NATIONAL ASSESSMENT OF BIODIVERSITY INFORMATION MANAGEMENT AND REPORTING BASELINE FOR MACEDONIA

ABBREVIATIONS

AEWA - Agreement on the Conservation of African-Eurasian Migratory Waterbirds
BIMR - Biodiversity Information Management and Reporting
BISE - Biodiversity Information System for Europe
CBD - Convention on Biological Diversity
CHM - Clearing House Mechanism
CITES - Convention on International Trade in Endangered Species
EEA - European Environmental Agency
EIA - Environmental Impact Assessment
EIONET - European Environment Information and Observation Network
EU - European Union
FAO – Food and Agriculture Organization
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
MAKKFIS - Macedonian forest fire information system
MASA - Macedonian Academy of Sciences and Arts
MES - Macedonian Ecological Society
MAFWE - Ministry of Agriculture, Forestry and Water Economy
MEIC - Macedonian Environmental Information Centre
MoEPP - Ministry of Environment and Physical Planning
NBIS - National Biodiversity Information System
NBSAP - National Biodiversity Strategy and Action Plan
NEIS - National Environmental Information System
NGO - Non Governmental Organization
NP - National Park
ORF-BD - Open Regional Fund for South-East Europe - Biodiversity
PA - Protected Area
PE - Public Enterprise
REC – Regional Environmental Centre
SDC – Swiss Agency for Development and Cooperation
SEA - Strategic Environmental Assessment
SEE - South-East Europe
UNDP – United Nations Development Programme
UNEP – United Nations Environment Programme

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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.

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Acknowledgment

1. INTRODUCTION AND BACKGROUND

Considering the fact that Republic of Macedonia is a biodiversity rich country, even in early 90's scientists and NGOs raised the voice for undertaking actions for biodiversity conservation on a national, but also on a transboundary level. Many international agreements have been ratified. Macedonia became Party to the Ramsar Convention on wetlands of international importance with nomination of Lake Prespa on World Ramsar List in 1995. Convention on Biological Diversity (CBD) was ratified in 1997; few years later, in 1999, Bern and Bonn conventions, Agreement on the Conservation of Bats in Europe (EUROBATS) and Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) as well as Convention on International Trade in Endangered Species (CITES) have been ratified. Following obligations from relevant ratified international agreements and the new global trends in nature conservation (adopted CBD Targets), global categorization of protected areas prescribed by International Union for Conservation of Nature (IUCN), sustainable development principles, as well as approximation of national legislation to the legislation of European Union (EU) as part of the EU integration process, restructuring of the environmental legislation was undertaken. Birds and Habitats Directives have been transposed to a higher extent in the new Law on Nature Protection adopted in 2004. These activities have been coordinated and supported by the Ministry of Environment and Physical Planning (MoEPP), established in 1998.

Importance for establishing national biodiversity information system in Macedonia has been identified even in 2004 – provision for its establishment is prescribed in the Law on Nature Protection and it was set as priority action in the first National Biodiversity Strategy and Action Plan (NBSAP, 2004).

The MoEPP is the main governmental body responsible for environment protection in the country including nature conservation. In fact, Nature Department is responsible for establishing and maintenance of biodiversity information system, but also there are other departments in the Ministry are involved in data processing and reporting. Another important governmental body is the Ministry of Agriculture, Forestry and Water Economy (MAFWE). Macedonian Academy of Sciences and Arts (MASA), scientific institutions, Macedonian Natural History Museum in Skopje, Hydrobiological institute - Ohrid, protected areas management authorities, public enterprises for forests and pasture management, as well as conservation NGOs are important stakeholders that collect biodiversity data.

Comprehensive monitoring of biodiversity in the country is not established. In practice, specific monitoring activities of the components of biological diversity are carried out only in the framework of different projects implemented by different organizations. Data from the monitoring is not gathered into a single integrated database but scattered in different institutions/experts. In the draft NBSAP from 2015 (not adopted yet) it is stated that entities responsible for biological diversity monitoring often have smaller than necessary capacity, and it needs to be enhanced in technical and expert terms; besides the necessary knowledge of biology and ecology of target species and habitats/ecosystems, relevant knowledge of spatial and temporal statistical analyses is needed as well. Accordingly, several targets/actions are proposed to overcome this condition. In fact, the main strategic principle of the draft NBSAP is mainstreaming of the conservation and sustainable use of biological diversity in all relevant sectors in the country that is expected to ease the process of communication between

stakeholders, exchange of data and cooperation. Updating and maintenance of national biodiversity information system as well as clearing house mechanism on biodiversity are identified as priority actions in the draft National Nature Protection Strategy for the period 2017-2027.

A serious step for establishment of comprehensive system of biodiversity information was made during 2010-2011 when the representative network of protected areas in the country was developed and National Biodiversity Information System (NBIS) was designed. However, this system is currently not operational thus proper management of biodiversity data is still lacking. Apart from hardware and software upgrading there is a need for adoption of the secondary legislation to regulate the process of NBIS functioning. Restarting of this system is crucial in order to establish baseline information (cadastre of protected areas, register of natural heritage, etc.), standardization of biodiversity monitoring, developing indicators and supporting the reporting process towards EU and other international agreements.

The idea of Biodiversity Information System Management and Reporting (BIMR) project, implemented by GIZ, is to help South-East Europe (SEE) countries to assess the current status of biodiversity information system setup on the both national and regional levels and improve the partner institutions' capacities to conform with the reporting requirements to the CBD and with other EU requirements (e.g. for the Natura 2000 network). It is a part of the Open Regional Fund for Biodiversity (ORF BD) that supports regional projects which aims at implementing the EU Biodiversity Strategy to 2020 through increased regional cooperation. In fact, significance of improving biodiversity information management and reporting, on both regional and national levels, was recognized by stakeholders in the target countries of SEE region in the project identification mission in 2014 and therefore addressed as one of the three priority intervention areas of ORF BD. Thus, implementation of BIMR project started in July 2016 with the objective to improve capacities of partner institutions in SEE needed to meet CBD and EU reporting requirements. Achieving this objective is foreseen through the three BIMR building blocks: (i) preparation of national and regional assessment of BIMR Baseline, (ii) development of BIMR Regional Guidelines that will represent common regional framework for biodiversity reporting to CBD and in line with EU requirements, and (iii) piloting of BIMR Regional Guidelines.

The purpose of the BIMR assessment for Macedonia was to get insight about biodiversity data management in the country, including stakeholder analysis, policy and information system set up. In the assessment, all data related to biodiversity and nature protection (water, forests, hunting, pastures, etc.) has been addressed, however the main focus is put on biodiversity data management.

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 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 are 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 has 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 fulfilled 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.

3. STAKEHOLDER ASSESSMENT

Responsible institution for establishing and maintenance of National biodiversity information system is the Ministry of Environment and Physical Planning (MoEPP) as the body of the state administration responsible for the affairs of environment protection including nature conservation; more precisely it is the Nature Department within the Administration of Environment that has been established as a constituent part of the MoEPP for the purpose of performing professional (expert) activities in the domain of environment and nature protection. In fact, Nature Department is the only organisational unit (in the framework of the MoEPP and overall, on a national scale) in charge of implementation of expert matters from the field of nature protection defined by the Law on Nature Protection (article 134). It includes the following four units: Unit for biodiversity, Unit for natural heritage protection, Unit for protected areas management and geo-diversity and Unit for Genetically modified organisms (GMO). Development and enforcement of the national legislation and international agreements from the area of nature protection, approximation of the national legislation with the EU Acquis, accomplishing procedures for proclamation and governing the protected areas, record keeping about protected areas, natural heritage and exported quantities of wild plants and fungi are part of their responsibilities. Management authorities of protected areas are supervised by Nature Department to which they are submitting annual working plan and report. For the purpose of this assessment only management authorities of the three national parks (Mavrovo, Pelister and Galicica) and multipurpose area Jasen have been considered.

Department for Water (as part of the Administration of Environment) is responsible for the implementation of water management legislation and the coordination of all related activities. Information system for waters (currently under preparation) is their responsibility as well.

The Office for Spatial Information System within MoEPP is responsible for integrating spatial information and presenting this information on the Internet in order to form a single environmental information system, managed by Macedonian Environmental Information Centre (MEIC). The Office is comprised of two units (Unit for Mapping and Remote Detection and GIS Unit); the second producing GIS data mainly related to protected areas and also important for implementation of Habitats and Birds Directive.

Macedonian Environmental Information Center (in the framework of the MoEPP) is collecting and processing data regarding status of environment in Macedonia and responsible for establishing National Environmental Information System.

In addition, relevant biodiversity data is collected by the Ministry of Agriculture, Forestry and Water Economy regarding state of forests (through Public Enterprise (PE) Macedonian Forests and Forestry Faculty - Skopje), game species and hunting (through concessionaires of hunting grounds), state of pastures (through PE for pastures management), agricultural production, agrobiodiversity (in cooperation with the Faculty of Agricultural Sciences and Food), management of waters used for agricultural purposes, etc. National gene bank is managed by the Agricultural Institute. Monitoring of forest ecosystems is targeted primarily at forest coverage by type of forests, diseases and insects causing calamity occurrences and major damages on forest. Also, forest fires are monitored regularly and collected data is filled in the Macedonian forest fire information system (MAKFFIS) managed by PE Macedonian Forests.

Targeted monitoring of forest habitats and species living therein (forest biodiversity) is not completely implemented although Forestry Faculty is collecting data about old growth forests.

Macedonian Academy of Sciences and Arts, scientific institutions (of which the most active is the Faculty of Natural Sciences and Mathematics at Ss. Cyril and Methodius University in Skopje), Macedonian Natural History Museum and Hydrobiological Institute in Ohrid are the most important primary stakeholders that collect biodiversity data. Protected areas management authorities, public enterprises for forests and pasture management, are important secondary stakeholders that collect biodiversity data.

Conservation NGOs, the biggest being Macedonian Ecological Society, are important stakeholders especially in collection of biodiversity data; also, international organizations (UNDP, UNEP, SDC, REC etc.) and some private consultancy companies (Farmahem, Dekons Ema etc.) that are implementing long term biodiversity conservation projects.

As part of the GIZ ORF Biodiversity information management and reporting project (BIMR), assessment of stakeholders involved in the process of collection of biodiversity data, processing and reporting in Macedonia was initiated in September 2016 and updated in the following months during consultation process. A draft list of stakeholders includes about 40 different institutions and organizations (see Annex 1). Assessment of stakeholders based on ranking tables was conducted and results are presented in the chapters below.

3.1. Consultation process with stakeholders

For the purpose of this assessment and collection of relevant information regarding biodiversity data collection, monitoring and reporting all relevant stakeholders have been contacted either through direct meeting or different communication tools (telephone, e-mail) in the period September-December 2016. Feedback on relevant issues regarding BIMR was provided from different Departments in the Ministry of Environment and Physical Planning, Institute of Biology on the Faculty of Natural Sciences and Mathematics, Macedonian Natural History Museum, Farmahem company as a coordinator of Swiss Nature Conservation Programme in Macedonia and EU IPA funded project on development of Natura 2000 in Macedonia.

The national briefing was organized on 29 September 2016 in Skopje with participation of representatives from the Nature Department and Spatial Information System Department within MoEPP as well as GIZ experts. After explanation of BIMR concept, the Nature Department staff shortly presented relevant implemented and on-going project activities. In fact, the National Biodiversity Information System (NBIS) developed in 2011 that is currently not in use but they are expecting this system to be up and running again (hopefully by the end of this year). Also, Clearing House Mechanism on biodiversity was developed in 2015 (http://biodiverzitet-chm.mk). As a part of the on-going capacity building project for development of Natura 2000 in Macedonia, web site for sharing information about Natura 2000 will be developed (www.natura2000.gov.mk) and all data obtained through this project will contribute to NBIS update. Additionally, they mentioned the information system for waters which are mutually compatible but managed by another department which lacks GIS skills to properly maintain the system. The Nature Department staff informed that policy set

up and stakeholder assessment part of BIMR project have already been tackled and to some extent prepared in scope of other projects however none of this reports are available. They informed that reporting obligations towards European Environmental Agency (EEA), CBD and other conventions are well managed, yet they need support for Natura 2000 reporting and expecting input from BIMR project in this regard.

Croatian experience related to development of National Nature Protection Information System presented during the national briefing raised attention of the MoEPP representatives that showed interest for knowledge transfer from Croatian National Cadastre of Speleological objects and geodiversity, in particular, emphasizing their interest for Macedonia to be included in the third component of BIMR project.

Through consultations with Natura 2000 project team leader more information about project outputs were provided. The project duration is from January 2016 to March 2017. No information system will be developed as part of the project. All distribution maps for selected species and habitats present in Macedonia (from Bird and Habitat directives) that were developed during the project implementation will be submitted to the Nature Department as shape files to be incorporated in NBIS once it is restarted. Also, standard data forms will be filled in only for 7 selected sites with all available information. Although the project coordination unit (implemented by Particip and its consortium) can be classified as biodiversity data integrator, questionnaire was not filled in. As the projects ends in the following months and all collected data will be delivered to the project beneficiary - Nature Department, MoEPP.

Consultations with the Faculty of Natural Sciences and Mathematics in Skopje and Macedonian Natural History Museum, as one of the main scientific institutions that are collecting biodiversity data, were mainly related to the specific questions in the questionnaire for this kind of institutions. It was concluded that one or two questionnaires per institution are not enough to cover the scope of work and biodiversity data that is collected. Thus, additional questionnaires have been collected from the Faculty of Natural Sciences and Mathematics that give better picture regarding the species groups and habitats for which data are collected. However general conclusion is that there is no central database, data is stored on personal computers, mainly excel tables, and not shared. As regarding Natural History Museum additional consultations were done to collect relevant information. Mainly personal databases (on personal computers) are used for field observations, however collected specimens are registered in a custom build Museum database.

Protected area 'Jasen' as a multi-purpose area (IUCN cat. 6) is managed by a public institution; it had very specific status during the previous regime (protected zone of importance for the defence of the country). Still, it continued to act as a modified protected area. Through the staff interviews, it was found out that they have very weak capacities, collecting only data about game species, stored on personal computers (and willing to share) and reporting to MAFWE (due to established hunting ground) but also to MoEPP, which is not done regularly.

Meetings with the Forestry Faculty in Skopje and public enterprises for forestry and pastures management were organized during December 2016 to discuss the status with data collection and databases.

PE Macedonian Forests managed to establish the software MAKFFIS (with support of JICA) and collecting data about forests, forest fires, etc. The database is not available to the public; still several institutions are involved in this process e.g. Center for Crisis Management, MAFWE, Inspectorate, etc. They are willing to share the data but will charge for it.

PE Pastures are managing about 700.000 ha of pastures (almost all in state property) through their 10 regional offices. Pastures are available to users through separate agreements signed for period of 5 years. Currently only data about farmers, number of livestock grazing on the pasture and annual fees paid is collected and stored in special software. There is no capacity for collection of biodiversity data. PE Pastures works on preparation of a new law in line with the European legislation and plans to initiate a project together with the MAFWE for setting a proper digitalized inventory and register of pastures in Macedonia.

Information gained through the direct interviews with stakeholders was very useful for developing this assessment report.

3.2. Stakeholder analysis

After identification and prioritization of stakeholders aiming to get better insight about their role, relevance, capacity and political influence, ranking tables have been prepared using collected information and own expertise. Stakeholder analysis is presented in sub chapters below.

Overview of stakeholders by institution/organization type

As part of the BIMR project, a list of stakeholders involved in the process of collection of biodiversity data, processing and reporting in Macedonia was drafted including a total of 38 different institutions and organizations (see Annex I). Most of them are scientific institutions (8) mainly responsible for data collection, 6 governmental institutions (several ministries and governmental agencies, 6 public institutions (including national parks management authorities), 6 NGOs and 6 international organizations, 3 public enterprises (for forests and pastures management and management body of protected area 'Jasen'), as well as some private consultancy companies.
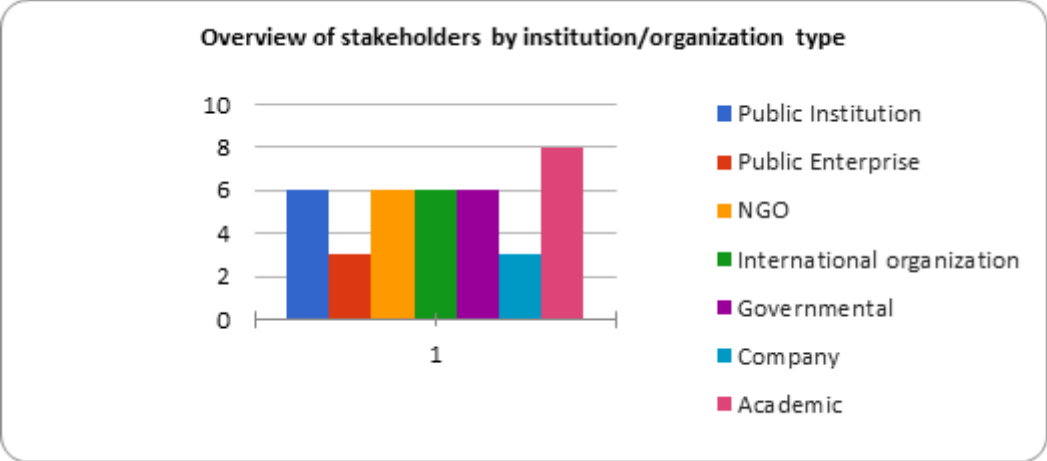
Prioritization has been done based on stakeholders' feedback and expert knowledge. Apart from MoEPP and MAFWE, Academia and scientific institutions, Macedonian Natural History Museum, Hydrobiological Institute-Ohrid, Hydro-meteorological Administration as well as conservation NGOs are of primary importance. Of course, their role in the process of biodiversity monitoring and reporting is different: some of them (mainly scientific institutions and NGOs) are collecting data through field inventory, some institutions are integrating data in different reports, data providers are presenting the results to the general public in different format, and very often institutions/organizations have combined role. Public enterprises for forests and pastures management are of secondary importance together with the Agencies for spatial planning and real estate cadastre. Local NGOs as well as international organizations and companies are of secondary importance due to discontinuous collection of biodiversity data that is usually a part of relevant biodiversity projects implementation. Stakeholders of third priority are Agency for tourism support, State Statistical Office and some NGOs that might indirectly contribute with data collection and analyses. This group also includes some international organizations that are providing financial support for biodiversity data collection and reporting, and given the fact that financial resources from national budget for biodiversity data collection are very poor they might be given a higher importance.

Overview of stakeholders by city/region

Centralization of the institutions involved in the process of collection of biodiversity data, processing and reporting is evident - the biggest part of the stakeholders (30) are based in the capital city Skopje, except for the Universities of Shtip and Tetovo, Hydrobiological Institute in Ohrid, and management authorities of the three national parks Mavrovo (Mavrovi Anovi), Galicica (Ohrid) and Pelister (Bitola).
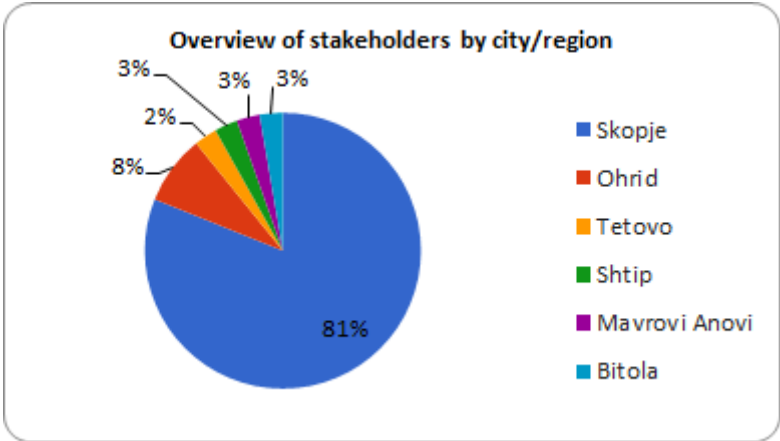
Even though they are based in Skopje, activities of scientific institutions and conservation NGOs are covering the whole territory of Macedonia.

Overview of stakeholders by political influence and relevance

Both ministries (MoEPP and MAFWE) that are of highest relevance for the process of collection of biodiversity data, processing and reporting have different levels of political

influence – most influential is MAFWE and MoEPP has lower influence. However, Academia, scientific institutions, national parks management authorities, that are of highest relevance for BIMR process especially as biodiversity data collectors have in general medium political influence. Even more, the most relevant conservation NGO Macedonian Ecological Society for biodiversity data collection and integration has low political influence, and the ongoing project on Natura 2000 has very low political influence on biodiversity related issues in the country.

High relevant international organizations Swiss Development and Cooperation Agency (SDC), UNDP country office Macedonia, UNEP office etc. that are providing financial support for different projects related to nature conservation have also high political influence. On the other hand, Universities in Shtip and Tetovo, and Ministry of Economy that are of medium relevance for BIMR process are identified as having high political influence. The rest of the stakeholders with medium to low relevance have medium to low political influence.

Overview of stakeholders by relevance and capacity

An average capacity of the most relevant governmental and scientific institutions as well as conservation NGOs is medium which leads to a conclusion that capacities are not satisfactory and there is a lack of resources (both human and financial) for establishing biodiversity information system and providing effective maintenance. None of the institutions have been assessed as having a full capacity in terms of biodiversity information management and reporting.

Human resource capacities in MoEPP, Nature Department, that is responsible for implementation of the national legislation, accomplishing procedures for protection and governing the protected areas, giving opinions about issuing licenses for trade of threatened wild species, implementation and reporting to international agreements concerning nature protection but also activities aimed at harmonizing national legislation with the EU Acquis and establishment of Natura 2000 network, are moderate (but not satisfactory to cover current and future responsibilities about biodiversity information management and reporting). Capacities of the Ministry of Agriculture, Forestry and Water Economy and public enterprises for forests and pastures management are even weaker.

Administrations of the three national parks are lacking human capacities for management of protected areas and conducting regular monitoring of biodiversity.

Scientific institutions are of very high and high relevance but with different capacities. Faculty of Natural sciences at Skopje University is probably the most relevant scientific institution that has high (but not satisfactory) capacities to cover most of biodiversity components (research on flora diversity, fungi and several fauna species groups). Capacities of MASA, Macedonian Natural History Museum, Hydrobiological institute in Ohrid are moderate.

International organizations (SDC, UNDP, UNEP, GEF SGP, etc.) are of high relevance for BIMR process because of their financial support of biodiversity related projects. Their capacities are very good in terms of developing different projects for biodiversity conservation and fundraising but usually projects are implemented through different national NGOs, consultancy companies, etc.

NGOs are important stakeholders in BIMR process in particular as data collector. Most of the environmental NGOs are in fact implementing awareness raising campaigns or policy issues and their capacities in terms of biodiversity data collection and monitoring are limited. The only conservation NGO that has a long experience in biodiversity conservation issues and wide focus of monitoring and collection of biodiversity data is Macedonian Ecological Society. Several others have very narrow focus and irregular collection of biodiversity data.

Overview of stakeholders by political influence and capacity

The Ministry of Agriculture, Forestry and Water Economy is indicated with the highest political influence however its capacities related to biodiversity data collection, processing and reporting are very weak.

MoEPP has a moderate political influence but with unsatisfactory capacities to push the upgrading of NBIS and complete the process of establishment of NBIS and its further maintenance. PE Macedonian Forests has high political influence but moderate capacities related to biodiversity. Capacities of other governmental institutions that are politically influential (Ministry of Economy, Tourism development agency, etc.) are even weaker. On the other hand, political influence of international organizations (SDC, UNDP) that financially support biodiversity related projects is high and they have very good capacities.

Some scientific institutions (MASA, Tetovo University), protected areas management authorities, Agency for spatial planning have moderate political influence and moderate capacities.

Finally, the political influence of the most important scientific institutions for biodiversity data collection (Faculty of Natural Sciences and Mathematics at Skopje University, Forestry Faculty-Skopje, Macedonian Natural History Museum, Hydrobiological Institute-Ohrid) is medium, however they have good to very good capacities (of course not enough) to implement biodiversity research projects but struggling with financial resources. Also, very good capacities for implementation of biodiversity project have conservation NGO Macedonian Ecological Society. There are some consultancy companies (e.g. Dekons, Ema) and international organizations (REC, CNVP) with good capacities, but very low political influence.

Stakeholder roles overview

Most of the stakeholders assessed during this process are data integrators (38%) and data collectors (32%). The level of data collection of different institutions is not equal. Faculty of Natural Sciences and Mathematics in Skopje as well as Macedonian Natural History Museum and Hydrobiological Institute-Ohrid are the most active institution in comprehensive biodiversity data collection. Very active NGO in data collection is Macedonian Ecological Society. Other universities in Tetovo and Shtip, governmental institutions and NGO's only sporadically collect information on biodiversity.

Governmental institutions but also international organizations, some NGOs and companies that are implementing different projects related to nature conservation are identified as data integrators. Financial support is provided mainly through international organizations and NGOs and to a lesser extent by governmental institutions.

Stakeholder roles overview

- data integrator — 38%
- data collector — 32%
- financial support — 17%
- supporting data provider — 9%
- data provider — 4%
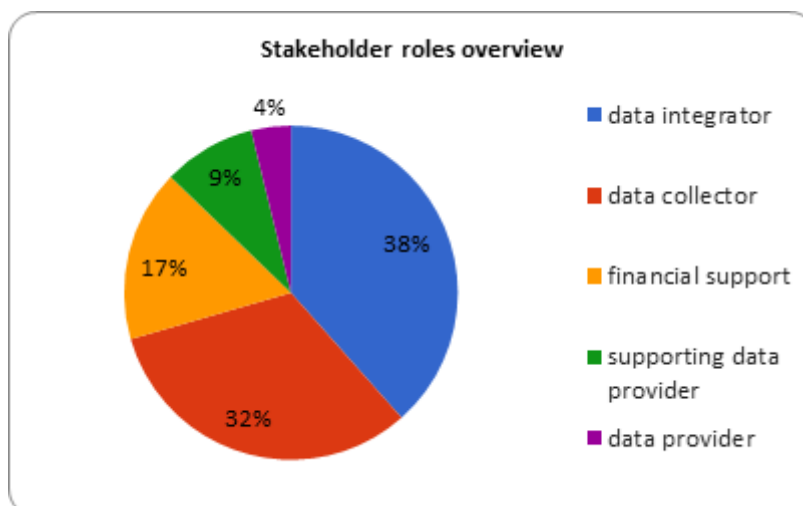
Very few organizations have been identified as data providers. State environmental inspectorate, Agency for real estate and cadastre, and the like, are identified as supporting data providers including State Statistical Office that publishes biennial report Environmental statistics based on developed national environmental indicators.

Reporting obligation overview

Reporting obligations of the country are defined from ratified international agreements as well as national legislation; imposing an obligation to establish regular monitoring of targeted species and habitats.

The Ministry of Environment and Physical Planning is responsible for reporting to the Convention on Biodiversity (CBD) and other relevant international agreements ratified by the Republic of Macedonia (Bern convention, Ramsar convention, CITES, Bonn convention etc. including UN Framework Convention on Climate Change and UN Convention to Combat Desertification). The last national report to CBD was prepared and submitted in 2014. Annual reports about international trade with endangered flora and fauna species and issued certificates are submitted to the CITES Secretariat.

MoEPP is also responsible for implementation of EU Environmental Acquis however currently only transposition of EU legislation and initial steps for establishment of Natura 2000 network are on-going (annual progress monitoring report). However, reporting obligations regarding Bird and Habitat directives will start when the negotiation process is open and after becoming an EU member state.

Macedonia cooperates with European Environmental Agency since 1997, hence MoEPP has reporting obligations towards EEA according to the requirements of EIONET (based on the developed national indicators). In 2008, 40 national environmental indicators were adopted including 3 biodiversity indicators: endangered and protected species, protected/designated areas and diversity of species. The last State of Environment Report was prepared by MEIC in 2014 available at MoEPP web site.

Ministry of Agriculture, Forestry and Water Economy has some reporting obligations towards Food and Agriculture organization (FAO).

GEF small grant programme in Macedonia and UN Agencies that are implementing GEF funded projects have reporting obligations towards GEF Secretariat.

Reporting obligations on a national level are mainly defined with national legislation still very

unclear. Management authorities of protected areas are reporting annually to MoEPP. Occasional reporting about biodiversity includes: EIA/SEA assessments (that are sent to the competent governmental authorities) as well as results of field surveys performed by academic institutions and/or NGOs are submitted to MoEPP (as an obligation from issued research permit). There are no standard forms for structured biodiversity data collection, thus a number of different reports from different stakeholders are collected by the Ministry.

Stakeholder relationships and data flow on a national level are described in the chapter below.

Stakeholder relationship mapping

Developed analyses of stakeholders for the purpose of this assessment (prioritization, relevance, legal obligations etc.) was used to prepare mapping of stakeholders (only for most relevant ones) in order to show how relevant institutions/organizations exchange data and information. Due to lack of bylaws prescribing methodology and procedures of data flow (exchange of information), access to data and maintenance of biodiversity information system the existing data flow is unclear and unsatisfactory.

A general scheme of all relevant stakeholders and their relationships in terms of biodiversity data flow is presented in Figure 1. Some of the stakeholders were grouped according similarities in obligations, data handling and reporting on biodiversity (scientific institutions and NGOs). The red arrows used in the graph indicate regular/obligatory reporting defined by actual national legislation. Black arrows indicate occasional reporting i.e. reporting by particular project or engagement. This include all forms of biodiversity data documents (reports, tables, graphs, images etc.) and not exclusively in digital format.
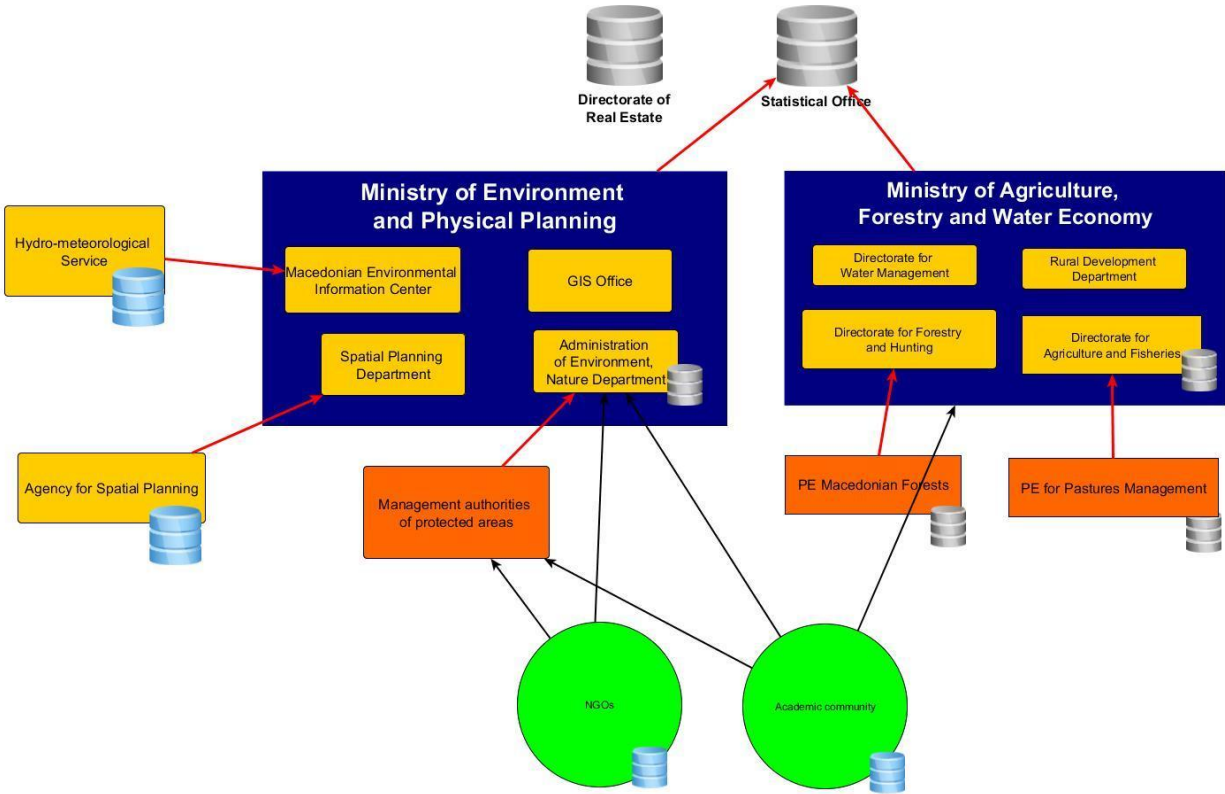
Figure 1. Conceptual chart of biodiversity data flow in Macedonia

As presented in the chart above, governance of nature conservation and natural resources management are divided between two ministries (MoEPP and MAFWE) with very weak communication and data flow. Management authorities of protected areas have legal obligation to report to the MoEPP regarding implemented management/conservation measures on annual basis. Academic institutions as well as NGOs cooperate with all institutions at all governmental levels but only on a project level or upon request by institutions. Governmental institutions are regularly providing data to the State Statistical Office; biennial environmental statistics is published.

3.3. Conclusions

The following statements (conclusions are summarizing the status of biodiversity data collection and management and maintenance of biodiversity information system:

- The only responsible institution for biodiversity data management and maintenance of NBIS is Nature Department within MoEPP; other expert body (Institute, Agency, etc.) does not exist.
- Capacities of governmental institutions for biodiversity data management (data integration and maintenance of NBIS) are very weak.
- Also capacities of academic institutions for biodiversity data collection are not enough. Procedures for structured collection of biodiversity data are not defined.
- Responsibilities in the field of natural resources management are dispersed between several ministries (MoEPP, MAFWE, Ministry of Economy, etc.); intersectoral cooperation is very weak.
- There are many different stakeholders involved in the process of biodiversity data management at different levels. Their roles are not clearly defined, likewise the data exchange procedure between governmental institutions, academic institutions and NGOs.
- The flow of data important for BIMR framework is non-functional because it is not defined by secondary legislation.
- The whole process of biodiversity data management and maintenance of NBIS is difficult due to lack of financial resources.

4. POLICY SET-UP ASSESSMENT

The legal basis for nature protection is found in the Constitution of the Republic of Macedonia (Official Gazette no. 52/91) that provides 'the right to a healthy living environment and duty to protect and improve the environment and the nature' and determines 'natural resources of the country, the flora and fauna, and amenities in common use are goods of common interest enjoying specific protection'.

A framework law regulating the protection and improvement of the environment is the Law on Environment (Official Gazette of the Republic of Macedonia No. 53/05, 81/05, 24/07, 159/08, 83/09, 48/10, 124/10, 51/11, 123/12, 13/13, 163/13, 41/14). In addition, the provisions of the special laws regulating specific environmental areas and media including nature, waters, etc. are applied. Also, international agreements ratified by the Republic of Macedonia (CBD, Bern, Bonn, Ramsar, UNESCO conventions etc.) create important legal base for nature conservation in the country.

The Ministry of Environment and Physical Planning is the body of the state administration responsible for the affairs of environment protection including nature conservation. One of the priorities in the Strategic plan of MoEPP for the period 2016-2018 is 'providing information for environment, nature and landscape, enabling public access to information, and active participation in international systems for environment, nature and landscape'.

Legislation regulating forests and pastures management, management of water used for agricultural purposes, hunting and fishing management, management of agricultural land, etc. is directly related to collection of relevant biodiversity data and its effective conservation. Implementation of this legislation is under responsibility of the Ministry of Agriculture, Forestry and Water Economy. Most of the 'field work' is, in fact, conducted by public enterprises for forests, pastures and water management, hunting ground concessionaires, fishery organisations etc.

4.1. Environment

The **Law on Environment** prescribes legal issues regarding monitoring of the environment and establishing national monitoring network (chapter V) and establishment of National Environmental Information System (NEIS) (chapter VI, articles 40-46) as a comprehensive database about the status of all specific environmental areas and media. Establishment, management and coordination of NEIS is under responsibility of the Macedonian National Information Center (article 40) that is part of MoEPP. All institutions and organizations that conduct monitoring of the environment in the country are obliged to transfer these data and information to MoEPP free of charge (article 40-a). Decision for establishing national network for monitoring of the environment was adopted in 2011 (Official Gazette of the Republic of Macedonia No. 122/11) but it only refers to the monitoring network of air quality, water and noise. Article 45 stipulates obligation for preparation of a biennial report based on the set of environmental indicators and the state of environment report every 4 years.

4.2. Nature protection

Law on Nature Protection (Official Gazette of the Republic of Macedonia No. 67/04, 14/06, 84/07, 35/10, 47/11, 148/11, 59/12, 13/2013, 163/13, 41/14, 146/15, 39/16) was adopted as a general law that regulates the protection of nature by protecting the biological and landscape diversity, and the protection of the natural heritage, in protected areas and outside of protected areas. It establishes, for the first time, IUCN categories in the protection of natural sites, regulates protection of species and habitats, prescribes monitoring activities, nature protection record keeping, financing, etc.

National Biodiversity Information System

National Biodiversity Information System (NBIS) is prescribed by article 153, to be established by the state administration responsible for the affairs of nature protection in order to strengthen management and decision-making for biodiversity protection through the application of appropriate information technologies. The NBIS is part of the National Environmental Information System.

No formal obligation regarding data exchange among institutions/organization on a national level are defined. In fact, the manner and procedure for establishing and maintaining the NBIS, including the technical and functional requirements of the system, the exchange of information and access to data shall be prescribed by secondary legislation. Decree for establishing of NBIS with Protocol on access to the database, and Contract for exchange of biodiversity information have been drafted during 2011 (as part of GEF/UNDP/MoEPP project on protected areas) however not adopted yet.

Monitoring of nature status

The body responsible for the execution of expert works in the field of nature protection shall monitor and organize the monitoring of the status of nature in accordance with the methodology for monitoring of the status of nature (Article 154). The methodology for monitoring of the status of nature shall be prescribed with the rulebook that is not developed and adopted yet. The monitoring data shall be public, except for the cases determined by law.

Law on Nature Protection further states that the body of the state administration responsible for the affairs of nature protection may award the performance of expert and scientific activities for nature protection and monitoring of nature to accredited legal entities. The Law defines requirements on the expertise and prescribes adoption of a rulebook (article 148) to define conditions regarding the equipment and business premises that need to be fulfilled by these accredited legal entities that is not yet adopted.

Records for nature protection

Nature protection records shall be established (article 149) and maintained by the Nature Department as a public record consisted of:

1. Cadastre of protected areas (article 149-a) – in which protected areas and parts of nature placed under temporary protection are registered.

2. Register of natural heritage (article 150) – in which strictly protected and protected wild species, fossils and characteristic minerals and natural rarities shall be registered. Also, data on the specimens and the collections of the zoological gardens, botanical gardens, the scientific and other similar institutions shall be matriculated in the Register of protected species as whole

Rulebook for records keeping for nature protection was adopted in 2012 (Official Gazette of RM no. 102/2012) prescribes the data to be collected and registered, the manner of establishing and keeping data, and the form and content of the template of the Cadastre and Register.

Threatened wild species i.e. those that are categorized as critically endangered, threatened and vulnerable may be proclaimed as strictly protected or protected wild species (Article 35) and shall be part of the Register of natural heritage. The **Lists of strictly protected and protected wild species** were adopted in 2011 (Official Gazette of the Republic of Macedonia no. 139/2011) without prior categorization of species based on their threat status. Red Lists of flora, fungi and fauna species and Red data book (Article 34) have not been prepared yet.

Access to information

Access to information concerning nature protection and access to justice (article 155) with reference to access to information on nature protection shall be provided in accordance with the Law on Environment.

According to article 158, the bodies, institutions, institutes and organizations competent for the execution of administrative, expert and other works in the field of nature protection shall inform the public on nature protection and nature conservation through the media, lectures, and publishing activities, as well as to notify the public about the existence of natural heritage and the possibility to visit it for the purposes of education, sightseeing and recreation.

4.3. Water management

Law on waters (Official Gazette of the Republic of Macedonia No. 87/08, 06/09, 161/09, 83/10, 51/11, 44/12, 23/13, 163/13) regulates issues concerning management of waters, shoreland and wetlands, water distribution, protection and conservation of waters, protection against harmful effects of waters, water management facilities and services, etc. Its implementation is the responsibility of Department for Waters within Administration of Environment, MoEPP. Obligation for establishing monitoring of status of water bodies is prescribed in details in chapter VI (article 144-159) as well as establishment of database for management of water resources. Aiming to inform the general public about the use of water resources, an obligation for establishing Register of all administrative decisions ('vodna kniga') is prescribed in article 160.

National water strategy (2012-2042) defines an obligation for establishing water information system (that will be available to the public) through adaptation of information system for use of water in accordance to the EU regulations.

Use of water for irrigation and hydrosystems maintenance is under the competence of the Administration of Water Management under MAFWE, regulated by the following laws:

- **Law on Water Management Companies** aimed at providing rationale water management, use, proper operation and maintenance of hydro systems, irrigation and drainage systems through water management companies as autonomous public legal entities, etc.
- **Law on Water Communities**, regulating conditions, foundation, operation and supervision of water communities (association of agricultural land owners or users, associated for the purposes of use, management, maintenance, construction, reconstruction and upgrading of the systems for irrigation and/or drainage).

4.4. Forests

Department of Forestry and Hunting within the Ministry of Agriculture, Forestry and Water Economy is responsible for enforcement of the Law on forests i.e. the affairs of management, protection, regulation and use of forests and forest land. The management of state owned forests with economic and protective features is performed by the Public Enterprise for managing state forests "Macedonian Forests (Makedonski Sumi)", while the management and conservation of forests and forest land in protected areas is carried out by the entities responsible for management (management bodies) of protected areas in accordance to the act of proclamation of PAs and the Law on Nature Protection. Management of private forests is carried out by the owners of the services to carry out professional activities in the field of forestry given by PE "Macedonian Forests" and the protected areas management authorities.

The **Law on Forests** (Official Gazette of the Republic of Macedonia, no. 64/09, 24/11, 53/11, 25/13, 79/13, 147/13, 43/14, 160/14, 33/2015, 44/2015, 147/15, 07/16, 39/16) regulates the planning, management, cultivation and protection of forests and forest land as a natural resource, under the principles of biological, economic, social and environmental acceptability, which relate to all forests and forest land regardless of ownership and purpose.

MAFWE should establish a *National inventory of forest resources* (according to article 25) which shall incorporate data pertaining to the condition of forests, the needs of forest policy, ecology, hunting, environmental protection, nature conservation, as well as for the needs of national and international organization. The content and the manner of establishing the national inventory of forest resources shall be prescribed by the Minister (it is not adopted yet).

Article 77 of the Law on Forests prescribes that MAFWE should establish and maintain the *Cadastre of forests and forest land* containing: cadastral data on forests and the forest lands, detailed maps for description of the area covered by forests and the identification and registration numbers of the owners and entities managing the forests. The form, contents and manner of keeping the Cadastre of forests and forest land shall be prescribed by the Minister (not adopted yet). Upon the request of the MAFWE and for the needs of maintaining this Cadastre, the Agency for Real Estate and Cadastre is obliged to submit cartographic and tabular data in hard copy and electronic form. The users and owners of forest who are to adopt specific plans and programs, shall be obliged to take inventory of the forests and forest land and to notify MAFWE.

MAFWE shall establish and manage the *Forestry information system* (Article 78). It shall provide all necessary information on the condition and changes of the forest reserves for the needs of planning, monitoring the conditions and reporting. The contents, methods of management and use of the information system, the inventory of forests and forest land, the manner of keeping records of the performed works and the reporting on the condition of forests shall be prescribed by the Minister.

Aiming to conduct intensive and permanent monitoring over the forest ecosystems, considering the damage caused by the weather conditions and other natural disasters which influence the change in the condition of the forests and forest land, MAFWE shall adopt a programme of measures and activities for collecting data on the forest damage and shall establish a *Register of the forest damage* (Article 79). The program is adopted for a period of two years and prepared and implemented by the Faculty of Forestry at the "Ss. Cyril and Methodius" University of Skopje. The manner of collecting data on the forest damage, the form, contents and method of keeping the Register of forest damage, as well as the manner of use of such data are prescribed by the Minister.

For the purpose of improving the monitoring over the forest fires, prevention, factors and reasons, type and size of the fire, participants and cost in the extinguishing of the fire, etc. a unique information system and a *Register of forest fires* shall be established and kept within the MAFWE (Article 80). The entities managing the forests are obliged to collect data on the forest fires and to notify the MAFWE within eight days as of the day of the outbreak of the fire. Collected data is submitted to the relevant national and international bodies and institutions upon the request thereof. The method of collecting the data, the keeping of the register of forest fires and the conditions for use of the data shall be prescribed by the Minister.

Also MAFWE shall keep records, establish and maintain a permanent *Database for the spread of the plant diseases and pests*, harmonized and connected into a single information system (article 49). Data are collected by the Faculty of Forestry at Skopje University.

4.5. Hunting

The **Law on Hunting** (Official Gazette of the Republic of Macedonia no. 26/09, 82/09, 136/11, 1/12, 69/13, 164/13, 187/13, 33/15, 147/15, 193/15) regulates breeding, protection, hunting and use of game and its parts. The game is a state property and of common interest for the Republic of Macedonia, enjoys special protection in a manner and under conditions stipulated by the Law on Hunting and the Law on Nature Protection. The Law on Hunting prescribes protection of 133 species nominated as game (110 birds and 23 mammal species) of which only 14 species are game without protection. Three ways of protection are prescribed for the protected game: closed season, temporary and permanent protection (Articles 11, 12 and 13).

The game is bred, protected and managed in accordance to the special hunting management programme. Concessionaire of the game (hunting area) is obliged to keep records for all hunting activities of wild animals without protection in the hunting ground and to report to MAFWE annually (article 50).

4.6. Agriculture

Law on Agriculture and Rural Development (Official Gazette of the Republic of Macedonia No. 49/2010; 53/2011, 126/2012, 15/2013 and 69/2013) provides legal basis for system based planning of the policies and the measures of organized agricultural policy in Macedonia. The Ministry of Agriculture, Forestry and Water Economy is responsible for its implementation.

In 2011, the **List of autochthonous agricultural plants and autochthonous livestock breeds** was published (Official Gazette of the Republic of Macedonia no.71/11). Based on this list, the Minister specifies the manner of monitoring and analysing the status of autochthonous agricultural plants and autochthonous livestock breeds in terms of their endangerment status and stipulates additional measures for preservation, collection and keeping of compulsory genetic reserves and their use in agricultural production.

Agricultural land is good of common interest for the Republic of Macedonia and enjoys special protection. The term agricultural land incorporates: fields, gardens, orchards, vineyards, olive and other perennial plantations, meadows, swamps and marshes, reed beds, fishponds, and other lands used or not used (uncultivated land) which upon application of specific measures can be activated for agricultural production, as stipulated by the **Law on Agricultural Land** (Official Gazette of the Republic of Macedonia no. 135/07, 18/11, 42/11. 148/11 and 95/12). The Agricultural Land Department within MAFWE is responsible for establishment and management of the Register on agricultural land (article 8).

Establishment of Land parcel identification system (LPIS) which is a system of identification of farmers' parcels using GIS tools was initiated in 2009 by MAFWE. These reference parcels are established on the basis of aerial photography or satellite imagery, land registry documents and consultations with farmers. Each reference parcel is uniquely identified and serves as the basis for the management of farmers' applications for subsidies

The **Law on Livestock Breeding** (Official Gazette of the Republic of Macedonia No. 7/2008, 116/2010 and 23/2013), article 54 defines 11 autochthonous breeds (the cattle Busha, Karakachanska, Ovchepolska and Sharplaninska sheep, Balkan goat, local primitive pig, domestic hen, domestic buffalo, domestic horse, domestic donkey, Macedonian bee and shepherd's dog Sharplaninec). The system for characterization, monitoring and recording (inventory) of local breeds and monitoring of the trends and threat extent of local breeds is under construction.

The operation of the Gene-Bank is regulated by the **Law on Seeds and Seedlings** (Official Gazette of the Republic of Macedonia no. 55/11), where Article 54 requires that reference

samples of seeding material are kept in gene-bank. Under the Law, Rulebook on the quantities, conditions and manner of keeping reference samples of agricultural plants species and varieties, as well as the manner of gene-bank operation (Official Gazette of the Republic of Macedonia no. 144/11) was developed. Gene-Bank is established in the Institute of Agriculture in Skopje and operates as a national gene-bank. The Gene-Bank also keeps seeds of medicinal and aromatic plants, and plants were planted in the Botanical garden of the Faculty of Natural Sciences and Mathematics.

4.7. Pastures

The **Law on Pastures** (Official Gazette of the Republic of Macedonia, no. 3/98, 101/00, 105/09, 116/10, 164/13, 193/15, 215/15) regulates the management, use and promotion of pastures in state ownership, as good of public interest, but it needs fundamental revision. PE for pastures management is responsible for its implementation. A 10-years program for management of state-owned pastures (Article 5) is adopted by the Government of the Republic of Macedonia. Annual programme of work is prepared by the PE for pastures and annual report for implementation of the programme is submitted to the Government with prior given consent by MAFWE.

According to Article 8-a of the Law of Pastures, PE for pastures has an obligation to prepare and maintain a Register of state-owned pastures and the form, content and manner of keeping the Register shall be prescribed with secondary legislation. Neither the bylaw nor the register have been established yet.

Gaps in the Law on Pastures imposed the need for preparation of a new law that is currently under development.

4.8. Conclusions

- The primary legislation concerning establishment of general environmental information system in the country including of biodiversity information system is developed; however, details about establishment of NBIS especially data exchange procedures are not yet prescribed and adopted.
- Secondary legislation related to establishment of national biodiversity monitoring programme and accredited legal entities responsible for monitoring is not prescribed.
- Establishment of different databases related to natural resources management are prescribed with different legislation and under competences of different ministries or institutions. Interference and relationships between databases are not clearly defined and intersectoral cooperation is very weak.

5. INFORMATION SYSTEM SET-UP ASSESSMENT

5.1. National biodiversity information system in Macedonia

The first step towards establishing National biodiversity information system (NBIS) in the Republic of Macedonia was made in the period 2010-2011, in the framework of the UNDP/GEF/MoEPP Project on protected areas. At that time, software application with web portal (nbis.moepp.gov.mk) was developed; prior available information on biological diversity in the Republic of Macedonia synthesized as Catalogue of Species was transformed into database; all available information regarding protected areas and areas proposed for protection identified as important for biological diversity, as well as existing data on biological diversity in several protected areas, were connected to the central SQL database. This system comprises data on around 10000 taxa, geographical and administrative data on around 250 areas and around 30,000 entries of species distribution in these areas. At the moment, the NBIS is not operational, it needs hardware and software upgrading. Also, there is a need for adoption of the secondary legislation prescribing exchange of biodiversity data (obligatory data flow), access to the database and database maintenance. Apart from legal basis, training of adequate staff for its maintenance is necessary for functioning of NBIS.

5.2. Ongoing initiatives related to biodiversity information system

The following projects might contribute towards the re-establishment and update of biodiversity information system in the country.

1. IPA TAIB 2011 - Strengthening the central and local administrative capacity for the implementation of Natura 2000 in the Republic of Macedonia project is planned to prepare inventory for development of EU ecological network Natura 2000 in the Republic of Macedonia. Distribution maps of habitats and species from Annex I and II of the Habitats Directive present in the country were prepared in the grid 5x5 km. Standard data forms for 7 selected future Natura 2000 sites will be filled in with all available information.

2. Swiss Nature Conservation programme in Macedonia – financed by SDC, supporting nature conservation and local development in the eastern part of the country, in particular Bregalnica Region. One of its components during the first phase of the programme was to support preparation of ecological gap analysis (biodiversity data for all species groups were collected and stored in a custom developed database in Memento) and development of ecological sensitivity map. This enabled identification, qualitative analysis and valorisation of the biodiversity in Bregalnica region, and will provide guidelines and recommendations for nature conservation and sustainable use.

3. GEF/UNEP/MoEPP Project "Achieving biodiversity conservation through creation and effective management of protected areas and the integration of biodiversity into land use planning", is structured in three components: increase of protected areas network; increased effectiveness of biodiversity management; and land use planning and biodiversity mainstreaming. Apart from contribution to expand the network of protected areas and improve management, this project will provide support for the preparation of national Red Lists and developing red list index, identification of biodiversity rich forests etc. The results of

this project will serve as a basis for planning of nature conservation and biodiversity in Macedonia.

Also, other projects that are supporting collection of biodiversity data are important to be mentioned mainly because their results should be used for updating of NBIS (once it is re-established):

- Balkan Lynx recovery programme – Macedonian Ecological Society in cooperation with other stakeholders has been continuously monitoring the Balkan lynx for more than 10 years aiming to undertake appropriate measures to recover this critically endangered species through lobbying for designation of new protected areas, involvement of local population in monitoring and research, education, etc.
- GIZ Project for Conservation and Sustainable Use of Biodiversity at Lakes Prespa, Ohrid and Shkodra/Skadar (CSBL) with the objective to set up transboundary monitoring schemes for the conservation of selected species and habitats at Lakes Prespa, Ohrid and Skadar
- SDC/UNDP project for 'Restoring the Health of the Strumica River Basin' - supports developing capacities or biological monitoring
- Continuous monitoring of vultures and other bird species (implemented by Macedonian Ecological Society) gave basis for quantitative assessments of the populations of certain priority species and documentation of trends in the populations of certain bird species (Griffon Vulture, Egyptian Vulture, Lesser Kestrel, Imperial Eagle).
- Continuous investigations under the Project "Flora of the Republic of Macedonia" implemented by the Macedonian Academy of Sciences and Arts resulted in publication of all books in Volume I and the first book in Volume II.
- Promotion and monitoring of selected plant species in several Important Plant Areas in the country is conducted by Macedonian Ecological Society in cooperation with local NGOs or informal groups.
- etc.

5.3. Data collection

Primary biodiversity data collectors in Macedonia are universities (including their scientific institutes), museums and some NGOs. Institute of Biology (Faculty of Natural Sciences and Mathematics, Ss. Cyril and Methodius University) has the highest human capacities in terms of biodiversity data collection. However, data is used in scientific purposes and limited to small groups of scientists.

Institute of Biology (Faculty of Natural Sciences and Mathematics) collects data on fungi, vascular plants, aquatic invertebrates, selected groups of land invertebrates, algae (mainly diatoms), fish, amphibians and reptiles, birds and mammals as well as plant communities and habitats. The following collections were established and are maintained: Macedonian collection of fungi - MACFUNGI (30000 specimens), Macedonian National Herbarium (~ 171500 specimens), Macedonian national diatom collection - MKNDC (10,600 samples & over 30,000 slides), Macedonian national collection of invertebrates (over 10,000 specimens). All of these collections are not maintained by custodians, rather they are an obligation of the

permanent staff involved in research and education. The specimens of these collections are collected within research projects (supported by the Ministry of Education and Science) and some other applied projects. Unfortunately, such research projects have not been financed since 2008. The data is stored in different types of databases software (mostly excel databases, and in some cases in specialized software - e.g. Turboveg). This data is published in scientific articles, otherwise there is no public access to the databases.

Macedonian Natural History Museum in Skopje is the oldest institution in biological science established in the country. Its main tasks include research on species taxonomy and gathering and presentation of museum collections. It maintains the largest collection of species, especially of animal species. The collection is maintained by custodians of fossils, birds, vertebrates, insects, invertebrates and vascular plants. The collection is supplement with new specimens by small grant projects supported by the Ministry of Culture of the Republic of Macedonia. The data is stored in standard Registry Books (legal obligation), word documents and excel files, but also in some specialized software (e.g. FoxPro). This data is not public (apart from several scientific papers) and are used mainly for maintenance of the collections.

The National Museum Nikola Nezlobinsky in Struga holds and interesting collection of flora and fauna. However, the collection is poorly maintained and at the moment there is only one biologist that curates the collection. It is the legal obligation for this Museum as well to keep the data in the Registry Books.

Hydrobiological Institute in Ohrid collects specimens primarily from Ohrid lake, but also from other natural lakes (Prespa and Doyran) and some river ecosystems. The research and collection is targeted towards fish fauna, zooplankton, phytoplankton, bottom-dwelling animal species (particularly aquatic snails) and fish parasites. This data is also used for scientific purposes and there is no public access. However, Hydrobiological Institute is responsible for conducting monitoring of Ohrid, Prespa and Doyran lakes, rivers entering the lakes, littoral zone before them and one measuring point in the pelagial of each lake.

Monitoring of river surface waters in Macedonia is performed by Hydro-meteorological Administration that manages the system for river monitoring (RIMSYS); 20 monitoring stations are defined in the frame of this monitoring programme. Unfortunately, this automatic system monitors only water level in rivers and water temperature (and other physical-chemical parameters), although it has been designed and applied to monitor very important parameters of relevance for the assessment of the quality of surface waters. Recently, HMA started developing capacity for biological monitoring (through the Restoring the Health of the Strumica River Basin project) in order to comply with the provisions of the Law on waters.

The Reporting diagnosis and prognosis service of the Faculty of Forestry in Skopje, through network of bio-indicating points, monitors the changes in forest health status on national level. Programme of measures and activities for collection of data on the extent of damage of forests is prepared and implemented by the Faculty of Forestry at Skopje University. A bylaw regulating details regarding establishment of the Register is adopted by MAFWE. The Register is not available.

MAKFFIS (Forest Fire Information System) database is established through JICA support in cooperation with the national Center for Crisis Management, PE Macedonian Forests, MAFWE, Hydro-Meteorological Service, Faculty of Forestry, Firefighting Union of Macedonia, and the Regional Fire Monitoring Center (RFMC); currently managed by PE Macedonian

Forests. Very few information of this database is available to the public (http://mkffis1.cuk.gov.mk/GISFINAL_public/gisV1/)

MASIS database has been recently established giving information about soil types and distribution in the country http://www.maksoil.ukim.mk/masis/. It was developed by several scientific institutions, MAFWE and with support of FAO and will be managed by Agricultural Institute in Skopje.

Macedonian Ecological Society conducts research and monitoring of birds (with emphasis of vultures, birds of prey and waterfowls), lynx and large carnivores and plant species. The data of the research and monitoring are stored in MS Access and ArcGIS. The databases are updated on regular basis.

5.4. Data processing and analysis

As indicated by interviewed stakeholders during this assessment, the data is collected mainly through field observations, some of them are taking photographs, audio records, collecting specimens, and only few of them are using remote sensing and features from maps and GIS data.
Collected data in field are stored in different formats; most data collectors are using tables in excel format; lower number uses databases (e.g. Access, SQL Server) or their own software solutions (custom-made databases) and very few geospatial data. There are still few cases collected data to be stored in text files.

Due to different and unstandardized format of data storage, data processing and analysis has been identified as one of obstacles in most of the institutions dealing with biodiversity information. This is especially relevant for developing indicators and/or using statistical approach for biodiversity analysis. Thus, even collected data is hardly usable for reporting purposes as well as biodiversity management efforts.

5.5. Data provision and data use

During the stakeholder assessment process in Macedonia most institutions identified readiness to share their data with individual researchers, training and education institutions and some of them with decision making institutions. Some institutions clearly indicated that they will share the data only upon payment for it; others indicated that are not ready to share unpublished data.

5.6. Information system financial and staff capacities

In Macedonia, there is no separate budget line allocated for protection of biodiversity including establishment and maintenance of biodiversity information system. Creation of NBIS was supported through international funding (which is acceptable). However, after project finalization there is no budget for maintenance of the system. Also data collected through other projects (whether they are implemented by scientific institutions, NGOs or companies) are not incorporated in NBIS.

Staff capacities (Nature Department in MoEPP) are far below the needs to maintain such system. There is no other expert body in the country to collect and integrate biodiversity data. Management authorities of protected areas have very low capacities (and not adequately trained) to provide biodiversity information to Nature Department and to use some standard format or software in order to make information provision smooth. Capacities and skills are also lacking in other data collectors. These are the main challenges regarding re-establishment

and maintenance of NBIS that should help in reporting process towards different international organizations.

5.7. Conclusions

- Regular collection of biodiversity data is not established. Primary biodiversity data collectors in the country are universities but still not covering all taxonomic groups. Some NGOs are also contributing to data collection. It is mainly done through implementation of internationally funded projects and usually during the project life span.
- Biodiversity data collection and storing is not done in standardized format.
- There is almost no financial support for primary collection of biodiversity data and maintenance of the information system.
- A lot of efforts have been put for establishing of National biodiversity information system (NBIS) in the country during 2010-2011, however it is currently non-functional. Financial constraints, not defined data exchange procedures and lack of capacities can be pointed out as main gaps.

6. CONCLUSIONS AND RECOMMENDATIONS

Based on the conducted analyses of stakeholders and legal framework in the country related to BIMR process the following conclusions and recommendations can be given:

– Existing legal framework only generally imposes establishment of NBIS, however, no details about data flow are defined. Secondary legislation needs to be completed and adopted in order to define procedures for exchange of information and access to data, including technical and functional requirements of the system.

– Responsible institutional for establishing and maintenance of NBIS is MoEPP (Nature Department) that is the only organisational unit (in the framework of the MoEPP and overall, on a national scale) for implementation of expert matters from the field of nature protection. Several assessments and strategic documents identify the need for establishment of other expert body (agency of environment or state institute for nature) in the country.

– Capacity of responsible institutions for both data collection and data processing are weak. There is a need of additional adequate staff, equipment, as well as adequate training for standardized data collection and use of software solutions.

– Comprehensive monitoring and collection of biodiversity data has not been established; monitoring programme and methodology are not developed; responsible institutions for monitoring are not accredited. Thus, even with the existing data, reporting obligations of the country are limited. Rulebook defining conditions regarding the equipment and business premises that need to be fulfilled by these accredited legal entities should be adopted as well as monitoring programme (with protocols) of the status of nature shall be prescribed.

– Currently, monitoring of biodiversity (for selected species and habitats) and collection of data is conducted by scientific institutions and conservation NGOs mainly through implementation of internationally funded projects. The Ministry of Education and Science financed research projects till 2008. Thus, activities are implemented during the project lifespan; this cannot provide sustainability and continuation of data collection. Implementation of international projects should be also supplemented with national budget for research of biodiversity; this will also allow streamlining/synchronization of different activities in the country and avoid duplication.

– There is almost no national budget allocated to biodiversity conservation in general (including data collection and establishment of NBIS). Dedication of separate budget line annual allocations for biodiversity are prerequisite for maintenance and long-term running of NBIS.

– Developed NBIS is not functional; collected data through other relevant projects are not adequately used. Allocation of funds and training of staff for re-starting of NBIS is very important; data flow needs to be defined; also, for further update and maintenance results of different project should be used.

– Recently developed National Strategy for Nature Protection (not adopted yet) prescribes the development of Cadastre for Geodiversity. Croatian experience might be

used for establishing this database.

–   Development of Natura 2000 Network in the country is in initial phase; many data about Natura 2000 species and habitats are lacking. Collection of relevant data is a prerequisite for implementing Natura 2000 reporting obligations towards EC.

Based on the conducted analysis of the stakeholders and policy framework in the country related to BIMR process as well as current situation with national biodiversity information system, the following recommendations can be proposed:

Improvement of legislation

–   Adopt bylaws of the Law of Nature Protection which will regulate organizational, technical and procedural mechanisms of data collecting, storing and exchange of biodiversity data.
–   Create legal framework and develop feasibility study for establishment of other expert body for biodiversity data management (agency of environment or state institute for nature) and support its establishment.
–   Develop national biodiversity monitoring programme and methodology and adopt rulebook defining conditions regarding the equipment and business premises that need to be fulfilled by accredited legal entities responsible for monitoring.

Strengthening inter sectoral cooperation

–   Provide legal and technical conditions for efficient exchange of biodiversity data with institutions (ministries, public enterprises) responsible for management of natural resources.
–   Implement international experiences dealing with data sharing protocols and 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.
–   Define lists of species and habitats (minimum and optimal set of attributes of field data in accordance with international standards) that will be requested from data collectors supported by public funding (could be part of the national biodiversity monitoring programme).
–   Establish regular monitoring of Natura 2000 species and habitats in accordance to EU directives protocols.
–   Restart and update the NBIS.
–   Develop Register of Natural Heritage and Cadastre for geodiversity (as part of NBIS).

Capacity building

- Improve the capacities of Nature Department as main biodiversity data integrators for incorporating biodiversity data into the NBIS.
- Improve capacities of scientific institutions and NGOs for standardized collection and efficient handling of "raw biodiversity data" and reaching full compatibility of their databases.
- Strengthen capacities of Nature Department for reporting about Natura 2000.
- Provide systematic financial support for biodiversity conservation including data collection and maintenance of NBIS.

7. ANNEXES

Annex 1. List of stakeholders

	Governmental institutions
	Governmental institutions
1	Ministry of Environment and Physical Planning
2	Ministry of Agriculture, Forestry and Water Economy
3	Ministry of Economy
4	State Environmental Inspectorate
5	Agency for Spatial Planning
6	Agency for real estate cadastre
7	Agency for Promotion and Support of Tourism
	Scientific institutions
8	Macedonian Academy of Sciences and Arts
9	University Ss 'Cyril and Methodius' Skopje, Faculty of Natural Sciences and Mathematics, Institute of Biology
10	University Ss 'Cyril and Methodius' Skopje, Faculty of Forestry
11	University Ss 'Cyril and Methodius' Skopje, Institute of Pharmacology, Faculty of Pharmacy
12	University 'Goce Delcev' Shtip, Faculty of Natural and Technical Sciences
13	Macedonian Natural History Museum
14	Hydrobiological Institute
15	State University Tetovo, Faculty of Natural Sciences and mathematics
	Public institutions
16	National Hydro-meteorological Service
17	State Statistical Office
18	PI National Park Galicica
19	PI National Park Mavrovo

20	PI National Park Pelister

Public enterprises

21	PE for Pastures Management
22	PE Macedonian Forests
23	PE Multipurpose area JASEN

NGOs

24	BIOECO
25	Connecting Natural Values and People
26	Lymnological Society
27	Macedonian Ecological Society (MES)
28	Society for study and protection of birds in Macedonia
29	Ursus Speleos

International organizations

30	GEF Small Grands Programme (GEF SGP)
31	Swiss Development and Cooperation Agency
32	UNDP Office Macedonia
33	UNEP Vienna Office
34	Regional Environmental Center
35	KfW

Private consultancy companies

36	Dekons-Ema
37	Farmahem
38	EuropeAid project on Natura 2000

Annex 2. List of consulted documentation

GEF Small Grant Programme in Macedonia. More information on the projects' results are available at: www.gefsgpmacedonia.org.mk

Macedonian Ecological Society (2011). Report for development of NBIS (GEF/UNDP/MEPP project "Strengthening the environmental, institutional and financial sustainability of the system of protected areas in Macedonia "), Skopje

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MoEPP (2003). Country study for biodiversity of the Republic of Macedonia - First national report. Ministry of Environment and Physical Planning, Skopje,

MAFWE (2014). National strategy for agriculture and rural development (2014-2020), Skopje

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MoEPP (2014). State of Environment Report, Skopje http://www.moepp.gov.mk/wp-content/uploads/2015/03/SOER-en-Godisen-2013-za-web-EN.pdf

MoEPP (2017). Draft National Strategy for Nature Protection (2017-2027), Skopje

Petkovski, S. (2009). Analysis and valuation of biodiversity at national level (report) and national catalogue (check-list) of species in digital form. Skopje

Perennou, C., Gletsos, M., Chauvelon, P., et al. (2009). Development of a Trans-boundary Monitoring System for the Prespa Park Area. SPP, Agios Germanos, Greece.

SDC/Farmahem/MoEPP "Programme for Conservation of Nature in Macedonia". More information about the programme are available at: www.bregalnica-ncp.mk

State Statistical Office of the Republic of Macedonia (2014). Environmental Statistics, Skopje

Constitution of the Republic of Macedonia (Official Gazette no. 52/91)

Law on Environment (Official Gazette of the Republic of Macedonia No. 53/05, 81/05, 24/07, 159/08, 83/09, 48/10, 124/10, 51/11, 123/12, 13/13, 163/13, 41/14)

Decision for establishing national network for monitoring of the environment (Official Gazette of the Republic of Macedonia No. 122/11)

Law on Nature Protection (Official Gazette of the Republic of Macedonia No. 67/04, 14/06, 84/07, 35/10, 47/11, 148/11, 59/12, 13/2013, 163/13, 41/14, 146/15, 39/16)

Rulebook for records keeping for nature protection (Official Gazette of RM no. 102/2012)

Lists of strictly protected and protected wild species (Official Gazette of the Republic of Macedonia no. 139/2011)

Law on waters (Official Gazette of the Republic of Macedonia No. 87/08, 06/09, 161/09, 83/10, 51/11, 44/12, 23/13, 163/13)

Law on Water Management Companies (Official Gazette of the Republic of Macedonia No. 85/03, 95/05, 103/08, 1/12, 95/12)

Law on Water Communities (Official Gazette of the Republic of Macedonia No. 51/03, 95/05, 113/07, 36/11)

Law on Forests (Official Gazette of the Republic of Macedonia, no. 64/09, 24/11, 53/11, 25/13, 79/13, 147/13, 43/14, 160/14, 33/2015, 44/2015, 147/15, 07/16, 39/16)

Law on Hunting (Official Gazette of the Republic of Macedonia no. 26/09, 82/09, 136/11, 1/12, 69/13, 164/13, 187/13, 33/15, 147/15, 193/15)

Law on Agriculture and Rural Development (Official Gazette of the Republic of Macedonia No. 49/2010; 53/2011, 126/2012, 15/2013 and 69/2013)

List of autochthonous agricultural plants and autochthonous livestock breeds (Official Gazette of the Republic of Macedonia No.71/11)

Law on Agricultural Land (Official Gazette of the Republic of Macedonia No. 135/07, 18/11, 42/11. 148/11 and 95/12)

Law on Livestock Breeding (Official Gazette of the Republic of Macedonia No. 7/2008, 116/2010 and 23/2013)

Law on Seeds and Seedlings (Official Gazette of the Republic of Macedonia no. 55/11)

Rulebook on the quantities, conditions and manner of keeping reference samples of agricultural plants species and varieties, as well as the manner of gene-bank operation (Official Gazette of the Republic of Macedonia no. 144/11)

Law on Pastures (Official Gazette of the Republic of Macedonia, no. 3/98, 101/00, 105/09, 116/10, 164/13, 193/15, 215/15)

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