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NATIONAL ASSESSMENT OF BIODIVERSITY INFORMATION MANAGEMENT AND REPORTING BASELINE FOR SERBIA

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On behalf of the
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ABBREVIATIONS

BIMR - Biodiversity Information Management and Reporting
CBD - Convention on Biological Diversity
CHM - Clearing House Mechanism
DBMS - DataBase Management System
EEA - European Environmental Agency
EIA - Environmental Impact Assessment
EIONET - European Environment Information and Observation Network
GEF - Global Environmental Facility
GIS - Geographical Information System
GIZ - Deutsche Gesellschaft für Internationale Zusammenarbeit
IPA - Instrument for Pre-Accession Assistance
IUCN - International Union for Conservation of Nature
MAFWM - Ministry of Agriculture, Forestry and Water Management
MAEP - Ministry of Agriculture and Environmental Protection
MEP - Ministry of Environmental Protection
NGO - Non Governmental Organization
NP - National Park
NISD - National Infrastructure of Spatial Data
ORF-BD - Open Regional Fund for South-East Europe - Biodiversity
PA - Protected Area
PE - Public Enterprise
PI - Public Institution
pSCI - proposed Sites of Community Importance
SEA - Strategic Environmental Assessment
SEE - South-East Europe
SEPA - Serbian Environmental Protection Agency
UNDP - United Nations Development Programme
WWF - World Wildlife Fund

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Preface

South-East Europe (SEE) is one of the richest parts of Europe in terms of biodiversity. In order to conserve and sustainably use these biodiversity assets and valuable natural resources under a concerted regional approach, a regional consensus on principles and key elements of a biodiversity information management and reporting (BIMR) mechanism in line with Convention on Biological Diversity (CBD) and European Union (EU) requirements is required. It will enable regional exchange of data and information for collaborative monitoring, reporting and management of (shared) biodiversity resources. Accession to the EU constitutes a common goal for economies of SEE, where an important pre-requisite is the transposition and full implementation of the environmental acquis communautaire, especially the Birds Directive (2009/147/EC) and Habitat Directive (92/43/EEC) and the EU Biodiversity Strategy 2020. Therefore, BIMR is a crucial component for all economies in the SEE region and improvements are needed.

In general, the SEE region has significant gaps at different levels in each economy regarding BIMR issues. For instance, key challenges in all economies relate to insufficient technical, organizational and financial capacities of the institutions involved (especially environmental ministries, environmental agencies and nature parks' institutions), as well as missing standards for data collection, verification and validation and indicators for monitoring of the implementation of national action plans and Aichi goals according to CBD recommendations.

One of the attempts to successfully contribute to the establishment or improvement of biodiversity information systems in the SEE region has commenced with this publication. It was scaled up from existing regional projects and initiatives, as well as European and global standards. This publication describes the current situation of BIMR elements at the national and regional level considering contributions from key stakeholders in the period from September 2016 to April 2017. The focus of the approach taken was on findings of high relevance adding value to related ongoing and future initiatives. Subsequent collaborative and coordinated efforts on implementing the recommendations are needed.

The German Federal Ministry for Economic Cooperation and Development (BMZ) supports this ongoing process including development of BIMR Regional Guidelines and piloting through the *Regional Network for Biodiversity Information Management and Reporting* project as part of the GIZ Open Regional Fund for South-East Europe-Biodiversity (ORF-BD) in close dialogue and coordination with relevant stakeholders and partners.

Gabriele Wagner
GIZ Sector Fund Manager – ORF-BD

Acknowledgment

This publication is the result of a joint effort of ministries, competent authorities, research institutions, NGOs and experts from Serbia to develop a comprehensive overview of biodiversity information management and reporting in the SEE region. This endeavour, which involved pooling of expertise from Serbia, was pursued with determination and in a spirit of high cooperation at all levels: political, technical and administrative. All parties and persons involved are greatly acknowledged in Serbia for their contribution to this work.

1. INTRODUCTION AND BACKGROUND

The legal framework for the area of environmental protection stems from the Constitution of the Republic of Serbia, which defines the rights of all citizens to a healthy environment, as well as the duty of all citizens to protect and develop the environment in compliance with law.

The **Ministry of Environmental Protection**[1] **(MEP)** is responsible for administration and policy development tasks in the field of environment including biodiversity and nature conservation. In close cooperation with the MEP there is a public administration authority, the **Serbian Environmental Protection Agency (SEPA)**, responsible for integrating data on environment and preparing reports on the state of environment in Serbia**.** Professional activities related to nature conservation and protected areas in Serbia are performed by the **Institute of Nature Conservation of Serbia** while for territory of Vojvodina Province these activities are delegated to the **Institute of Nature Conservation of Vojvodina Province**.

Administering and policy development in the area of nature resources management is in the responsibility of the **Ministry of Agriculture, Forestry and Water Management** (MAFWM).

As a mechanism for the implementation of ratified international agreements in the field of biodiversity (nature) conservation, for preservation of natural values of Serbia a long term strategic planning suggested by the Convention on Biological Diversity (CBD) has been introduced.

The most important operational state institutions in the BIMR framework are SEPA, Institute for Nature Conservation of Serbia and Institute for Nature Conservation of Vojvodina Province. A significant number of teams and individual scientists operate at the University of Belgrade, Novi Sad, Kragujevac and Niš and their cooperation in Centre for Biodiversity Informatics can be a good starting point for centralisation of providing scientifically verified biodiversity data in Serbia. The BioRaS portal, managed by group of non-governmental organizations (NGOs) and technically supported by Petnica Research Center, proved to be a robust platform for integrating civil society initiatives in biodiversity assessments and engaging general public in inventarisation and monitoring of biodiversity in Serbia.

The idea of BIMR project (Biodiversity Information Management and Reporting) was to help South-East Europe (SEE) region countries to assess the current status of biodiversity information system setup on the both regional and national level and improve the partner institutions' capacities to conform with the reporting requirements to the CBD and with other European Union (EU) requirements (e.g. for the Natura 2000 network). In order to get clear insight into procedures and methodologies of biodiversity data management in Serbia, a comprehensive assessment regarding stakeholders, policy and information system setup on national level were performed. The information for this assessment is based on: (i) desk review

[1] After reorganisation of the Serbian government in June 2017. the former Ministry for Agriculture and Environmental Protection (MAEP) was divided to Ministry of Environmental Protection (MEP) and Ministry of Agriculture, Forestry and Water Management (MAFWM)

of relevant legislative and other documents (studies, reports) prepared by competent organisations; (ii) face-to-face and telephone interviews with the key stakeholders and (iii) online survey.

The assessment was focused on management of all forms of biodiversity data (field data, indicators and/or metadata on biodiversity) but, owing to its importance for planning, conservation and monitoring biodiversity, management of data on natural resources like forests, water and agricultural land was also tackled.

2. METHODOLOGY

The assessment methodology consisted of four main steps along with a set of sub-steps, as follows:

1) Stakeholder identification by means of local expert knowledge.
2) Stakeholder analysis by means of ranking stakeholders according to their relevance to BIMR, political influence and capacity.
3) Policy analysis by means of desk-reviewing all relevant sources
4) Stakeholder meetings:
    a) National briefings
    b) Stakeholder interviews (in person and by telephone)
5) Collecting the data on information system set-up by conducting online questionnaire.

1) Stakeholder identification

In order to get detailed insight into information about legal, organisational and technical background of biodiversity data management and data flow among different entities in each country, all relevant stakeholders engaged in biodiversity data inventory, storage, processing and reporting were identified. For this purpose, as well as for the purposes of later stakeholder analysis, three local experts have been engaged, which provided valuable knowledge and insights related to BIMR stakeholder identification in their respective countries. With their help, the initial stakeholder list was prepared and all relevant stakeholders were identified. This list was additionally extended after the feedback from national briefings and stakeholder meetings held in October and November 2016. In addition to the identification they also provided important information about stakeholders and ranked them according to their political influence, relevance, capacity, roles and reporting obligation.

2) Stakeholder analysis

All stakeholders were first ranked in respect to their political influence, relevance, capacity, roles and reporting obligations by means of local expert knowledge and other available information.

After the initial screening all stakeholders have been divided in their respective groups according to the roles they have in BIMR context. The first role and "the first link in the chain" are individuals that collect biodiversity data in the field (**biodiversity data collectors**) about species, habitats and/or landscape features that are important for biodiversity. The collected data can be used for individual purposes (publishing scientific papers for instance) or can be integrated with data that comes from other data collectors.

Stakeholders that integrate biodiversity data from different sources into a single database (**biodiversity data integrators**) must take care about standardisation of structure and harmonisation of collecting methodologies of different sources.

Stakeholders willing and ready to share their structured data with other individuals or organisations (by granting access to their biodiversity data or providing structured digital data) are **biodiversity data providers**.

Data providers that provide data, which is not directly related to biodiversity data but is useful for better understanding of biological patterns and processes (like ortho-photo or satellite

images, land use maps etc.) are **supporting data providers**, and are also important for efficient biodiversity data processing and reporting.
Stakeholders that are not directly involved in activities on biodiversity data collecting and processing but are ready to provide support (logistical, in-kind or financial) are **financial supporters**.
In addition to stakeholder ranking, detailed data flow between all the stakeholder groups have been mapped to show specific relationships between stakeholders and to give insights in all existing and planned information systems and databases.

3) Policy set-up analysis
By reviewing all relevant sources (legislative, studies, reports etc.) related to policy set-up of biodiversity information system the list of all relevant legislative documents that mention the obligation of establishing biodiversity information system in any of the stakeholder institutions have been compiled.

4) Stakeholder meetings
To gain additional information about specific stakeholders two types of meetings have been organised.
First, in each country national briefings were organised for Ministries and Agencies for nature protection and environment. The objective was to follow up on BIMR Kick-off meeting held in Sarajevo and particularly to secure engagement of national stakeholders involved in BIMR project. "Development of the Croatian National Nature Protection Information System" has been presented to the meeting participants as an example of Croatian experience with dissemination at the national level.
In parallel with meetings, individual stakeholder consultations have been conducted which involved in person (or in some situations telephone) meetings with relevant stakeholders (mostly academia and NGOs) related to biodiversity data collection, provision, integration and management.

5) BIMR questionnaire
For the purposes of acquiring specific information related to information system set-up and data management for each stakeholder organisation the online questionnaire has been implemented and hosted on Google Form platform. BIMR questionnaire was published and sent to stakeholders on 11 November 2016 and remained online until the end of December 2016.
Questionnaire was intended to be filled in by each stakeholder organisation and each group received explanations before: biodiversity data collectors, biodiversity data integrators and biodiversity data providers as those three groups are most important and relevant for BIMR assessment. Complete questionnaire with all the questions is available in Annex 3 of this document.

6) Biodiversity data
The focus of BIMR framework has been put on solutions for efficient data handling and reporting about biodiversity. Biodiversity data can be oriented towards a particular area or

group of living organisms; they may store specimen-level information, species-level information, ecosystem-level information, information on nomenclature, or any combination of the above. Biodiversity data collected at the field according the level of processing can be divided into:

Primary (raw) biodiversity data

Occurrences - an observation (in the field or vouchered/labelled specimen in a collection) of a taxon (or ecosystem/biological community) at a particular place on a specified date (eventually enriched with other attributes of the collecting/sampling event like collector name, number of specimens etc.).

Checklists - lists of scientific names of organisms grouped into taxonomic hierarchies that are common in a particular area.

Registers of places and/or landscape features - list of (if possible spatially referenced) elements of an environment.

Processed biodiversity data

Indicators - statistical measures of biodiversity which help scientists, managers and politicians understand the state of biodiversity and the factors that affect it. Usually indicators are result of some kind of processing like grouping, categorising, pulling, or mathematical transformations of primary biodiversity data.

Metadata - structured descriptions of other datasets.

Supporting biodiversity data

There are data that are not directly related to biodiversity but are useful for better understanding of biological patterns, explain biological processes and are valuable resource for monitoring of the state of nature. These data are usually collected and maintained by institutions entrusted for natural resource management and available in the form of ortho-photo or satellite images, land use maps, geological maps, meteorological data as well as data used for fish, game and forest stock surveys.

Understanding the nature of biodiversity data which will be handled in the information system is essential because the design and functionality that will be implemented must be adapted to their specific features.

3. POLICY SET-UP ASSESSMENT

Serbia takes seriously its international obligations and all relevant Conventions are officially adopted and embedded into the national legislative. Most important international agreements relevant for BIMR framework are ratified by special national laws (**Decree ratifying the Convention on Wetlands of International Importance especially as Waterfowl Habitat**, **Law on Ratification of the CBD**, **Law on Ratification of the Convention on the Conservation of European Wildlife and Natural Habitats**, **Law on Ratification of the Convention on Conservation of Migratory Species of Wild Animals** and **Law on Ratification of the Framework Convention on the Protection and Sustainable Development of the Carpathians**).

According to Article 18.3 of the CBD, national clearing house mechanisms operate for several years and provide metadata on biodiversity of Serbia for facilitation of the implementation of the national biodiversity strategies and action plans.

Despite some shortcomings, the most important document that influenced the recent activities in the field of protection of biodiversity is the **Biodiversity Strategy of the Republic of Serbia** for the period 2011–2018. The new (draft) **Strategy of nature protection of the Republic of Serbia** for the period from 2016 to 2026 was in the moment of preparation of this assessment under a public debate and should correct and complement the Strategy for the previous period. In order to meet Aichi Strategic goal 5. (Enhance implementation through participatory planning, knowledge management and capacity building) the Action Plan highlights the strategic goal "Establish an integrated national information system for biodiversity with the database". The Strategy, together with the fifth national report from 2014 to the CBD has been prepared within the project "*National Biodiversity Planning to Support the implementation of the CBD 2011 - 2020 Strategic Plan in the Republic of Serbia*", which is financed by the GEF and implemented in partnership with the UNDP and the Ministry of Agriculture and Environmental Protection.

Biodiversity management and protection remains under the control of the state at both the national and Autonomous Province of Vojvodina levels, although certain institutional and legal activities have been transferred to the municipality level. Management of protected areas and fishing waters is offered to institutions that show necessary technical and human capacities for maintenance and improvement of the entrusted area. The current legislation, which regulates details related to the biodiversity data management, was analysed in the following thematic units: Nature conservation and environment, Natural resources management, System of official statistics and National Spatial Data Infrastructure (NSDI).

The list of relevant legislative and other documents in Serbia that defines obligations, procedures, and methodologies on collecting and managing data important for biodiversity is shown in Annex 1.

3.1. Nature conservation and environment

Most solutions for biodiversity data management implemented in previous period are based on recommendations from the **Biodiversity Strategy of the Republic of Serbia** for the period 2011–2018. The new strategy should correct and supplement solutions and precise activities in implementation of Aichi Biodiversity Targets, especially its target No. 19: Knowledge improved, shared and applied.

The **MEP** is responsible for administration and policy development tasks in the field of environment including biodiversity and nature conservation. In close cooperation with the Ministry there is a public administration authority, the **SEPA**, responsible for integrating data on environment and preparing reports on the State of environment in Serbia**.** For the purpose of efficient identification, classification, processing, monitoring and recording of natural resources and environmental management in the Republic of Serbia the **Law on Environmental Protection** has provisioned the Information system for environment that is set and maintained by the SEPA. Professional activities related to nature conservation and protected areas are delegated to the **Institute of Nature Conservation of Serbia and Institute of Nature Conservation of Vojvodina Province**.

The Republic of Serbia, autonomous provinces and municipalities provide continuous control and environmental monitoring, within their competence as defined by law. Monitoring the quality of surface and groundwater is performed by the SEPA at the national level. The monitoring programs for other parameters are adopted by administration of autonomous regions and local authorities on their respective territories and they organise data collection and reporting. Results of the monitoring have to be a part of the Information system of environment.

Important bylaw that defines environmental data flow and its structuring in environmental protection is the **Regulation on keeping of the information system of environmental protection, methodology, structure, common bases, categories and levels of data collection, as well as on the content of information which regularly informs the public**. This regulation defines activities on establishing, managing, developing, coordinating and maintaining a unified information system of environment data organized by thematic areas and collected according to the list of indicators defined by the Minister. Thematic areas relevant for BIMR framework are: air and climate change; water; nature and biodiversity; soil; forestry, hunting and fishing; sustainable use of natural resources; international and national legislation, as well as measures (strategies, plans, programs, and agreements), reports and other documents and activities in the field of environmental protection and subjects of the environmental protection systems.

Nature conservation matters are regulated by the **Nature Protection Law**. The Law stipulates that the institution responsible for nature conservation (Institutes for nature conservation in Belgrade and Novi Sad) has to keep a register of protected natural areas and maintain an information system on the protection of nature (a database of protected natural areas, habitats, protected species and ecological network). Those institutions also have to produce medium-term program for the protection of natural resources, produce professional assessments of natural values, suggest protection strategies and prepare reports on the state of nature. Information systems that meet these requirements were set in Institute for Nature Conservation of Serbia and Institute for Nature Conservation of Vojvodina Province. The database in the field of nature conservation is a part of the Information system for environment in SEPA but only organizationally, not technically. The Law also provides an

establishment of the Geographic Information System (GIS) of speleological objects in Serbia - Cadastre.

The draft of Appropriate Assessment regulation, as a key instrument for protection of natural habitats and species, is in the final stage of preparation and it is expected to be ready for adoption during 2017.

The most important natural values of Serbia are enlisted in separate bylaws*:* ***Rulebook on proclamation and protection of strictly protected and protected wild species of plants, animals and fungi*** (contain a list of species with special ecological, ecosystem, bio geographical, scientific, health, economic and other significance) and **Rulebook on criteria for separation of habitats, the habitat types, sensitive, vulnerable, rare and habitat types with priority for protection and the measures of protection for their conservation** (which defines criteria for separation of habitat types and the list of types of habitats that are vulnerable, endangered, rare or important for conservation in Serbia).

There are five national parks in Serbia: National Park "Fruška Gora", National Park "Đerdap", National Park "Tara", National Park "Kopaonik" and National Park "Šara mountain". The **Law on National Parks** regulates the goals, values, size, boundaries and regime of protection, management and sustainable use of areas included in conservation and entrusts these to corresponding public enterprises. The managers of national parks, among other things, have to "*...monitor and analyse the state of flora and fauna and other values of the National Park, keep records and in cooperation with relevant organizations for nature conservation take appropriate measures and activities...*".

According the **Law on the Protection and Sustainable Use of Fish Fund** fishing waters are entrusted for management to commercial entities or public enterprises that meet certain conditions (Users of fishing waters). Waters that lie within protected areas are entrusted to the respective manager of the particular area. The users, among other things, are obliged to prepare a Fishing area management program and collect data on the state of fish stock in waters they are entrusted with. Fishing area management program may be prepared only by organizations registered for professional and scientific research in the field of fishery, ichthyology, fish biology or ecology of continental waters. Users have to collect data about fish stock and regularly send reports to the MEP.

Biodiversity data is also important for making proper decisions about intervention in nature. According the **Law on environmental impact assessment** and the **Law on strategic environmental impact assessment** plans for interventions in the environment that could affect the environment, investors have to enclose a special study (Impact assessment study). Costs of preparation of the study are borne by the investors and are prepared by specialised agencies or academic institutions. **Regulation on the contents of the environmental impact assessments** stipulates that the study, among other things, has to contain "*...a description of the flora and fauna, natural areas of special value (protected) rare and endangered plant and animal species and their habitats and vegetation...*". Depending on the level of intervention, organization of a procedure and public review of studies is organized by a governmental body at local, regional or national level.

3.2. Forestry

The **MAFWM** is responsible for administration and policy development tasks in the field of forest management. Within the Ministry, the **Directorate of Forests** is in charge of administration and technical tasks related to forest management. Management of publicly owned forests is entrusted to the **Public Enterprise "Serbia Forests" and Public Enterprise "Vojvodina Forests"**.

Forest management is regulated by the **Forest Law**. The law obliges users of forests to maintain records of forests and forest land that was entrusted to them – Forest Cadastre. Also, the Law proscribes the establishment of an information system for forests and forestry of the Republic of Serbia in the corresponding Ministry. The operational GIS based systems are launched and operate in public enterprises which are in charge of forests.

All questions concerning game species and hunting are regulated by a special law **(Law on Wildlife and Hunting).** The law proscribes an establishment of the Hunting ground cadastre and the Central database. In the **Rulebook on the Cadastre of hunting grounds and the Central database** the attributes and data necessary to collect for the Cadastre of hunting grounds and the Central database are defined. Information collected in the hunting area of importance for Cadastre and Central database are collected by the user of the hunting ground and provided to the competent state body i.e. **Ministry of Agriculture and Environmental Protection** and **Provincial Secretary for Agriculture, Water Management and Forestry** which manage their respective segments of the Central database.

3.3. Water management

The **MAFWM** is responsible for administration and policy development tasks in the field of water management. Within the Ministry, the **National Water Directorate** is in charge of administration and technical tasks related to water management. Management of all waters in Serbia are entrusted to the **Public Water Management Company "Serbia Waters"** and **Public Water Management Company "Vojvodina Waters"**.

The most important law for water management in Serbia is the **Law on Waters** that deals with all aspects of water utilization, water supply, flood protection and water protection. In order to classify waters, organize a monitoring and improvement of water regime, and enhance a planning of the development of water systems and water management in the Republic of Serbia the Law proscribes an establishment of the **Water information system.** The System provide formation, maintenance, presentation and distribution of data on: the state of water quality classes of water bodies of surface water and groundwater, water management documentation, legislative, organizational, strategic and planning measures in the field of water management, scientific and technical and other information of importance for water management and exchange of information with other information systems at national and international level. Water information system is established by the MAFWM and maintained by Public Water Management Companies entrusted for water.

The structure, methodology and organisation of the Water information system is explained in greater details by a number of bylaws like **Rulebook on keeping of the Water information system, methodology, structure, categories and levels of data collection, as well as on the content of the data for informing the public** (in which the content and way of keeping a water information system, methodology, structure, categories and levels of data collection, as well as the content of the data for information of public is defined), **Rulebook on determining the water bodies of surface water and groundwater** (that contains a list of water bodies of surface waters and ground waters in Serbia with their basic attributes) and **Rulebook on keeping of the cadastre of water bodies,** that defines the content and way of keeping the cadastre of water objects (control buildings, dams with reservoir, embankments, channels, other objects on the water, pumping stations, water intake, treatment plants for drinking water, the main pipelines, tanks, ponds, buildings for navigation, treatment plants for waste water, drains and facilities).

Cadastre of water bodies for the assigned water areas are held by Public Water Management Company "Serbia Waters" and Public Water Management Company "Vojvodina Waters" and Public Water Management Company "Beogradvode".

In a separate bylaw (**Rulebook on parameters of the ecological and chemical status of surface waters and the parameters of the chemical and quantitative status of groundwater**) the parameters of ecological and chemical status of rivers and lakes, artificial water bodies, significantly modified water bodies and groundwater are enlisted and provide the basis for monitoring and evaluation of their status.

3.4. Agricultural land management

The **MAFWM** is responsible for administration and policy development tasks in the field of agricultural land management. Within the Ministry, the **Agricultural Land Administration** is in charge of administration and technical tasks related to agricultural lands. The **Law on Agricultural Land** stipulates the formation of Information system on agricultural land. The Agricultural land administration is responsible for establishment and management of the Information system. This system is operational and used in procedures for leasing state owned agricultural land.

3.5. Mineral resources management

The **Ministry of Mining and Energy (MME)** is responsible for administration and policy development tasks in the field of mineral resources management. The most important document in this topic is the **Law on Mining and Geological Research** that entrusted an organization and performing of all activities on mining and geological research in Serbia to the **Geological Survey of Serbia**. Among other things, the Survey is responsible for "*...collecting, updating and storing data and technical documentation of importance for geological information system of the Republic of Serbia...*". The Law also stipulates the foundation of the Geological Information System of Serbia (GeolISS) and the Information System for Geological and Mining Research (CIS GIR). GeolISS is meant to be the basis for understanding the geological resources of the Republic of Serbia, and the occurrence of mineral deposits and groundwater, making

different types and purposes of geological maps etc. CIS GIR provides formation, classification, maintenance, presentation and distribution of numerical, descriptive and spatial databases on all geological and mining activities in Serbia. Basic geological map and several specialized geological maps are publicly available on internet.

3.6. Meteorology and hydrometeorology

According to the **Law on meteorological and hydrological activities** the Serbian state has entrusted the jurisdictions of organization and performing of meteorological and hydrological activities on national level to the **Republic Hydrometeorological Institute**. Among other things, the Institute is responsible for: planning, establishing, maintaining and developing the national network of meteorological and hydrological stations; performing systematic meteorological and hydrological measurements and observations in the national network of meteorological and hydrological stations and monitoring changes in the chemical composition of the atmosphere and water in the national network of meteorological and hydrological stations.

The Law provides integration of meteorological and hydrological data into single Hydrometeorological Information System of the Republic of Serbia that is set and maintained by Republic Hydrometeorological Institute. According the special Law, the monitoring results of the quality of air and water have to be included into the Information system for environment and Water information system. Details about methodologies and organization of data collecting are explained in the **Regulation on establishing of the network of meteorological stations, work program and ways of reporting.**

3.7. System of official statistics

According the **Law on Official Statistics** the Republic Institute for Statistics is a special professional organization in the public administration system of the Republic of Serbia which performs all tasks related to the organization of collection, processing, statistical analysis and publication of statistical data. The activities of the Institute are directed by the periodic programs and operationalized for each year through a special action plan. From a significant number of planned researches only a few are only indirectly significant for biodiversity and are related to hunting and forestry.

3.8. National Spatial Data Infrastructure

The **Law on State Survey and Cadastre** provides the formation of Geodetic and Cadastral Information System (GCIS) and National Spatial Data Infrastructure (NSDI). GCIS contains data and data services on basic geodetic works, real estate cadastre, the address register, the register of spatial units, register of geographical names, topographic map data etc. NSDI refers to digital geodata and geodata services for the territory of the Republic of Serbia within the jurisdiction of public administration, local administration, public enterprises and legal persons entrusted with the management of geospatial data and it was established and maintained in accordance with the EU directive Infrastructure for Spatial Information in the European

Community – INSPIRE. The ETRS 89 and UTM projection system was officially accepted and shifting from the old system started on 1 January 2011. The responsible institution for implementation assigned by the Law is the **Republic Geodetic Authority** that launched a public portal that provide insight into a number of different thematic layers of geospatial data as well as a possibility for online searching and insight into the Real Estate cadastre.
In the period of preparation of this assessment the (draft) **Law on the National Spatial Data Infrastructure** (prepared by expert service of the Republic Geodetic Authority) was in the public debate and it is expected to provide changes in management of geospatial data that are more harmonized with requirements of the INSPIRE directive.

3.9. Conclusions

- Most of the laws that regulate data management directly or indirectly relevant to biodiversity are adopted with explicit statements for creating databases and setting appropriate information systems.
- Some important laws are not in form of single documents but rather consist of a base text and a number of changes and additions published lately in Official Gazette which makes them difficult to read and understand.
- It is not rare that the bylaws that were adopted within some law, are not amended after an amendment of that law, which leads to their doubtful legality.
- There are no official procedures for getting insight into the databases managed by public enterprises that were entrusted with water and forestry.
- There is no available bylaw that will regulate and standardise methodologies for collecting and structuring primary biodiversity data.
- In the system of official statistics there is no planned research directly related to biodiversity.

There is no operational Environmental Fund in Serbia at the moment but, according to the latest information, a budget fund will be supposedly operational during 2017.

4. STAKEHOLDER ASSESSMENT

4.1. Consultation process

In order to gain insight into information about legal, organisational and technical background of biodiversity data management and data flow between different legal entities in Serbia, during the period September - December 2016 all relevant stakeholders that are engaged in biodiversity data inventory, storage, processing and reporting were listed. In this moment in Serbia we identified over two hundred stakeholders from nearly 80 legal entities. Using different methods of communication, we interviewed nearly 50 individuals from 23 legal entities in Serbia. A request for participation in the electronic BIMR questionnaire survey was sent to almost 100 individuals and we received 33 filled questionnaires from 21 legal entities and 4 personal responses.

The National briefing held in Belgrade on early October 2016 with the representatives from the Ministry of Agriculture and Environmental Protection, Institute for Nature Conservation of Serbia, Institute for Nature Conservation of Vojvodina Province, National Geodetic Authority and IUCN Regional Office for Eastern Europe and Central Asia pointed out some shortcomings in actual legislative and chances to improve biodiversity management and reporting by perfecting some laws that are in preparation. It was concluded that an evident lack of precise explanation of databases on biodiversity in actual legislative has to be corrected by including necessary explanations and clarifications into the new version of the Law on Nature Protection. Also, the participants of the meeting agreed that there is an urgent need to find a suitable solution to improve two-way data flow with the National Infrastructure of Spatial Data (and other stakeholders) by facilitating access to geospatial data (provided by stakeholders that are not directly involved in collection of biodiversity data but produce outputs important for biodiversity data management like electronic cadastre, land use maps etc.). Also, it was concluded that it was necessary to ensure technical and other conditions to include “pure” biodiversity geospatial data into NISD.

During the series of interviews which were performed during October to December 2016 direct personal meetings were organised with the representatives of SEPA, Institute for Nature Conservation of Serbia, Institute for Nature Conservation of Vojvodina Province, Republic Geodetic Authority, Centre for Information on Biodiversity/Faculty for Biology, University of Belgrade, Department of Biology - University of Niš, Institute for Biology and Ecology - University of Kragujevac, Department of Biology and Ecology - University of Novi Sad, PE Palić-Ludaš, IUCN Regional Office for Eastern Europe and Central Asia, WWF Adria Serbia office, Goran’s organisation of Sremska Mitrovica, Petnica Research Center, Bird Protection and Study Society of Serbia, Serbian Owl Conservation, NGO HabiProt, NGO Protego and NGO Scientific Research Society of Biology and Ecology Students "Josif Pančić". During this consultation a valuable information about ongoing activities on collecting, structuring, storing and sharing biodiversity data was gathered.

4.2. Stakeholder analysis

Based on the review of their legal responsibilities, recent activities and results, we enlisted stakeholders who are related to biodiversity, nature conservation or use of natural resources.

All stakeholders were evaluated, classified, ranked and filtered according relevance to the BIMR framework. More detailed analyses are made on a smaller number (90) of relevant stakeholders.

Overview of stakeholders by institution/organization type

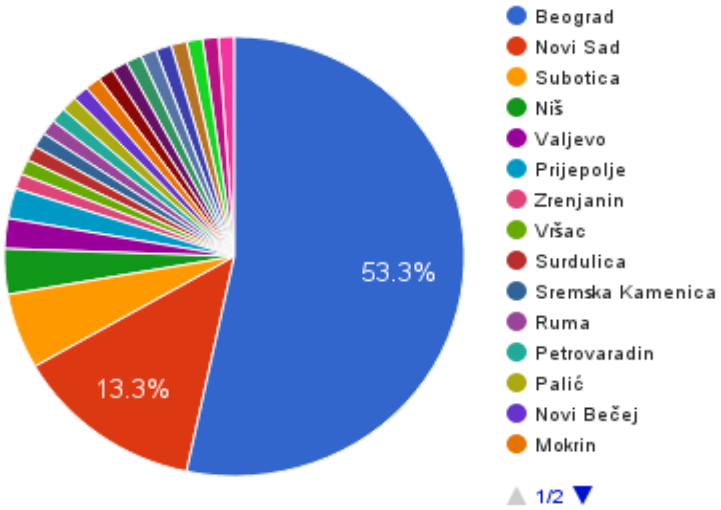
Institution/organisation type	Number
Governmental institution	6
Public institution	12
Public enterprise	12
Academic institution	18
NGO	24
International organisation	3
Religious institution	1
Company	14

The most numerous stakeholders are from the NGO and academic community that are also recognized as the most important stakeholders for collecting and structuring biodiversity data. Although most academic institutions are located in Belgrade, there are significant scientific bases in Novi Sad, Kragujevac and Niš. With more than 20 relevant organizations the NGO community seems strong with numerous volunteer base. Unfortunately, this is not a case. Most of the organisations that collect and process biodiversity data are with only a few members initiated by graduates of biology who have no other opportunity for finding a job. Only a few organizations are working on the national level (Bird Protection and Study Society of Serbia, NGO Habiprot and Scientific research student association "Josif Pančić") and recruit a significant number of members that are collecting biodiversity data in the field. Others are local organisations with several volunteers that are frequently working in close cooperation with the local managers of the protected area.

There is also a significant number of public institutions and public enterprises that are relevant for BIMR framework. Public institutions are mostly expert institutes founded and supported by the government to carry out different activities including collecting, storing and managing biodiversity data. Public enterprises are state owned institutions that are in charge of managing natural resources like water or forests.

Private companies relevant to BIMR framework are almost exclusively managers of protected areas or users of fishing waters.

Overview of stakeholders by city/region



Although the stakeholders are distributed all across Serbia in 34 settlements, the largest number of them, around 53% of all stakeholders, are located in Belgrade. More than 13% of all stakeholders in Serbia, are located in Novi Sad. In most of other settlements one, rarely two stakeholders are located. Only in Subotica and Niš, 4 and 5 stakeholders have their headquarters, respectively. According the concentration of population as well as governmental and academic institutions in the capital city this distribution is logical and expected.

Overview of stakeholders by political influence, relevance and capacity

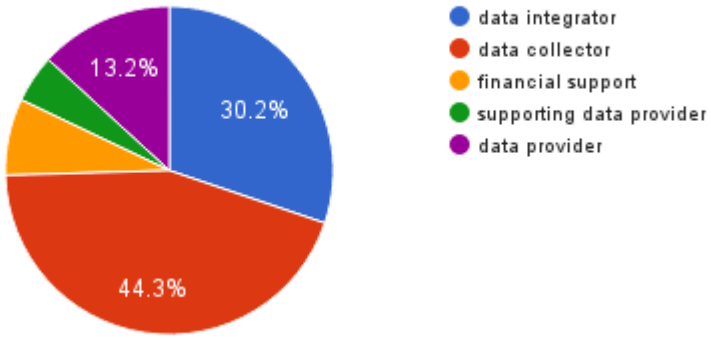
Unfortunately, relevance for the BIMR framework is not correlated with political influence and capacity of stakeholders. MEP and SEPA are of the most relevant institutions and with the strongest political influence but with a limited capacity to manage all necessary activities on environment protection, including organisation of collecting, integrating and reporting. Complex structure of the Ministry with a number of Sectors and Directorates (sometimes with different priorities and interests) as well as a variety of Departments and Groups within relevant sectors, affects the quality and efficiency of the work done. Public institutions like Institutes for nature conservation of Serbia and Vojvodina can boast with great relevance and considerable capacities when it comes to managing biodiversity data, but a limited political influence of these institutions reduce the impact of their efforts. Academic institutions and NGOs are with significant relevance but with negligible political influence and limited capacities. Scientific work based on biodiversity data collecting and processing is of low priority for the Ministry of Education, Science and Technological Development which results in that most of the scientists orient their activities towards other disciplines, mostly experimental and laboratory based, that are not useful for biodiversity conservation.

With the exception of a few organizations of civil society (like Bird Protection and Study Society of Serbia, NGO HabiProt or Scientific research student association "Josif Pančić") the capacities of NGOs in Serbia are not correlated with their evident high relevance for biodiversity data collecting and processing. Lack of human resources and technical background of NGOs are elevated due to the absence of stable funding sources.

Generally, all legal entities that manage or use natural resources, and have obligation to collects data in the field, show poor results because of low human, technical and financial capacities. Several examples of good results in biodiversity data collecting and supported or realised by manages/users (e.g. **Gorans organisation of Sremska Mitrovica** which manages a Special reserve Zasavica) are based mainly on individual enthusiasm and commitment, rather that proper official financial support.

Organisations and institutions in Serbia that support biodiversity data management activities are only a few and there are no continuous funding resources, especially for academic institutions and NGOs. The governmental institutions (Ministry and Provincial secretariats) sporadically call for proposals for projects but biodiversity data collecting and processing is always poorly rated. Recently, managers of protected areas have sought for help in the process of identification of natural values and monitoring of biodiversity of their areas but, because of their low capacities, they can provide only some in-kind and logistical support for field studies. Financial support, if any, is very low ("seed money"). International organisations oriented their focus toward other topics like capacity building, policy development and advocacy.

Stakeholder roles overview



Almost one half of relevant stakeholders recognized during the analysis (44%) are collecting biodiversity data in the field. Mainly these are academic institutions and NGOs but also public institutions responsible for nature protection and some managers of protected areas. Delegation of responsibilities for biodiversity from central to regional and local level and several initiatives in academic and NGO community results in a relatively large number of stakeholders that integrate biodiversity data (30%), but less than half of these stakeholders (13%) possess technical and other capacities to share their structured data with other

stakeholders. Personal interviews with stakeholders and results of the questionnaire show a low level of standardisation of biodiversity data which negatively affects an efficient data flow.

Having a few Supporting data providers does not mean that they are less important and less influential. A significant number of thematic data set are publicly available for a wider public. The leader is for sure the Republic Geodetic Authority with their geosrbija data portal that integrates their spatial data with data for a number of public institutions. Some of the data are already publicly available and some (even sensitive one) will be available over the web services for public and academic institutions, when the new regulation is adopted and become operational. Cooperation with public institutions entrusted for natural resources (agricultural land, water and forests) and insight into their data always went with difficulties. The National Spatial Data Infrastructure, whose functioning arises from obligations towards the Inspire directive, could be a good inter-sectoral sharing point in the future.

Reporting obligation overview

Responsibilities for monitoring and reporting on the state of targeted populations and habitats are defined by international obligations and national legislative. Serbia is a signatory party to the most important international conventions that tackle biodiversity and biodiversity data management such as: CBD, Convention on Wetlands, Convention on the Conservation of European Wildlife and Natural Habitats, Convention on International Trade in Endangered Species of Wild Fauna and Flora and Convention on the Conservation of Migratory Species of Wild Animals.

- In accordance with the **Law on Environmental Protection** the **SEPA** has a responsibility to prepare a national State of the Environment report on a yearly basis. These reports are based on the indicators approach by applying the Driving Forces-Pressures-State-Impacts-Responses concept. The environmental topics presented in the report are grouped and organized in accordance with National list of Environmental Indicators. Indicators potentially interested for the BIMR belongs to the groups; **Nature and biodiversity** and (partly) **Forestry, hunting and fisheries**. These reports are provided to the EEA (Eionet). Institutions included into Eionet network for Serbia, upon request of the EPA, have to send reports on indicators for which they are responsible.
- Responsibility for preparation and submission of National reports on the implementation of the Convention on Biological Diversity is on the **MEP** which performs it with assistance of state expert institutions, academic institutions and international organisations. The fifth report, submitted in 2014, were prepared after a series of workshops initiated by MEP, organised and moderated by the Institute of Nature Conservation of Serbia with participation a number of experts from academic institutions and NGOs. Activities of preparation of the report were supported by GEF and supervised by UNDP.
- Institute for Nature Conservation of Serbia is nominated as a reference institution for compile necessary documentation and for nomination of areas to the Natura 2000 network i.e. potential Sites of Community Importance.

Along with the reports arising from international obligations, in accordance with national legislation several reports on biodiversity is prepared on regular basis.

- Institute for Nature Conservation of Serbia prepares a five-year report on the state of nature and provide it to the MEP.
- Institute for Nature Conservation of Vojvodina prepares a five-year report on the state of nature of the territory of Vojvodina and provide it to the MEP.
- Managers of protected areas have to send their annual reports to the local community, provincial secretary or the MEP, depending on the level on which the Decision on protection was adopted.
- Users of fishing waters have to send annual report to the MEP.
- Local communities have to send reports about the status of the environment to the MEP.

Occasional reporting about biodiversity includes:

- EIA/SEA assessments sent to the competent government service (local, regional or national).
- Results of field surveys performed by academic institutions and/or NGOs are forwarded to the appropriate investors (managers of protected areas, users of fishing waters, provincial secretaries, MEP etc.).

There are no standard forms for structure biodiversity data in a huge number of different reports that flow within Serbia between different stakeholders.

The focus in obligatory reports from managers and user of natural assets (that they sent to local, regional or national authorities) are mainly on financial justification of received funds, not the data and effects of their activities in the field. There is no official obligation to send field data to the corresponding Institute of Nature Protection.

Information sharing between different sectors of the same ministry (MEP) - like Nature conservation, Environmental permits, and different ministries (MAFWM) - Forestry, Water management, Agricultural land management, in the absence of clear procedures and standards, is faced with a number of obstacles and bottlenecks.

Stakeholder relationship mapping

Figure 1 gives a general scheme of all relevant stakeholders and their relationships in terms of data flow. The stakeholders were grouped according similarities in legal status, obligations and methodologies used in data handling and reporting on biodiversity. The red arrows used in the graph indicate regular/obligatory reporting defined by actual legislative while black arrows indicate occasional reporting, i.e. reporting by particular project or engagement. The keg icons scattered on the graph indicate a biodiversity database management system (DBMS) where blue colour points to biodiversity DBMS. Grey colour points to DBMS that operates with data

useful for BIMR framework. Note that arrows used on the Figures 1 and 2 mean paths of all forms of biodiversity data documents (reports, tables, graphs, images etc...), not exclusively in digital format.

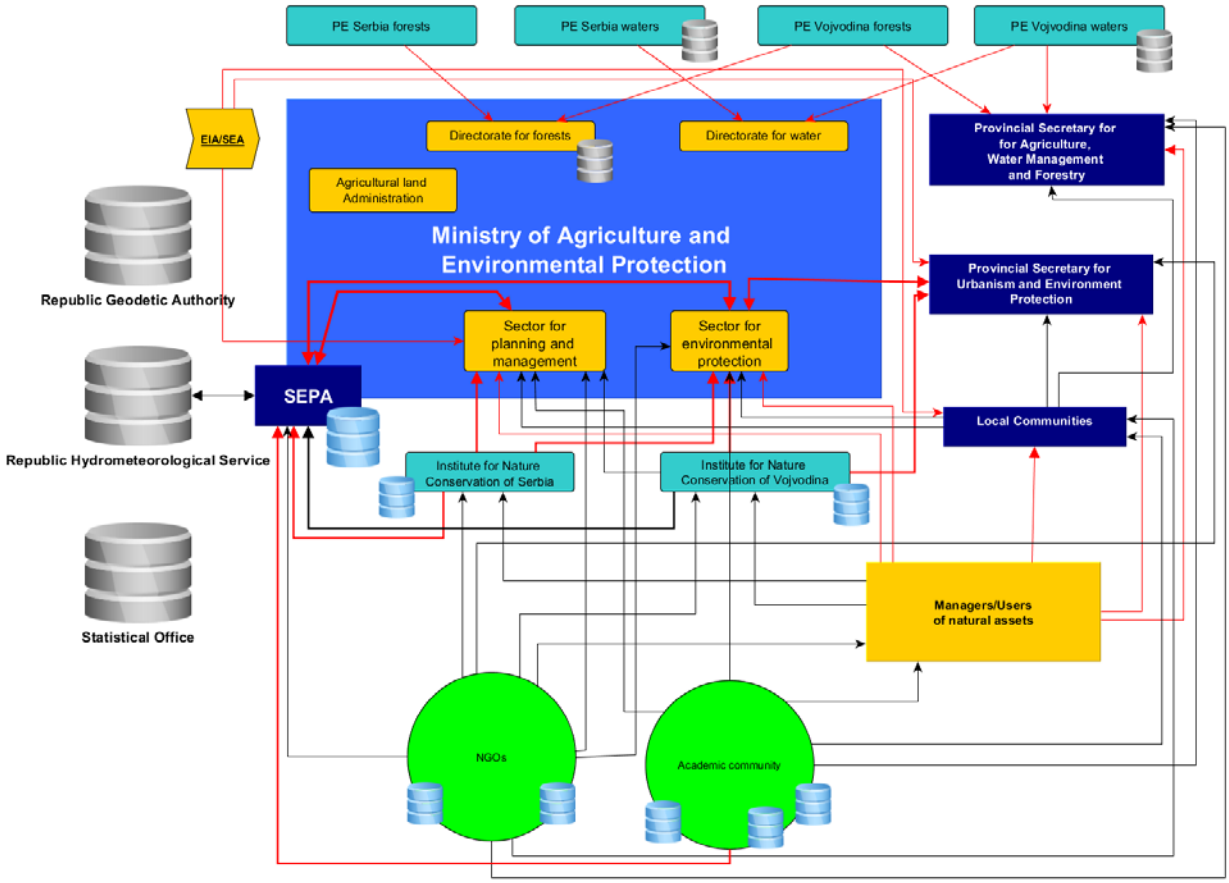


Figure 1. Conceptual chart of biodiversity data flow in Serbia[2]

Governing of areas directly related to biodiversity (nature conservation, protected areas...) and nature resources management (forestry, water and agricultural land) in previous period was within the same Ministry (MAEP). After the reorganisation of the Serbian government in June 2017. these areas are separated into different Ministries - MEP and MAFWM. At the regional level these areas are governed by different secretaries - Secretary for Urbanism and Environment protection and Secretary for Agriculture, water management and Forestry. There are two Institutes for Nature Conservation, in Belgrade and Novi Sad, with clearly defined territorial responsibilities for organisation of nature conservation but, it is expected, that the Belgrade office has more authorities for international contacts and cooperation. Academic institutions cooperate with all institutions on all governmental levels but only on project level i.e. there is no continuous support of their activities. Results of studies performed in within EIAs are submitted to the appropriate governmental body that leads the particular procedure.

[2] The Conceptual charts are designed according the procedures of functioning of the previous Ministry of Agriculture and Environmental Protection

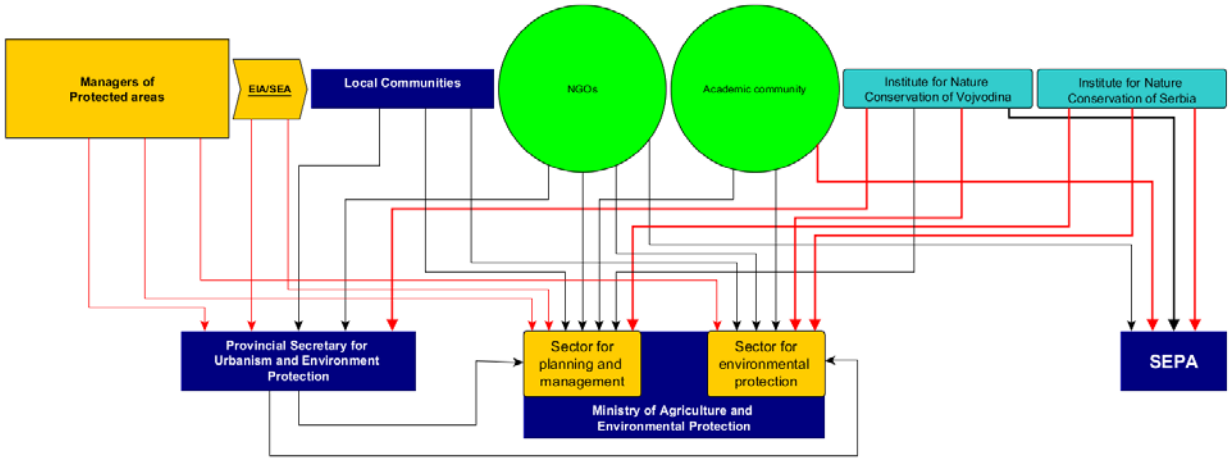


Figure 2. Chart of stakeholders that exchange biodiversity data
with the former Ministry of Agriculture and Environmental Protection

Figure 2. shows the flow of biodiversity data important for BIMR framework organised around MAEP in more detail. The key biodiversity data collectors in Serbia are the two Institutes of Nature conservation, academic institutions and NGOs. Institutes of Nature Conservation are sending their reports to the MAEP and/or appropriate provincial secretary while academic institutions and NGOs are sending their reports to governmental institutions at local, regional or state level, according particular engagement. According the actual legislation, managers of PA and users of natural resources are obliged to monitor entrusted natural assets, and they do it with more or less success. Rarely independently, usually with assistance of some key biodiversity data collectors they collect data and prepare different plans and reports that are being sent to MEP, Provincial secretary or local government, depending on the governmental level on which the protected area was declared. The data submitted in reports from different stakeholders are gathered in the appropriate organizational unit of the MEP and/or appropriate provincial body. EPA collects data on defined set of indicators from different stakeholders and prepare reports according national and international obligations.

4.3. Conclusions

- Natural resource management is still sharply divided on nature protection, on one side and nature resource management, on other side.
- Institutions responsible for nature resource management even developed their methodologies and practice of, as they call it, nature protection (supported from appropriate state funding), that are sometimes not sustainable enough.
- There is no comprehensive institutional solution for organisation of biodiversity data collection and management in Serbia. Institutes for Nature Conservation in Belgrade and Novi Sad perform only part of the job because they are focused on data of targeted species and habitats and protected areas.

- Complex institutional framework, with responsibilities for different areas distributed on different levels of government, in practice frequently leads to bottlenecks and obstacles in communication as well as duplication of work and absence of coordination in implementation of activities that can influence nature.
- The deficiency of organisations and institutions that support biodiversity data management activities is evident and there are no continuous funding resources for collecting, structuring and providing biodiversity data, especially for academic institutions and NGOs.

5. INFORMATION SYSTEM SET-UP ASSESSMENT

5.1. Ongoing initiatives related to biodiversity information system

Maybe the most important organisation for biodiversity reporting on national level is SEPA, with their **Information system for environment**. The system has been operational for several years and regularly used for preparing reports for international and national stakeholders. But, at the moment, the system is configured for managing only processed data (indicators) that are usually used in reports on state of the nature/environment. Unfortunately, the system was not designed to store and process primary biodiversity data.

According to the Law on Nature Protection, the raw biodiversity data about protected species and habitats has to be organised and managed within the **Institute of Nature Protection of Serbia** and **Institute of Nature Protection of Vojvodina Province**. Headquarters of these institutions in Belgrade and Novi Sad feature information systems that operate in their local networks but, at this moment, do not fully satisfy the requirements of an efficient biodiversity data management. There are certain challenges in compatibility between systems in Belgrade and Novi Sad and the absence of some basic functionalities discourages professionals in these institutions for more intensive use of the system. Obtaining significant amounts of structured data from the implementers of the project "*Data for red lists/red books and ecological network of Serbia*", it is expected that these problems will be solved in the near future. The project started in 2016 and is scheduled to last for three years but, legal contracting of specification of topics, tasks and scope of financial support is done on a yearly basis. Negotiations about the continuation of the project in its second year (2017) have been in progress in the period of preparation of this assessment.

The **Information System of the Centre of Biodiversity Informatics** at the Faculty of Biology of the University of Belgrade is under construction. The IS is designed to give a professional tool for scientists for management of reliable data about biodiversity of Serbia and Balkans stored in standardised form (Darwin core). According to the Conceptual Design the IS, it is organised around Specify software (specifyx.specifysoftware.org) that gives all necessary functionalities for managing biodiversity data with a fine granulated rights of accessing to data. The access to this tool will be granted only to the associates of the CBI (nearly twenty experts from different academic institutions and NGOs) with whom the Faculty signed a contract with legal details about providing and ownership rights on biodiversity data. The data of this segment of the IS is managed by mySQL database management system. Public insight into the data is planned to be enabled only by means of a replica of the database, limited in extent and spatial accuracy. The publicly available data will be organised around Drupal CMS supported by PostgreSQL DBMS powered with PostGIS. The visualisation of spatial data is planned to be performed by using the Geoserver in combination with OpenLayers. The Linux server at the Faculty's network has been launched and most of the necessary services are configured. The CBI in this moment handles nearly half a million species/habitat occurrence data of all species group except birds at primary level of digitalisation. Out of this number, nearly one hundred thousand occurrences are georeferenced and most of them are submitted

to the Institute for Nature Conservation, as an obligation for implementation of the first phase of the project "Data for Red lists/Red books and Ecological network of Serbia".

Supported by the former Ministry of Science and Environmental Protection in 2006, within the project "*Biodiversity in aquatic ecosystems in Serbia, ex situ conservation*" that was implemented by the Institute of Biology and Ecology of the University of Kragujevac, following activities were performed; 1) Inventorisation of aquatic organisms in Serbia (digitalisation and structuring published and unpublished data of aquatic species-occurrence data) and 2) species endangerment level classification by the international IUCN criteria. A significant database (**BAES *ex situ***) were compiled and published on the Internet. Public access to the application for browsing and reporting was operational for a while, but was soon cancelled because an abuse of proprietary rights over the data. In this moment, access to the data is possible only by direct request. More information is available at baes.pmf.kg.ac.rs/english/index.html

In the previous period, a significant amount of geospatial data from Serbia was compiled for determining **areas important for conservation** of different groups of organisms. The data was provided by a huge number of institutions, NGOs and experts and made it possible to define the boundaries of 62 Important Plant Area (IPA), 42 Important Bird Area (IBA) and 40 Prime Butterfly Area (PBA). The database is compiled and maintained by the Institute of Nature Protection of Serbia.

The Museum of Natural History in Belgrade is a national institution with a long tradition, experience and results in biodiversity inventories. With over a dozen professional curators and preparators together with a number of external collaborators in the Division for Biology, they are an important stakeholder in the Serbian biodiversity arena. For management of their biodiversity data (data about specimens in the collection) a special application was developed in their local network. The design and functionality of the system is similar as in Institutes for Nature Conservation in Belgrade and Novi Sad. Not surprisingly, it was developed by the same outsourcing company. Based on the similar object-relation model, it has a flexible structure to store and manage raw biodiversity data but, maintenance is completely dependent on developers. The Museum does not own in-house technical staff that could maintain the application so, every, even simple, intervention in the database vocabularies and structure depends on external assistance. This is always connected with time delays. Bearing all this in mind, together with poor IT capacities of the staff in the Museum the result is that the System is not used to the extent which it deserves.

BioRaS portal (at bioras.petnica.rs) is a thorough informative resource about Serbian wildlife and a sophisticated tool for harvesting field observations of all species of animal, plant and fungi collected by civil society. It is a full featured citizens' science initiative (launched in 2010) supported by the Netherlands Embassy in Belgrade and Serbian Government, designed by several organizations of the civil society, harmonized with academic institutions and implemented by Petnica Research Center. Organization of the data input, verification and ownership on the database is specified by the Agreement that was signed by seven Serbian

naturalist organizations, members of the ad hoc Consortium. The system runs on telecommunication infrastructure of Petnica Research Center and is built "from scratch" in LAMP environment. As a result of a mutual agreement between Petnica and Consortium, the ownership of all logistics (dedicated hardware and scripts) is Petnica's, while the ownership on data belongs to the Consortium. At this moment, the system handles near 190.000 single geospatial species-occurrence data entries on 6,582 species. The system is open for registration (there are 178 registered users at this moment) and it allows publication of spatial observations from the nature illustrated by photography. The published observations are checked by authorised moderators that verify determinations of species and allow public insight into the findings. The attribute set of the observation that has to be provided by observers was derived from the Darwin core, according to the scientific requirements and estimated capacities of the data collectors. The data provided by observers is stored into the database and visualisations of the publicly available spatial data in the map are degraded to 10X10 km accuracy. All data with appropriate access rights can be downloaded by a registered user in structured (Excel) table.

Alciphron database (at address alciphron.habiprot.org.rs/) is yet another initiative of the civil society in Serbia started and managed by the NGO HabiProt from Belgrade. For several years HabiProt is collecting data on biodiversity of insects and maintaining a database. This database was maintained on a local computer through a dedicated application and finally they managed to make it available on the Internet. The application has made it possible for registered users to publish observations from the nature. The verification of published data is enabled through the web application. According to their statistics, they collected a respectable number of observations and photographs of insect eggs, larvae, pupae and adults from the nature. The data in the database is searchable for anonymous visitors and spatial data is viewable but, only on the map with unknown precision. The methodology for selecting attribute set for collecting in the field and verification system of data collected before launching the internet application remains unclear.

There are several databases managed by public enterprises responsible for management of natural resources (water, forests and agricultural land). Management of these databases was stipulated by appropriate laws and their structures are defined by separate bylaws. According to the interviews and personal efforts to get information about these databases, it is evident that these databases exist in some kind of information system but, there is no public insight into data and no defined procedures about possibilities of using the data. They are willing to provide information only to the public institutions on the basis of precise and formally submitted request.

Recently, the Alliance of speleological organisations of Serbia compiled, geo-referenced and published on the internet the **Register of speleological objects in Serbia**. It is a searchable spatial database visualised on an interactive map.

In the framework of the project "*Bioregio Carpathians - Integrated management of biological and landscape diversity for sustainable regional development and ecological connectivity in the Carpathians*", implemented from 2011 to 2013 under coordination of the National Forest

Administration ROMSILVIA from Romania and participation a number of partners from the Carpathian countries (including Serbia), an interactive Carpathian biodiversity database and regional inventories were planned. Among other things, the **Carpathian Countries Integrated Biodiversity Information System** (CCIBIS) at www.ccibis.org was launched and managed by the WWF Danube-Carpathian Programme, that includes also a geoportal with several thematic pages about flora, fauna and protected areas of the Bioregio Carpathians. Some geospatial data from parts of Serbia that belong to the Carpathian region (north-east mountainous area) were embedded into the database. The portal is still active.

Geosrbija data portal (geosrbija.rs) is a central repository of geospatial data in Serbia. The Republic Geodetic Authority, with support of Norwegian Mapping and cadastre Authority Statens Kartverk, have started initial activity to establish spatial data infrastructure in Serbia in compliance with the European initiatives and trends. In 2009, they launched a geoportal that provides access to a number of spatial data sets - for professional users and for general public alike. The collection of available data (and a number of institutions that provides their data) grew over time and now it is a respectable collection of services for selected metadata, spatial data sets, and services via the Internet.

It has been found that in Serbia there are several operational databases and systems for biodiversity data management in different stage of implementation and production. These databases are set in governmental institutions (SEPA), public institutions (Institutes for nature conservation in Belgrade and Novi Sad), academic community (Center for biodiversity informatics) as well in NGOs (BioRaS, Alciphron). During the interviews it became clear that these systems are designed by not sufficiently taking into account standards of biodiversity informatics and it has a negative impact on efficient data sharing.

One of the planned projects of the MEP is an “Information system on nature protection and biodiversity conservation”. Preparation of complete technical documentation for the information system is projected to period 2018 to 2019.

5.2. Data collection

In Serbia there are several programs of collecting and structuring field data on biodiversity. Maybe the most important is implemented on national level, namely the projects “Establishment of an ecological network in the Republic of Serbia” and "Development of the Red Book of Plants, Animals and Fungi in the Republic of Serbia" are planned for 2015-2017, coordinated and financed by the MEP and implemented by the Faculty of biology in Belgrade, Department of biology and ecology in Novi Sad and Bird protection and conservation society. The Institute of Nature Conservation of Serbia is a beneficiary institution that will accept structured biodiversity data on targeted species and habitats from the implementing institutions and embed into their information system. There are also some activities on regional level (Monitoring of targeted species and habitats in Vojvodina, performed by Institute of nature conservation of Vojvodina Province) and local level (several projects of Rapid ecological assessments of natural values of protected areas, supported by managers of PAs and realised mainly by NGOs). Worth mentioning also activities on collecting field biodiversity data coordinated by some NGOs that include involvement of general

(unprofessional) public. These activities are not focused on an in-depth analysis of some territory or taxonomic group, but to registering opportunistic data on species and habitats collected by volunteers of NGOs, nature photographers and other that regularly visit and spend time in nature. Data collected by them are valuable addition for better knowledge and monitoring of Serbian biodiversity.

Biodiversity data actually and potentially valuable for BIMR framework are from various sources and the most important in Serbia are (not in order of importance):

- Data used in the Studies of protection, collected by experts from the Institutes for Nature Conservation in Belgrade and Novi Sad;
- Data of monitoring of target species, collected by experts from the Institute for Nature Conservation of Vojvodina and Managers of protected areas;
- Data used for preparation of action plans for protection of large carnivores, collected and processed by experts from the Faculty of Biology in Belgrade, Institute for biological Research in Belgrade and Museum of Natural History in Belgrade;
- Data provided by the projects "Establishment of an ecological network in the Republic of Serbia" and "Development of the Red Book of Plants, Animals and Fungi in the Republic of Serbia", compiled and verified by experts from Faculty of Biology in Belgrade, Department for biology and ecology in Novi Sad and Birds Protection and Study Society from Novi Sad;
- Data of rapid ecological assessment of Serbian natural assets, collected by academic institutions and NGOs and provided to managers of PAs;
- Data collected by experts from Universities in Novi Sad, Belgrade, Kragujevac and Niš and Institute for Biological Research, in the framework of scientific projects supported by the Ministry of Education, Science and Technological Development;
- Data used for Fish stock management programmes, compiled by experts from Biological faculty in Belgrade, Institute for Multidisciplinary Research in Belgrade, Institute of Biology and Ecology in Kragujevac and Department for biology and ecology in Novi Sad;
- Data collected by support of local projects from the Rufford Small Projects Grants Scheme (or similar funders);
- Data collected by support of local/regional/national environmental authorities;
- Data used in EIA/SEA studies;
- Data published on the BioRaS portal;
- Data published into the Alciphron database;
- IPA project Natura 2000 Serbia / The project ceased operations due to administrative reasons.

Most of the data collectors use some kind of data structuring (e.g. Excel tables) but, in the lack of exact requirements from funders/supporters or widely accepted recommendations; the data are stored in a variety of formats, created according the appraisal of project or study performers. Harmonization of this data will present a serious challenge. A huge step forward toward standardization was made during first phase of the project "*Establishment of an*

ecological network in the Republic of Serbia", when structuring of raw biodiversity data (according Darwin core) was requested from project collaborators in a form of proposed sets of attributes for different levels of data processing.

A serious problem emphasised by several interviewees and appeared in the questionnaires is the fact that there is no official species lists for Serbia for most groups of organisms. There are no nominated expert bodies on national level that will deal with nomenclatural issues on using scientific naming of species. It has a significantly negative influence on compatibility and efficient data sharing.

5.3. Data processing and analysis

Most of the data collectors collect biodiversity data according their individual plans and operating liabilities. The processing/analysis of biodiversity data is most frequently adjusted to requirements of a particular commitment. Unfortunately, it is not rare that the biodiversity data did not pass even the first level of structuring (e.g. tabulation) or the data is even in an analogue form, like filled paper forms or notes in field diaries. Only a few stakeholders use DBMS as a solution for management of biodiversity data.

5.4. Data provision and data use

Institutions with operational information systems (Institute for Nature Conservation or Museum of Natural History) have made the first steps towards the integration of biodiversity data and use it in different contexts but, the first results are poor and insufficient. Even more, their data is not accessible by outsiders. However, recently both Institutes for Nature Conservation published maps of all protected areas on the Internet in WebGIS format with some useful functionalities for browsing and searching the database. Public access to raw biodiversity data in Serbia is available only through the BioRas portal and Alcifron database.

The data gathered through the analysis of filled questionnaires help us to better understand the problems stakeholders in Serbia are facing during their work and the scope and quality of data they handle. Although a number of stakeholders that filled the questionnaires claim that their data passes through the system of validation, it is necessary to get some detail information about particular performed procedures. Not all interviewed stakeholders regularly backup their data. It is encouraging that almost all biodiversity data collectors and integrators do not have negative attitude toward data sharing. Under certain conditions, they are ready and willing to share their data with other stakeholders.

5.5. Information system financial and staff capacities

Except financing of the National **Information system for environment** in EPA, there is no systematic financial support of biodiversity data management. In 2014, as part of the call for projects announced for NGOs, the former Ministry of Energy, Development and Environmental Protection supported the projects for upgrade of the BioRaS portal and publishing the Alciphron database to the internet. After that there has been no similar support.

The overall impression on attitude of public institution management to the information systems (except in Republic Geodetic Authority) is not positive. Most Institutions (like SEPA, Institutes for Nature Conservation of Serbia and Vojvodina or faculties) does have service for maintenance and development of info-communication technologies but, these sectors are always under-capacitated with only one or several professional individuals, usually not specialised for biodiversity data management.

There are serious obstacles in efficient communication between field biologists and IT experts: field biologists have a serious lack of knowledge about technologies for efficient data management, while technical staff engaged on maintenance and development of information systems do not understand the character and purpose of the data collected by field biologists.

5.6. Conclusions

- There is an abundance of valuable data about biodiversity of Serbia collected during last decades by individuals from academic institutions, NGO and general public.
- Despite recent efforts to allow united access to biodiversity data, a significant amount of data is still scattered across collections and experts' notes.
- Significant amount of biodiversity data is in form that is not suitable for automatic processing.
- For programmes supported by public funding, there are no official guidelines or recommendations for preferred methodologies of collecting biodiversity data on field surveys.
- Methods of structuring and storing biodiversity data developed and used by different institutions are not harmonised between them.
- There is no academic authority that will review national checklists for most groups of organisms.
- Capacities for efficient biodiversity data management are poor in most governmental, state owned expert and academic institutions.

6. CONCLUSIONS AND RECOMMENDATIONS

Recently, several important steps have been made in organisation of nature conservation and sustainable nature resource management in Serbia. Legal framework is shaped and harmonised with international standards, mandates of relevant institutions are more or less defined, even some public funding is oriented towards studying and monitoring biodiversity. Still, our analysis showed that some lack and/or mistakes in procedures and practices infer efficient biodiversity monitoring and reporting. The most important are:

- Most of the laws that regulate data management directly or indirectly relevant to biodiversity are adopted with explicit statements for creating databases and setting appropriate information systems but, there are no adopted bylaws that will regulate and standardise methodologies for collecting and structuring primary biodiversity data.
- There is no comprehensive institutional solution for organisation of biodiversity data collection and management in Serbia. Institutes for Nature Conservation in Belgrade and Novi Sad are focused on data on targeted species and habitats and protected areas only.
- Capacities for efficient biodiversity data management are insufficient: Field biologists have a serious lack of knowledge about available technologies, while IT staff do not understand the characteristics and purpose of the data collected by field biologists.

Based on the conducted analyses of stakeholders, legal framework in the country related to BIMR process and the current situation with Information systems for biodiversity data management, the following recommendations can be suggested:

Improvement of legislation

- **Adopt** bylaws of the Laws of Nature Conservation which will regulate organizational, technical and procedural mechanisms of collecting, storing and providing biodiversity data;
- **Create** legal framework for nomination of institution(s) that will perform tasks related to the management of biodiversity data for public needs.

Strengthening between and within sectoral cooperation

- **Provide** legal and technical conditions for efficient exchange of biodiversity data between institutions responsible for nature conservation with institutions responsible for management of natural resources;
- **Implement** international experiences dealing with authorship on biodiversity data**.**

Standardisation and harmonisation of biodiversity data collecting and processing

- **Prepare** guidelines for all potential data collectors about (semi)structuring field biodiversity data;
- **Organise** expert groups for reaching consensus about lists of species and habitats that are common in Serbia;

- **Advance** regional cooperation between experts for coordination of research and monitoring of species (and habitats) distributed exclusively on the territories of western Balkan economies (Balkan endemics);
- **Define** the lists of minimum and optimal sets of attributes of field species-occurrence data (in accordance with international standards) that will be requested from data collectors supported by public funding;
- **Promote** full featured software solutions for biodiversity database management.

Capacity building

- **Harmonise** and **upgrade** the information systems in Institutes for nature conservation in Belgrade and Novi Sad for efficient handling of "raw biodiversity data" and reaching full compatibility of their databases;
- **Improve** the capacities of information systems of main biodiversity data integrators (Institutes for Nature Conservation in Belgrade and Novi Sad, Faculty of Biology in Belgrade and Petnica Research Center) for incorporating their biodiversity data into the National Spatial Data Infrastructure using web services;
- **Provide** systematic financial support for trouble-free operation of existing information systems in academic and NGO communities.

7. ANNEXES

Annex 1. List of consulted documentation

List of relevant legislation, reports and assessments in Serbia that define obligations, procedures, and methodologies on collecting and managing data important for biodiversity data management.

International obligations

- **Decree ratifying the Convention on Wetlands of International Importance especially as Waterfowl Habitat** (Official Journal of the Socialistic Federal Republic of Yugoslavia, 9/77)
- **Law on ratification of the Convention on Biological Diversity** (Official Journal of the Federal Republic of Yugoslavia, 01/01)
- **Law on ratification of the Convention on the conservation of European wildlife and natural habitats** (Official Gazette of the Republic of Serbia, 102/07)
- **Law on Ratification of the Convention on conservation of migratory species of wild animals** (Official Gazette of the Republic of Serbia, 102/07)
- **Law on Ratification of the Framework Convention on the Protection and Sustainable Development of the Carpathians** (Official Gazette of the Republic of Serbia, 102/07)
- **Law on Ratification of the Convention on cooperation for protection and sustainable use of the Danube river.** (Official Gazette of the Republic of Serbia, 2/03)
- **Biodiversity Strategy of the Republic of Serbia** for the period 2011 – 2018. Ministry of environment and spatial planning, 2011.
- (Draft) **Strategy of nature protection of the Republic of Serbia** for the period from 2016. to 2026. Ministry of agriculture and environmental protection, 2016.

Environment/nature protection

- **The Law on Environmental Protection** (Official Gazette of the Republic of Serbia, 135/04, 36/09, 36/09, 72/2009, 43/11, 14/16)
    - **Regulation on keeping of the information system of environmental protection, methodology, structure, common bases, categories and levels of data collection, as well as on the content of information which regularly informs the public** (Official Gazette of the Republic of Serbia, no. 112/09)
- **Nature Protection Law** (Official Gazette of the Republic of Serbia, 36/2009, 88/2010, 91/2010, 14/16)
    - **Rulebook on proclamation and protection of strictly protected and protected wild species of plants, animals and fungi** (Official Gazette of the Republic of Serbia, 47/11)
    - **Rulebook on criteria for separation of habitat, the habitat types, sensitive, vulnerable, rare and habitat types with priority for protection and the measures of protection for their conservation** (Official Gazette of the Republic of Serbia, 35/10)
- **Law on National Parks** (Official Gazette of the Republic of Serbia, 84/15)
- **Law on the Protection and Sustainable Use of Fish Fund** (Official Gazette of the Republic of Serbia, 128/14)

- **Law on environmental impact assessment** (Official Gazette of the Republic of Serbia, 135/04 and 36/09)
- **Law on strategic environmental impact assessment** (Official Gazette of the Republic of Serbia, 135/04 and 88/10)
    - **Regulation on the contents of the environmental impact assessments** (Official Gazette of the Republic of Serbia, 69/05)

Other legislative relevant to biodiversity data management

- **Forestry Law** (Official Gazette of the Republic of Serbia, 30/10, 93/12 and 89/15)
- **Law on Wildlife and Hunting** (Official Gazette of the Republic of Serbia, 18/10)
    - **Rulebook on the Cadastre of hunting grounds and the Central database** (Official Gazette of the Republic of Serbia, 40/12)
- **Law on Waters** (Official Gazette of the Republic of Serbia, 30/10, 93/12)
    - **Rulebook on keeping of the Water information system, methodology, structure, categories and levels of data collection, as well as on the content of the data for informing the public** (Official Gazette of the Republic of Serbia, 54/11)
    - **Rulebook on determining the water bodies of surface water and groundwater** (Official Gazette of the Republic of Serbia, 96/10)
    - **Rulebook on keeping of the cadastre of water bodies** (Official Gazette of the Republic of Serbia, 11/11)
    - **Rulebook on parameters of the ecological and chemical status of surface waters and the parameters of the chemical and quantitative status of groundwater** (Official Gazette of the Republic of Serbia, 74/11)
- **Law on Agricultural Land** (Official Gazette of the Republic of Serbia, 62/06, 65/08, 41/09 and 112/15)
- **Law on Mining and Geological Research** (Official Gazette of the Republic of Serbia, 88/11)
- **Law on meteorological and hydrological activities** (Official Gazette of the Republic of Serbia, 88/10)
    - **Regulation on establishing of the network of meteorological stations, work program and ways of reporting** (Official Gazette of the Republic of Serbia, 123/12)
- **Law on State Survey and Cadastre** (Official Gazette of the Republic of Serbia, 72/09, 18/10, 65/13, 15/15 and 96/15)
- (Draft) **Law on the National Spatial Data Infrastructure.** Republic Geodetic Authority, 2016.
- **Law on Official Statistics** (Official Gazette of the Republic of Serbia, 104/2009)
    - **Decision on the program of official statistics** for the period 2016 - 2020. Parliament of Republic of Serbia, 2015.
    - **Decree on establishing the Plan of official statistics for the year 2016.** (Official Gazette of the Republic of Serbia, 114/2015)

Annex 2. Stakeholder list

Governmental institutions
Environmental Protection Agency
Ministry of Agriculture and Environmental Protection
Ministry of Agriculture and Environmental Protection, Directorate for forests of Republic of Serbia
Ministry of Agriculture and Environmental Protection, Directorate for water of Republic of Serbia
Provincial Secretary for Agriculture, Water Management and Forestry, Novi Sad
Provincial Secretary for Urbanism and environment protection, Novi Sad

Public institutions
Institute of Lowland Forestry, Novi Sad
Institute for Nature Conservation of Serbia, Belgrade
Institute for Nature Conservation of Serbia – Liaison Office Niš
Institute for Nature Conservation of Vojvodina Province, Novi Sad
PI Đerdap National Park, Donji Milanovac
PI Fruška Gora National Park, Sremska Kamenica
PI Kopaonik National Park, Raška
PI Tara National Park, Bajina Bašta
Republic Geodetic Authority, Sector for informatics and telecommunication, Belgrade
Republic Hydrometeorological Service of Serbia, Department of Hydro- logical Observation System and Analysis, Belgrade
Republic Hydrometeorological Service of Serbia, Department of National Center for Climate Changes, Belgrade
Statistical Office of the Republic of Serbia, Belgrade

Public Enterprises
PE Komunalac, Bečej
PE Directorate for Building Land and Roads, Surdulica
PE Palić Ludaš, Subotica
PE Srbija forests, Sector for forestry and environment protection, Belgrade
PE Serbia waters, Directorate, Belgrade
PE Srbija waters, Service for care of protected areas, Belgrade
PE Touristic organisation, Čačak
PE Varoš, Vršac
PE Vojvodina forests, Directorate, Novi Sad
PE Vojvodina forests, Service for care of protected areas, Novi Sad
PE Vojvodina waters, Novi Sad
PE Zelenilo, Belgrade
PE Zrenjanin Nature Reserves, Zrenjanin

Academic institutions

Faculty of Agriculture, Department for Agroecology and Environmental Protection, University of Novi Sad
Faculty of Agriculture, Department for Engineer in Agriculture and Agricultural Economics, University of Belgrade
Faculty of Agriculture, Department for Phytomedicine and Environmental Protection, University of Novi Sad
Faculty of Agriculture, Department for Phytomedicine, University of Belgrade
Faculty of Applied Ecology Futura, Singidunum University, Belgrade
Faculty of Biology, University of Belgrade
Faculty of Biology, Centre for Biodiversity Informatics, University of Belgrade
Faculty of Forestry, University of Belgrade
Faculty of Geography, Department for Geospatial and Environmental Science, University of Belgrade
Faculty of Natural Science and Mathematics, Department for biology and ecology, University of Novi Sad
Faculty of Science, Department of Biology and Ecology, University of Niš
Institute for Biological Research, Belgrade
Institute for Multidisciplinary Research, Group for ichthyology and aquaculture, Belgrade
Faculty of Science, Institute of Biology and Ecology, University of Kragujevac
Municipal museum of Subotica
Museum of Natural Science, Belgrade
Serbian Academy of Sciences and Arts, Geographical Institute “Jovan Cvijić”, Belgrade

Organisations of civil society

Alliance of speleological organizations of Serbia, Belgrade
Association of naturalists “Riparia”, Subotica
Association Protego, Subotica
Biological Association "Dr Sava Petrović", Niš
Bird Protection and Study Society of Serbia, Novi Sad
Biological Research Association “Josif Pančić”, Belgrade
Ecological Association “Richard Čornai”, Subotica
Ecological society Gradac, Valjevo
Fish Protection and Study Society, Novi Sad
Fund for protection of birds of prey, Belgrade
GEA - Naturalist's society, Vršac
Hunting society Novi Bečej
Hunting society Perjanica, Mokrin
League 4 Ornithological Action of Serbia, Belgrade
Mountaineering Society "Kamena gora", Prijepolje
Petnica Research Center, Valjevo
Pokret gorana Sremska Mitrovica, Sremska Mitrovica

Scientific research student association "Josif Pancic", Novi Sad
Serbian Herpetological Society, Belgrade
NGO Endemit, Belgrade
NGO HabiProt, Belgrade
Serbian owl conservation center, Novi Sad
Student association of the faculty of forestry, Belgrade

International organisations
IUCN Regional Office for Eastern Europe and Central Asia, Belgrade
REC Serbia, Belgrade
WWF Adria Serbia office, Belgrade

Companies
Association Veternica-Vlasina Ltd., Leskovac
Ballcan Eco Team Ltd., Prijepolje
Eko ribarstvo Ltd., Valjevo
Elit Lux, Ruma
Fish farm, Ečka
Fishing Alliance of Vojvodina Ltd., Novi Sad
Kapetanski rit Ltd, Kanjiža
Nature park Mokra Gora Ltd., Mokra gora
Plus sport Ltd., Kraljevo
Rasina plus Ltd., Kruševac
Rivers Protect Ltd., Paraćin
South Morava 2 Ltd., Niš
Uvac Reserve Ltd., Nova varoš
ZR „Timočka krajina“ Ltd., Zaječar

Religious institutions
Serbian orthodox church, Orthodox eparchy Vranjska, Vranje

Annex 3. BIMR questionnaire

Regional Network for Biodiversity Information Management and Reporting (BIMR) Assessment

This questionnaire is prepared in scope of Open Regional Fund (ORF) for South East Europe - Biodiversity Sub-project: Regional Network for Biodiversity Information Management and Reporting (BIMR).

The Open Regional Fund for South-East Europe Biodiversity (ORF BD) project promotes regional cooperation of biodiversity-related organisations – in particular the ministries in charge of environment and environmental protection agencies, institutes for nature conservation as well as the ministries that deal with or impact on biodiversity and environment , including forestry, agriculture, tourism, water and energy, the municipal administrations, academic institutions and research institutes as well as non-governmental environmental organisations. Activities of the ORF are bundled and channelled through so-called sub-projects (SP).
Importance of improving regional biodiversity information management and reporting was raised by stakeholders in the target economies of South-East Europe (SEE) region in the project identification mission in 2014 and therefore addressed as one of the three priority intervention areas of ORF BD. The continued project consultations up to now, including those held at the ORF BD kick-off meeting in Belgrade, in February 2016 reconfirmed the need for intervention and resulted in the development of a SP Biodiversity Information Management and Reporting (BIMR).
The objective of SP BIMR is that capacities of partner institutions needed to meet Convention on Biological Diversity (CBD) and EU reporting requirements have been improved in SEE.

This questionnaire is intended for collecting data regarding biodiversity information system set-up assessment in each country and are intended for: Biodiversity data collectors (data collector is an institution/organization/expert that collects biodiversity data through field inventory); Biodiversity data integrators (data integrator is an institution/organization that finances biodiversity data field research or an institution/organization that collects biodiversity data from external experts/institutions on the basis of legal obligation); Biodiversity data providers (data provider is an institution/organization that serves biodiversity data to other stakeholders in structured form - database, web service etc.).

BIMR questionnaire in PDF format is available at the following link:
https://drive.google.com/file/d/0B35G6cPOz8QjUTBNUTZlb0dkTXM/view

* Required

Skip to question 1.

Stakeholder general information

Institution/organisation contact information

Please enter the info regarding your institution/organisation

1. **Name** *

2. **Address** *

3. **Postal code** *

4. **City** *

Stakeholder person contact information

Please enter the info regarding the person filling the questionnaire

5. **Name and surname of the person filling the questionnaire** *

6. **Position of the person filling the questionnaire** *

7. **E-mail of the person filling the questionnaire** *

8. **How would you describe your role in regards to the biodiversity data?** *
Check all that apply.

- [ ] Biodiversity data collector (data collector is an institution/organization/expert that collects biodiversity data through field inventory)
- [ ] Biodiversity data integrator (data integrator is an institution/organization that finances biodiversity data field research or an institution/organization that collects biodiversity data from external experts/institutions on the basis of legal obligation)
- [ ] Biodiversity data provider (data provider is an institution/organization that serves biodiversity data to other stakeholders in structured form - database, web service etc.)

Important notice

Questions in this questionnaire are divided in sections and are organized in three groups - Group 1. Biodiversity data collectors, Group 2. Biodiversity data integrators and Group 3. Biodiversity data providers.

Please answer ONLY question group(s) based on your selected role (data collector, data integrator or data provider).

Please SKIP question group(s) that are not intended for your role by choosing Next option (button) on the bottom of each question group page.

Stakoholder that belongs in two or more categories has to complete each corresponding parts of the questionnaire

A. Data collectors specific questions

This question group is intended specifically for Biodiversity data collectors.

Leave answers empty if you (or your organization) does not fit into the stakeholder category.

9. **A1. What group(s) of organism do you collect data about?**
   Check all that apply.
   - [ ] Plants
   - [ ] Invertebrates (marine and terrestrial)
   - [ ] Vertebrates
   - [ ] Fungi
   - [ ] Microorganisms

10. **A2. What specific area of your country do you cover with biodiversity data?**
    Check all that apply.
    - [ ] Entire county territory
    - [ ] Specific region(s)

11. **A2.1. If you collect data for specific region(s), please indicate which region(s) you cover with biodiversity data:**

    _____

    _____

    _____

    _____

    _____

12. **A3. What is the category of biodiversity data you are collecting?**
    Check all that apply.
    - [ ] Species
    - [ ] Ecosystems
    - [ ] Biological communities
    - [ ] Landscape features
    - [ ] Land use
    - [ ] Other: _____

13. **A4. What specific biodiversity data do you collect/store? (i.e. specific groups of species, animals, populations etc.)**

14. **A5. In what form do you collect biodiversity data/information?**
Check all that apply.

- [ ] Photographs, audio records etc.
- [ ] Processed/collected specimens or their parts
- [ ] Field observations
- [ ] Remote sensing (telemetry, photo-traps, satelit imagery etc.)
- [ ] Collecting biodiversity features from maps and GIS data Other:
- [ ]

15. **A6. Do you keep biodiversity specimens (collections)?**
Mark only one oval.

- ◯ Yes
- ◯ No

16. **A6.1. If you selected "Yes" in the previous question, please describe the type of specimens you keep in your collection:**

17. **A6.2. If you selected "Yes" in the previous question, please indicate approximate number of specimens you keep in your collection:**

18. **A7. Do you use any predefined standardized forms for data collecting?**
Mark only one oval.

- ◯ Yes
- ◯ No

19. **A8. Do you use any software solutions for data collection (used on PDAs, mobile devices, laptops)?**
Mark only one oval.

- ◯ Yes
- ◯ No

20. **A8.1. If you selected "Yes" in the previous question, please describe which software solutions you use for biodiversity data collecting.**

_____

_____

_____

_____

_____

21. **A9. Do you use any software solutions for data storage (database systems, digital table formats or any other solution for storage of structured data)?**
Mark only one oval.

- ◯ Yes
- ◯ No

22. **A9.1. If you selected "Yes" in the previous question, please describe which software solutions you use for data storage.**

_____

_____

_____

_____

_____

23. **A10. In which format do you keep your biodiversity data?**
Check all that apply.

- ☐ Text documents
- ☐ Tables (e.g. Excel, CSV)
- ☐ Databases (e.g. Access, SQL Server) Geo tagged
- ☐ photographs
- ☐ Geospatial data (e.g. Shapefile, GPX, KML)
- ☐ Other: _____

24. **A11. Please specify where your biodiversity data is stored.**

Check all that apply.

- [ ] Personal computer
- [ ] Local network
- [ ] Remote server
- [ ] Cloud service

25. **A12. What type of biodiversity data are you ready to share?**

Check all that apply.

- [ ] Information on taxonomy and nomenclature
- [ ] Information on species occurrences
- [ ] Ecosystem information
- [ ] Genetic information
- [ ] Geographical information
- [ ] Information on natural resources
- [ ] Other: _____

26. **A13. Who are you ready to provide biodiversity information to?**

Check all that apply.

- [ ] Individual researchers
- [ ] Training/educational institutions
- [ ] Research institutions
- [ ] Decision makers on governmental, regional and local level
- [ ] NGOs
- [ ] Media
- [ ] Companies dealing with EIA-SEA
- [ ] Other: _____

27. **A14. In your opinion which are major obstacles to sharing biodiversity data?**

Check all that apply.

- [ ] Although the dataset has been used in at least one published paper, I need to do more analyses
- [ ] I am afraid of colleagues with conflict interests using my data
- [ ] I cannot obtain expected benefits from sharing biodiversity data
- [ ] I do not know any properly public database to archive my data
- [ ] I am not authorized to share data by my organisation or supervisor
- [ ] Databases have no easy tool to submit my data
- [ ] Other: _____

28. **A15. What benefits do you wish to obtain from sharing data?**
Check all that apply.

- [ ] Material benefits
- [ ] Reputation
- [ ] Higher citation rates
- [ ] Involvement in future assessments and field research
- [ ] Other: _____

29. **A16. Are there sufficient capacities and skills for adequate data collecting?**
Mark only one oval.

- ◯ Yes
- ◯ No

30. **A16.1. If answer to previous question is "No", please specify what capacities and skills are you missing?**

_____

_____

_____

_____

_____

31. **A17. Are there sufficient capacities and skills for adequate data processing and analysis?**
Mark only one oval.

- ◯ Yes
- ◯ No

32. **A17.1. If answer to previous question is "No", please specify what capacities and skills are you missing?**

_____

_____

_____

_____

_____

B. Data integrators specific questions

This question group is intended specifically for Biodiversity data integrators.

Leave answers empty if you (or your organization) does not fit into the stakeholder category.

33. **B1. What is the source of biodiversity data that you integrate - is data collection conducted in-house (with your own experts) or/and obtained from external expert institutions or individuals (faculties, museums, institutes, NGOs, individual experts)?**

Check all that apply.

- [ ] In-house data collection
- [ ] External sources

34. **B2. What are the external sources that you obtain biodiversity data from?**

Check all that apply.

- [ ] Faculties/academia
- [ ] Museums
- [ ] Institutes
- [ ] NGOs
- [ ] Individual experts
- [ ] General public

35. **B3. Do you have formal cooperation agreements or contracts with external sources of biodiversity data?**

Mark only one oval.

- ◯ Yes
- ◯ No

36. **B4. Do cooperation agreements or contracts with researchers/external sources cover data ownership and data usage aspects?**

Mark only one oval.

- ◯ Yes
- ◯ No

37. **B5. Are there any specific biodiversity data that you integrate/maintain? (i.e. only marine data, forest ecosystems, fresh water ecosystems etc.)**

_____

_____

_____

_____

_____

38. **B6. Do you use any software solutions for data storage (database systems, digital table formats or any other solution for storage of structured data)?**

Mark only one oval.

- ◯ Yes
- ◯ No

39. **B6.1. If you selected "Yes" in the previous question, please describe which software solutions you use for data storage.**

40. **B7. Do you maintain biodiversity bibliography database?**
Mark only one oval.

- ◯ Yes
- ◯ No

41. **B7.1. If you selected "Yes" in the previous question, please indicate approximate number of bibliography data you have in your database.**

42. **B8. What type of biodiversity data are you ready to share?**
Check all that apply.

- ☐ Information on taxonomy and nomenclature
- ☐ Information on species occurrences
- ☐ Ecosystem information
- ☐ Genetic information
- ☐ Geographical information
- ☐ Information on natural resources
- ☐ Other: _____

43. **B9. In your opinion which are major obstacles to sharing biodiversity data?**
Check all that apply.

- ☐ Although the dataset has been used in at least one published paper, I need to do more analyses
- ☐ I am afraid of colleagues with conflict interests using my data
- ☐ I cannot obtain expected benefits from sharing biodiversity data
- ☐ I do not know any properly public database to archive my data
- ☐ I am not authorized to share data by my organisation or supervisor
- ☐ Databases have no easy tool to submit my data
- ☐ Other: _____

44. **B10. Are there sufficient capacities and skills for adequate data processing and analysis?**
Mark only one oval.

- Yes
- No

45. **B10.1. If answer to previous question is "no" can you please specify what capacities and skills are you missing?**

46. **B11. Is there any data quality control or data validation performed?**
Mark only one oval.

- Yes
- No

47. **B11.1. If answer to previous question is "Yes" please describe in more details how you perform data quality control or data validation on your data?**

48. **B12. Do you have practice of regular data backup?**
Mark only one oval.

- Yes
- No

49. **B13. Do you use any of the national or international species/habitats catalogues for resolving taxonomic status of your biodiversity data (such as national checklists, EU Nomen PESI, Catalogue of Life, Fish Base or similar)?**
Mark only one oval.

- Yes
- No

50. **B14. Are you responsible for maintaining and updating of check-lists for any group of flora and fauna?**

Mark only one oval.

- Yes
- No

51. **B14.1. If answer to previous question is "Yes" please could you explain in more details how you are performing activities related to maintaining and updating the relevant checklists.**

_____

_____

_____

_____

_____

52. **B15. Are you aware of EU INSPIRE Directive?**

Mark only one oval.

- Yes, but I have only heard about this Directive and I am not fully familiar with the scope and objective of the Directive
- Yes, I am familiar with INSPIRE Directive scope, regulations and technical guidelines
- No

C. Data providers specific questions

This question group is intended specifically for Biodiversity data poviders.

Leave answers empty if you (or your organization) does not fit into the stakeholder category.

53. **C1. Do you provide your data to external users?** *Mark only one oval.*

- Yes
- No

54. **C2. Is the provided data available in structured format (database, web service)?** *Mark only one oval.*

- Yes
- No

55. **C2.1. If the answer to previous question is "Yes", please specify in which structured format is data available.**

_____

_____

_____

_____

_____

56. **C3. Do you charge for data (i.e. do users need to pay for data)?**

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Other: _____

57. **C4. If you charge for data access do you make exceptions - are there specific institutions/ organizations that you provide your data for free (such as ministries, agencies or public institutions)?**

Mark only one oval.

- ◯ Yes
- ◯ No

58. **C4.1. If the answer to previous question is "Yes", please specify to which institutions/organizations do you provide or you are ready to provide your data for free.**

_____

_____

_____

_____

_____

59. **C5. Are you aware of EU INSPIRE Directive?**

Mark only one oval.

- ◯ Yes, but I have only heard about this Directive and I am not fully familiar with the scope and objective of the Directive
- ◯ Yes, I am familiar with INSPIRE Directive scope, regulations and technical guidelines
- ◯ No