biodiversa+
European Biodiversity Partnership

EUROPEAN PARTNERSHIP

Mapping of national and sub-national organisations that fund and steer biodiversity monitoring schemes

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What is Biodiversa+

Biodiversa+ is the new European co-funded biodiversity partnership supporting excellent research on biodiversity with an impact for policy and society. It was jointly developed by BiodivERsA and the European Commission (DG Research & Innovation and DG Environment) and was officially launched on 1 October 2021.

Biodiversa+ is part of the European Biodiversity Strategy for 2030 that aims to put Europe's biodiversity on a path to recovery by 2030.

The Partnership aims to connect science, policy and practise for transformative change. It currently gathers 74 research programmers and funders and environmental policy actors from 36 European and associated countries to work on 5 main objectives:

1. Plan and support research and innovation on biodiversity through a shared strategy, annual joint calls for research projects and capacity building activities
2. Set up a network of harmonised schemes to improve monitoring of biodiversity and ecosystem services across Europe
3. Contribute to high-end knowledge for deploying Nature-based Solutions and valuation of biodiversity in the private sector
4. Ensure efficient science-based support for policy-making and implementation in Europe
5. Strengthen the relevance and impact of pan-European research on biodiversity in a global context

More information at: https://www.biodiversa.eu/

Executive Summary

Biodiversa+, the European Biodiversity Partnership, has compiled a mapping of the ministries and other organisations that fund and steer national and sub-national biodiversity monitoring schemes across the network that involves active partners currently from 23 countries. Those countries cover most of the Member States in the EU, but not all; in addition, a few non-EU countries are also partner of the network. This report summarises the outcomes of the questionnaires and interviews about the state-of-the-art of biodiversity monitoring governance in those countries based on the responses from the ministries of the environment and environmental protection agencies.

In most countries, Ministries of Environment and/or Environmental Protection Agencies are the actors in charge of steering and governing biodiversity monitoring schemes. Biodiversity governance is split by realms (e.g., terrestrial and aquatic) in 2/3 of the countries.

An overview of biodiversity monitoring in each country is provided. Information about key organisations in charge of biodiversity monitoring is presented as well as the coverage of realms by those organisations. Also, the complexity of data gathering networks and the role of volunteers is reported when such data is available, and solutions and/or challenges in data availability or workflows are described. Finally, information on the budget and financing of the biodiversity monitoring schemes is reported.

This mapping exercise will be useful in supporting the set-up of a European Biodiversity Observation Network and the development of an EU Biodiversity Monitoring Coordination Centre and its national and, when relevant, sub-national counterparts, leading therefore to improved biodiversity monitoring in Europe across all taxa and realms in space and time.

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Main acronyms

CBD	Convention on Biological Diversity
EBVs	Essential Biodiversity Variables
EC	European Commission
EEA	European Environment Agency
EPAs	Environmental Protection Agencies
EU	European Union
FAIR	Findability, Accessibility, Interoperability, and Reuse
GBIF	Global Biodiversity Information Facility
IUCN	International Union for Conservation of Nature
KCBD	Knowledge Centre for Biodiversity
MoEs	Ministries of Environment
MS	Member States
NGOs	Non-Governmental Organisations
WFD	Water Framework Directive

General Introduction

One of the objectives of Biodiversa+, the European Biodiversity Partnership, is to map the ministries, agencies and organisations that fund and steer national and sub-national biodiversity monitoring schemes in view of supporting the set-up of a European Observation Network leading to improved biodiversity monitoring in Europe across all taxa, realms, and in space and time. This is especially relevant in the context of monitoring the progress towards the targets set by the EU Biodiversity Strategy 2030 and the Kunming-Montreal Global Biodiversity Framework. In this context, between April and June 2022 Biodiversa+ conducted, a survey in 23 countries, including a focus on the Azores, an outermost region of Portugal (see fig 1). The survey was carried out under the lead of the Ministry of the Environment of Finland and of the French Biodiversity Agency and it was followed by bilateral interviews to better understand how biodiversity monitoring is steered, governed and funded in Europe and beyond.

Fig 1: Countries covered by the Biodiversa+ survey and interviews on biodiversity monitoring

The objective of the survey and interviews was to get a comprehensive understanding of how biodiversity monitoring is organised and governed at national or subnational levels within the 23 countries that are actively participating in Task 2.5 of Biodiversa+ in the development of a transnational network of biodiversity monitoring schemes. An overview was expected on what are the activities performed by the organisations that fund and steer biodiversity monitoring, how much budget (when such figures were available) is spent on biodiversity monitoring, and what type of support Biodiversa+ and the European Union could provide to strengthen monitoring activities and coordination and interoperability across regions and countries.

Building on the survey and interviews, Biodiversa+ developed the current report. This report complements the existing EuropaBON's biodiversity observation network, which is supported by a database of different actors and entities involved in biodiversity monitoring in Europe and beyond, as well as the EuropaBON's "report on stakeholder engagement needs" (Moersberger et al. 2022[1]), which addresses at wide the needs for a coherent biodiversity monitoring in Europe. For marine realm, there is also a recent review available (EC et al., 2023[2], see also Palialexis et al., 2021[3], and Palialexis et al., 2019[4]). This work will be a key building block to establish a transnational network of national and sub-national biodiversity monitoring schemes for specific domains at the European level. Moreover, additional work could aim at engaging with more European and non-European countries. Further discussions with the Biodiversa+ Partners and other relevant actors, such as the European Commission, the European Environment Agency (EEA), EuropaBON, the Knowledge Centre for Biodiversity (KCBD) and key research infrastructures such as the Global Biodiversity Information Facility (GBIF) will be of uttermost importance to pursue this work.

The report is introduced by the definition of what an "organisation funding and steering biodiversity monitoring schemes" refers to, followed by a detailed description of the methodology used to implement the survey and interviews that were used to produce this report. In a second part, an overview of the national and sub-national organisations that fund and steer biodiversity monitoring schemes is presented. Finally, some concluding remarks and future perspectives are provided.

[1] Moersberger H, Martin JGC, Junker J, Georgieva I, Bauer S, Beja P, Breeze T, Brotons L, Bruelheide H, Fernández N, Fernandez M, Jandt U, Langer C, Lyche Solheim A, Maes J, Moreira F, Pe'er G, Santana J, Shamoun-Baranes J, Smets B, Valdez J, McCallum I, Pereira HM, Bonn A (2022) Europa Biodiversity Observation Network: User and Policy Needs Assessment. ARPHA Preprints. https://doi.org/10.3897/arphapreprints.e84517

[2] European Commission, Directorate-General for Research and Innovation, Jessop, A., Chow, C., Dornelas, M., et al., *MarBioME : overview and assessment of the current state of Marine Biodiversity Monitoring in the European Union and adjacent marine waters*, Publications Office of the European Union, 2023, https://data.europa.eu/doi/10.2777/57760

[3] Palialexis, A., Kousteni, V., Boicenco, L., Enserink, L., Pagou, K., Zweifel, U.L., Somma, F., Cheilari, A., Connor, D. 2021: Monitoring biodiversity for the EU Marine Strategy Framework Directive: Lessons learnt from evaluating the official reports, Marine Policy 128, 104473, https://doi.org/10.1016/j.marpol.2021.104473

[4] Palialexis, A., V. Kousteni and F. Somma, In-depth assessment of the Member States' reporting for the Marine Strategy's biodiversity monitoring, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-76-07986-6, doi:10.2760/051785.

1. Definitions & methodology

Biodiversity monitoring covers various dimensions from genetic to species and to ecosystems, including both aquatic and terrestrial realms. The Ministries of the Environment (MoEs) as well as Environmental Protection Agencies (EPAs) in some countries are often in charge of policy implementation and overall coordination, funding and steering of biodiversity monitoring. However, they rarely collect data and do monitoring themselves, but rather hire third parties such as universities, institutes, or non-governmental organisations (NGOs) to arrange monitoring surveys and sampling. Data synthesis and reporting is also sometimes contracted to third parties, but in some cases such work is also done by the Ministry or EPA itself. For this report, through a survey and interviews, we have asked MoEs and EPAs to describe the governance of biodiversity monitoring in their country.

Survey

The survey consisted of three sections: i) current governance and coordination structure, relevant monitoring networks and activities implemented of biodiversity monitoring, ii) harmonisation of results via Essential Biodiversity Variables (EBVs), and iii) expectation towards Biodiversa+ collaboration and its biodiversity monitoring pilots allowing for on-the-ground improvements of transnational biodiversity monitoring. Survey questions are shown in Annex II.

The EBVs define a minimum set of essential measurements to capture major dimensions of biodiversity change. Within the framework of the EBVs, there are six major classes that cover key areas of biodiversity: genetic, species populations, species traits, community structure, ecosystem structure and ecosystem function (Pereira et al. 2013[5]). In the survey, the EBVs were addressed quite flexibly. Respondents were asked to describe to the possible extent the monitoring system in their country/region that includes key data providers and collectors of the data, as well as organisations in charge for compiling and synthesising the data, and reporting to EU and international agreements. Data interoperability solutions will be covered more comprehensively in another Biodiversa+ publication by Basset & Onem (2023[6]), but a good overview of issues relating to data gaps and data sharing issues is available also by Wetzel et al. (2018[7]).

[5] Pereira HM, Ferrier S, Walters M, Geller GN, Jongman RHG, Scholes RJ, Bruford MW, Brummitt N, Butchart SHM, Cardoso AC, Coops NC, Dulloo E, Faith DP, Freyhof J, Gregory RD, Heip C, Ho¨ft R, Hurtt G, Jetz W, Karp DS, McGeoch MA, Obura D, Onoda Y, Pettorelli N, Reyers B, Sayre R, Scharlemann JPW, Stuart SN, Turak E, Walpole M, Wegmann M (2013) Essential biodiversity variables. Science 339:277–278

[6] Basset, A. & Onem, S. 2023 : D2.2 Report on the harmonisation and interoperability of datasets across regions and countries. Biodiversa+ report.

[7] Wetzel, F.T., Bingham, H.C., Groom, Q., Haase, P., Kõljalg, U., Kuhlmann, M., Martin, C.S., Penev, L., Robertson, T., Saarenmaa, H.,. Schmeller, D.S., Stoll, S., Tonkin, J.D., Häuser, C.L. 2018: Unlocking biodiversity data: Prioritization and filling the gaps in biodiversity observation data in Europe, Biological Conservation, 221:78-85, https://doi.org/10.1016/j.biocon.2017.12.024

Interviews

The survey was followed by bilateral interviews conducted with all the Biodiversa+ Partners involved in the Biodiversa+ activities on biodiversity monitoring, representing 23 countries. Themes of the survey were deepened during one-hour interviews (i.e., one per country, so in some cases this involved several Partners and experts) (Annex II). During these interviews the survey answers were gone through, and if there were some topics that needed to be clarified that was discussed.

2. Overview of the coordination of biodiversity monitoring schemes

Biodiversity monitoring schemes are coordinated in various ways across the 23 studied countries, yet some similarities exist.

Regarding the **scale** of the coordination of these schemes, in all countries except Belgium and Italy, biodiversity monitoring schemes are coordinated at the national level (see Fig 2).

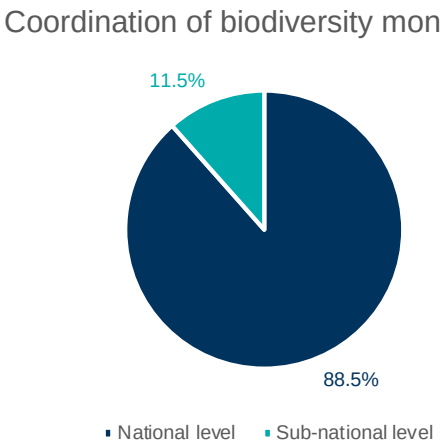

Fig 2: Scale of the coordination of biodiversity monitoring monitoring in the 23 studied countries

In most countries, Ministries of Environment and/or Environmental Protection Agencies are the **actors in charge of coordinating biodiversity monitoring schemes**. Yet, in some cases, the coordination of biodiversity monitoring schemes is ensured by several Ministries such as in Morocco. In Ireland, the Department of Housing, Local Government and Heritage, which is a part of the Government of Ireland, is coordinating biodiversity monitoring. In some countries or sub-national regions, biodiversity monitoring schemes are coordinated by a research organisation such as in Flanders (Belgium), in the Netherlands (coordination through the Wageningen University and Research Centre (WUR): Nature and Environment) and in Turkey (see country descriptions in the next chapter for details). In Denmark, biodiversity monitoring schemes are coordinated by the Ministry of Environment, the Danish Environmental Protection Agency and a research organisation.

The coordination of biodiversity monitoring schemes can also be **split by realms**. In 30.4% of the countries, the coordination of biodiversity monitoring schemes is not split by realms. In the remaining 69.6% of the countries the coordination of biodiversity monitoring schemes is split by realms (see table 1). In the latter case, it has to be stressed that not all countries and sub-national regions do split their schemes in the same way to cover the three main biodiversity realms (terrestrial, freshwater and marine). In some countries, freshwater and marine are grouped together while in others there are no marine biodiversity monitoring schemes as the country doesn't have access to the sea. In addition, some countries structure the coordination of their biodiversity monitoring schemes based on the policy framework: reporting for EU Directives or legislation at subnational level (see table 1). An overview of the main national/subnational organisations that coordinate biodiversity monitoring programmes is presented in Annex I, and the institutions that contributed to this report are listed in Annex III.

Table 1: Is the coordination of biodiversity schemes split by realms?

Split by:	Countries
Coordination of biodiversity monitoring schemes **is not split** by realms	Austria; Croatia; Czechia; Estonia; Finland; Montenegro; the Netherlands; Autonomous Province of Bolzano (Italy)
Split by Terrestrial and Freshwater realms	Slovakia
Split by Terrestrial, Freshwater and Marine realms	Bulgaria; Belgium (both for Flanders and Wallonia); France; Germany; Israel; Norway
Spilt by Terrestrial and Marine realms	Portugal (including the Azores)
Split by Terrestrial, Marine and microbial realms	Turkey
Split by Terrestrial and Water (Marine + Freshwater) realms	Sweden
Split by Terrestrial/Marine, Forestry and National Parks	Spain
Split by 7 sub-systems (air; water; soil and land; nature; noise; electromagnetic field; ionisation radiation)	Poland
Split to address EU Directives and other policy frameworks	Italy
Split but not specified	Morocco; Denmark; Ireland

Finally, these entities in charge of coordinating biodiversity monitoring perform different types of **activities**. Most of these activities are similar, yet with some specificities (see table 2). Other activities performed by the coordinating entities included: capacity building and education on biodiversity monitoring, protection and conservation of biodiversity, development/ harmonisation/ standardisation of protocols and managing unified information systems on environment and area monitoring.

For the budget to monitor biodiversity, through national or sub-national, biodiversity monitoring programmes and coordinate these biodiversity monitoring programmes, 72% of the studied countries or sub-national regions could provide some budget figures (see Fig 3).

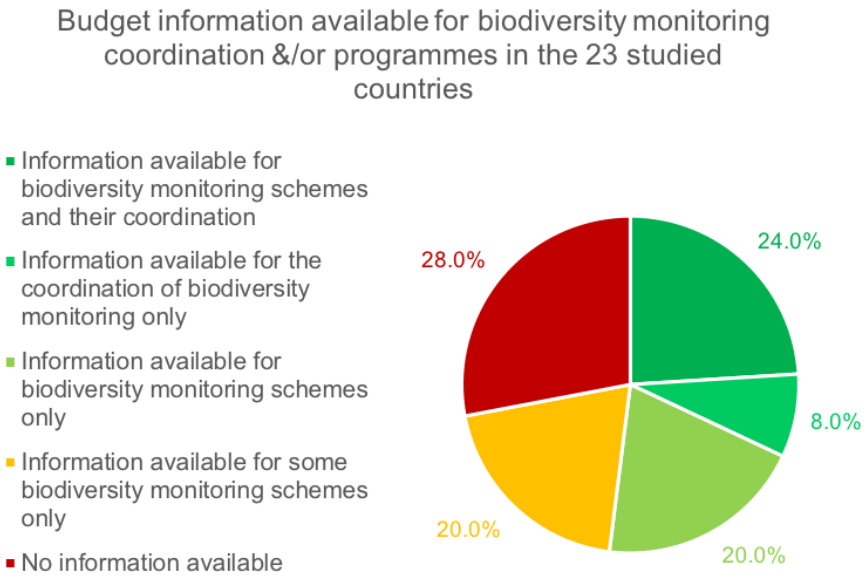

Fig 3: Availability of budget information for biodiversity monitoring schemes and/or their coordination in Austria, Flanders – Belgium, Wallonia – Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Ireland, Israel, Italy, the Autonomous Province of Bolzano – Italy, Montenegro, Morocco, the Netherlands, Norway, Poland, the Azores – Portugal, Slovakia, Spain, Sweden and Turkey.

Overall, providing budget figures covering all the biodiversity monitoring schemes was for some countries as many organisations, including NGOs and also citizens can be involved in biodiversity monitoring activities. Often, this budget to monitor biodiversity is first used to report on European Directives and European funding (eg. coming from LIFE) was often mentioned as an important support for the EU member states to support their biodiversity monitoring activities. Finally, some countries such as Croatia, Germany and Italy are setting up national biodiversity coordination centres. To establish such centre, Italy has a budget of 400M€ coming from EU funding and Croatia has a budget of 10M€. The German biodiversity monitoring coordination centre receive 4.3 to 6.2M€ per year to ensure from the State budget.

Table 2: Activities performed by the entities coordinating biodiversity monitoring schemes.

Countries	Networking activities between monitoring actors	Centralising results of monitoring programmes	Funding of monitoring	Centralising raw data	Reporting EU Directives	Monitoring on the ground	Creating biodiversity indicators	Other	Total
Austria	Yes	Yes		Yes	Yes	Yes	Yes		6
Belgium (Flanders)	Yes	Yes	Yes	Yes	Yes	Yes	Yes		7
Belgium (Wallonia)	Yes	Yes	Yes	Yes	Yes	Yes	Yes		7
Bulgaria	Yes	Yes	Yes	Yes	Yes	Yes	Yes		7
Croatia	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8
Czech Republic	Yes	Yes	Yes	Yes	Yes	Yes	Yes		7
Denmark	Yes	Yes		Yes	Yes	Yes	Yes		6
Estonia	Yes	Yes	Yes	Yes	Yes	Yes			6
Finland	Yes		Yes		Yes				3
France	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8
Germany	Yes	Yes	Yes	Yes	Yes	Yes	Yes		7
Ireland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8
Israel	Yes	Yes	Yes			Yes	Yes		5
Italy	Yes		Yes		Yes				3
Montenegro		Yes	Yes	Yes	Yes	Yes	Yes		6
Morocco	Yes	Yes	Yes	Yes		Yes			5
Norway	Yes	Yes	Yes	Yes	Yes		Yes		6
Poland	Yes				Yes	Yes			3
Portugal		Yes		Yes	Yes	Yes			4
Slovakia	Yes		Yes	Yes				Yes	4
Spain	Yes	Yes			Yes				3
Sweden	Yes	Yes	Yes	Yes	Yes		Yes		6
The Netherlands	Yes	Yes			Yes				3
Turkey	Yes		Yes	Yes		Yes			4
Total	**22**	**19**	**18**	**18**	**20**	**17**	**14**	**4**	**132**

3. Organisations that fund & steer national and sub-national biodiversity monitoring schemes

An overview of each country is described below. **The structure of each country description is divided in two parts: i) governance and coordination of biodiversity monitoring, and ii) budget**. Governance and coordination information on key organisations in charge of biodiversity monitoring is presented as well as the coverage of realms by those organisations. Also, the complexity of data gathering networks and the role of volunteers is reported when such data is available, and solutions and/or challenges in data availability or workflows are described. Finally, information on the budget and financing of the biodiversity monitoring schemes are reported.

Austria

Governance and coordination of biodiversity monitoring in Austria

In Austria, the Environment Agency Austria (EAA), under auspices of the Ministry of the Environment, is in charge of biodiversity monitoring coordination on a national scale. EAA's biodiversity and conservation unit consists of 18 people and they are currently working to map biodiversity monitoring activities in Austria, to compare them to demand of monitoring data for reporting and other obligations as well as to define gaps. EAA is responsible for Habitat Directive reporting. There is also another team in charge of monitoring and reporting for the Water Framework Directive (WFD). The landscape of actors contributing to biodiversity monitoring is continuously changing. Austria consists of 9 Federal States (Länder). Most of the monitoring is done by the Länder. One of the challenges is that EAA is not allowed to do monitoring on a federal scale. BOKU University contributes to collecting data, and EAA also has other contracted data providers, and their own role in field work is rather small.

Open Cultural Landscapes monitoring programme (ÖBM-Kulturlandschaft) is one of the major monitoring programmes which has over 200 study sites (random sampling) across the country and provides data from habitats, vascular plants, grasshoppers and butterflies. The frequency of monitoring is now five years but optimally it would be continuous sampling. Sometimes it is difficult to get access to monitoring sites due to private landowners as approximately half of them are positive towards monitoring. The main aim is to gather data for Article 11 of Habitat Directive. There is also monitoring of alien species ongoing. BirdLife is also an important NGO for monitoring birds. Citizen science databases are becoming more reliable, and volunteers are providing important support for biodiversity monitoring also in the future. Use of remote sensing has been quite marginal so far, but there are new plans to increase use of it for monitoring of ecosystem structure and function. Data is partially collected to EAA, and there is a database of vascular plants and grasshoppers. The aim is to develop data management towards open access.

Budget

Total budget for Habitat Directive monitoring (especially Article 11, but also some aspects of monitoring on article 12 of Bird Directive) and reporting for years 2021-2025 is 4.4M€. ÖBM-Kulturlandschaft has a budget of 800 k€ per monitoring round.

Belgium (Wallonia and Flanders)

Governance and coordination of biodiversity monitoring in Belgium

Governance of nature is organised on a regional (sub-national) level in Belgium, and there are three regions: Wallonia, Flanders and the Brussels-Capital Region. Nature monitoring is mostly organised on a regional level, except for the marine monitoring, which is organised on the Federal and Flemish level (VLIZ). Next to the monitoring organised by the government, there are several NGOs who help in official monitoring programmes or organise their own monitoring initiatives. Next to these initiatives there are several cross-region monitoring programmes running, on invasive species[8] and on exotic mosquitoes[9] for example.

In Wallonia, the Public Service of Wallonia - Agriculture, Natural Resources and Environment (SPW ARNE) is coordinating biodiversity monitoring. Two different units, Nature and Water, are managed in the same directorate of the Walloon administration. Wallonia is monitoring its own nature, both the species and habitat of community interest and patrimonial nature (sites of high biological interest). Reporting for the EU Habitats and Birds directive is done in coordination with Flanders, Brussels and the Federal. There is a sampling programme for species and habitats done every 6 years, usually in a rotational schedule.

Data is collected in two ways, by a team of 20 people at SPW ARNE involved in data collecting, and by subcontractors. Subcontractors are selected from public tenders for specific schemes (i.e., amphibians, birds, reptiles, bats, birds). Besides the Public Service's own staff in the data collecting in the field, different nature conservation organisations and working groups participate in the monitoring of regional biodiversity, involving hundreds of volunteers. The most important of them are Natagora and Natagriwal associations.

The collected data are recorded in several dedicated databases that regularly need to be merged into a single database available for the use by the administration. These merged databases are also used for the European reporting, as they compile all relevant data to be analysed. This scheme is the same for patrimonial and community interest habitats and species monitoring.

In Flanders, biodiversity monitoring is mostly coordinated by the Research Institute for Nature and Forest (INBO) (Natura 2000 monitoring, Fish monitoring 'Water Directive', Forest health monitoring, Scheldt estuary monitoring, Meetnetten monitoring). The Flemish Environment Agency (VMM) organises the monitoring of macroinvertebrates and macrophytes in the framework of the Water directive. The Agency for Nature and Forest is the entity who coordinates biodiversity data reporting to Europe (together with SPW ARNE)

Species of European (Natura 2000) and Flemish conservation concern are monitored by professionals of INBO or under the supervision of INBO. In addition, all bird species, higher plants and freshwater fish (WFD) are monitored as well. In the case of INBO supervision, field work is carried out by volunteers (citizen scientists) under the coordination of Natuurpunt, a nature conservation NGO. Currently, attempts are made to start up monitoring networks for communities in e.g., agricultural areas. For the species, there is a rather similar procedure as SPW ARNE in

[8] https://www.iasregulation.be/
[9] https://muggensurveillance.be/

Wallonia. Habitats are mainly monitored by a dedicated team of INBO. Field mapping for all Natura 2000 areas has been done, and a habitat quality framework is developed in Flanders. Quality habitats refer to different types of vegetation that don't need to be reported to the EU.

INBO is an open data research institute and has the goal to publish all the monitoring data collected on GBIF, to make sure this data can be used.

The main goal is to get trends in (relative) population abundance for various species on the scale of Flanders. Monitoring of breeding and wintering birds and fish (Freshwater and estuarine) has been done for a long time, while monitoring networks for other species are starting gradually in the 'meetnetten' programme (since 2016).

In INBO there are about 25-30 people working with biodiversity monitoring and approximately 10 people of those working with habitat and vegetation mapping. For VL O there are 6-8 people working on biodiversity monitoring.

Budget

Total budget of biodiversity monitoring in Wallonia is estimated to be around 1.6M€, and about 0.5M€ of that is allocated for external contracts each year.

For Flanders, there is approximately 250k€ per year allocated to NGOs for species monitoring via INBO, but just for a specific programme, that is not the total budget of monitoring. Volunteer contributions are important but their value is difficult to estimate.

Bulgaria

Governance and coordination of biodiversity monitoring in Bulgaria

In Bulgaria, the Ministry of Environment and Water (MoEW) is the main policy-maker for biodiversity conservation, and the Executive Environmental Agency (ExEA) (under auspices of MoEW) is the main coordinator of the National Biodiversity Monitoring System launched in 2005. The main duty of ExEA is to collect primary data on species and habitats. Biodiversity monitoring is split into three realms: terrestrial, marine and freshwater, and all these three realms are also divided into species and habitats. In the agency there is also a hydro-biological monitoring programme according to the Water Framework Directive. For implementation of the EU Marine Strategy Framework Directive (MSFD), there is a specific institution, Black Sea Basin Directorate, which is also under auspices of the Ministry of Environment and Water that conducts a monitoring programme for species and habitats in the Black Sea. ExEA is working with them to collect data, but at ExEA they don't have a lot of data for some of the marine species. Altogether, there are approximately 4 to 6 experts involved in ExEA, and in addition to that also more experts working in National and Nature Parks for biodiversity monitoring. Data gathering by volunteers contributing to some monitoring schemes such as wintering and breeding birds, is coordinated via NGOs and they convey data to ExEA.

Most of the experience of ExEA lies with species monitoring schemes, while monitoring of habitats is a relatively new initiative. Ongoing habitat mapping uses data from various agencies, for

instance, forestry data of the agency under the Ministry of Agriculture. Also, aerial orthophoto images are used to select areas for field inventories. Copernicus satellite products such as land cover maps of CORINE are used but they are not detailed enough. According to the National Biodiversity Monitoring System, ExEA works with several other organisations as Regional Environmental inspectorates, Natural and National Parks. The most long-standing and popular monitoring scheme is the Mid-winter waterfowl birds census. It started in 1977 by the activity of Bulgarian scientists, and today ExEA coordinates this scheme with the help of more than 25 governmental and non-governmental organisations including NGOs and hunting organisations. In addition, 3 National and 11 Natural parks and almost all Regional Environment Inspectorates conduct monitoring of some species such as bear, chamois, and some vascular plants. For other monitoring schemes such as monitoring of invertebrates, fish, amphibians and reptiles and etc. as well as monitoring for the needs of EU Birds and Habitats Directive (data collected 1-2 times per reporting period of six years), ExEA makes a public procurement (a tender) to hire a specialist for field monitoring.

There is a national database and information system for species, but for habitats and ecosystems such a work is in the beginning[10]. National PAF (Prioritised Action Framework) reporting is important in Bulgaria. It includes elements such as raw data, indicators, and measures of implementation. Data standardisation and interoperability is still challenging among other Bulgarian organisations. Major needs of knowledge relate to the better understanding of species abundances (population sizes) and their distributions and threats. Collaboration with neighbouring countries Romania and Greece is a promising opportunity in the future.

Budget

Budget for biodiversity monitoring in the framework of the National Biodiversity Monitoring System is rather scarce (only 15 k€/year) and the total budget varies a lot (from 1M€ to 10M€ depending on the project funding). There is no secured monitoring for every 6 years period of Nature Directive reporting. More stable and long-term financing mechanisms are needed.

[10] http://ecosys.eea.government.bg

Croatia

Governance and coordination of biodiversity monitoring in Croatia

In Croatia, the Institute for Environment and Nature at the Ministry of Economy and Sustainable Development (MESD) is responsible for coordination of biodiversity monitoring (species and habitats) and in charge of reporting for Nature Directives. In addition to overall coordination by MESD, the implementation of biodiversity monitoring is split by realms for marine through the Croatian Institute of Oceanography and Fisheries and Croatian Waters, also in charge of Water Framework Directive, and for forests by the Ministry of Agriculture.

Croatia barely has a volunteer network – some organisations periodically invite citizens to report the occasional observations of sea vertebrates, IAS and saproxylic beetles. No one actually works with volunteers with the purpose of encouragement and facilitation of volunteer participation in biodiversity monitoring.

The major proportion of biodiversity data is ordered and paid for by MESD. For the purpose of inventory and monitoring of biodiversity, MESD cooperates with around **30 organisations** (faculties, non-governmental and governmental institutes and organisations) dealing with biodiversity inventory and monitoring. A good example of how biodiversity monitoring could be organised is bird monitoring: PECBMS[11] has a well organised and efficient coordination scheme covering also Croatia.

Some recognised challenges in current biodiversity monitoring relate to the lack of data, for instance monitoring of terrestrial biodiversity, and lack of funding for capacity building and long-term sustainability of monitoring schemes. Thus, it is hard to develop a biodiversity monitoring system. Croatia has, however, got a project through EU structural funds, but there isn't a continuous set-up through the national budget. European biodiversity monitoring schemes/programmes should be developed in such a way to be applicable in different countries. Funds (European, EU, international) for implementation of such schemes should be available.

Budget

Estimation for total costs for biodiversity monitoring in Croatia is about 30 M€ for 5 years (all realms). This includes a budget for setting up a biodiversity monitoring centre that is 10M€ for 5 years (EU structural funds). The project will be finished in September 2023. In addition to that funding for marine realm was divided as follows:

- Marine biodiversity monitoring 500k€ per year;
- Marine strategy 1.5M€ per year;
- Marine habitat monitoring 12.5M€ (a project of 5 years).

[11] https://pecbms.info/

Financing of biodiversity monitoring is not stable, and this was the situation of the 2022 budget but it can be decreased. When you report to the EC for the directive, quality of the data is not taken into account. A higher budget can provide better quality data.

Czech Republic

Governance and coordination of biodiversity monitoring in Czech Republic

In the Czech Republic, the Ministry of Environment is more focused on policy and strategies, while the Nature Conservation Agency of the Czech Republic (NCA CR) is state administrative body in nature conservation and technical expert institution, e.g. in field of biodiversity monitoring (/incl. reporting under EU Nature Directives). NCA CR, Biodiversity Monitoring Department has a staff of 15 persons, approx. 200 persons are hired for field work per year. National parks are independent bodies, fulfilling local monitoring needs.

The biodiversity monitoring system is quite elaborated, building on a long history of natural protection and research. The NCA CR organises habitat mapping with its own employees and the network of contractors. Species monitoring is organised by the agency's own staff together with the network of contractors that also includes specialised organisations and volunteer networks. Such a structure was established by the EU accession. Habitat monitoring is now quite developed due to the Habitats Directive. At the species level, the main emphasis (laid by budgetary resources) is on species listed for the Habitats Directive and bird species.

In the Czech Republic, there is a centralised national biodiversity data portal (https://portal.nature.cz). However, data is not yet connected to GBIF. This is expected in near future, to enhance the visibility and use of the data. Collaboration with Biodiversa+ and EuropaBON is expected to support data interoperability and solutions, and thus to improve quality of reporting.

Budget

Biodiversity monitoring is mainly funded by the State's budget. Funding is limited and thus focusing on some species, especially those related to Nature Directives. The contractual costs of habitat mapping (including Natura 2000 areas) and monitoring of directive species in the NCA CR are approximately 400k€ per year and the costs have been relatively stable over the last 10 years. EU funding (structural funds) and also LIFE funding are also important surpluses for specific and additional projects. Biodiversity indicators and data collection on common birds are not covered by the State budget. CZ BirdLife partner (CSO) has some own funding and is based on volunteers. However, the state pays for specific results/data for them. Butterfly indicator is funded partially by NCA CR, partially done on a voluntary basis.

Denmark

Governance and coordination of biodiversity monitoring in Denmark

The Ministry of Environment of Denmark is in charge of implementation of biodiversity policy and steering and coordinating the monitoring. The Ministry of Environment, Agency for Environment, is overall responsible for the national monitoring programme (NOVANA) and a large number of permanent staffs in the ministry are involved in data collection and designing of surveys. Some components of the monitoring programme are outsourced to consultants. Aarhus University undertakes the data analysis and produces yearly thematic monitoring reports for each of the thematic programs at national level.

Monitoring is very much bound to the EU Directives in Denmark, there is little monitoring beyond the Directives. For example, Denmark is the only Western European country with no harmonised butterfly monitoring scheme. There would be a butterfly monitoring community available, but because there is no legal obligation EPA is not funding it, and private funding organisations think that it should be a responsibility of EPA. Bird monitoring is based on active volunteers' contributions. The Ministry of Environment has an agreement with BirdLife in Denmark in order to make data open and accessible. These data are used to report on Birds Directive. Hunting Bag Statistics are also a unique element in the Danish monitoring landscape and their role is important for monitoring of large mammals. Habitat monitoring is a responsibility of the Ministry of Environment. Altogether, 60 habitat types are monitored in order to report on the Habitats Directive and in order to develop a management planning. Marine monitoring is included also in NOVANA and there is a strong component, for instance focusing on nutrients and sea grass, from the marine side but related to EU Directives.

Denmark is a rather small country hence there are not many challenges regarding coordination at sub-national level. The responsibilities for the national monitoring program are quite clear and set in contracts. Standardised monitoring schemes at trans-European level is a challenge for many countries including Denmark. Continuation of monitoring schemes and long time series are needed as well as adapting to standardised requirements from e.g. EU reporting or standardised monitoring for biodiversity at large at European level.

Collected monitoring data is quite centralised and well-organised in Denmark. Number of data sets are available from public entities, a big database hosted by central administration. Yet, specialists may argue that the collected data is not sufficient. Monitoring reports are available yearly. The EU has an important role in developing national biodiversity monitoring in Denmark and providing both pressure but also some funding. Private initiatives are hesitant to increase monitoring load on their own.

Budget

Total budget of the NOVANA project is approximately 43.3 M€. Thousands of citizen scientists are contributing to monitoring.

Estonia

Governance and coordination of biodiversity monitoring in Estonia

The Ministry of the Environment (Nature Conservation department) provides funding for the Republic of Estonia Environment Agency that coordinates biodiversity monitoring in Estonia. Number of people working on biodiversity monitoring coordination in the Environmental Agency is currently 7, and as a whole 10 people are working full time. Marine and freshwater monitoring is not coordinated nor organised by the Environmental Agency, but they belong to the duties of a different department in the Ministry of the Environment. Novel methods such as using remote sensing have been developed for sea monitoring.

The terrestrial monitoring system is rather transparent and public procurements (tenders) are used to find experts to do the monitoring. Approximately 20 contracts are done yearly. There is a diverse network of Estonian experts of biodiversity monitoring including small private companies, NGOs, professional organisations (e.g. Estonian Ornithological Society), hunters, universities, research centres, etc. For some organism groups (e.g. amphibians) also citizen science is used to obtain information. Monitoring is divided in two groups: habitat and species monitoring. Species monitoring can be done at species level or species groups. Sometimes shortages of experts can inhibit monitoring efforts, and for instance, directive reporting of bird populations is still challenging. Wildlife monitoring programme has been running since 1990. Novel techniques such as camera traps and artificial intelligence are used for game species monitoring. The newest monitoring schemes are butterflies, moths and bumblebees.

Data management is centralised in the Environmental Agency. The aim is to develop data to FAIR and machine-readable format that could in the future be linked with European databases. Existing national monitoring schemes need to be taken into account when developing trans-European biodiversity monitoring schemes. It is important to facilitate networking between experts and sharing contact information. Major gaps in current monitoring schemes are habitats (Nature Directive) and soil monitoring.

Budget

The estimated budget of terrestrial biodiversity monitoring for the Environmental Agency is about 400 k€ per year. This budget is not divided by species and habitats and it is used for the most urgent monitoring demands. Marine and freshwater monitoring has a separate budget. Some monitoring funding is coming from environmental taxes.

Finland

Governance and coordination of biodiversity monitoring in Finland

The Ministry of the Environment is in charge of funding and steering biodiversity monitoring in Finland. Most of the concrete work on compiling biodiversity information as well as assessments and reporting is done by the Finnish Environment Institute (SYKE) that works under auspices of the Ministry of the Environment. However, there is not yet a national biodiversity monitoring centre in Finland, but a coordinating working group has been established with a mandate to provide Terms of Reference of national biodiversity monitoring coordination, analysis of monitoring schemes, and suggestions for data interoperability solutions by the end of 2023. Two main initiatives are the Finnish Ecosystem Observatory (FEO) hosted by SYKE, and Finnish Biodiversity Information Facility (FinBIF) hosted by the Finnish Museum of Natural History (Luomus) at the Helsinki University. FEO and FinBIF could form the core of the national biodiversity coordination centre (a national hub) as a national level counterpart for the European Biodiversity Monitoring Coordination Centre designed by EuropaBON project in the future.

In addition to SYKE, there are 3 other main data providers in Finland: Luomus, Finnish Natural Resource Institute (Luke), and Forest and Parks Service (Metsähallitus), but in addition to those also some other institutes and organisations provide some relevant data sets for biodiversity. Luomus coordinates national bird monitoring census, and operates FinBIF development providing also a national node for GBIF. Finnish Natural Resource Institute (Luke) under auspices of the Ministry of Forestry and Agriculture is responsible for national forest inventories, inventories of game and fisheries, inventories of agricultural environments, but also monitoring of invasive alien species and soils. Forest and Parks Service monitor and manage state land and sea areas, especially protected areas (e.g. Natura 2000). In addition to those there are several other NGOs (such as BirdLife Finland) contributing to some species monitoring schemes, and expert groups of different taxa doing inventories of threatened and unknown species; their work is supported by the Ministry of the Environment.

Data interoperability in Finland is under progress with FEO until spring 2024 when a national data portal should be open to the public. FinBIF has been developing during previous years compiling national species data into one hub where it is available for public and expert users, as well as linked with GBIF. FinBIF has launched a Finnish version of iNaturalist to collect citizen science observations into the portal. Currently, there is a national research infrastructure project in place where FinBIF and FEO are planned to be integrated with each other so that both species and habitat data can be supported and collected in harmonised ways.

Budget

In Finland, the main costs of national biodiversity monitoring conducted by the four major organisations (i.e. SYKE, Luke, Luomus, Metsähallitus) were altogether 11.5M€ for the year 2020 (as an example year). SYKE is steered by the Ministry of the Environment, Luke by the Ministry of Forestry and Agriculture, Metsähallitus is steered by both of those ministries, and Luomus by the

Ministry of Education. Part of the lump sum of all monitoring costs came directly from ministries (less than 50 %), part from projects with various funding sources (both national and international) (more than 50 %). One of those organisations, i.e. Luomus, uses the citizen science work contributions of approximately 1000 volunteers yearly. The Ministry of the Environment supports the work of about 25 different taxonomic expert groups with a sum varying between 200-400k€ per year. Besides the biodiversity monitoring schemes, there are 4 different research infrastructures with some relevance for biodiversity monitoring schemes having their independent budgets varying from 1-12M€/a.

France

Governance and coordination of biodiversity monitoring in France

The Ministry for Ecological Transition is in charge of reporting to the Convention on Biological Diversity (CBD), and not very involved in biodiversity monitoring except for funding and overall coordination (coordination is different depending on the environment). The French Biodiversity Agency (OFB) has a national duty to coordinate three national monitoring scheme (marine, terrestrial biodiversity and freshwater) and three national information systems (marine, freshwater, biodiversity). The duties include to coordinate information, to make it available, to communicate to the general public and to make the link between data/information available and policy needs.

One department of OFB, partially mixt with the national natural history museum (MNHN) through the Patrinat unit, is specialised on monitoring governance, reporting and data management. This department is involved in the three realms (freshwater, marine, terrestrial) and provides all the services surrounding monitoring: 1) (monitoring) development of national monitoring scheme and coordinating national observation systems, developing and publishing monitoring methodologies, 2) (data) coordination of data management infrastructure and information systems, referential list of habitat and ecosystem, information/data visualisation, synthesis and indicator development for general and specialised public, 3) (assessment) reporting to european directive, supporting IUCN red list assessment, supporting ministries with expertise, supporting other direction for local assessment. This department does not perform monitoring by itself. The French BON, a national BON of GEO BON that consists of experts from OFB, French Natural History Museum, and research community is also included in the Patrinat unit. French BON is very much focussed on the operationalisation of EBVs but has been recently linked with the French Biodiversity Information System.

Governance of biodiversity monitoring in France is split by realms. All three are interested in monitoring the state of biodiversity as well as the pressures.

- For freshwater, biodiversity monitoring is well-organised due to the Water Framework Directive. It is coordinated by the Water Agencies and OFB and follows a national scheme. Six water agencies, and 4 overseas water agencies, are the interface between OFB, private operators and other public sectors. OFB is also directly in charge of some operations. Monitoring protocols are normalised at the national scale.

- Marine environment: monitoring aligns with the marine strategy framework directive, habitat directive and bird directive, as well as regional convention (OSPAR). The Marine monitoring is being organised by a national scheme, coordinated by the ministry of ecological transition, together with Water Agencies and OFB. OFB has a strategic cooperation with IFREMER (marine research national agency) to coordinate producers. Important actors around monitoring (larger than just biodiversity) are around 10 public/research entities such as SHOM (ministry of defence), CEREMA, PELAGIS, MNHN and multiple NGOs. OFB is mostly funding third parties, except in marine protected areas where OFB is in charge.
- For terrestrial environments, the landscape is not as well-organised. The monitoring scheme is under development, coordinated by the ministry of ecological transition and OFB, with subnational groups (NUTS2). OFB is directly performing some monitoring program and is in charge of the coordination of producers. The landscape of data producers is large, diverse and hardly known (OFB, other national agencies, NGOs, hunters, citizen science, regional organisations, researchers). Many programmes work through non-funding cooperation or through research project funding.

OFB relies a lot on private organisations and sometimes these organisations do not release and share all their data because they need to sell these data (terrestrial realm only), freshwater is not so problematic, and marine realm is quite well arranged as they both are funded by public services and thus data is open and FAIR. Sometimes it is hard to know which data is coming from public or private money.

Budget

Overall cost of freshwater data (larger than just biodiversity) is approximately 130 M€/year. The overall cost of marine monitoring is approximately 60 M€/year. The cost of terrestrial monitoring and biodiversity information collection is estimated between 30 and 65 M€/year. Estimation of terrestrial monitoring costs is difficult because a lot of the work is made by associations (NGOs) and citizens. The represented budgets also include research programmes, i.e. costs from the Ministry of Ecological transition, but do not include fundamental research costs carried out by the Ministry of Research.

Despite significant national funding even France is relying a lot on EC money coming, for instance, from the LIFE Programme that is a very important funding source for biodiversity monitoring (excluding freshwater realm). There is no plan how a new national biodiversity monitoring scheme will be financed.

Germany

Governance and coordination of biodiversity monitoring in Germany

Germany as a federal state consists of 16 partly sovereign federal states (Länder). In Germany, the main responsible for coordination of biodiversity monitoring is the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV), where the Directorate for Nature Conservation is responsible for biodiversity monitoring, while the two other relevant parties are the Federal Agency for Nature Conservation (BfN) and the German Environment Agency (UBA). Länder authorities are responsible for implementation of biodiversity monitoring on sub-national geographical scale. The newly founded National Monitoring Centre on Biodiversity (NMZB)[12] with a secretariat hosted by BfN, has the task to develop a general concept for a nationwide biodiversity monitoring that includes the actual monitoring activities. The NMZB has also the task to promote the establishment of the nationwide biodiversity monitoring and to coordinate the activities in the nationwide biodiversity monitoring programmes. The NMZB was established to provide a better understanding and coordination to the already complex governance history and landscape of monitoring schemes in Germany. The need for its establishment came from the administrative side, but also from monitoring schemes themselves as well as from natural history societies.

Terrestrial Monitoring:

Monitoring of terrestrial habitats and species (e.g. birds, insects, higher plants) is coordinated by BfN (overlap with freshwater environments and marine environments); monitoring standards and conceptions have been developed and implemented by BfN for terrestrial habitats/species in close cooperation with the German Länder, NGOs (DDA, Federation of German Avifaunists) and experts. Monitoring of (terrestrial) protected areas is also coordinated respectively closely accompanied by BfN in case of the areas of National Natural Heritage.

For terrestrial monitoring, cooperation between national and Länder authorities is organised specifically for the different monitoring programmes. Working groups lead by BfN exist for i) Monitoring according to the Habitats Directive, ii) National Bird Monitoring, iii) National Ecosystem Monitoring, iv) High Nature-Value Farmland Monitoring and v) National Insect Monitoring. Furthermore, a working group exists for the vi) Monitoring of National Natural Heritage.

Collection of monitoring data varies between the monitoring programmes.

i) Habitats directive monitoring: data collection in the field is mainly carried out by professionals. A comprehensive, nationally uniform monitoring system was launched in 2008. Besides the distribution and area of natural habitats and species of common interest, the quality of individual occurrences is regularly surveyed. To limit the effort involved in the assessment of quality, the survey uses random sampling for common and widespread species and habitat types, while for rare species and habitat types all known localities are sampled (complete survey). The monitoring survey is conducted both within

[12] www.monitoringzentrum.de

and outside the Nature 2000 protected area network." Field data is being gathered by German Länder. Data storage and analysis is performed by the national coordination unit (BfN).

ii) National bird monitoring programmes: data collection in the field mainly by volunteers (data owners), data aggregation on Länder and national level by NGOs (Länder NGOs and DDA, Federation of German Avifaunists). Bird monitoring in SPAs: data collection in the field by volunteers (as part of national bird monitoring) and by professionals (site-related population estimates as part of Länder activities); depending on data origin, the coordination lies with the NGOs or the Länder authorities; aggregated data are gathered nationally (BfN, DDA)

iii) Ecosystem monitoring: this habitat mapping programme is currently under development and represents an extension of the High nature value farmland monitoring in Germany. It is to be implemented by the Länder. When implemented, a comprehensive mapping and assessment of habitat types on 1 km² sampling plots is carried out in the field by professionals, coordinated by BfN and the Länder. A first national survey was conducted by a research and development project funded by BfN.

iv) High nature-value farmland monitoring: coordination by BfN, data collection in the field by professionals, data being gathered by German Länder (data owners), data analysis on Länder und national scale by BfN

v) Insect monitoring: The 89th UMK (conference of environmental ministers of the German federal states) recommended the setup of a nationwide structured insect monitoring scheme. This recommendation was followed by the development of the conceptual basis for a nationwide insect monitoring scheme within ongoing research and development projects (2018 -2023) and in close collaboration with national and federal states' nature conservation agencies. The purpose of this monitoring scheme is to provide a data basis on trends of the German entomofauna by regular, nationally representative, systematic and standardised long-term surveys to deduct scientifically robust and nationwide valid statements and to fill knowledge gaps (e.g. on land use-specific differences in trends, large-scale effectiveness of protective instruments and potential causes of threat). Therefore, both common insects and insects of rare habitats and those of special interest for nature conservation (such as naturally rare species, endangered species or species of national responsibility because of e.g. the occurrence of major parts of the worldwide population in Germany) are to be addressed. The range of specific data collection approaches is wide and can consider specific (groups of) species and surveys of a broad range of species, various parameters such as diversity, population density and biomass as well as classical methods and innovative techniques. Taken as a whole, this set of different sampling modules (addressing a range of different insect orders, species groups, single species and habitats), is intended to provide an insight into the status and development of the insect fauna in Germany. Potential synergies with established biodiversity monitoring schemes are acknowledged as well as outcomes of discussions with entomologists and further experts. Interim result is the document "Einheitlicher Methodenleitfaden Insektenmonitoring" - "Standardized Methods Manual for the Nationwide Insect Monitoring" (in Germany), created as a first milestone in cooperation

with the federal states until March 2019, in which first methodological elements are drawn up in order to harmonize early insect monitoring activities of federal states. Consequently, several federal states started the realization of one or more herein described modules focusing on insect groups such as grasshoppers, butterflies or carabid beetles mainly in the wider landscape. Based on the “Einheitlicher Methodenleitfaden Insektenmonitoring” as well as the experiences of federal states, a method handbook describing sampling methods in detail for the sampling modules of the prioritized “minimal program” is expected to be finished in 2023, likewise in close collaboration with the federal states. Additionally, a voluntary butterfly monitoring scheme is coordinated by the Helmholtz-Centre for Environmental Research (UFZ), including data aggregation on national level.

vi) Monitoring of National Natural Heritage (NNE): Until now 156,000 ha of valuable areas for nature conservation formerly owned by the German Federal Republic have been transferred to e.g. the Länder and NGOs for long-term protection. One main aim is the near-natural development of forest ecosystems. For the new site owners monitoring is optional. However, to document and compare trends in development of the NNE-sites simplified monitoring methods were standardised in accordance to other monitoring programs in Germany. Forest, bird and butterfly monitoring schemes are already implemented, and others are currently being developed. Data collection in the field is coordinated by site owners and is mainly carried out by volunteers. BfN is responsible for the monitoring concepts and their implementation in NNE-sites still owned by the German Federal Republic.

Additional monitoring activities by the Ministry in charge of agriculture and forestry are in development.

Marine Monitoring:

The federal states are responsible for monitoring on land and within the 12-mile zone. In the Exclusive Economic Zone, responsibility lies with the Federal Government, as Germany has only limited sovereign rights here due to the Convention on the Law of the Sea (UNCLOS). Here, marine nature conservation is represented by the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV), and the Federal Agency for Nature Conservation (BfN) is the competent nature conservation authority for the entire area of the German EEZ and the continental shelf. Biodiversity Monitoring as a task of the federal government and the Länder is also anchored in the Federal Nature Conservation Act (BNatSchG). The German marine monitoring is nationally harmonised and integrated by the „Bund/Länder Arbeitsgemeinschaft Nord- und Ostsee“ (BLANO).

For marine monitoring the "Bund/Länder-Arbeitsgemeinschaft Nord- und Ostsee (BLANO)" and its structures coordinate the management of the German part of the North Sea and the Baltic Sea within a national and a regional framework (relevant Regional Sea Conventions: Oslo-Paris Convention for the protection of the Northeast Atlantic, OSPAR and the Helsinki convention for the Protection of the Baltic Sea, HELCOM). This includes, among other things, the joint monitoring and assessment of the marine environment of the North Sea and Baltic Sea (“Bund/Länder-

Messprogramm Meeresumwelt Nord- und Ostsee"). The entire marine monitoring in Germany and the cooperation between the federal government and the coastal states is regulated by an administrative agreement "Bund/Länder-Verwaltungsabkommen Meeresschutz" between the federal and state ministries. To implement the technical tasks, experts from the Länder and the federal government work together in the cross-sectional working group "ErBe - Erfassung, Bewertung", among others, and are supported by external experts, e.g. from research institutions. The marine monitoring is supervised by this working group. It is responsible for conceptual and content-related support and finalisation of draft monitoring programmes as well as coordination of activities and support of the implementation of the national marine monitoring[13].

The focus of the German marine biodiversity monitoring is not only on marine mammals, fish and seabirds, but also on benthic species and biotopes. In contrast to terrestrial areas, monitoring in the sea is associated with high logistical and financial costs. BfN is not the competent authority for construction and operational monitoring in official approval procedures. All collected data and raw data are submitted to BfN in agreed formats and made available by BfN to fulfil reporting obligations and to the public. Concrete monitoring is done by several organisations:

i) Habitats: The BfN coordinates the monitoring of marine habitats in the German EEZ; in coastal waters, the federal states are responsible. Data collection and analysis is carried out in cooperation with and on behalf of the BfN by various research institutions and private consultancies. These currently include the Leibniz Institute for Baltic Sea Research Warnemünde (IOW) and its cooperation partners and the Alfred Wegener Helmholtz centre for Polar and Marine Research (AWI). As a private consultancy, BioConsult GmbH & Co. KG carries out surveys on behalf of BfN.

ii) Species: In the case of monitoring marine vertebrates, it follows from the requirements that BfN carries out the monitoring of seabirds and cetaceans in the offshore areas, and the Länder record seals as well as resting and wintering waders/waterbirds as part of the wading and waterbird counts from land. Data collection in the offshore areas is also carried out here on behalf of the BfN by various research institutions and private consultancies. These currently include the Dachverband Deutscher Avifaunisten (DDA), German Oceanographic Museum Foundation in Stralsund, Research and Technology Centre, West Coast (FTZ) and Institute for Terrestrial and Aquatic Wildlife Research (ITAW). As a private consultancy, BioConsult SH GmbH & Co. KG carries out digital surveys on behalf of BfN. Seal monitoring is coordinated by the Länder and includes, among other things, the examination of the health status and population development as well as administrative measures for the protection of the seal at national and international level. Wading and waterbird counts from land in Germany are based on voluntary surveys and programmes of the Länder. The nationwide voluntary programmes are also coordinated by the Dachverband Deutscher Avifaunisten (DDA).

[13] https://www.meeresschutz.info/ministerien.html

Soil and freshwater quality monitoring:

Soil monitoring and monitoring of freshwater quality (according to the Water Framework Directive) is in the responsibility of the German Federal States and guided by the German Environment Agency (UBA)[14] and by German Working Group on water issues of the Federal States and the Federal Government (LAWA) represented by the Federal Environment Ministry[15].

Data interoperability is still a challenge. In principle, all monitoring data stays where it is collected and is owned by the collector (often Länder) but it is available on demand. For marine data, BfN compiles the data and delivers it to interested partners. Yet, not all marine data are available in one single place. Marine data infrastructure is still under construction but should become ready in a few years. The National Monitoring Centre on Biodiversity is working on overall data management and aims to improve data availability in Germany in the future.

One of the biggest challenges in organising trans-European marine biodiversity monitoring systems is the considerable cost of marine monitoring and the requirements for cross-border coordination. To address this, a clear mandate from the EU for improved monitoring of biodiversity or even individual species at national level would be extremely helpful to meet the requirements under the Habitats Directive, Birds Directive, Marine Strategy Framework Directive and the Maritime Spatial Planning Directive. The high cost of methods for monitoring different populations and the lack of sufficient harmonised international monitoring of the location and extent of threats to these populations are another bottleneck. Synergies can and must be created through the establishment of trans-European monitoring systems and the full potential of financial resources at EU and national level. One big challenge for the use of the WFD biological data is that they are currently stored in different databases of the federal states. A national database summarising these data is needed.

Budget

There is no comprehensive overview of funding spent on biodiversity monitoring programmes in Germany, as there are many different actors involved which makes estimation of total costs difficult. Furthermore, the role of volunteers in German biodiversity monitoring is very important and their invaluable contribution is hard to valorize in monetary value. A lot of the monitoring funding is project based. The budget for the National Monitoring Centre on Biodiversity is funded by the national government (Bundesregierung), and the total budget lies between 4.3 and 6.2 Mio € per annum. Subsequently, a new budget will be negotiated. Part of this yearly budget will be used to co-fund selected monitoring programmes carried out by the federal states (Länder) to foster harmonised national biodiversity monitoring schemes.

[14] https://www.umweltbundesamt.de/en
[15] https://www.lawa.de/English-About-LAWA.html

Ireland

Governance and coordination of biodiversity monitoring in in Ireland

In Ireland, National Parks & Wildlife Service (NPWS), Department of Housing, Local Government & Heritage is responsible for biodiversity monitoring coordination. NPWS is reporting for Nature Directives and that is also the main focus on the monitoring programmes on habitats and species. NPWS commissions private sector ecologists & NGOs to undertake monitoring programmes. NPWS/Marine Institute commission academic sector & private consultants to develop monitoring survey methods. Besides NPWS there are also other organisations involved in biodiversity monitoring. The Environmental Protection Agency (EPA) is responsible for biological monitoring related to the Water Framework Directive (WFD). In addition, Inland Fisheries Ireland does fish monitoring in the country for the WFD and other reasons; EPA doesn't monitor fish. WFD surveys are not only biodiversity surveys, they are conducted to investigate the effects of water quality on indicator species and are not for the purpose of documenting biodiversity although such data is also shared. Marine monitoring is not coordinated by the NPWS, as there is another institute, Marine Institute, focusing on marine research responsible for that.

The National Biodiversity Data Centre of NPWS centralises the data from various data collectors. Technical manuals covering the data and programmes are available on the website. There is no national mapping of habitats conducted, but the EPA is working to update its land use map. Some citizen science monitoring programmes are coordinated by NGOs but the outcomes of those surveys are uploaded back to the National Biodiversity Data Centre. The main challenge is the collation of data that would support the interpretation of monitoring data leading to assessments, e.g. remote sensing data, data on conservation measures and their effectiveness, and data arising from Environment Impact Assessments. The SNAP (Strategic Nature Action Plan) instrument under the LIFE programme will be used to determine the effectiveness of conservation measures in Ireland which has been challenging. However, there are lots of gaps in their biodiversity monitoring. Remote sensing will be used in the future to better map the habitat's extent and condition, especially for small farms that are hard to monitor.

Budget

The budget for biodiversity monitoring schemes in Ireland is about 3M€ per year. National Parks and Wildlife Services have a staff of 100 people and in addition to that there are 35 people in the department.

Israel

Governance and coordination of biodiversity monitoring in Israel

In Israel, the Ministry of Environmental Protection is in charge of biodiversity monitoring of ecological ecosystems – terrestrial, wetlands and marine ecosystems (Mediterranean and Red Sea). Several organisations (at least 8) perform biodiversity monitoring and/or collect ecological data.

There are four main long term monitoring programs: terrestrial, wetlands, Mediterranean Sea, and the Red Sea, which are ongoing, and several additional projects; HAMAARAG and Israel Center for Aquatic Ecology (operated by The Steinhardt National Museum of Natural History at the Tel Aviv University) perform long term monitoring of terrestrial ecosystems and wetlands and produce periodic National State of Nature Reports; The Israel Nature and Parks Authority (INPA) monitor specific species; Israel Oceanographic & Limnological Research (IOLR) monitor biodiversity in the Mediterranean Sea and The Interuniversity Institute for marine Sciences in Eilat (IUI) monitor biodiversity in the Red Sea. Other organisations also perform small scale monitoring programs and/or collect data, including The Hebrew University (BIO-GIS), The Society for Protection of Nature in Israel (SPNI), The Israel Gene Bank (IGB), and the Charney School of Marine Sciences. In addition to those, many small organisations and NGOs conduct monitoring (e.g., of butterflies).

Since monitoring is performed by several bodies, it is stored at different locations and there is no centralised data platform. Yet, the marine environment has a data centre for the Mediterranean Sea (ISRAMAR), and this year we started submitting the marine biodiversity monitoring data to the UNEP's IMAP info-system database.

The need for the use of open and FAIR data is recognized. Moreover, the current monitoring schemes were developed over the years, step by step, and there is no clear coordination of the entire national monitoring plan. Improved national coordination and design of biodiversity monitoring schemes should be built and implemented. That is a task where Biodiversa+ could hopefully provide help. It was accepted that a national biodiversity hub should not be located at a Ministry, but rather at an institute or academia (e.g., by the Steinhardt National Museum of Natural History).

Budget

Biodiversity monitoring is mainly financed by the government (especially the long-term monitoring programs). So far, much of the government funding for biodiversity has been periodic and we struggle each year to provide it. Therefore, it is hard to provide an estimation of the yearly budget spent on biodiversity monitoring, and it is even more difficult since several organisations perform monitoring and are financed by different governmental sources. Moreover, citizen science is becoming more important for monitoring, and the budget invested in this direction is increasing during the last years. Estimates of the budget for the main activities were and will be mapped for Biodiversa+.

Italy (including the Province of Bolzano)

Governance and coordination of biodiversity monitoring in Italy

In Italy, biodiversity monitoring governance follows the thematic split under the Nature, Water Framework (WFD) and Marine Strategy Framework (MSFD) Directives and according to regional peculiarities (e.g., Province of Bolzano). The Ministry of Universities and Research (MIUR), and Ministry for Ecological Transition (MiTE) are the key ministries in the area of biodiversity monitoring. In addition to that, autonomous regions/provinces such as the Autonomous Province of Bolzano play a key role in biodiversity monitoring implementation and coordination in Italy. Altogether there are 20 Regions in Italy of which less than half are providing data for biodiversity monitoring and directive reporting. Regions are then divided into provinces, some more autonomous than others. Other relevant organisations are, for instance, Italian National Institute for Environmental Research and Protection (ISPRA) especially for habitat monitoring, and EURAC Research. Biodiversity monitoring landscape has been very fragmented in Italy, but at the moment a new national biodiversity monitoring centre is set up for all environments with the support of EU recovery funds of over 400M€.

For now, biodiversity monitoring is oriented on:

- Nature Directives of which reporting is made at national level and compiled by MiTE, but the collection of data is made at the regional /province levels, and aggregation of data at sub-national level.
- Marine Strategy and Water Framework Directives which are more centralised but still most data are collected at the local level.
- At sub-national level the autonomous provinces and regions may have additional monitoring such as the Autonomous Province of Bolzano.

Flow of biodiversity monitoring data aggregates from local/regional to national level. Data is collected at regional level by experts and funded by specific projects (Administrative Regions/Autonomous Provinces). Data is aggregated at national level for legally binding reporting activities by MiTE. ISPRA produces national guidelines for species and habitats monitoring activities and coordinates scientific societies and universities to integrate data collection in case of data gaps; it also assists the MiTE in order to coordinate data aggregation from local monitoring activities. Data from citizen science networks are also collected e.g., for invasive species. Marine biodiversity is mostly unknown in the non-protected areas.

Standardisation and harmonisation for the collection of data is very important for the ministry, and guidelines towards harmonisation are published. Despite that, it has been hard to convince local researchers to change their methods and adapt to new/ different monitoring schemes. It would be useful to have European monitoring standards and harmonised approaches where common monitoring schemes would refer to. MiTE is working on a national repository due to October 2024 in order to make data public. The repository is tailored for experts providing data, but it includes only synthesised results of assessments, not raw data itself. So far most of the raw data is located in local servers and thus is not available which is problematic as also raw data should be available better. GBIF is not very active in Italy so far, while LifeWatch is more relevant and will be linked with the new national biodiversity centre.

Budget

Estimates of current national biodiversity monitoring costs were difficult to get. At national level, collection and harmonisation of data for Nature directive reporting is financed by MiTE to the experts with 500k€ every 6 years. Italy got over 400 M€ of EU recovery funds which is aimed to be invested in establishing a new national biodiversity monitoring centre, but more detailed information of that will be available later.

The Autonomous Province of Bolzano has invested 500k€ per year for biodiversity monitoring.

LIFE funds are quite crucial in Italy for biodiversity monitoring.

Montenegro

Governance and coordination of biodiversity monitoring in Montenegro

In Montenegro, coordination of biodiversity monitoring is organised at national level by the Environmental Protection Agency, Department for monitoring. The agency is in charge of both terrestrial and marine realms, and shares the budget and approves annual monitoring programmes. It hosts about 10 experts of different taxa.

Organisations that collect data on biodiversity are: Environmental Protection Agency, University of Montenegro- Natural mathematics Faculty- Biology Department, Natural Museum, Institute of Marine Biology, NGO Centre for Protection of Birds, NGO Montenegrin Ecological Society, NGO Bear in Mind. Altogether there are approximately 40-50 in the whole country participating in biodiversity monitoring.

There is separate thematic coordination on common methodologies, indicators, and joint programmes for animal, plants and fungi. Raw field data is collected from Natura2000 areas in GIS format for species and habitats, but a problem is that there is no tradition nor practice on data sharing in Montenegro so far, and no clear protocols on data formats. More taxonomic data is needed from mammals and herpetofauna. There is detailed habitat inventory ongoing based on EUNIS and Habitat Directive Annex I classification. This work involves 2 experts from EPA and 28 external experts. Altogether 35 % of territory is under habitat mapping and also some marine sites. The major challenge in Montenegro is lack of secured, long-term funding for biodiversity monitoring.

Budget

The EPA instrument for monitoring has been approximately 3M€ in total. This includes EU IFA funding of 1.5M€ and national budget for monitoring of Natura2000 areas in 2019-2022 that was about 300k€/year. There are plans to develop a long-term monitoring programme in Montenegro from 2025, after the habitat inventory is finished.

Morocco

Governance and coordination of biodiversity monitoring in Morocco

The point of contact on biodiversity monitoring in Morocco is the Ministry of Higher Education, Scientific Research and Innovation. Biodiversity monitoring is a new and transversal topic in Morocco, hence it was difficult to answer the questionnaire. However, there are several ministries involved in this topic. Biodiversity information is not coordinated in Morocco. They need more time to collect proper information and are keen on capacity-building and collaboration.

There is a National Committee for biodiversity monitoring, both for terrestrial and marine monitoring (Atlantic Ocean), but there is no national contact point. For CBD, the Ministry of Energy Transition and Sustainable Development (Department of Sustainable Development) is in charge.

Budget

There was no clear budget estimation for biodiversity monitoring available. They are interested in having support from EC / Biodiversa+ to conduct a survey on biodiversity monitoring in Morocco.

The Netherlands

Governance and coordination of biodiversity monitoring in the Netherlands

In the Netherlands, biodiversity monitoring belongs under the Ministry of Agriculture, Nature and Food Quality (LNV) (in particular Nature Action Department, and Knowledge Department), but is concretely coordinated by one of the 'Programme units for Statutory Research Tasks' of Wageningen University and Research Centre (WUR): Nature and Environment (in Dutch: Natuur en Milieu). WUR and the Dutch Network of Ecological Monitoring are contracted by the ministry for 5 years. The Dutch Network of Ecological Monitoring (in Dutch: Netwerk Ecologische Monitoring (NEM)[16] is a cooperative endeavour of different government entities and species organisations aiming to collect information for the establishment of trend indices for species numbers.

'Network Ecological Monitoring' (NEM) is being commissioned for by the ministry of LNV and supported by one of the 'Programme units for Statutory Research Tasks' of Wageningen University and Research Centre (WUR): Nature and Environment (in Dutch: Natuur en Milieu). These Statutory research tasks of WUR[17] do follow a specific set of Administrative and Management Regulations. See: WR Administrative and Management Regulations - WUR[18].

[16] http://www.netwerkecologischemonitoring.nl/
[17] https://www.wur.nl/en/Research-Results/Statutory-research-tasks.htm
[18] https://www.wur.nl/en/Research-Results/Statutory-research-tasks.htm see pages 18 and 19

The programme unit Nature and Environment is responsible for the coordination of the NEM and also takes care of the outsourcing of the different monitoring schemes to a number of organisations specialised in monitoring of specific taxonomic groups: Zoogdiervereniging (Mammals), SOVON (Birds), RAVON (Reptiles, Amphibians, Fish), Vlinderstichting (Dragonflies, Butterflies), EIS (Other insects), Anemoon (Molluscs), FLORON Vascular plants, BLWG (Mosses), Paddenstoelenstichting (Fungi). The programme unit also closely cooperates with Statistics Netherlands (CBS; responsible for the protocols and the statistical analysis of the data), and it organises the transfer of data to CBS and to the Dutch National Database Flora and Fauna (NDFF[19]; distribution data of species) and also takes care of the website maintenance.

LNV takes part in the directing group (in Dutch: Regiegroep Informatievoorziening en Monitoring Natuur) with other partners such as Rijkswaterstaat[20] and provinces.[21] Additionally the Dutch provinces do monitor Natura 2000 areas in the context of the so called 'Subsidy system Nature and Landscape (SNL)'[22].

Volunteers are crucial for biodiversity monitoring in the Netherlands and their number exceeds 50.000 people, some of them are also hired as experts in NGOs. The volunteers do especially field observations and count species. Yet, there are lots of new techniques and technologies such as remote sensing that could be used for biodiversity monitoring but in the meantime, it is important to keep the volunteers involved. It is important to find a balance between traditional and more modern techniques which is not always easy. The ministry also hires people to produce statistics (hard core of the monitoring). The goal is to store all biodiversity data in a public database (Ndff) and to make all data public which is not the case for all data now. For now, data is available but not free, people need to pay to access it. If the database becomes free, the government will have to pay for it. Habitat mapping is related to Habitat Directive reporting (further information: WUR) but not very well organised: there are various actors working on it, using sometimes different classifications, and the database is not operational but there are plans to integrate it in the national data bank.

Budget

The total budget for biodiversity monitoring in the Netherlands consists of the following parts:

- 2.7M€ per year is paid for the Network of Ecological Monitoring;
- 1M€ per year for the büro (Nature & Environment);
- 900k€ per year for establishing a national data bank (NDFF), which is a four-year project (2020-2024) with a full budget of approximately 4M€ (paid together with the government and the provinces).

[19] NDFF: https://www.ndff.nl/english/
[20] https://www.rijkswaterstaat.nl/english/index.aspx
[21] For more details (in Dutch) on the network see the brochure: http://www.netwerkecologischemonitoring.nl/wp-content/uploads/2020/11/meten_wat_er_leeft_de_kracht_van_samenwerking_in_-wageningen_university_and_research_532548.pdf.
[22] https://www.rvo.nl/subsidies-regelingen/natuurbeheer-snl

Norway

Governance and coordination of biodiversity monitoring in Norway

The main responsible for coordinating biodiversity monitoring is the Norwegian Environment Agency (NEA) that belongs under the Ministry of Environment. NEA is coordinating several biodiversity monitoring programmes for threatened species and habitats, but not focus on those species that are harvested as natural resources such as fisheries and game. For the Norwegian seas, there is a cross-sectoral collaboration with another agency. Concrete monitoring is done by NINA for terrestrial environments and NIVA for coastal areas, and in addition to them also consultants are contributing to monitoring schemes.

The Norwegian monitoring programmes are large, and competitive calls are open every 5 years and coordinated by NEA. Some examples of current monitoring programmes are, for instance, coastal monitoring programme and a new insect monitoring programme. For invasive alien species, there are two monitoring programmes ongoing. Monitoring programmes emphasise threatened species and habitats. There are some attempts to find synergies between all these programmes. All monitoring programmes are reported to NEA, and then NEA compiles the information and reports further to international/ European processes such as the Convention on Biological Diversity (CBD), Bird Convention and Habitats assessment, as well as to IUCN assessments.

Data management and interoperability is recognised as an important topic in Norway. There is a Norwegian Biodiversity Information Centre (NBIC, Artsdatabanken Norge)[23] established. There is also a new “Future Environmental Data” project ongoing that aims to look at all monitoring going on in Norway, and to provide support for data storing and availability. Open and interoperable data solutions are noticed as a major problem that needs to be improved.

Budget

The annual budget of the Norwegian Environment Agency for biodiversity monitoring activities is of 17M€.

[23] Norwegian Biodiversity Information Centre https://www.biodiversity.no/

Poland

Governance and coordination of biodiversity monitoring in Poland

In Poland, the Ministry of Climate and Environment is responsible for steering biodiversity monitoring. Chief Inspectorate of Environmental Protection – CIEP - governmental authority, Institute of Nature Conservation of the Polish Academy of Sciences – INC PAS, and University of Warsaw – UW provided information about the biodiversity monitoring in Poland.

The Chief Inspectorate of Environmental Protection (CIEP) is the leading institution in conducting environmental monitoring in Poland, as, according to the Environmental Protection Inspection Act, it carries out State Environmental Monitoring, which includes nature monitoring. Pursuant to the Law on Nature Protection, biodiversity monitoring is carried out within the framework of State Environmental Monitoring (SEM), including special emphasis on natural habitats and species of EU interest. Nature monitoring carried out by the CIEP includes several specialized programs: Monitoring of Species and Habitats (devoted mainly to species and habitats from the Habitats Directive), Monitoring of Marine Species and Habitats (the same as above, but concerning species and habitats related to the Baltic Sea, also for the purposes of the Marine Strategy Framework Directive), Monitoring of Birds (dedicated to bird species, implemented mainly for the purposes of the Birds Directive), forest monitoring, the Integrated Monitoring of the Natural Environment. In addition, biodiversity data is collected as part of water monitoring carried out by the CIEP for the purposes of the Water Framework Directive and the Marine Strategy Framework Directive, such as data on ichthyofauna, zoobenthos, phytoplankton, etc.
The CIEP performs monitoring throughout the country, both in protected and unprotected areas. However, independent and additional monitoring of nature in Natura 2000 areas, based on the provisions of the Conservation Plan and the Conservation Task Plan, is carried out by Regional Directorates for Environmental Protection hereinafter regional directorates (Regionalne Dyrekcje Ochrony Środowiska), maritime offices and national parks (these monitoring schemes are carried out regionally, regional directorates and maritime offices carry out monitoring in Natura 2000 in the areas of the respective voivodships, and national parks in the areas managed by them.

Directly, the monitoring is conducted by research institutions (e.g. INC PAS), NGOs (e.g. Polish Society for the Protection of Birds) or commercial companies which are chosen in competitive tendering in given stage of the monitoring.

Nowadays CIEP, regional directorates, national parks and marine offices use its own solutions (IT systems /data bases/ other) to store and manage monitoring results. Although work is planned to develop an integrated information system for collecting monitoring species and habitats results for CIEP, regional directorates, maritime offices and national parks.
Reports on nature monitoring carried out by CIEP are available on the CIEP dedicated websites. In addition, some of the nature monitoring components of CIEP have map viewers that enable viewing and downloading monitoring results, e.g. Monitoring of Birds[24], Monitoring of Species and Habitats[25], Monitoring of Marine Species and Habitats[26]. Data in map viewers is processed so that it can be easily browsed, filtered and downloaded in various formats, including shp and csv. Most of the CIEP environmental monitoring data has also been adapted according to the data specification for the spatial data as defined in the INSPIRE Directive. It is available here[27]. Data is also made available

[24] http://monitoringptakow.gios.gov.pl/PM-GIS
[25] http://ekoinfonet.gios.gov.pl/simgsp_mapa
[26] https://morskiesiedliska.gios.gov.pl/pl/mapa
[27] https://inspire.gios.gov.pl/portal/en/zbiory-inspire/

on request, including data not made available through dedicated tools such as sensitive data regarding precise locations of protected species. However, there are other data that are collected e.g. during scientific research, and those data belong to the institution that collects them e.g. INC PAS maintains scientific database on alien species in Poland, which is available to everyone here[28]. If "national biodiversity data providers" means also other entities collecting biodiversity data, then the potential provider range is much wider, including ca. 30 institutions creating a Polish Biodiversity Information Network (Krajowa Sieć Informacji o Bioróżnorodności – KSIB[29]), and individual universities and scientific institutes, as well as NGOs. Some of them cooperate and share their data, others do not. The most successful and unifying platform is Global Biodiversity Information Facility (GBIF). Polish institutions contributing to GBIF are coordinated by the National Node located at the University of Warsaw, and its partners in the KSIB.

The following figures describe the people involved (on the side of CIEP) in composing the art. 12 birds directive and art. 17 habitats directive reports submitted in 2019:
• habitats and species (other than birds): 298 persons, 0 volunteers
• birds: 1180 persons, including 664 volunteers (56%)
These include all levels of work, from ground work (field data collection), through data analysis to data validation and filling the actual reports schemes.

Budget

No information about the biodiversity monitoring budget in Poland was available.

Portugal - Azores Autonomous Regions

Governance and coordination of biodiversity monitoring in the Azores Autonomous Region

In the Azores, the terrestrial biodiversity governance is under the seal of government entities with competence in the area of the environment and climate change (Regional Secretariat for the Environment and Climate Change); while the monitoring and management of marine biodiversity is under the auspices of the governmental entity with competences in the sea (Regional Secretariat for the Sea and Fisheries). Information on biodiversity monitoring in the Azores was given by the Regional Fund for Science and Technology (FRCT).

The Azores, by comparison with the mainland, is in some areas independent for biodiversity monitoring. Data is collected in the Azores and after that the data (habitat & water) is centralised in Portugal mainland. Marine biodiversity monitoring in the Azores is not as independent as marine area is at some point shared with other neighbouring countries and islands. Marine habitat reporting is separated by the Azores and other Macaronesian islands.

The Azores Regional Government was recently restructured (December 2020, following the Regional Elections of October 2020), leading to a new organisation of departments. At this phase, beyond the identification of the Regional Governmental Departments responsible for Biodiversity

[28] https://www.iop.krakow.pl/ias/en
[29] https://www.ksib.pl/?l=en

monitoring and coordination in the region, the names of the contact persons were not available as key positions are dependent on the government.

For Portugal mainland, the entity responsible for the governance and monitoring of the implementation of the National Strategy for Nature Conservation and Biodiversity - ENCNB 2025[30] it is the Institute for the Conservation of Nature and Forests (ICNF), with the cooperation of the different ministries. Regarding marine areas, the Biodiversity reporting is under the responsibility of the National Network of Marine Protected Areas (RNAMP).

Budget

The information of the biodiversity monitoring budget was not available.

Slovakia

Governance and coordination of biodiversity monitoring in Slovakia

In Slovakia, the Ministry of Environment of the SR is responsible for biodiversity monitoring. In addition to the Ministry of Environment of the SR, also the Ministry of Agriculture and Rural Development of the SR also partly contributes to biodiversity monitoring. Also, expert organisations under both ministries as well as research, scientific & academic institutions, mainly Slovak Academy of Sciences (SAS) and universities are contributing to monitoring. NGOs at the regional and local level are also important. Biodiversity monitoring is divided in terrestrial realm (for the Habitats Directive/Birds Directive reporting purposes) and freshwater realm (for the Water Framework Directive reporting purposes). The Ministry of Environment of Slovakia is also a contact point for the Convention on Biological Diversity (CBD).

The Ministry of Environment of the Slovak Republic is providing the institutional and financial basis for biodiversity monitoring and should harmonise and apply its data and results for all relevant biodiversity purposes. Through its expert organisations, it executes centralisation of raw data and results of monitoring programs, management of unified information system (State Nature Conservancy of the Slovak Republic, Statna Ochrana Prirody Slovenskej Republiky SNC SR, Slovak Environment Agency), creation of biodiversity indicators (Slovak Environment Agency), reporting and monitoring on the ground (SNC SR).

Institutes of the Slovak Academy of Sciences collect biodiversity distribution and other data as part of the research projects funded by the grant agency of the Academy of Sciences as well as by other funding bodies. Data on vascular plants and fungi are stored in a central database, which is now under reconstruction. Data is provided also via the GBIF portal, where the Plant Science and Biodiversity Centre of the Slovak Academy of Sciences is the national node. In the future, one central

[30] http://www.drapal.min-agricultura.pt/drapal/images/servicos/Apoio_Zonal/Biblioteca/ENCNB.pdf

database of distribution of vascular plants will be developed in Slovakia. SAS is also a contact point of JPIs (Joint Programming Initiatives).

Habitats and species monitoring, including Natura 2000 areas, is organised by SNC SR. Data is collected in two ways: random sampling (species and their occurrence) and permanent monitoring of habitats and species on the permanent monitoring plots, with help of contract experts. Altogether, 200 to 300 experts are contributing to this work. These data are used for the reporting for the EU, as well. Vegetation of Slovakia is monitored via a project of SAS. The data is stored in a database which is part of the European Vegetation survey.

Organisations of the Ministry of Environment of the SR are using one central database system: KIMS[31] (Complex information and monitoring system), which is operated by the SNC SR. Collecting data on distribution of plants, fungi and animals at museums, universities and research institutes is not yet centralised or networked (except the data from protected areas provided to the KIMS system). Database for vascular plants is now reconstructed and the aim is to provide data from all museums, research institutes and universities in a horizon of a few years.

The most important next steps in biodiversity monitoring in Slovakia is to make the collection, cooperation and exchange of data within the country more effective – after that the gaps can be identified and it will be possible to see what kind of data is missing. This would also improve the setup of financial allocations and human expertise. However, the data across different environmentally related sectors are scattered between organisations and widely fragmented, thus harmonisation and more coordinated access and overview of ongoing monitoring systems is needed.

Apart from that, other main challenges in biodiversity monitoring and reporting are: i) Lack of long-term policies for monitoring and sustainable financing; ii) No international agreement on which biodiversity variables should be measured; iii) Lack of human and technical capacities; iv) Financial resource constraints; v) Lack of (raw) free data; vi) Lack of integration between in situ and remote sensing data; vii) Data standardisation across Europe would enhance national biodiversity reporting, as well as enable comparison of declining trends for the habitats and species in different countries and will help to better understanding the causes, and to contribute to more effective conservation of cross-border protected areas and migratory species.

Budget

Funding of monitoring is to a great extent supported by European funding (at the national level especially Structural and Investment Funds, at the subnational level also project funding such as LIFE). There is not sustainable state funding for biodiversity monitoring in Slovakia. It is crucial to change the actual system into sustainable financing based on national budget instead of using project activities for financing monitoring, which creates gaps in between project preparation and implementation in data collection and assessments. These data gaps affect bias to the data and it is much more difficult to assess the trends. No exact budget was available.

[31] http://www.biomonitoring.sk/

Spain

Governance and coordination of biodiversity monitoring in Spain

In Spain, the Ministry of the Environment compiles together the biodiversity information (for instance for reporting to the EU Nature Directives) that is collected by the Regions. There are 17 Regions in Spain of which Catalonia and Basque Country are currently developing Regional biodiversity observatories. Also, Andalucía is providing important biodiversity monitoring data. The governance of biodiversity monitoring in Spain is complex and with a certain and significant lack of coordination, partly due to the federal organisation of the state: regional administrations - Comunidades Autónomas - are responsible for biodiversity monitoring in each of the territories, and often there is a huge lack of communication, interoperability and common grounds. Spanish National Parks Network (OAPN) is monitoring biodiversity only at protected areas such as 16 national parks (most of them managed by regions, only 2 by the state), which cover 500 km2 of Spain.

There is a centralised national biodiversity database (directed by the Spanish Ministry of Environment) that is used for EU directive reporting. Apart from that, there are three departments in the Ministry which carry out biodiversity monitoring schemes: a general sub-directorate of marine and terrestrial biodiversity, and a general sub-directorate of forestry policy. Also, OAPN provides data on species to the database. Data is homogenised and can be used by everybody. The database provides outputs in the form of maps for example. However, further development of coordination is needed across the regions.

Budget

Since 2008, Spain has had financial problems that have also reduced resources for nature protection. In 2022, the budget for nature protection is still 40 % of the level of 2008.

Budget figures were got only for the Spanish National Parks Network which consists of two parts:

- Research projects related to biodiversity in National Parks was 1.6M€ in 2022, but this budget varies over the years.
- Biodiversity monitoring in National Parks is 1M€ per year, approximately.

National government also invests in biodiversity monitoring (e.g. mapping of habitats) as well as regional governments, but these figures were not available.

Sweden

Governance and coordination of biodiversity monitoring in Sweden

The Swedish environmental protection agency (SEPA) is responsible for the planning and running of the national monitoring programs for the terrestrial environment, including that for biodiversity monitoring. The Swedish Agency for Marine and Water Management (SWAM) is responsible for the planning and running of the national monitoring programs for marine and freshwater environments. SEPA coordinates the national environmental monitoring[32].

Monitoring is done by third parties. Main part is done by the Swedish University of Agricultural Sciences (SLU). SLU has historically been responsible for the Swedish National Forest Inventory (for which it has direct state funding). Now it is responsible for environmental monitoring more widely (programme for Environmental Monitoring and Assessment). This arrangement is unique for this university in Sweden. Except for the Swedish NFI, the monitoring performed by the SLU is mostly commanded by SEPA and SWAM. An important program is the National Inventory of Landscape Systems (NILS) that provides information on habitats in Sweden. The universities of Lund, Stockholm and Göteborg also contribute to some biodiversity monitoring schemes. The University of Lund is taking care of birds and butterflies monitoring. The 21 County administrative boards also have some state funding for biodiversity monitoring (https://www.regionalmiljoovervakning.se/), and in addition function as third parties for SEPA for monitoring of species in the EU habitats directive. In addition to SEPA and SWAM other agencies such as Swedish Forest Agency, Swedish Board of Agriculture, Swedish Meteorological and Hydrological Institute, and Geological Survey of Sweden provide information that is used for biodiversity monitoring.

Monitoring within national protected areas is done by the 21 county administrative boards in Sweden but SEPA and SWAM provide guidelines and methods.

Other parties that contribute to biodiversity monitoring are consulting companies, research institutes (for example IVL Swedish Environmental Research Institute), associations (for example BirdLife Sweden, The Swedish Society for Nature Conservation, World Wildlife Fund, and Swedish Botanical Society). The role of citizen science is important for several species monitoring schemes.[33]

Data management for species observations is focused on the Swedish Species Information Centre[34] hosted by SLU (an exception is birds and butterflies, which are managed by Lund University). Swedish Species Information Centre main duties are, for instance, to assess and evaluate the conservation status of the Swedish species, to accumulate and disseminate information about findings of individual species, and to support the implementation of EU regulations. For habitat monitoring data, SLU (Umeå) is a data host for different data providers. Altogether there are 3-4 data hosts in Sweden. Ongoing development plans for new data management solutions cover eDNA data, including tracking of operational taxonomic units (OTUs).

[32] https://www.naturvardsverket.se/en/environmental-work/environmental-monitoring/
[33] See for example https://www.artportalen.se/, https://rapportera.artfakta.se/eftersokta/ias/skapa, https://vinterfaglar.se/, https://www.xn--vrkollen-9za.se/Varkollen.aspx
[34] www.artdatabanken.se

New monitoring schemes are developed for bumblebees and other insects as well as for soil monitoring, and genetic diversity. SEPA has plans to develop the monitoring program for habitats further, with focus on valuable habitats (i.e., Habitats Directive). The plan also includes analysing data and development of indicators with a focus on habitat quality.

Budget

Exact information on biodiversity monitoring budgets was not available. Calculations both for terrestrial and aquatic monitoring schemes can be collected.

Turkey

Governance of biodiversity monitoring in Turkey

In Turkey, the General Directorate of Agricultural Research and Policies (TAGEM) is a point of contact for Biodiversa+. In addition to them, the Ministry of Environment is in charge of biodiversity at national level and reporting for the Convention on Biological Diversity. Concrete biodiversity monitoring is happening at the level of research organisations (universities) and governance is split by plants / marine-water/ microbial. Coordination of biodiversity monitoring is challenging. In general, there is a need for a specific organisation for biodiversity monitoring in Turkey. There is a national biodiversity database.

The General Directorate of Agricultural Research and Policies (TAGEM) is Turkey's Largest R&D Institution with 130 Years of Experience. The main target in R&D studies is to produce solutions applicable to all areas of the agriculture and food sector, to develop imported technology with public-private sector cooperation, to reduce the foreign dependency of our sector and to protect our biological wealth.

Biodiversity and Genetic Resources is one of the Agricultural Research Areas and carries out its studies with four research programs. These are Plant genetic resources, Animal genetic resources, Aquaculture genetic resources, Microorganisms and Invertebrate genetic resources research programs. Studies on terrestrial (soil biodiversity) and freshwater, and marine biodiversity monitoring are carried out under the roof of TAGEM.

The Central Fisheries Research Institute has conducted studies on monitoring marine environments by the coast of Turkey. For this purpose, Demersal Fish Stocks and Pelagic Fish stocks are regularly monitored by sea surveys every year. Also, surveys are conducted for Benthic invertebrates and ichthyoplankton to analyse food web situation and pressure on species. If necessary, a survey is arranged to monitor specific species. After these surveys, biological materials are reserved in the National Genbank and sperm or embryos of fish are cryopreserved. Also, genetic material (DNA) are isolated from biological material and DNA barcode sequences are collected for national in sequence databases. With this information, genetic structure and diversity are analysed

for marine species to foresee possible problems of next generations. Furthermore, metagenomics studies are started to provide a holistic perspective on marine biodiversity.

Microbial fertiliser studies are carried out at the Soil, Fertilizer and Water Resources Central Research Institute. Systematic and continuous studies on microbial fertiliser have focused on Rhizobium (Root Nodosity Bacteria). Selection of Mycorrhiza fungi, which are effective in the uptake of phosphorus and various micro plant nutrients, from the soil, studies on their reproduction, studies on bacteria belonging to various families in order to bring the microorganisms naturally found in the soil to agriculture, and also studies continue on the effect of C-degrading bacteria in the composting studies of materials rich in cellulose content with a high C/N ratio.

Budget

There was no information available about the budget used for biodiversity monitoring. Estimation is difficult because there are many research units and their financing vary a lot. In general, there is a lack of funds for biodiversity monitoring.

Conclusions

This report provides an overview of how biodiversity monitoring governance is organised in 23 countries/regions by ministries of environment and/or environmental protection agencies, part of Biodiversa+. The key authorities that are steering and funding biodiversity monitoring in their country, as well as are in charge of reporting and implementation of biodiversity policies are identified. However, the main focus was at national scale – thus sub-national level might need more attention in the future. In addition, the report gives an overview of key biodiversity monitoring networks and organisations in the respective countries. The complexity of those networks varies from a few official institutes and academic research groups to tens of different organisations in some countries, depending on the culture and practices across the countries/regions. In 2/3 of the countries, biodiversity governance is split by realms (e.g., terrestrial and aquatic). It is also important to recognise that the focus on which dimensions of biodiversity are monitored varies a lot across countries: some put more emphasize on threatened species while others pay more attention to habitat mapping, and/or other biodiversity facets. The report highlights many differences between the countries which emphasizes the need of harmonisation of biodiversity monitoring at European level, in which the work of Biodiversa+ is crucial.

Many countries highlighted the importance of providing guidance and best practices to support the work of the entities that are currently coordinating the monitoring work, and possibly also supporting the development of national biodiversity monitoring coordination centres. This is a task that Biodiversa+ can help to facilitate. Few countries have started to establish such centres already. It was also noted that quite a few countries have some sort of data infrastructures in place, while lack of the standards of monitoring protocols/schemes – as well as the availability of comparable data – was mentioned by several respondents to hinder interoperability, use and re-use of open data. In addition, data accessibility is a key issue of open data principles, but this topic will be investigated more comprehensively in the Biodiversa+ report on data harmonisation and interoperability (Basset & Senem 2023[35]) and in the future. However, these findings emphasizes the benefits, in terms of data interoperability and data exchange between countries, that more similar protocols can bring. This underlines the need for Biodiversa+ to work hand in hand with data/ research infrastructures to promote and support data interoperability and FAIR data. Biodiversa+ should also provide support to data harmonization and integration, first at the national scale and then at the EU level.

Finally, estimations of the average budgets for biodiversity monitoring are given in this report, acknowledging that several countries had difficulties to estimate the exact numbers. One of the challenges here relates to the important role of volunteers, especially in species monitoring schemes, which was often difficult to estimate. Many countries stressed the challenge of keeping alive their long-term monitoring schemes given project-based funding is often the main source of funding. More sustainable and structural funding is needed to ensure long-term sustainability of biodiversity monitoring across Europe. The outcomes of this report will feed into the overall objective of Biodiversa+ to co-develop a trans-national network of the biodiversity monitoring schemes across Europe and to define the concrete activities it should implement over the next few years.

[35] Basset, A. & Onem, S. 2023 : D2.2 Report on the harmonisation and interoperability of datasets across regions and countries. Biodiversa+ report.

Annex I: Overview of the main national/subnational organisations that coordinate biodiversity monitoring programmes.

Country	Organisation names	Coordination at:	Realms covered	Weblink	Email/Contact details
Austria	Environment Agency Austria	National level	All	https://www.umweltbundesamt.at/en/	office@umweltbundesamt.at
Belgium (Flanders)	INBO (Research Institute for Nature and Forests)	Sub-national level	Terrestrial and freshwater	https://www.vlaanderen.be/inbo/en-gb/homepage/	INBO contact form: https://www.vlaanderen.be/inbo/en-gb/contact-inbo/
Belgium (Wallonia)	Directorate of Nature and Water (Public service of Wallonia)	Sub-national level	Terrestrial and water	Weblink (in French)	Email contact available in weblink
Belgium (federal state)		National level	Marine		
Bulgaria	● Ministry of environment and Water (coordinate) ● Executive Environment Agency (implement biodiversity monitoring)	National level	All	https://www.moew.government.bg/en/ https://eea.government.bg/en	iaos@eea.government.bg
Croatia	Institute for Environment and Nature at the Ministry of Economy and Sustainable Development	National level	All	https://www.see-river.net/dzzp.html	
Czech Republic	Nature Conservation Agency	National level	Terrestrial and freshwater	https://www.nature.cz/web/en	aopkcr@nature.cz
Denmark	Ministry of Environment	National level			

Country	Organisation names	Coordination at:	Realms covered	Weblink	Email/Contact details
Estonia	Environment Agency	National level	All	https://keskkonnaagentuur.ee/en	See this weblink, contacts for the Wildlife Department
Finland	Ministry of Environment of Finland	National level	All[36]	https://ym.fi/en/front-page	Dept of Natural Environment, senior specialist Joona Lehtomäki (firstname.surname@gov.fi)
France	Ministry of Environment (overall coordination and funding) French Biodiversity Agency (coordination of marine, freshwater and terrestrial monitoring schemes)	National level	All	Ministry French Biodiversity Agency	
Germany	Coordination by: Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection Federal Agency for Nature Conservation Environment Agency Länder authorities (implement biodiversity monitoring) A biodiversity monitoring centre is being established	National level	All		NI1@bmuv.bund.de (Ministry contact point)
Ireland	Department of Housing, Local Government and Heritage	National level	All	https://www.gov.ie/en/organisation/department-of-housing-	qcsofficer@housing.gov.ie

[36] Officially biodiversity monitoring is coordinated by the Ministry of Environment of Finland but there is no clear coordination of comprehensive biodiversity monitoring of all realms.

Country	Organisation names	Coordination at:	Realms covered	Weblink	Email/Contact details
				local-government-and-heritage/	
Israel	Ministry of Environmental Protection	National level	All	https://www.gov.il/en/departments/ministry_of_environmental_protection/govil-landing-page	Contact details available here.
Italy	Ministry of Ecological Transition (overall coordination) Sub-national regions (coordinate and implement biodiversity monitoring) A biodiversity monitoring coordination centre is being set-up	Sub-national level	All		
Montenegro	Environmental Protection Agency, Department for monitoring	National level	All	https://epa.org.me	Contact details available here. Milena Batakovic: milena.batakovic@epa.org.me
Morocco	Ministry of Energy Transition and Sustainable Development (Department of Sustainable Development)	National level	All	https://www.environnement.gov.ma/fr/	dccbev@environnement.gov.ma
Netherlands	Ministry of Agriculture, Nature and Food Quality (commissioning WUR) Wageningen University and Research Centre (WUR): Nature and Environment	National level	All		Contact details available here.

Country	Organisation names	Coordination at:	Realms covered	Weblink	Email/Contact details
Norway	Norwegian Environment agency	National level	All	https://www.environmentagency.no	Contact details available here. Contact person: Anne Sundbye
Poland	Chief Inspectorate for Environmental Protection (CIEP) - Regional Directorates for Environmental Protection (Regional Directorates) - National Parks - Maritime Offices	National level (CIEP), Regional level (Regional Directorates, National Parks, Maritime Offices)	All	CIEP: https://www.gov.pl/web/gios-en Regional Directorates: https://www.gov.pl/web/gdos/rdos National Parks: https://www.gov.pl/web/klimat/przyroda Maritime Offices: https://en.ums.gov.pl/ https://www.umgdy.gov.pl/en/	CIEP: https://www.gov.pl/web/gios-en Regional Directorates: https://www.gov.pl/web/gdos/rdos National Parks: https://www.gov.pl/web/klimat/przyroda Maritime Offices: https://en.ums.gov.pl/ https://www.umgdy.gov.pl/en/
The Azores (Portugal)	Institute for the Conservation of Nature and Forests Ministries of the Sea and Environment	National level	All		
Slovakia	Ministry of Environment + State Nature Conservancy Ministry of Agriculture and Rural Development Expert, Research and academic, Scientific organisations (implement)	National level	Terrestrial and freshwater		
Spain	Ministry of Environment (sub-direction of terrestrial and marine	National level	All	https://fundacion-	

Country	Organisation names	Coordination at:	Realms covered	Weblink	Email/Contact details
	biodiversity and forestry policy) National organism of national parks			biodiversidad.es/	biodiversa@fundacion-biodiversidad.es Javier Remiro Perlado Carmen Gutiérrez Bárcena Sandra Blázquez Cabrera
Sweden	Environmental protection agency (SEPA) Agency for Marine and Water Management (SWAM)	National level	SEPA: terrestrial SWAM: marine	SEPA SWAM	Contact details for SWAM. SEPA: Mona Naeslund: Mona.Naeslund@Naturvardsverket.se
Turkey	By research organisations/ universities	National level			

Annex II: Survey sent to the Biodiversa+ partners

Introduction

One of the main objectives of Biodiversa+ is to promote and support transnational biodiversity monitoring, by building a transnational (pan-European) network of harmonised monitoring schemes on common priorities for Biodiversa+ members. This objective will build on relevant outcomes from the highly complementary Horizon2020 CSA project EuropaBON with whom Biodiversa+ is closely collaborating. Indeed, some monitoring challenges and recommendations have already been identified by EuropaBON, and Biodiversa+ will seek solutions to test these recommendations for improved biodiversity monitoring as proposed by EuropaBON. Between September and October 2021, EuropaBON also conducted a survey across multiple EC agencies and EU member states, the results of which are presented in the EuropaBON User and Policy Needs Assessment.

The current survey is specifically related to Biodiversa+ task 2.5 "***Establish a transnational network of national biodiversity monitoring schemes (for specific priorities)***" led by the Ministry of the Environment, Finland (MoE_FI) and Biodiversa+ task 2.1 "***Define shared priorities and adequate coverage and indicators for biodiversity monitoring to better fit research, society and policy needs***" led by Office français de la biodiversité (OFB). This survey aims at:

1. Understanding national and subnational **biodiversity monitoring governance structure**.
2. Understanding national and subnational **biodiversity monitoring priorities**, building on the work done by Biodiversa+ members in 2021 that identified 7 priorities for biodiversity monitoring: terrestrial and marine protected areas (including Natura2000 protected sites), habitats, offshore marine biodiversity &/ or marine mega-fauna, pollinators, butterflies and other insects, invasive alien species, soil biodiversity, wildlife diseases and biodiversity facets linked to health issues.
3. Assessing if and how **Essential Biodiversity Variables (EBVs)** could be used as a way forward to harmonise biodiversity monitoring schemes.

This survey is specifically addressed to Biodiversa+ members, but we highly encourage you to complete it with the support of your colleagues and when relevant to your third parties (full PDF survey is available here).

To get more detailed feedback on some elements, bilateral interviews will follow for a better understanding of the biodiversity monitoring situation in your country. The results will be used to further guide the Biodiversa+ biodiversity monitoring activities, as well as to develop - in close collaboration with EuropaBON - a strategic document on the options towards a governance structure of transnational biodiversity monitoring schemes (due December 2022).

Please note that the deadline to send us back your answers is on the **25th of April** (at 10am CEST). Many thanks in advance for your support!

Information on your organisation

Name

Email address

Organisation full name in English

Acronym of your organisation (as mentioned in the Biodiversa+ Grant Agreement)

Country of your organisation (in English)

Level of the information that you are going to present (national/ federal/ subnational…)?

Realms that you are going to present? (multiple answers possible)

- Terrestrial
- Marine
- Freshwater

Type of respondent (select from list)

- Ministry of Environment
- Environmental Agency
- Research Funding Organisation
- Research Ministry
- Other (if other: free text)

What is your background? (Free text)

Have you engaged with other/third parties to complete the survey? If yes, could you provide the name of these third or other parties? (Free text)

Section I - Governance and coordination of national and subnational biodiversity monitoring schemes

IA) At which level is the coordination of biodiversity monitoring mainly and currently organised in your country?

- National
- Subnational
- Other
- Unknown

IB) Is biodiversity monitoring governance split by realms (environments: terrestrial, marine and freshwater)?

- Yes
- No
- Unknown

How is this splitted? (Free text)

IC) Who is the main responsible for the coordination of biodiversity monitoring in your country/ sub-national region? (multiple options)

- Ministry in charge of Environment/ Environmental Protection Agency
- Research organisation
- NGOs
- No current coordination

- Other (please specify)
- Unknown

Please provide more details as needed, including the name of the contact person/organisation in charge of the coordination (free text)

ID) What are the activities performed by the coordination entity identified above ? (multiple answers possible)

- Funding of monitoring
- Monitoring on the ground
- Networking activities between monitoring actors
- Centralising raw data
- Centralising results of monitoring programs
- Reporting (Habitat Directive, Birds Directive, Water Framework Directive, Marine Strategy Framework Directive)
- Creating biodiversity indicators
- Other (please specify)
- Unknown

Please provide more details as needed (free text)

IE) How do you wish to see the interplay of biodiversity monitoring coordination in the future (by the end of the partnership 2028)? (multiple answers possible)

- More focus on national coordination hubs/centres
- More focus on a European biodiversity monitoring coordination centre
- Both national and European, including well-defined roles and areas of collaboration of national and European biodiversity monitoring coordination centres,
- Separate thematic coordination networks across the EU (e.g. expert networks focusing on pollinators or birds alone, and extending those to cover other taxa)
- Other (please specify)
- Unknown

Please provide more details as needed (free text)

IF) How complex is the national biodiversity data providers network? For example, you can describe how many organisations or volunteer networks are collecting data on i) habitats and ii) species (free text)

Description of the question: Data providers connect data users and providers (i.e. those who monitor and make observations as well as those who integrate various data flows together and make them accessible) With this question, we aim to 1) understand who coordinates and is in charge, and 2) who collects the data.

IG) Would you like Biodiversa+ to help with collaboration/solutions/support for: (rank options or max 3 ticks)

- Coordination at national/subnational scale
- Coordination at European scale
- Data provisioning & guidance
- Data management and interoperability
- Indicator development
- Methods
- Other please specify
- Unknown

IH) Is there anything else you would like to share in relation to governance and coordination of national and subnational biodiversity monitoring schemes? (free text)

e.g. governance challenges/bottlenecks that should be taken into consideration when designing trans-European biodiversity monitoring schemes, such as national vs. federal responsibilities/resources, different ministries in charge of monitoring, the need for a clear mandate from the EU for improved national biodiversity monitoring etc…

Section II- National and sub/national biodiversity monitoring priorities

When drafting the Biodiversa+ proposal in early 2021, 7 biodiversity monitoring priorities where pre-identified by the Biodiversa+ members for the set up of the harmonised monitoring schemes:

- Terrestrial and marine protected areas (including Natura2000 protected sites)
- Habitats
- Offshore marine biodiversity &/ or marine mega-fauna
- Pollinators, butterflies and other insects
- Invasive alien species
- Soil biodiversity
- Wildlife diseases and biodiversity facets linked to health issues

Biodiversa+ members will thus implement biodiversity monitoring activities at national/subnational level related to these priorities and foster the establishment of harmonised monitoring schemes accordingly. These priorities will now be further refined and needs for adequate coverage and representativeness of biodiversity monitoring schemes identified.

IIA) Which biodiversity monitoring priority is of most interest to your organisation, to start working on the harmonisation across Europe? (Rank priorities in order)

- Terrestrial and marine protected areas (including Natura2000 protected sites)
- Habitats
- Offshore marine biodiversity &/ or marine mega-fauna
- Pollinators, butterflies and other insects
- Invasive alien species
- Soil biodiversity
- Wildlife diseases and biodiversity facets linked to health issues

IIB) Please identify precise topics (free text)

IIC) Is your organisation valorising biodiversity monitoring costs in Biodiversa+ (in the current Grant Agreement 2021-2023)?

- Yes
- No

If yes in IIC →	*If no in IIC →*
IID) What is your prioritised way for spending the EC top-up in your country? (free text - eg. Which topical biodiversity monitoring priorities will you address? Are you planning to set-up a new monitoring scheme? Will you use the EC top-up for transversal activities such as improved coordination, data management, or monitoring strategy?)	**IID) Would you be interested in valorising biodiversity monitoring costs in the next Grant Agreement starting in late 2023?** ● Yes ● No ● Maybe, we still have to think about it

Section III - Essential Biodiversity Variables

Essential Biodiversity Variables (EBV) are a list of ecological variables that can be monitored on species or ecosystems. They have been identified at the international scale by GEO BON (https://geobon.org/ebvs/what-are-ebvs/). They are positioned between raw data and high-level indicators of biodiversity, and can be seen as estimated data corresponding to the results of monitoring programs (EBV results hereafter), such as the trend of the population of a particular species at national scale, or the distribution of an ecosystem at a particular sub-national scale.

For instance:

- the vegetation phenology (EBV class: Ecosystem functioning; EBV: ecosystem phenology) of Finland can be found here: https://portal.geobon.org/ebv-detail?id=10
- the distribution of some birds and mammals (EBV class: Population; EBV: distribution) in France can be found here: https://professionnels.ofb.fr/fr/node/1089
- The PanEuropean Common Bird Monitoring Scheme (PECBMS) shows the trend of abundance (EBV class: Population ; EBV: Abundance) of 170 bird species here: https://pecbms.info/trends-and-indicators/species-trends/

IIIA) Are EBV results stored at the national/subnational level?

Yes, and centralised

Yes, but dispersed

Only a few

No

Unknown

IIIB) For each EBV class, are the EBV results easily available? s (1 not available to 5 easily available)

Ecosystem structure

Ecosystem functioning

Community composition

Species population

Species traits

Species genetic composition

As needed, please identify precise EBV results that are available (free text)

IIIC) For each biodiversity facet, are the EBV results easily available? (1 not available to 5 easily available)

- Terrestrial vertebrates
- Freshwater species and ecosystems
  Terrestrial and marine protected areas (including Natura2000 protected sites)
- Habitats
- Offshore marine biodiversity &/ or marine mega-fauna
- Pollinators, butterflies and other insects
- Invasive alien species
- Soil biodiversity
- Wildlife diseases
- Other: free text

IIID) if the EBV results are not yet stored, are you thinking at storing them in a near future:

- Yes
- No
- We may think about it

IIIE) For building a transnational monitoring system in Europe, do you think centralising national/subnational EBV results:

- will not help
- will have minor impact
- will be a key stone
- Unknown

Section IV - Additional information

Do you have any additional comments? (Free text)

Many thanks for completing this survey! If you are interested in receiving additional news on EuropaBON and on Biodiversa+, you can register to their newsletters/ networks.

- Biodiversa+ newsletter: https://biodiversity.us14.list-manage.com/subscribe?u=fbdec6faee1cff3b6ba035c7c&id=9481975b89
- Register as a member/stakeholder in the EuropaBON network: https://europabon.org/register/

Annex III: Contributors of the report

For:

AUSTRIA - Environment Agency of Austria (EAA) with Stefan Schindle.

BELGIUM - Agency for Nature and Forests of the Flemmish Governement (VL O) with Joris Janssens and Bernard Van Elegem.

BELGIUM - Public Service of Wallonia (SPW-ARNE) with Philippe Goffart, Luc Derochette and Baraba Geschier.

BELGIUM - Research Institute for Nature and Forest (INBO) with Anna Heck.*

BULGARIA - Executive Environment Agency (ExEA) with Radoslav Stanchev.

BULGARIA - Ministry of Environment and Water (Moew) with Yuliya Grigovora-Ivanova and Tanya Vladimirova.

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CZECH REPUBLIC - Ministry of Environment of the Czech Republic (MoE CR) with Jiri Guth.

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GERMANY - Environment Agency (UBA).*

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IRELAND - National Parks & Wildlife Service, Department of Housing, Local Government & Heritage with Deirdre Lynn.*

ISRAEL - Ministry of Environmental Protection (MoEP) with Noga Kronfeld-Schor and Orna Mazner.

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NETHERLANDS - Ministry of Agriculture, Nature and Food Quality (LNV) with Rob J.J. Hendriks, Frank Tillie and Louis van Vlet.

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SLOVAKIA - State Nature Conservancy (SNC SR).

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SWEDEN - Swedish Environment Protection Agency (SEPA) with Henrik Lange, Ola Inghe, Mona Naeslund and Hannah Östergård Roswall.

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* *These organisations are not Biodiversa+ partners. They contributed to the survey and/or participated in the bilateral interviews.*