use. The platform must be user-friendly.

№	Criteria	Czechia NBMS	Ukraine NBMS
		points (0-5)	
5.	Methods (data collection and data analysis)	4	0
6.	Structure and executive body(s)	5	0

2.4.1. METHODS AND MANAGEMENT OF THE NBMS OF CZECHIA

(5) Methods (data collection and data analysis)

Uniformity is currently ensured by providing the relevant actors the methodologies for data collection and data storage. The Nature Conservation Agency is the methodological leader in the area of biodiversity monitoring. Species inventories, mapping, and monitoring of the target taxa. However, these are often not being followed in practice and individual nature conservation authorities and NGOs may use their databases or repositories. These are rarely compatible with the central system. There is currently an effort to provide more clear methodological guidance (especially to the regional governments) and to provide the nature conservation actors with a more robust biodiversity monitoring planning and data sharing environment.

Nowadays, traditional biodiversity methods are used almost exclusively to collect data on the occurrence of species and habitats in respect to the Habitats and Birds Directives. Some nature conservation authorities are actively using UAVs in their work (especially the regional administration of the South Bohemian region), however, a unified methodology and a systematic approach to their large-scale application are lacking. A similar situation applies to molecular methods which currently remain limited to individual studies and are applied in an isolated manner. However, a strategy for the protection of genetic diversity is currently under development and this may potentially lead to systemic changes in the use of molecular methods.

GIS software is commonly used for analysis. ESRI in the institutions of the central government. Regional governments rely mainly either on ESRI technologies or use QGIS.

Analytical tasks are undertaken by various bodies. Routine analysis is mainly conducted on a daily basis by each nature conservation authority. Complex tasks are often outsourced to universities and academic institutions.

Biodiversa+ supports Czechia in harmonizing biodiversity monitoring by providing European guidance, tools, and collaborative frameworks developed together with the other Biodiversa+ partner organizations. It issues reports and guides on aligning monitoring protocols and ensuring data interoperability, helping Czech institutions integrate with the EU standards including Darwin Core standards concerning the Species Occurrence Database. Through expert workshops, it connects Czech stakeholders with European peers working on Essential Biodiversity Variables and harmonized methods. The Nature Conservation Agency of the Czech Republic engages in Biodiversa+ initiatives testing innovative approaches such as automated monitoring traps and remote sensing. Such novel methods are not yet widely used in Czechia and Biodiversa+ provides an opportunity to fund and pilot their deployment at several sites. Transnational research calls further enable Czech organizations to access funding and partnerships, strengthening consistent, modernized biodiversity monitoring across Europe.

Considering mentioned above, the score for this criterion is 4.

(6) Data management system and data policy

The Species Occurrence Database is an application for entering and editing data on the occurrence of plant and animal species. It is a long-term project of the Nature Conservation Agency of the Czech Republic (NCA ČR), in use since 2008. According to defined rules, data can be entered, edited, and viewed not only by NCA staff but also by a wide network of expert collaborators.

Use of the database: The Species Occurrence Database supports nature conservation activities at the national, regional, and local levels. It is used by public authorities (e.g., the Ministry of Environment, regional and municipal authorities) as well as universities, research institutes, and museums. The data are applied in species and site protection (e.g., granting legal exemptions, planning measures), in procedures for environmental impact assessments (SEA, EIA, Natura 2000 evaluations), by investors to consider conservation interests during project planning, and for EU reporting obligations on species populations. Data are also provided under agreements for research, including theses and dissertations.

System structure: The Species Occurrence Database consists of two applications:

- Data entry tool – allows users to record individual observations by placing points or polygons on a map, including observer details and notes (e.g., behavior, habitat, taxonomy). Data can be entered individually or imported in bulk from scientific projects (e.g., habitat mapping updates).
- Data viewing tool – enables users to search and filter records by species, registration date, location, observer, source, region, or cadastral unit, with flexible combinations of criteria.

To maintain data quality and its applicability in conservation practice, a two-step data validation process is established:

Validation: Species occurrence is reviewed by the state nature conservation authority at the regional level. This is usually done by the biodiversity experts at the regional branches

and administrations of protected areas and national parks. External experts also have the right to validate the findings. For verified users (employees of the NCA, national parks and selected experts) the data enter the Species Occurrence database marked as reliable and therefore are automatically validated.

Verification: Data are reviewed by the biodiversity monitoring experts at the Department of Biodiversity Monitoring at the NCA headquarters. The validity of the data is checked in the second step, especially regarding the author if less known, and the likelihood of occurrence given the season of the year.

The Habitat Mapping Database stores data on the occurrence and quality of natural, semi-natural, and anthropogenic habitats. The data collection is coordinated by the NCA, and mainly external contractors participate in it. A validation process similar to the one on species is in place. The experts at the NCA regional branches validate the data sent by the external contractors, and based on this step, the contractors are then paid.

Both databases are open to the public with the exception of selected species (e.g., some birds of prey, critically endangered species of plants and fungi threatened by collectors). Each data point is georeferenced (possesses a GIS component).

While the species occurrence database is relatively easy to use, understanding and working with the habitat data requires good knowledge of the methodology available. Neither database automatically provides interpretation of the data apart from basic summaries (e.g., number of species' occurrences at the given time and place).

Overall, this criterion is implemented at a high level in the Czech Republic due to the operation of centralised databases on the distribution of species and habitats.

Considering mentioned above, the score for this criterion is 5.

2.4.2. METHODS AND MANAGEMENT OF THE NBMS IN UKRAINE

(5) Methods (data collection and data analysis)

There are no approved methodology and methods. Practitioners and scientists use standard scientific methods to collect data on biodiversity. There are methods approved by the Order of the Ministry, «[Program of the chronicle of nature for reserves and national natural parks](#)», to be used by PAs (biosphere reserves, national parks, etc). Some PAs use some of them. There are no control or verification procedures.

There are several methods of habitat mapping developed by the Ukrainian academics and Frankfurt Zoological Society. There are some methods used by different actors. For example, the State Fishery Agency is responsible for the monitoring (accounting) of fish species and population, and the state forestry agency is responsible for the monitoring (accounting) of game species.

Tech use is limited due to a lack of equipment and skills. Some are valid for the use of advanced scientific methods and data analysis.

Considering mentioned above, the score for this criterion is 0.

(6) Data management system and data policy

A national biodiversity data management system, as well as a clear policy are absent.

Considering mentioned above, the score for this criterion is 0.

2.5. EVALUATION OF THE CAPACITY OF THE NBMS OF CZECHIA AND UKRAINE

(7) Funding

Stability: availability of an annual budget (allocated from the State budget) to ensure monitoring.

Sufficiency: the yearly budget can cover primary monitoring needs.

Fair budget distribution (geographical and institutional).

Quality of budget planning and financial management by institutions.

Possibility (legal) of spending funds on attracting external experts and carrying out monitoring work.

Diversification of funding sources, with basic needs covered by state funding, but the possibility of attracting other sources (grants, carbon credits, etc.).

(8) Human resources

Availability and sufficiency of trained staff and technical expertise (e.g., field teams, maintenance staff, data analysis, etc.).

Sufficiency of personnel's expertise (Botany, Zoology, Geography, Ecology, GIS, remote sensing, data management, and analysis).

Capacity-building programs and knowledge transfer mechanisms are in place.

The system can attract external experts (expertise).

(9) Infrastructure

Laboratory, cars, technical devices, monitoring equipment, GIS-environment, etc.

(10) Partners | stakeholder engagement

Inclusion and cooperation between government agencies, universities, science, NGOs, citizens, volunteers, companies, etc., are ensured.

Transparent mechanisms of cooperation, participatory monitoring, and knowledge co-production are defined.

Opportunity of multi-level cooperation exists (i.e., the possibility of both cooperating on the development of a monitoring system, methods, or data analysis, etc., and the possibility of cooperation only at the level of data collection)

Strategies for managing stakeholder conflict and ensuring legitimacy. Communication strategy in place.

No	Criteria	Czechia NBMS	Ukraine NBMS
		points (0-5)	
7.	Funding	4	0
8.	Human resources	5	0
9.	Infrastructure	3	0
10.	Partners and stakeholder engagement	5	0

2.5.1. CAPACITY OF THE NBMS IN CZECHIA

(7) Funding

Fulfilled in Czechia to the extent of obligations set by the Habitats Directive and Birds Directive. Mainly covered by the state budget, but significant funds are also coming from the EU funding since the real budget is gradually decreasing, due to inflation, which is not being taken into account when allocating budget for many schemes (ie, habitat mapping). Moreover, the current funding is insufficient in the face of the new obligations set by the Nature Restoration regulation.

One Nature project has been an important source for monitoring the condition of the Natura 2000 Network in Czechia. It is a 5-year project with circa €1.2M available for monitoring over the 5 years, making it circa €250k/year to cover all the target feature species within the Natura 2000 Network. However, this is based on the Czech interpretation of the target feature concept, when only selected occurrences of the HD Annexe II species are reported as the target features. Accepting the interpretation of every species' occurrence, establishing grounds for a target feature listing would either significantly increase the costs of N2K (Natura2000) monitoring (circa 2-3 times) or cause a decrease in frequency and/or detail of monitoring.

The habitat mapping scheme is allocated circa €250,000 from the state budget annually. A similar budget is available for species monitoring. The amount is stable in absolute terms, hence it has gradually decreased due to inflation.

The operation programme Environment is a long-term source of funding. It combines funding from the Cohesion Fund and the EU Fund. The programme has been used successfully for decades for both conservation action and biodiversity monitoring. Two major projects are currently being funded by the programme, focusing on mapping the distribution of invasive alien species and monitoring the biodiversity within protected areas.

Iceland-Lichtenstein-Norway Grants had also been historically utilised.

Thus, the funding criteria is fulfilled in Czechia. Funding can be potentially threatened by budget cuts. Moreover, the real budget is gradually decreasing, due to inflation, which is not being taken into account when allocating budget for many schemes (i.e., habitat mapping) and needs to be thus covered by various projects. Annual variation and volatility of sources cause instability of system.

Considering mentioned above, the score for this criterion is 4.

(8) Human resources

About 110 NCA staff out of almost 900 are primarily tasked with biodiversity monitoring, although they often fulfil other ad hoc tasks. With 14 regional branches and given that 25 of those employees are based at the headquarters, coordinating the monitoring efforts and evaluating the results, the average manpower per regional branch is 6 people. This differs between the branches due to differences in the number of SSPAs, PLAs, and area. A general rule is that each regional branch aims to employ at least one zoologist and one botanist, plus the same duo for each protected landscape area it administers. Naturally, large protected landscape areas like the Beskydy PLA require more staff to cover.

Methodology regarding the time required to survey/monitor the individual sites of occurrence is species- or group-specific. For example, the monitoring of target amphibian species within the Natura2000 Network requires 2-5 visits during the vegetation period. The price depends on the size of the protected area, ranging from 200 € paid for the smallest sites to more than 3000 € for large-scale Natura2000 sites. A similar concept is applied to most of the vertebrate species. The HD Annexe II insect species monitoring follows a different scheme, focusing on the 5x5 km mapping fields. The monitoring experts are required to visit primarily the Natura2000 sites established for the target species in each field, and at least 3 sites of occurrence or probable occurrence need to be monitored. Each mapping field is worth 100 €.

The possibility of attracting experts is mainly focused on financial incentives, although the pay available often requires enthusiasm. Voluntary schemes such as the effective use of citizen science are still underutilised compared to many European countries, although these exist in Czechia too. One of these is the Butterfly Monitoring Scheme based on monitoring transects by volunteers. The initiative is coordinated by academic institutions, and the NCA supports the coordination financially.

Habitat mapping is largely dependent on the capacities of external contractors due to historical (the scheme was designed in such a way from the very beginning in 2000) and practical (strictly seasonal character of the task) reasons. Furthermore, most of the contractors prefer to work externally since it is easier for them to combine habitat mapping with other jobs. Last but not least, it is also more profitable for many experts to be contracted rather than permanently hired due to the tax system in Czechia. Trends in the number of experts.»

In general, the criteria is fulfilled in Czechia. However, the future for many groups is uncertain regarding their capacities despite fairly close collaboration with academia, but this presents a global problem. The need for mobilisation and stable demand for expert capacity is dependent on funding.

Considering mentioned above, the score for this criterion is 5.

(9) Infrastructure

No nature conservation authority (concerning territorial protection) has a laboratory available.

Cars - number dependent on the number of employees within the regional branch

or protected landscape administration. Typically, 3-4 per unit (branch/administration). About 17 cars at the NCA headquarters, including those used by the top management.

Monitoring gear - binoculars, umbrella traps, kick nets, electrofishing gear. Drones are becoming more popular, but there is no central systemic support. Moreover, the legislation is preventing an effective use of drones since the nature conservation authority needs to provide its own official statement before reaching out to the Civil Aviation Authority to receive a permit.

GIS: ESRI ecosystems used for the GIS at the NCA. This provides an integrated environment and simplifies a number of tasks; however, it is a costly solution. Many regional governments, therefore, prefer to use open-source and free-to-use QGIS.

Considering mentioned above, the score for this criterion is 3.

(10) Partners and stakeholder engagement

There is regular cooperation between the Ministry of Environment, government agencies, universities, the Academy of Sciences, and NGOs. Much of the cooperation is codified in various memoranda and depends on good relations between the individual actors at the same time.

Considering mentioned above, the score for this criterion is 5.

2.5.2. CAPACITY OF THE NBMS OF UKRAINE

(7) Funding

Currently, there is no NBMS in operation, and consequently, unlike in Chechia, no funds are allocated directly for this purpose. PAs with administrations (like national parks) perform monitoring within their designated territories, within the budget allocated for the PA to operate. It is usually a salary, and additional funds to conduct the research and monitoring.

Procedure for monitoring biological and landscape diversity under the Resolution of the Cabinet of Ministers of Ukraine No. 45 dated January 17, 2025, "[On Approval of the Procedure for Monitoring Biological and Landscape Diversity](#)" states that «Monitoring of biological and landscape diversity is financed from state and local budgets, as well as from other sources not prohibited by law. Financing of these measures from the state budget is carried out within the limits of expenditures provided for in the Law on the State Budget of Ukraine for the relevant year. Some institutions identified in the Resolution as responsible for monitoring, such as the Ministry of Environment, have been abolished. And, as was mentioned above, the Resolution will come into force later.

Considering mentioned above, the score for this criterion is 0.

(8) Human resources

No centralized system or Agency responsible for biodiversity monitoring exists, so no employees are working on it at the central and regional levels.

It is impossible to evaluate objectively in the absence of objective data how many people

are doing the biodiversity monitoring/observation. There are biodiversity monitoring professionals, mainly working in academia, who occasionally do practical work on species, forestry, fisheries, and some experts working in PA. No centralized authority is responsible for species and habitat monitoring.

Considering mentioned above, the score for this criterion is 0.

(9) Infrastructure

Absent on the central level. A couple of laboratories in the PAs with administrations. There are also some cars used for scientific research. Lack of scientific devices (monitoring gear), as well as knowledge of GIS utilisation. Not aimed at monitoring currently. Could be used in the future.

Substantial help in this regard has been provided to some PAs by NGO (international, national, and mixed).

Considering mentioned above, the score for this criterion is 0.

(10) Partners and stakeholder engagement

There is some occasional cooperation between NGOs, Universities, Academia, and PAs. But there is no central entity responsible for BM and the system, no feedback.

Considering mentioned above, the score for this criterion is 0.

3 RESULTS

Thus, the existing national biodiversity monitoring systems in Ukraine and the Czech Republic were evaluated according to a developed framework. The results of the assessment are presented in the table and on the diagram below.

Table 1. Results NBMSs assessments of Czechia and Ukraine.

№	Criteria	Czechia NBMS	Ukraine NBMS
		points (0-5)	
1.	Certainty with the main purpose of monitoring	5	2
2.	Targeted selection of monitoring objects	5	3
3.	Systematicity and continuity with mandatory reporting	5	1
4.	Structure and executive body(s)	4	0
5.	Methods (data collection and data analysis)	4	0
6.	Data management system and data analysis	5	0
7.	Funding	4	0
8.	Human resources	5	0
9.	Infrastructure	3	0
10.	Partners and stakeholder engagement	5	0
Sum of points (max. 50):		45	6
Percentage (max. 100 %)		90	12

Assessment of NBMSs

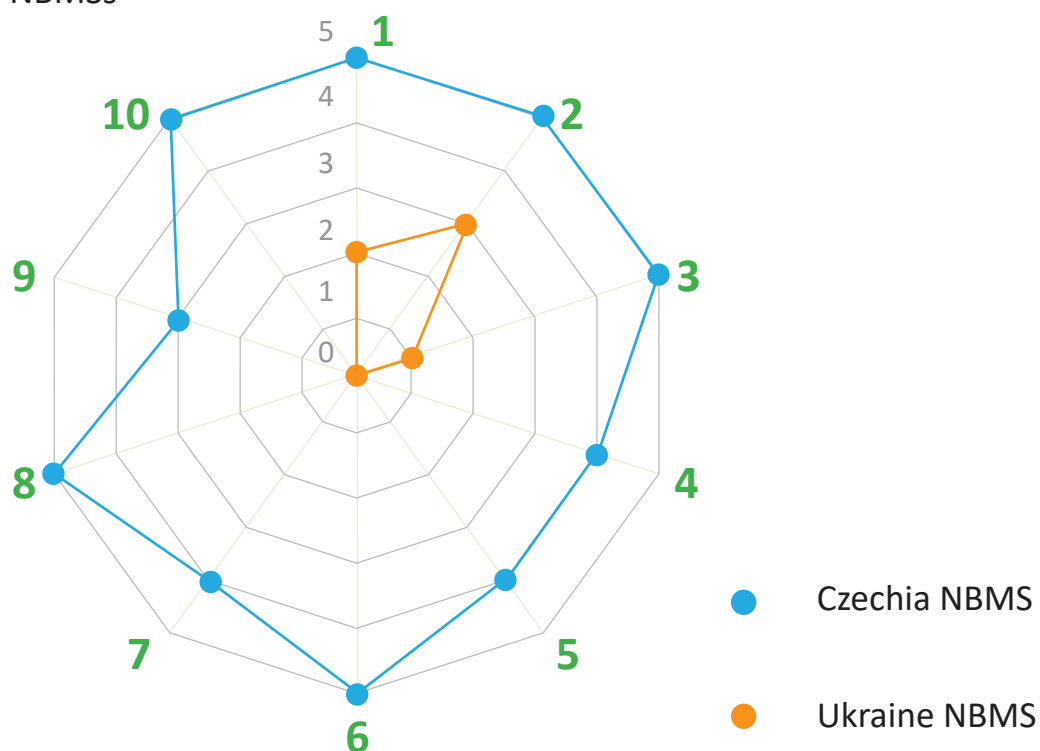


Figure 1. The diagram presents the result score of the assessment of National Biodiversity Monitoring Systems in Czechia (blue) and in Ukraine (orange) in accordance with 10 criterias.

4 CONCLUSIONS

Thus, based on the evaluation of the existing biodiversity monitoring systems, Ukraine received a total score of 6 out of a possible 50 points or 12%, while the Czech Republic scored 45 points or 90%.

Both countries face threats to biodiversity, including habitat destruction, pollution, and the overexploitation of natural resources. In Ukraine, these threats are significantly more pronounced due to the impacts of war.

The Czech Republic has already made significant progress in establishing a well-coordinated national biodiversity monitoring system. By contrast, Ukraine still needs to take key steps towards the development of a comprehensive national biodiversity monitoring system across its entire territory. This requires strengthening the institutional NBMS's capacity, developing effective methodological and management approaches, building close cooperation between governmental bodies, research institutions, NGOs, and international partners, with a view to improving overall approaches to biodiversity monitoring and creating a system capable of effectively managing biodiversity data.

Biodiversity monitoring in Ukraine was only regulated at the legislative level in 2023. The Biodiversity Monitoring Procedure was approved by Resolution on January 17, 2025. The approach to monitoring set out in this Procedure includes activities primarily conducted by central executive bodies (CEBs), many of which in practice lack scientific staff capable of carrying out monitoring activities, as well as by institutions of the National Academy of Sciences of Ukraine (NASU) and the National Academy of Agrarian Sciences of Ukraine (NAASU) – that is, only those entities funded by the state budget. At the same time, neither the Procedure nor the related legislative amendments provide for any institutional transformations to support the implementation of this new function.. Moreover, the relevant Resolution will come into force later, only after martial law is cancelled, and some of the institutions designated in the Resolution as responsible for monitoring, such as the Ministry of Environment, have already been abolished.

Consequently, it can be concluded that the biodiversity monitoring process in Ukraine is currently envisaged to be implemented solely on the basis of existing state authorities and their structural units, for which this function will effectively constitute an additional burden. Such an approach is not integrated and requires not only significant improvement in coordination between the relevant state and research institutions, NGOs, and international partners, but also the establishment of a new responsible body with a significant, qualified workforce capable of directly managing biodiversity monitoring and ensuring their effective implementation.

By embracing these dimensions, Ukraine can establish resilient, adaptive, and harmonized national biodiversity monitoring systems that support evidence-based decision-making, contribute to sustainable development, and facilitate the achievement of global biodiversity conservation goals.

ANNEX 1. A FRAMEWORK DEVELOPED FOR COUNTRIES' NBMS CHARACTERIZATION

Dimension	Criterion	Description
Legal	(1) Monitoring purpose	The monitoring system's aim and scope are defined, as well as SMART goals for the monitoring, aligned with national and international policy objectives. Clarity of legal mandates for biodiversity monitoring is set.
	(2) Targeted selection of monitoring objects	Including the species and habitats of the international (Appendix I, II HD, Appendix I BD, Resolutions 4 and 6 of the Bern Convention) and national (Red Data Book of Ukraine, RDBU) level, as well as deviations (Article 16 HD) Monitoring priorities should be established and accepted, with the obligations set by the EU membership given the highest priority.
	(3) Systematicity and continuity with mandatory reporting	Long-term biodiversity monitoring programs that support national biodiversity strategy and action plans (NBSAPs) and fulfil the obligations of the Habitats and Birds Directives. Official Guidelines developed and used for unified monitoring (intervals between monitoring activities periods and intervals, minimum required amount of data, responsibility, etc. are defined)
Governance	(4) Structure and executive body(s)	Governance structures established and Institutional coordination ensured. There is a central executive body (and regional) responsible for biodiversity monitoring and reporting to the EU. It develops the relevant policy in the country and ensures: • Data Management and Interoperability (Standardization of protocols and data; Data interoperability; Data accessibility and sharing). • Resource Allocation and Sustainability (Funding stability and adequacy; Resource allocation across realms). • Utilization of Monitoring Results (Integration into policy and decision-making). • Stakeholder engagement and feedback mechanisms. It is multi-level, transparent, collaborative, independent, science-intensive, sustainable, and adaptable.
Methods and Management	(5) Methods (data collection and data analysis)	Uniformity (using unified, internationally compatible methodologies/protocols (appropriate for different taxa) for data collecting and analysis to ensure their compatibility and comparability (e.g., from different regions and time periods), which are approved at the state level and updated in accordance with the current level of scientific development). Technological (GIS, UAVs, etc.) that allow to increase precision and efficiency. Use of advanced scientific methods (e.g., molecular methods like barcoding) that ensures a deeper level of taxonomic accuracy and biological insight than traditional observation alone. Robust Data analysis methods: rigorous analytical frameworks to process data, ensuring that findings are statistically significant and capable of being integrated into broader scientific databases.
	(6) Data management system and data policy	Existence of sound data policy, reliable and adaptable database management system (DBMS) and a single platform (core repository) for biodiversity data that align with following requirements. Verification Protocols in place. The system must include a robust mechanism for data verification to ensure accuracy and scientific validity. Centralized Infrastructure. DBMS and core repository infrastructure must be centralized and governed accordingly. Integrity and Interoperability: The system must support cross-platform data exchange and be fully compatible with major international databases such as GBIF, iNaturalist, sPlot, and EVA, allowing for integration into the European database(s). Geospatial Capabilities. A built-in GIS (Geoinformation System) component is required to manage and visualize spatial data. Data analysis capacity in place. The system should provide automated analytical tools capable of identifying (species population) trends, calculating biodiversity indices, generating semi-automatic reports and data visualizations, etc. Transparent terms-of-use. Conditions for data use must be clearly defined and transparent for both contributors (authors) and end-users. Easy to use. The platform must be user-friendly.

Dimension	Criterion	Description
Capacity	(7) Funding	Stability: availability of an annual budget (allocated from the State budget) to ensure monitoring. Sufficiency: the yearly budget can cover primary monitoring needs. Fair budget distribution (geographical and institutional). Quality of budget planning and financial management by institutions. legal possibility of spending funds on attracting external experts and carrying out monitoring work. Diversification of funding sources with basic needs covered by state funding, but the possibility of attracting other sources (grants, carbon credits, etc.).
	(8) Human resources	Availability and sufficiency of trained personnel and technical expertise (e.g., field teams, maintenance staff, data analysis, etc.). Sufficiency of personnel's expertise (Botany, Zoology, Geography, Ecology, GIS, remote sensing, data management, and analysis). Capacity-building programs and knowledge transfer mechanisms are in place. The system can attract external experts (expertise).
	(9) Infrastructure	Laboratory, cars, technical devices, monitoring equipment, GIS-environment, etc.
	(10) Partners and stakeholder engagement	Inclusion and Cooperation between Government agencies, Universities, Science, NGOs, citizens, volunteers, companies, etc., are ensured. Transparent mechanisms of cooperation, participatory monitoring, and knowledge co-production are defined. Opportunity of multilevel cooperation exists (i.e., the possibility of both cooperating on the development of a monitoring system, methods, or data analysis, etc., and the possibility of cooperation only at the level of data collection) Strategies for managing stakeholder conflict and ensuring legitimacy. Communication strategy in place.