

# Integrated Biodiversity Management, South Caucasus

## Options for the Management of Biodiversity and Forestry Data, Georgia



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**Report**

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## Abbreviations

|              |   |
|--------------|---|
| ABC          | Abiotic-Biotic-Cultural baseline research methodology   |
| APA          | Agency of Protected Areas under MoENRP of Georgia   |
| BalkanGEONet | FP7 project ( <a href="http://balkangeo.net">http://balkangeo.net</a> )   |
| BD           | Biodiversity  |
| BD DB        | Biodiversity database   |
| BISE         | Biodiversity Information System for Europe  |
| BMP          | Biodiversity Monitoring Programs  |
| BPS          | Biodiversity Protection Service of MoENRP   |
| BMZ          | Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung  |
| CC0          | <a href="http://creativecommons.org/choose/zero">http://creativecommons.org/choose/zero</a>                                       |
| CC-BY        | <a href="https://creativecommons.org/licenses/by/4.0">https://creativecommons.org/licenses/by/4.0</a>                             |
| CC-BY-NC     | <a href="https://creativecommons.org/licenses/by-nc/4.0">https://creativecommons.org/licenses/by-nc/4.0</a>                       |
| CBD          | Convention on Biodiversity  |
| CBD CHM      | CBD Clearinghouse Mechanism   |
| CBMN         | Caucasus Biodiversity Monitoring Network  |
| CENN         | Caucasus Environmental NGO Network  |
| CI           | Conservation International  |
| CLASLite     | Carnegie Landsat Analysis System – Lite ( <a href="http://claslite.carnegiescience.edu">http://claslite.carnegiescience.edu</a> ) |
| CNF          | Caucasus Nature Fund  |
| CSW          | OGC’s Catalog Service for Web   |
| CoE          | Council of Europe   |
| DB           | Database  |
| DMP(s)       | Data Management Plan(s)   |
| EBP          | European Biodiversity Portal  |
| EC           | European Commission   |
| EEA          | European Environmental Agency   |
| EGIDA        | FP7 project ( <a href="http://egida-project.eu">http://egida-project.eu</a> )   |
| EIA          | Environmental Impact Assessment   |
| EIEC         | Environmental Information and Education Centre under MoENRP of Georgia  |
| EIONET       | European Environment Information and Observation Network  |
| EML          | Ecological Metadata Language  |
| EN           | Emerald Network   |
| ENPI-SEIS    | Toward SEIS in the European Neighbourhood   |
| enviroGRIDS  | FP7 project ( <a href="http://envirogrids.net">http://envirogrids.net</a> )   |
| EO           | Earth Observations  |
| EOPower      | FP7 project ( <a href="http://www.eopower.eu">http://www.eopower.eu</a> )   |
| ERMS         | European Register of Marine Species   |
| ESRI         | Environmental Systems Research Institute ( <a href="http://esri.com">http://esri.com</a> )  |
| ET           | EvapoTranspiration  |
| EU           | European Union  |
| EU BON       | European Union Biodiversity Observation Network   |
| EU BON       | FP7 project ( <a href="http://eubon.eu">http://eubon.eu</a> )   |
| EUNIS        | European Nature Information System  |
| FAIR         | Findable, Accessible, Interoperable, and Re-usable (data principles)  |
| FIRMS        | NASA’s Fire Information for Resource Management System  |
| FP7          | EU’s research 7 <sup>th</sup> Framework Programme   |
| FPS          | Forest Policy Service of MoENRP   |
| GBIF         | Global Biodiversity Information Facility  |
| GEF          | Global Environment Facility   |
| GE           | Internet code for Georgia   |
| GEL          | Georgian Lari   |

|            |  |
|------------|--|
| GEO        | Group on Earth Observations  |
| GEO        | ISO country code for Georgia   |
| GeoGraphic | GIS and RS Consulting Center GeoGraphic, Georgia   |
| GEO BON    | GEO Biodiversity Observation Network   |
| GEONetCaB  | FP7 project GEO Network for Capacity Building ( <a href="http://www.geonetcab.eu">http://www.geonetcab.eu</a> )          |
| GEOSS      | Global Earth Observation System of Systems   |
| GeoStat    | National Statistics Office of Georgia ( <a href="http://geostat.ge">http://geostat.ge</a> )                              |
| GFA        | GFA Consulting Group   |
| GFW        | Global Forest Watch  |
| GI-cat     | Data broker catalog service  |
| GIS        | Geographic Information System  |
| GIZ        | Deutsche Gesellschaft für Internationale Zusammenarbeit ( <a href="https://giz.de">https://giz.de</a> )                  |
| GLC        | Global Land Cover in 30 metre resolution ( <a href="http://www.globallandcover.org">http://www.globallandcover.org</a> ) |
| GLOBIL     | Global Observation and Biodiversity Information Portal ( <a href="http://globil.panda.org">http://globil.panda.org</a> ) |
| GoG        | Government of Georgia  |
| GPS        | Global Positioning System  |
| H2020      | EU's Horizon 2020 research programme   |
| HPP        | Hydro Power Plant  |
| IASON      | FP7 project ( <a href="http://iason-fp7.eu">http://iason-fp7.eu</a> )  |
| IBiS       | GIZ's Integrated Biodiversity Management in South Caucasus   |
| ICCAMGR    | Institutionalisation of climate change adaptation & mitigation in Georgian regions                                       |
| IMS        | Information Management System  |
| INSPIRE    | Directive on Infrastructure for Spatial Information in the European Community  |
| IPT        | GBIF's Integrated Publishing Toolkit   |
| ISO        | International Standards Organisation   |
| ISU        | Ilia State University  |
| ISU IoZ    | Ilia State University Institute of Zoology   |
| ISU IoB    | Ilia State University Institute of Botany  |
| ISU IoE    | Ilia State University Institute of Ecology   |
| ISU NE     | Ilia State University School of Natural Sciences and Engineering   |
| ITIC       | International Telecommunications and Information Center, Georgia   |
| IUCN       | International Union for the Conservation of Nature   |
| JRC        | Joint Research Centre of the European Commission   |
| KfW        | Kreditanstalt für Wiederaufbau   |
| KNP        | Kolkheti National Park   |
| LENS       | WWF's Learning Exchange for Network Science ( <a href="http://wwfscience.org">http://wwfscience.org</a> )                |
| LEPL       | Legal Entity of Public Law in Georgia  |
| LiDAR      | Light Detection and Ranging  |
| MDF        | Municipal Development Fund under MoRDI of Georgia  |
| MEA        | Multilateral Environmental Agreements  |
| MIA        | Ministry of Internal Affairs of Georgia  |
| MoENRP     | Ministry of Environment and Natural Resources Protection of Georgia  |
| MoF        | Ministry of Finance  |
| MoJ        | Ministry of Justice of Georgia   |
| MoA        | Ministry of Agriculture of Georgia   |
| MoESD      | Ministry of Economy and Sustainable Development of Georgia   |
| MoRDI      | Ministry of Regional Development and Infrastructure of Georgia   |
| MoU        | Memorandum of Understanding  |
| NACRES     | NGO Noah's Arch for the Recovery of Endangered Species   |
| NAPR       | National Agency of Public Registry under MoJ of Georgia  |
| NASA       | National Aeronautics and Space Administration of United States of America  |
| NBMN       | National Biodiversity Monitoring Network   |
| NBSAP      | National Biodiversity Strategy and Action Plan of Georgia  |
| NGO        | Non-Governmental Organisation  |

|              |   |
|--------------|---|
| NDVI         | Normalized Differential Vegetation Index  |
| NEA          | National Environment Agency under MoENRP of Georgia   |
| NBMS         | National Biodiversity Monitoring Systems  |
| NFMS         | National Forest Monitoring Systems  |
| NFA          | National Forestry Agency  |
| NP           | National Park   |
| NSDI         | National SDI of Georgia   |
| NVE          | The Norwegian Water Resources and Energy Directorate  |
| OBSERVE      | FP7 project ( <a href="http://observe-fp7.eu">http://observe-fp7.eu</a> )   |
| OGC          | Open Geospatial Consortium  |
| PA(s)        | Protected Area(s)   |
| PEGASO       | FP7 project ( <a href="http://pegasoproject.eu">http://pegasoproject.eu</a> , <a href="http://pegasosdi.uab.es/geoportal">http://pegasosdi.uab.es/geoportal</a> ) |
| PESI         | Pan-European Species directories Infrastructure   |
| PNF          | Permanent Networking Facility   |
| QA/QC        | Quality Assurance/Quality Control   |
| REC-Caucasus | Regional Environmental Centre of Caucasus   |
| REDD+        | Reducing Emissions from Deforestation and Forest Degradation +  |
| RS           | Remote Sensing  |
| SDF          | Standard Data Form  |
| SDI          | Spatial Data Infrastructure   |
| SEA          | Strategic Environmental Assessment  |
| SEIS         | EU's Shared Environmental Information Systems   |
| SIDA         | Swedish Agency of International Development   |
| SME          | Small and Medium size Enterprise  |
| SMBP         | GIZ's Sustainable Management of Biodiversity Project  |
| SPPA         | KfW-funded Support Programme for Protected Areas for Georgia  |
| SPSS         | A proprietary statistical software package  |
| SWOT         | Strengths-Weaknesses-Opportunities-Threats analysis   |
| TSU          | Tbilisi State University  |
| TJS          | BMZ's Transboundary Joint Secretariat   |
| TRIPLE I     | Integrated Management System for PAs proposed by GFA  |
| TRMM         | Tropical Rainfall Monitoring Mission (precipitation radar satellite constellation)  |
| UNDP         | United Nations Development Programme  |
| UNEP         | United Nations Environment Programme  |
| UNFCCC       | United Nations Framework Convention on Climate Change   |
| UNIGE        | University of Geneva, Switzerland   |
| UNS          | University of Novi Sad, Serbia  |
| USAID        | United States Agency for International Development  |
| VWS          | VolkswagenStiftung (Volkswagen Foundation)  |
| WB           | The World Bank Group  |
| WG           | Working Group   |
| WMO          | World Meteorological Organisation   |
| WRI          | World Resources Institute   |
| WWF          | World Wildlife Fund   |
| XML          | eXtensible Mark-up Language   |

## Introduction

Monitoring biodiversity as well as monitoring forests and forest management is the basis of sound development and sustainable governance. GIZ's Sustainable Management of Biodiversity Programme (SMBP) had been advising all three countries of the South Caucasus in setting up the National Biodiversity Monitoring Systems (NBMS), as well as the National Forest Monitoring Systems (NFMS). Within the frame of its newly initiated follow-up programme on "Integrated Biodiversity Management, South Caucasus – IBiS", GIZ continues to support the NBMS and NFMS through technical assistance, capacity development (especially in data collecting, analysis and management, including GIS), as well as limited procurement.

The objective of this particular assignment is the elaboration of institutional and technical options for biodiversity and forestry data collection, data processing and management, as well as publication, reflecting various aspects, including: existing capacities, capacity needs, resources available, resources needed, long-term viability/sustainability, sense of ownership, political influence/power, likely acceptance by government and civil society, etc.

Specific tasks included:

- Assessment of existing normative mandates and actual activities and capacities of the relevant government entities, NGO initiatives, academic initiatives and various international projects in terms of biodiversity and forest data.
- Assessment of web-based open-access systems for possible application in case of Georgia.
- Developing assessment scheme for options for the consolidated collection, management and publication of biodiversity and forest related data.
- Developing options for consolidated collection, management and publication of biodiversity and forest related data.

Outputs of the assignment include:

- Assessment Report
- Assessment Scheme (for Options)
- Assessment and Options Report

This report provides the final version of the Assessment and Options Report.

# 1. Assessment

This subchapter provides concise description of approaches employed in the study.

## 1.1 Scope

The assessment of the following themes was conducted:

### *Existing data*

Information about existing data relevant for National Biodiversity Monitoring Systems (NBMS) was collected based on interviews with key stakeholders and data available online.

Information about existing data relevant for National Forest Monitoring Systems (NFMS), again, is based on interviews with key stakeholders and exploration of RapidEye 2011 satellite imagery processed database. As instructed by the client, an emphasis on forestry data sources was less intensive due to other ongoing studies and initiatives underway by GIZ and other supports.

All sources of data relevant for biodiversity and forestry systems identified in the course of the study was summarised and presented in various sections of this report.

Face-to-face interviews and online/offline survey (see next two subparagraphs) were used to collect the roster of existing datasets on subject thematics (biodiversity, forestry and related).

### *Institutional alignments, Technical capabilities, Personnel capacities*

Opportunity of interviews with key biodiversity, forestry and other relevant governmental and non-governmental stakeholders (see next subsection) was used to explore institutional plans and ambitions to manage various biodiversity, forestry and other relevant datasets, which were explored during the interview and whenever required requested to provide short communication describing technical capabilities (software, hardware, allocated office space, etc.) and personnel capacities (staff number, specific qualification, etc.), photo and other documentation were collected as well, whenever appropriate.

Normative mandates and actual activities and capacities of the relevant government entities (including NEA, APA, BPS, NFA, EIEC and other key players) were clarified as well.

## 1.2 Interviews

The following is the GIZ requested list of key institutions for consultations on environmental data management with emphasis on biodiversity and forestry and other relevant data:

Ministry of Environment and Natural Resources Protection:

- National Environment Agency (NEA)
- Agency of Protected Areas (APA),
- Biodiversity Protection Service (BPS)
- Environmental Information and Education Centre (EIEC)
- National Forestry Agency (NFA)

Key NGOs:

- WWF-Caucasus Office, NACRES, CENN, REC-Caucasus, others.

Research and education institutions:

- Iliia State University (Institute of Zoology, Institute of Botany, Institute of Ecology, others)

### ***Stakeholders on environmental data***

Results of consultations with all stakeholders are reproduced in Annex B in the form of the minutes of discussions and interviews held with each consultee.

Consultations, in particular, were held with persons in charge of technical tasks concerned with data collection and database management in these institutions/organisations, and whenever appropriate, with key decision-making personnel (in coordination with GIZ project team leader).

Opportunities of the consultation meetings were used to alert stakeholders and invite them at potential meeting planned to present study findings and to discuss its outcomes. The meeting opportunities were also used to request stakeholders to indicate further biodiversity and contact points for subsequent interview/discussion.

## **1.3 Survey**

All those interviewed were invited to complete simple online survey, outlined in Annex D, seeking first organisational and contact details, after which the questionnaire invited the respondents to enter biodiversity datasets (i) produced by the organisation (non-geospatial, and geospatial including vector and raster datasets) and (ii) accessed and frequently used by the organisation. Survey sought to complete datasets of global, national & local level of aggregation.

Google Forms were used to collect the survey, with links distributed via email to simplify the online access to survey form. Results were collected in Google spreadsheet, which can be exported into any other format (excel, etc.).

Questionnaires were prepared in MS Word form as well for cases on-line survey would provide for some unlikely reason difficult to organise.

As mentioned above, the structure of the survey is provided in Annex D.

## **1.4 Initiatives**

Relevant initiatives concerning biodiversity and forestry data management ongoing at various levels (international, national, as well as local, as encountered) are characterised below, and is including the following initiatives concerned with the biodiversity and forest data:

### **- GIZ**

As mentioned in introduction, GIZ's Sustainable Management of Biodiversity Programme (SMBP) had been advising all three countries of the South Caucasus in setting up National Biodiversity Monitoring Systems (NBMS), as well as National Forest Monitoring Systems (NFMS). Altogether two activities are critical ingredients of the newly initiated follow-up programme on "Integrated Biodiversity Management, South Caucasus – IBiS", as described on the informative webpage of <http://biodivers-southcaucasus.org>, building on all past activities of

GIZ in biodiversity and forestry sectors. Within the frame of the overall IBiS programme, GIZ will continue to support the NBMS and NFMS through technical assistance, capacity development (especially in data collecting, analysis and management, including GIS), as well as limited procurement. Above mentioned informative webpage could indeed be extended in the future to mirror-host the geospatial web services and metadata catalogues sharing the biodiversity and forestry datasets for South Caucasus and for Georgia. Very informative report on development of the GIS and Remote Sensing technologies in South Caucasus countries is provided on webpage of GIZ biodiversity programme <http://biodivers-southcaucasus.org/wp-content/uploads/2015/02/Schlager-Winterscheid-GIS-and-RS-Capacities-AM-GE-AZ-2016.pdf> and this report should be read in conjunction with the content of this informative analysis.

#### **- KfW/CNF**

The Caucasus Nature Fund (CNF) is a conservation trust fund founded in 2007 with the support of the German Federal Ministry for Economic Cooperation and Development (BMZ) through the German Development Bank KfW, Conservation International (CI) and WWF. CNF provides long-term funding and management assistance to help meet the core needs for protected areas in Armenia, Azerbaijan and Georgia. The initiatives to ensure meeting basic needs of protected areas includes activities of monitoring flora and fauna species diversity and the health of natural ecosystems.

For the purpose of developing standardized Biodiversity Monitoring Programs (BMP) the CNF recently launched pilot desk study initiative for two protected areas (Borjomi-Kharagauli National Park and Lagodekhi Protected Areas) in order to produce the set of baseline data, and select appropriate indicators for biodiversity monitoring. Study includes the tasks to (i) summarize the biodiversity values; (ii) describe pressures and threats; (iii) summarize baseline data (iv) generate the list of potential indicators and (v) propose 1 or 2 most suitable indicators. Study was planned to be completed in February-March period of 2016.

Importantly, based on the outcomes of the pilot studies and related consultations, CNF plans to formulate detailed project proposals for the field-based monitoring of the agreed indicators in selected PAs during 2016-2018. Terms of reference of the study was published by CNF via CENN list-server (filed in the collected documentation accompanying this report).

#### **- KfW/GFA**

KfW-funded Support Programme for Protected Areas for Georgia (SPPA-Georgia) is the 8.2 million Euros programmatic five-year initiative implemented in agreement with the Agency of Protected Areas of Georgia by the German GFA Consulting Group, in partnership with two Georgian NGOs implementing the program.

The program seeks to improve the management of four protected areas in the Greater Caucasus mountain ridge: Kazbegi National Park and the Pshavi and Khevsureti Protected Areas, Kintrishi Protected Area in Adjara Autonomous Republic and the Algeti National Park. The program supports the protected areas in terms of management development, staff training, demarcation of boundaries and improving the physical infrastructure. Visitor centres and administration offices will be built and various facilities for ecotourism development such as hiking trails are planned. Twenty-five percent of the budget is earmarked to finance community development measures and sustainable income generating opportunities.

Ecological baseline studies are also part of the programme (which would ultimately contribute into development of management plans) and is being carried out by the GIS and RS Consulting

Centre GeoGraphic (see more details on Baseline Datasets for 4 Protected Areas in Annex B.12), as well as the bio-monitoring system is to be set up in order to provide APA with up-to-date scientific data contributing into the sustainable management of the protected areas. More details on approaches towards the GFA program activities and intentions in Georgia see in Annex B.11. Of particular relevance for this study is the intention of GFA to install within APA and its protected areas' administrations integrated management system based on GFA's TRIPLE I toolset, including certain routines for geospatial, monitoring and enforcement data management.

**- UNDP**

UNDP initiated in late 2015 the GEF-financed three-year project Harmonization of information management for improved knowledge and monitoring of the global environment in Georgia.<sup>1</sup>

The goal of the project is to make the best practices and innovative approaches, for meeting and sustaining the Rio Conventions (Biodiversity, Climate Change, Desertification), available and accessible for implementation through national development policies and programmes.

The immediate objective is to develop individual and organizational capacities in the Ministry of Environment and Natural Resources Protection, and its Environmental Information and Education Centre (EIEC) for improved monitoring of environmental impacts and trends for elaboration of collaborative environmental management.

The project is built around the two components:

- Development of coordinated information management and monitoring system. The access and use of information and knowledge through improved decision-support mechanisms and the development of an environmental information and knowledge system;
- Enhancing Capacities for evidence-based policy making and management. Under this component, the project will help by creating and enhancing capacities for management and implementation of convention guidelines.

Project's objectives, outcomes and outputs, as described in the project document, are provided in the next table below:

|   |   |
|---|---|
| <b>Project objective:</b> Develop individual and organizational capacities in the Ministry of Environment and Natural Resources Protection, and the Environmental Information and Education Centre for improved monitoring of environmental impacts and trends for elaboration of collaborative environmental management. |   |
| <b>Outcome 1.</b> Capacities for environmental monitoring are better enabled.   | <p><b>Output 1.1.</b> System of information exchange among relevant departments in key ministries (Environment and Natural Resources Protection, Economy and Sustainable Development, Regional Development and Infrastructure, Agriculture etc.) and the EIEC to support environmental monitoring in implementing Rio Conventions improved.</p> <p><b>Output 1.2.</b> Clear legal framework established to facilitate monitoring in implementing Rio Conventions.</p> <p><b>Output 1.3.</b> Data collection, analysis and monitoring system developed at the EIEC with optimal linkages to local authorities.</p> |
| <b>Outcome 2.</b> Technical and management staff sufficiently trained in monitoring and data analysis, and linkage to decision-making process.  | <p><b>Output 2.1.</b> Convention monitoring and reporting capacities developed.</p> <p><b>Output 2.2.</b> Inter-ministerial cooperation for collaborative decision-making among policy makers achieved.</p>   |

The project document when discussing national reporting for CBD notes that submission "Dates indicate lack of coordination in report submission... Method in collection and systematic

<sup>1</sup> <https://info.undp.org/docs/pdc/Documents/GEO>  
[https://info.undp.org/docs/pdc/Documents/GEO/4883\\_CCCD\\_Georgia\\_ProDoc\\_FINAL\\_ENG\\_18\\_Jun\\_2015.doc](https://info.undp.org/docs/pdc/Documents/GEO/4883_CCCD_Georgia_ProDoc_FINAL_ENG_18_Jun_2015.doc)

monitoring mechanisms need improvement: Lack of data verification mechanisms. Data ownership/responsibilities not clear between the competent authorities".

The project document further describes, that “Due to lack of data it is not possible to accurately assess biodiversity conditions. Lack of updated forest data prevents planning of sustainable, multifunctional forest use. Lack of capacities and lack of financial resources are obstacles for implementing comprehensive biodiversity monitoring, improving forest information systems, implementing conservation measures, undertaking research, implementing education activities etc. Forest related measures outlined in the First NBSAP have been implemented to a least extent due to lack of funding and lack of capacities, as well as frequent changes in the forest sector priorities. Lack of administrative and human resources, including lack of sufficient number of qualified staff are among the biggest constraints for improvement of the forest information systems. In addition, interagency coordination for strengthening the biodiversity information systems needs improvement.”

Project description also mentions that “currently, there is slight overlapping in NEA and EIEC responsibilities pertaining to data collection, analysis and sharing, in addition to the un-clarity in terms of horizontal cooperation between the two Agencies (the NEA and the EIEC) under the MoENRP. According to the Centre’s statute, the sphere of activity of the EIEC is to facilitate access to the environmental information; public participation in environmental decision making and access to justice, as well as to promote environmental awareness raising of general public and provide trainings and refresher courses for the improvement of skills of the appropriate professionals. While the main official functions of the NEA are, among others: data collection and analysis, creating data bases, preparing and spreading information on environmental conditions, creating data bases of engineering infrastructure.”

It is further noted, that “The EIEC at the MoENRP, the main responsible institution for collecting, analysing and sharing environmental data, as well as for developing and implementing policies and projects in the field of environment, remains understaffed; moreover, the resources to implement national policies are inadequate. Inefficient and incomplete administrative procedures preclude more robust monitoring and protection of environment and natural resources in Georgia.”

In technical terms, therefore, the project aims to establish “two information management and synchronized data entry and management systems within the newly established Environmental Information and Education Centre of the Ministry of Environment and Natural Resources Protection”, and in the Ministry itself.

The Project will be implemented over 3 Years with a total budget of \$1,350,000, UNDP will provide \$150,000 from its core resources (cash \$80k, in-kind \$70k), and the GEF will provide \$1.2 Million. The EIEC will provide in-kind support to the project (around \$ 1.2 Million).

IT Equipment budgeted line item of \$13,600 is to enable the development and deployment of the two systems for data collection, analysis and sharing, and for monitoring and reporting on the implementation of the Rio Conventions. These software and IT equipment will be purchased, however costs will be greatly shared by Government of Georgia and the maintenance and running costs provided by Government of Georgia.

Finally, it is worth noticing, that to resolve the policy coordination issues one of the approaches taken by the project is that “a critical requirement for success of this project is the establishment of a working group or inter-ministerial committee within the MoENRP which is empowered and is publically managed to drive the project forward from an official level.”

## **- Global Forest Watch (GFW)**

In response to global forest resources challenges, World Resources Institute (WRI) in 2011 relaunched Global Forest Watch (GFW), a system for monitoring forest cover change that had first been developed in 1997 and which in February 2014, following an active period of site development, the GFW beta website was officially launched.

GFW applies cutting-edge science and technology to generate the timely, precise, and reliable information available about what is happening in the world's forests. The GFW platform is unrestricted access to this information in relevant formats.

To validate and replicate global approaches, WRI and its partners mobilized in 2015 GEF supported project entitled Global Forest Watch.<sup>2</sup> While global level activities cover all 4 components, the national level pilot country activities support Georgia and Madagascar within Component 1. Pilot country activities offer global demonstration opportunities. Work in Georgia, in particular, will help to demonstrate GFW's potential contribution to sustainable use and conservation of Mediterranean forests, with replication opportunities.

At the pilot country level, GEF support will enable “deep dive” partnerships to achieve sustained impact, including through long-term partnerships with government agencies, civil society and the private sector. Forest stakeholders, including governmental officers, civil society, donors and buyers of commodities, in the pilot countries will acquire capacity and gain easy access to near-real-time and reliable data to support their forest conservation, sustainable forest management, REDD+ efforts and risk management.

The project includes the following components:

- 1: Application and enhancement of GFW globally and in pilot countries
- 2: System uptake and replication
- 3: Strengthening and sustaining the GFW partnership
- 4: Private sector application to reduce deforestation in key commodity sector supply chains

GFW activities have been initiated in September 2015, are at initial stages of development and are expected to be completed in 3 years' time in September 2018. Two critical positions National Coordinator and GIS Technical Assistant were announced recently (ToRs filed in the collected documentation accompanying this report)

As there was no opportunity to discuss issues with GFW, and per study outline to concentrate more on NBMS rather than NFMS, there is no further analysis given in this report.

## **- EEA/EIONET/Emerald Network**

This subsection is mostly based on the January 2014 report “Development of Emerald Network in Georgia in 2013” by Centre for Biodiversity Conservation and Research – NACRES.<sup>3</sup>

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<sup>2</sup> See Project Appraisal Document (PAD) at the following link:

[http://www.thegef.org/sites/default/files/project\\_documents/05-25-15\\_Project\\_document\\_PAD\\_full.pdf](http://www.thegef.org/sites/default/files/project_documents/05-25-15_Project_document_PAD_full.pdf)

<sup>3</sup> [http://pjp-eu.coe.int/documents/1461016/4159207/Report\\_2013\\_Emerald\\_developments\\_NACRES.pdf/d0ded329-fcdd-49a2-aac5-46db6fe3cf60](http://pjp-eu.coe.int/documents/1461016/4159207/Report_2013_Emerald_developments_NACRES.pdf/d0ded329-fcdd-49a2-aac5-46db6fe3cf60)

The development of the Emerald Network of Nature Protection Sites is an international tool for the implementation of the Bern Convention (Convention on the conservation of European wildlife and natural habitats, 1979).

The Phase I of the development of the Emerald Network in Georgia began in 2009 and lasted until the end of 2011. NGO NACRES was responsible for technical implementation, in close cooperation initially with the APA/MoENRP, subsequently with BPS/ MoENRP.

The following results were achieved during Phase I:

- 15 habitats identified based on analysis of 117 Bern species found in Georgia, including population estimate and distribution;
- Distribution GIS maps were created for each of the identified habitats (15 in total);
- Out of the identified 117 species, 83 species were covered with GIS distribution maps;
- 20 Emerald Network candidate sites were identified for the country. Required data were collected using Standard Data Form (SDF) and Software. A corresponding database was compiled and presented to the Council of Europe.

In Phase II ongoing activity for the period 2013-2016 following was planned and achieved so far: additional potential sites (34), species (125) and habitats (27).

All above activities are to be in compliance with the new European Nature Information System, or EUNIS (<http://eunis.eea.europa.eu>), classification system.

The following datasets are reported by NACRES as uploaded to the EEA/EIONET Central Data Repository (<http://cdr.eionet.europa.eu>):

- Reference Data file “Reference201401-GE.mdb”
- Verification of 8 GIS habitat maps according to EUNIS classification:
  - D4.2 - Basic mountain flushes and streamsides, with a rich arctic-mountain flora
  - E1.2 – Perennial calcareous grassland and basic steppes
  - E3.4 – Moist or wet eutrophic and mesotrophic grassland
  - E3.5 - Moist or wet oligotrophic grassland
  - F7.4 – Hedgehog-heaths
  - F7.3 – East Mediterranean phrygana
  - F9.1 - Riverine scrub
  - G1.6 - Fagus woodland
- Validation of Phase I and new Phase II GIS maps for species distribution
- Sites Data Base file “CNTRYGE.mdb”

As of to date, the following datasets can be traced at the Georgian section of the Emerald Network repository at the address <http://cdr.eionet.europa.eu/ge/coltlvahq/coltlvamg>:

[http://cdr.eionet.europa.eu/ge/coltlvahq/coltlvamg/coltiqzcg/envtiqazg/201104\\_proposed\\_species.rar](http://cdr.eionet.europa.eu/ge/coltlvahq/coltlvamg/coltiqzcg/envtiqazg/201104_proposed_species.rar)  
<http://cdr.eionet.europa.eu/ge/coltlvahq/coltlvamg/envtps8pg/CNTRYGE.MDB>  
<http://cdr.eionet.europa.eu/ge/coltlvahq/coltlvamg/envtpsztw/Reference201008-GE.mdb>  
[http://cdr.eionet.europa.eu/ge/coltlvahq/coltlvamg/envtps1jg/Shp\\_Spec\\_Hab-prj.rar](http://cdr.eionet.europa.eu/ge/coltlvahq/coltlvamg/envtps1jg/Shp_Spec_Hab-prj.rar)  
[http://cdr.eionet.europa.eu/ge/coltlvahq/coltlvamg/envtpi1kq/Habitats\\_proposed\\_to\\_be\\_added\\_Res\\_4.doc](http://cdr.eionet.europa.eu/ge/coltlvahq/coltlvamg/envtpi1kq/Habitats_proposed_to_be_added_Res_4.doc)  
[http://cdr.eionet.europa.eu/ge/coltlvahq/coltlvamg/envtpi0ha/Species\\_proposed\\_to\\_be\\_added\\_Res\\_6.doc](http://cdr.eionet.europa.eu/ge/coltlvahq/coltlvamg/envtpi0ha/Species_proposed_to_be_added_Res_6.doc)  
<http://cdr.eionet.europa.eu/ge/coltlvahq/coltlvamg/envtpiulq/CNTRYGE.MDB>  
[http://cdr.eionet.europa.eu/ge/coltlvahq/coltlvamg/envtpirhq/Shp\\_prj.rar](http://cdr.eionet.europa.eu/ge/coltlvahq/coltlvamg/envtpirhq/Shp_prj.rar)

Above data is not yet accessible at the date of access indicated below and the EEA/EIONET system returns the following notification: ‘This envelope is not yet available for public view. Work is still in progress.’ Exception is the CNTRYGE.MDB data, which became accessible in the course of this study, first accessed on 10 April 2016, with status displayed as ‘Redeliver or Finish’ dated as of 28 Nov 2010. Latter development is very much encouraging and it is hoped that would apply to this and many other data producing initiatives taking place for Georgia.

In addition, GIZ was commissioned by BMZ to implement the project “Supporting the Implementation of Biodiversity-related EU Directives in Georgia”. The project contributes to the Emerald Network development in Georgia and aims at closing some gaps in overall process.

In particular, the project comprises the following four fields of intervention:

- a) Identification of additional suitable ASCI and SPA
- b) Elaboration of necessary subsidiary legislation
- c) Development of management schemes in close cooperation with relevant stakeholders
- d) Development of methods for habitat monitoring

All four fields of intervention will include respective capacity development measures at individual, organisational and network level.

Within the abovementioned project NACRES and ISU were contracted to accomplish project-related activities.

As of June, 2016, the results are as follows:

- List of 33 habitats – based on EUNIS classification, out of which 21 have been mapped.
- Distribution maps of 125 species and 33 habitats in GIS were completed
- 51 potential Emerald sites are selected in Georgia.

#### **- EEA/ENPI-SEIS**

The SEIS is an EU initiative to modernise and simplify the collection, exchange and use of the data and information required for designing and implementing environmental policy.

The ENPI-SEIS project (Toward Shared Environmental Information Systems in the European Neighbourhood) was implemented by the European Environment Agency in 2010-2015 period. The aim of this project was to engage countries of the European Neighbourhood in regional cooperation to improve national capacities for managing and sharing environmental data and information. Georgia was participating in ENPI-SEIS-EAST (see documentation at <http://enpi-seis.pbe.eea.europa.eu/east/georgia>). Key national agencies such as MoENRP and GeoStat, were represented in the project by ENPI-SEIS National Focal Points.

The SEIS principles establish that environmental information should be:

- managed as close as possible to its source;
- collected once and shared with others for many purposes;
- readily available to easily fulfil reporting obligations;
- easily accessible to all users;
- accessible to enable comparisons of the environment at the appropriate geographical scale;
- fully available to the general public, and at the national level in relevant national language(s);
- supported through common, free open software standards.

Participation in the ENPI SEIS project provided Georgia with the opportunity to acquire valuable EU experience. The project worked with the national environmental and statistical organizations

- MoENRP, NEA and GeoStat. The Country Background Report was prepared to assess the current state of environmental data and selected environmental indicators/datasets to advance the implementation of SEIS project in Georgia. The Report describes the priority datasets for the thematic areas: air, climate, water, waste and biodiversity, assesses current state of national environmental data flow in consideration of their compatibility to SEIS, and identification of actions need to improve and advance situation for taking SEIS implementation forward. The project culminated with the 'ENPI-SEIS implementation of priority data flows National workshop in Georgia', December 2-3, 2013 in Georgia and by signing Joint Statement between the GoG (represented by the Minister, MoENRP) and the EEA.

## - INSPIRE

The INSPIRE is the European Directive 2007/2/EC establishing an INfrastructure for SPatial InfoRrmation in the European Community (INSPIRE). It entered into force on the 15th May 2007 and will be implemented in various stages, with full implementation required by 2019.

The INSPIRE aims to create a European Union (EU) Spatial Data Infrastructure (SDI), enabling the better sharing of environmental spatial information and public access to spatial information across Europe.

INSPIRE is based on a number of common principles:

- Data should be collected only once and kept where it can be maintained most effectively.
- Seamlessly combine spatial information from different sources across Europe and share it with many users and applications.
- Information collected at one level/scale to be shared with all levels/scales.
- Geospatial data for good governance at all levels should be readily & transparently available.
- Easy to find what geospatial information is available, with conditions of acquisition and use.

Geospatial information considered under the Directive is extensive and includes a great variety of themes, defined in its Annexes I, II and III <http://inspire.ec.europa.eu/Themes/Data-Specifications/2892>).

INSPIRE geoportal prototype is available at <http://inspire-geoportal.ec.europa.eu>.

Institutionally INSPIRE implementation is coordinated by following four European institutions:

- DG Environment acts as an overall legislative and policy co-ordinator for INSPIRE.
- The Joint Research Centre (JRC) acts as the overall technical co-ordinator of INSPIRE.
- EEA is taking on tasks related to SEIS and EIONET in the overall INSPIRE context.
- In addition to Coordination Team, EuroStat acts as the secretariat to INSPIRE Committee.

Particularly important for this study are the so called INSPIRE Data Specifications (Technical Guidelines), developed for almost all ISNPIRE themes, namely the following latest version documents are of direct concern for biodiversity:

- *Protected Site*  
[http://inspire.jrc.ec.europa.eu/documents/Data\\_Specifications/INSPIRE\\_DataSpecification\\_PS\\_v3.2.pdf](http://inspire.jrc.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_PS_v3.2.pdf)
- *Species Distribution*  
[http://inspire.jrc.ec.europa.eu/documents/Data\\_Specifications/INSPIRE\\_DataSpecification\\_SD\\_v3.0.pdf](http://inspire.jrc.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_SD_v3.0.pdf)
- *Bio-geographical Regions*  
[http://inspire.jrc.ec.europa.eu/documents/Data\\_Specifications/INSPIRE\\_DataSpecification\\_BR\\_v3.0.pdf](http://inspire.jrc.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_BR_v3.0.pdf)
- *Habitats and Biotopes*  
[http://inspire.jrc.ec.europa.eu/documents/Data\\_Specifications/INSPIRE\\_DataSpecification\\_HB\\_v3.0.pdf](http://inspire.jrc.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_HB_v3.0.pdf)

– *Land Cover*

[http://inspire.jrc.ec.europa.eu/documents/Data\\_Specifications/INSPIRE\\_DataSpecification\\_LC\\_v3.0.pdf](http://inspire.jrc.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_LC_v3.0.pdf)

– *Land Use*

[http://inspire.jrc.ec.europa.eu/documents/Data\\_Specifications/INSPIRE\\_DataSpecification\\_LU\\_v3.0.pdf](http://inspire.jrc.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_LU_v3.0.pdf)

Many other INSPIRE guidelines (see them all at <http://inspire.ec.europa.eu/Themes/Data-Specifications/2892>) would be important for Georgia in the context of building up its INSPIRE-compliant National SDI (NSDI) framework for Georgian.

Indeed, with SIDA funding, the National Agency of Public Registry of Georgia, supported by its European partners, is implementing NSDI development project in Georgia (to be completed in 2018). Further details on developments and processes at this initial stage are covered on the webpage <http://nsdi.gov.ge>, operated by the National Agency of Public Registry (NAPR) under the Ministry of Justice of Georgia, including information about the establishment of the State Commission on NSDI Establishment and Development (chaired and co-chaired respectively by MoJ and MoENRP Deputy Ministers), per Resolution No. 262 of the Government of Georgia of 9 October 2013. This legal act mandates NAPR to coordinate NSDI development, form the Secretariat to NSDI State Commission, establish and coordinated thematic working groups (currently 6: legislation, PR, business model, GIS, IT and education). Some prototype for the NSDI geoportal is available at <http://nsdi.gov.ge/en/Maps>. Importantly, Article 3 of the GoG Resolution No. 262 is almost entirely devoted to mandating the NSDI of Georgia to become INSPIRE-compliant.

It is important to note therefore, that as Georgian NSDI ambition is to be built in compliance with INSPIRE, environment, including biodiversity are then contemplated as key components of the NSDI and every development in the field of biodiversity data and metadata collection and sharing should take into account NSDI development direction and processes. Intense cooperation and coordination with the NSDI stakeholders is strongly urged in any decision-making affecting the prospects of such cooperation and coordination. There are signs though that this is not always the case, and some key stakeholders mandated with biodiversity and forestry data and metadata management are not sensitive and/or sensitized to NSDI establishment and development process.

In addition to building its own INSPIRE system, European institutions are closely coordinating with global earth observation initiatives and institutions, such as the GEO/GEOSS. Many large scale European projects on earth observations are promoting INSPIRE and GEO/GEOSS in European and neighbourhood countries as well as globally. European 7<sup>th</sup> Framework Programme projects such as enviroGRIDS, PEGASO, GEONetCaB, IASON supported the Black Sea and Mediterranean region countries to aspire to INSPIRE and to join GEO/GEOSS. This was indeed the case for Georgia, which decided to join GEO in 2014 (see more on this here further below).

#### **- GEO/GEOSS and GEO BON**

Established in 2005, GEO is a voluntary partnership of governments and organizations concerned with Earth observations in support of sound decision-making. As of to date GEO unites 101 Member governments and the European Commission, and 95 participating international organizations specialised in Earth observations. GEO is in charge of creating a Global Earth Observation System of Systems (GEOSS) that will link Earth observation resources world-wide across nine Societal Benefit Areas - Disasters, Health, Energy, Climate, Agriculture, Weather, Water and last but not least, *Ecosystems*, and *Biodiversity*.

The European Commission is very active member of the GEO/GEOSS. As mentioned above, several European policy research projects stimulated the Black Sea and Caucasus countries to

become members of this global network of earth observations. Cases of Georgia (joined 2014), Armenia and Bulgaria (joined 2015) are considered as success stories.<sup>4</sup>

Particularly noteworthy in the context of this report is the GEO/GEOSS flagship biodiversity initiative such as GEO BON (Biodiversity Observation Network, see <http://geobon.org>). Within the GEO family of ‘community of practices’, GEO BON represents biodiversity, one of GEO’s nine Societal-Benefit-Areas. GEO BON, the Biodiversity Observation Network of GEO, is building up for the pathway to link biodiversity data and metadata to GEOSS, the Global Earth Observation System of Systems. GEO BON secretariat is hosted by iDiv (German Centre for Integrative Biodiversity Research, <https://www.idiv.de>) and supported by German Science Foundation (<http://www.dfg.de/en>).

Relevant for Georgia and Caucasus would be to achieve endorsement as national and regional Biodiversity Observation Networks satisfying the criteria and process set by the GEO BON.<sup>5</sup>

Some other European FP7 (programme superseded by Horizon 2020, or H2020) policy research projects provided various toolsets, literature lists and other capacity building resources such as the GEONetCaB (GEO Network for Capacity Building) project web portal. Most recent sampled list of GEO biodiversity resources is provided in Annex A (courtesy of project coordinator, Mark Noort, <http://www.hcpinternational.com>). These toolset & references could be of strong interest and utility for regional and national biodiversity and forestry network concerned in this study and in future GIZ initiatives in the Caucasus.

Key recommendations in this regard is therefore to provide for support and better participation and connection of Georgian biodiversity institutions and network within GEO/GEOSS and GEO BON, and much preferably doing this from the perspective of European INSPIRE framework.

## 1.5 Mandates

This subsection deals with various international, regional, national, local and institutional mandates of dealing with biodiversity and forestry data and information and sharing with public.

In addition to NSDI, INSPIRE and GEO/GEOSS impetus, strong European policy framework for environmental information sharing is set by the Aarhus Convention (1998, ratified by Georgia in 2000), which, in particular, mandates participating countries, including Georgia, to provide for the right of everyone to receive environmental information that is held by public authorities. This can include, inter alia, data and information on the state of the environment, obviously including data on the biodiversity and the forests. Still, despite constitutionally stated precedence of international agreements over national legislation, multilateral instruments cannot work at national level without sovereign legislation implementing such international provisions.

At the national level the Georgian Constitution provides the basis for environmental legislation. Article 37 (paragraphs 3 and 4) of this document states that: ”Everyone has the right to live in a healthy environment and use natural and cultural surroundings. Everyone is obliged to protect the natural and cultural environment” also “The state guarantees the protection and rational use of nature to ensure a healthy environment, corresponding to the ecological and economic interests of society, and taking into account the interests of current and future generations”.

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<sup>4</sup> <http://iason-fp7.eu/index.php/en/knowledge-base-eng/documents-eng?download=66:georgia-success-story> and <http://iason-fp7.eu/index.php/en/knowledge-base-eng/documents-eng?download=65:armenia-success-story>

<sup>5</sup> [http://geobon.org/Downloads/Other\\_documents/Draft\\_Criteria\\_for\\_BONs.pdf](http://geobon.org/Downloads/Other_documents/Draft_Criteria_for_BONs.pdf)

1996 Law on Environment Protection Chapter VII defines the environmental information system as a combination of (a) information collection (Article 26) and (b) monitoring systems (defined as data collection, storage and analyses) (Article 27).

One of the biodiversity related targets mentioned in Second National Environmental Action Programme of Georgia (NEAP) 2012-2016 is the creation of proper information systems for biodiversity conservation and sustainable management of biological resources through developing the national bio-monitoring system.

According to the NBSAP-2, 2014-2020, the current status of biodiversity monitoring in Georgia can be characterized as follows: (i) biodiversity data is collected and stored by various agencies among which there is little or no systematic information exchange, and thus there is no unified monitoring system; (ii) responsible agencies have limited knowledge of modern monitoring techniques (such as GIS), and lack of an integrated system means that different agencies use different methods of data collection, analysis and thus there are discrepancies in the interpretation of results; and easily accessible or shared electronic database on the status of biodiversity has not been established. It can be confirmed with this study, that situation did not change much since that assessment of the state of biodiversity monitoring and data management.

Order 262 of Minister of Environment and Natural Resources Protection of 18 December 2012 on approving indicators for unified system of biodiversity monitoring and related methodologies and procedures defines 25 biodiversity indicators, including those related to forests, corresponding methodologies for their description and related procedures. The aim is to create unified biodiversity monitoring system and to promote data exchange in order to obtain adequate information on biodiversity and trends, create response system and integrate this into national policies.

Almost all agencies/stakeholders interviewed (see Annex B) do not have any specific regulations forbidding them to share data openly, except two agencies discussed further below. Still, here is provided in summarised form opinions of stakeholders on data sharing regulations:

| <b>BD DB Stakeholder</b>  | <b>Expressed policy on data sharing</b>   |
|---------------------------|---|
| UNDP 3MEA Project         | Maximally public access, with the exception of ‘sensitive’ data. Access by respective stakeholders to respective parts of database.   |
| MoENRP BPS                | In terms of access to information, general legislation on administrative obligation to satisfy information requests is guiding regulation for BPS. In general, if data is not secret, it can be shared.                 |
| EIEC                      | General approach to data sharing is that if data processing costs for sharing are involved, these costs might be charged.   |
| ISU, Institute of Ecology | No legal constraints, but without research publication completed, data access cannot be made public. In some cases researchers just do not have incentive to publish their research data as this requires extra effort. |
| ISU Institute of Zoology  | Metadata accessibility supported, but hard to expect sharing data.  |
| ISU, School of NS         | Open access to existing biodiversity portal, encouraged crowd sourcing for moderated data entry by portal scientific editors.   |
| APA                       | Legal /regulatory changes needed to establish and to operationalise the environmental (including biodiversity) data sharing principles.   |
| GIS-LAB                   | Constraint can be agreement or contract conditions on data sharing. Access to data by public and at least by Georgian stakeholders should be a condition of every agreement with assisting party.                       |

|                    |   |
|--------------------|---|
| NACRES             | Data access can be restricted by funding agencies to only key local stakeholders (e.g. Emerald Network case).   |
| WWF-Caucasus       | WWF has its intranet system restricted to its family members. Metadata can almost always be shared. Applications with potential conflict of interest with conservation objectives would be declined (such as in case of EIAs for environmentally harmful projects). |
| KfW/GFA            | Data owned by APA would be provided upon request consideration  |
| KfW/GFA/GeoGraphic | Authors and data owners should be contacted.  |
| CNF                | Data access referred to NGO producing it.   |
| NEA                | See below.  |
| NFA                | See below.  |

Bit more specific opinion of the interviewed stakeholders on data sharing issues can be found in the tables documenting the stakeholder survey results, please consult with Annex E for details. What can be stated here is that stakeholders provided quite confusing mix of responses, directing to some other higher (and sometimes subordinated) authority for sharing permission. Top down approach is clearly needed to streamline the data sharing and thus stimulate bottom up initiatives.

Perhaps the most noteworthy agency in terms of its data sharing policy is the National Environmental Agency (NEA), an institution with the statutes of the Legal Entity of Public Law (LEPL), subordinated to the MoENRP (under its so called ‘State Control’). Even before this legal act NEA was mostly selling its data products per established price lists, contributing into NEA’s budget in addition to core funding from the national budget, but with the enactment of 2014 order (see below), the situation has changed further and now funding of NEA comes almost entirely from licensing sources, as is evident from the approved budget for 2014, which reads for national budget contribution as 0.0 GEL, see <http://nea.gov.ge/uploads/files/542bbddf0a61a.pdf> since the same 2014. With the approval of the Decree No 502 dated 18 August 2014 and annexed service price lists (15 total) for all possible data provided by NEA instead of free and open access policy the business model of the data selling public authority is now fully established, see links to Georgian legal gazette Matsne:

<https://matsne.gov.ge/ka/document/view/2465275> (Decree)

- <https://matsne.gov.ge/ka/document/download/2465275/0/1> (Geology)
- <https://matsne.gov.ge/ka/document/download/2465275/0/2> (Pollution, including *aquatic biology*)
- <https://matsne.gov.ge/ka/document/download/2465275/0/3> (Hydrometeorology historic data)
- <https://matsne.gov.ge/ka/document/download/2465275/0/4> (Climatology data)
- <https://matsne.gov.ge/ka/document/download/2465275/0/5> (Climatology studies)
- <https://matsne.gov.ge/ka/document/download/2465275/0/6> (Hydrometeorology calculations)
- <https://matsne.gov.ge/ka/document/download/2465275/0/7> (Hydrometeorology prognosis)
- <https://matsne.gov.ge/ka/document/download/2465275/0/8> (Hydrology data streams)
- <https://matsne.gov.ge/ka/document/download/2465275/0/9> (Hydrology fieldwork)
- <https://matsne.gov.ge/ka/document/download/2465275/0/10> (Hydromorphology studies/designs)
- <https://matsne.gov.ge/ka/document/download/2465275/0/11> (Hydrometry gauge installation)
- <https://matsne.gov.ge/ka/document/download/2465275/0/12> (*Cyclamen, Galantus assessments*)
- <https://matsne.gov.ge/ka/document/download/2465275/0/13> (Web-advertisements [meteo.gov.ge](http://meteo.gov.ge))
- <https://matsne.gov.ge/ka/document/download/2465275/0/14> (Licensing services)
- <https://matsne.gov.ge/ka/document/download/2465275/0/15> (Free public data list)

Biodiversity parameters of direct relevance are highlighted in *italic*, although most of NEA data is highly relevant for ecological and biodiversity studies, such as those concerned with various

types of modelling. Above indicated Annex 15 on free and open data is of questionable utility, listing access to low precision averaged data products.

As for the forestry data, generation and sharing of forest inventory datasets is partially regulated by the GoG Decree No. 179 dated 2013 on Forestry Inventory, Planning and Monitoring Rule.<sup>6</sup> It mandates the Head of the NFA to approve the specific terms of reference for each forestry management plan contract commissioned by NFA. Although the plan itself has to be disclosed publicly and public is to be consulted (this report does not analyse the adequacy of this process), same is not required for inventory and other datasets, used in plan production. NSDI process is believed to be the ultimate instrument for sharing forestry data sometime in future once NSDI is fully functional. Same applies to forest use plan and monitoring plan, stipulated in the Decree.

Last but not least, the legal act on Establishment and Development of State Commission on NSDI (at Deputy Ministers' equivalent level representation from participating agencies) with Resolution No. 262 of the Government of Georgia of 9 October 2013 should be underlined. According to this legal act, NAPR/MoJ coordinates NSDI development, sets-up Secretariat to NSDI State Commission, as well as establishes and coordinates thematic working groups. It is surprising, that Georgia-EU association agreement never mentions INSPIRE, but fortunately Article 3 of GoG Resolution 262 is devoted to mandating NSDI of Georgia to become INSPIRE-compliant. Same is strongly advised to biodiversity and forestry sector databases and datasets.

## 1.6 Options

This is the key chapter of the document, presenting preliminary results of the analysis/ratings for institutional capabilities of concerned institutions based on interviews and personnel assessments by the consultant.

Each of the key institutions holding biodiversity and forestry datasets and claiming the lead role were analysed with a set of criteria, each criterion rated with following simple colour coded scoring rates:

|    |                       |
|----|-----------------------|
| +1 | = <b>Strong</b>       |
| 0  | = <b>Satisfactory</b> |
| -1 | = <b>Weak</b>         |

These criteria, based on study survey objectives and parameters, constituted the following:

**Policy** experience/influence (in terms of data management)

**Institutional** experience (in terms of data management)

**Personnel** capabilities (quality and quantity)

**Technical** capabilities (hardware, software)

**Data** resources available

**Sustainability**

**Ownership**

**Government** acceptance

**Public** acceptance

**Relevance** to host NBMS

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<sup>6</sup> <https://matsne.gov.ge/ka/document/view/1971205> and <https://matsne.gov.ge/ka/document/download/1971205/0/1>

Streamlined SWOT analysis was conducted for these criteria per each institution and scoring was established for each criterion promptly after the assessment of each line item. Detailed results of the analysis and respective scorings are presented in Annex C, and are summarized in the Table 1.1 below.

The following important assumptions were considered when deriving judgments from the SWOT analysis of institutional capabilities:

- Decision-making process should not be reduced to arithmetical exercise only
- Solutions proposed for hosting NBMS and NFMS can be single agency lead based, or double agency lead based
- It may well be that solution proposed would be network based (with lead agency) rather than single agency based solution
- It may well be intersectoral integration would be required, going beyond environment sector

**Table 1.1.** Results of SWOT analysis

| <b>ORGANISATIONS</b>                                    |             |             |             |            |            |                  |                 |            |
|---|-------------|-------------|-------------|------------|------------|------------------|-----------------|------------|
| <b>CRITERIA</b>   | <b>APA</b>  | <b>BPS</b>  | <b>EIEC</b> | <b>NEA</b> | <b>ISU</b> | <b>NGO (i/n)</b> | <b>Fund (i)</b> | <b>NFA</b> |
| <b>Policy</b> experience/influence (in data management) | 0           | 0           | +1          | 0          | 0          | 0                | +1              | 0          |
| <b>Institutional</b> experience (in data management)    | 0           | -1          | 0           | 0          | +1         | 0                | 0               | 0          |
| <b>Personnel</b> capabilities (quality and quantity)    | 0           | -1          | 0           | +1         | +1         | 0                | +1              | +1         |
| <b>Technical</b> capabilities (hardware, software)      | 0           | -1          | -1          | +1         | 0          | 0                | 0               | 0          |
| <b>Data</b> resources available                         | 0           | -1          | 0           | +1         | 0          | 0                | -1              | 0          |
| <b>Sustainability</b>                                   | 0           | -1          | 0           | 0          | 0          | 0                | 0               | 0          |
| <b>Ownership</b>  | -1          | -1          | 0           | 0          | 0          | 0                | 0               | 0          |
| <b>Government</b> acceptance                            | -1          | 0           | +1          | 0          | 0          | -1               | 0               | 0          |
| <b>Public</b> acceptance                                | -1          | 0           | 0           | 0          | 0          | 0                | -1              | -1         |
| <b>Relevance</b> to host NBMS                           | -1          | 0           | 0           | 0          | 0          | 0                | -1              | 0          |
| <b>AVERAGE SCORES</b>                                   | <b>-0.4</b> | <b>-0.6</b> | <b>0.1</b>  | <b>0.3</b> | <b>0.2</b> | <b>-0.1</b>      | <b>-0.1</b>     | <b>0.0</b> |

As can be seen from SWOT scoring argumentation in the Annex C and the summary results presented in the Table 1.1 above, the following three institutions emerge as lead stakeholders for the purposes of NBMS: EIEC, NEA and ISU (latter assuming all research institutes subordinated to ISU). As there is no unanimous champion revealed through this rating, indeed, networking

solution seems justified and respective findings, as well as the potential distribution of roles and responsibilities are outlined in the next Recommendations section of this report.

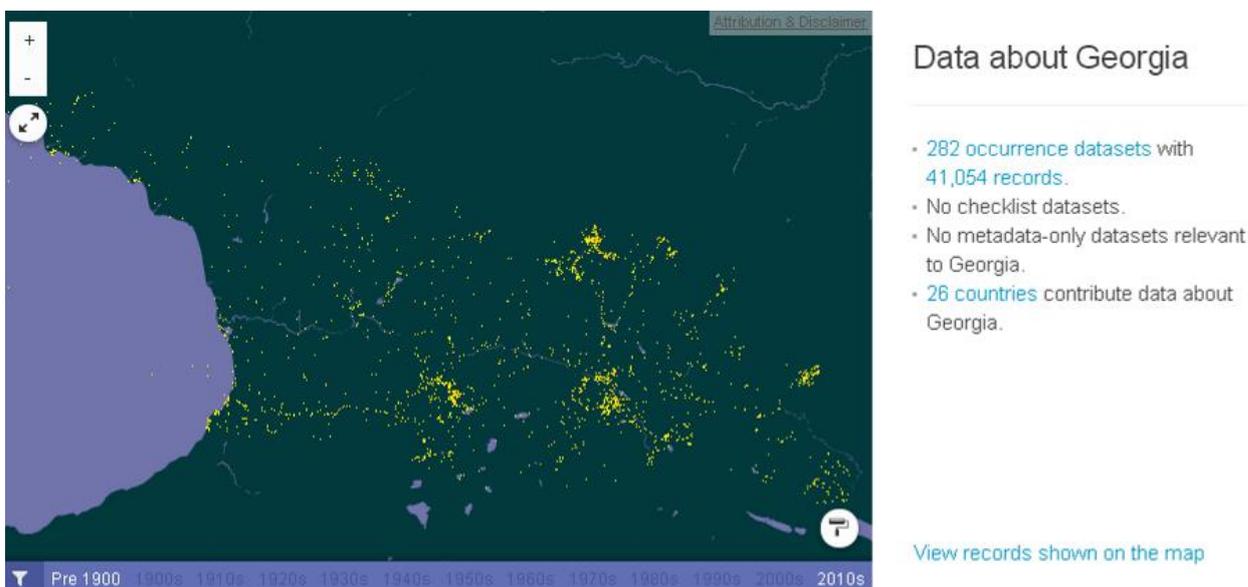
Taking account of GIZ task order, consultant refrained to undertake similar analysis for NFMS, but capabilities of NFA was still assessed with regard to NBMS. As a result, expert judgement of the consultant is that NFA is an unlikely institution to host and lead NBMS (see findings in the next section), while no other institution but NFA can be considered to host/lead NFMS effort.

## 1.7 Examples

Examples provided below reflect consultant's preferences to highlight the benefits of networking solutions, as well as open and free access to data, relevant for biodiversity in particular.

### - Global Biodiversity Information Facility (GBIF)

We start this section with a striking example of the automatic country report generated by Global Biodiversity Information Facility (<http://gbif.org>, an international initiative for open access to all types of data of life on Earth, encouraging and helping institutions to publish data according to common standards), when querying GBIF portal on results for Georgia (see Figs. 1.1 and 1.2).



**Fig. 1.1** Biodiversity data for Georgia as extracted from GBIF web-mapping service (<http://www.gbif.org/country/GE/summary> accessed on 15 March 2016)

It shows that there are certain range of datasets from Georgia registered with GBIF by sources from 26 countries, but none of them from Georgia! It is quite likely that vast majority of these datasets were generated by Georgian experts, but they were uploaded by their counterparts. This trend needs to be changed. Actually same is true for both Armenia and Azerbaijan; therefore, issue is region-wide in the Caucasus. International supporters are urged to help researches from Georgia and Caucasian to 'map' their presence on global biodiversity data portals.



**Fig. 1.2** Contribution of Georgian researchers into GBIF activity (extracted from GBIF webpage <http://www.gbif.org/country/GE/report> accessed on 15 March 2016)

In their turn, Georgian institutions and researchers, in addition to developing own solutions, are encouraged to more actively use biodiversity and environmental data portals such as GBIF, and other more specific instruments, to enhance the presence of available datasets at European and Global repositories. Some of these mechanisms were described above, and some are mentioning below in a more specific way.

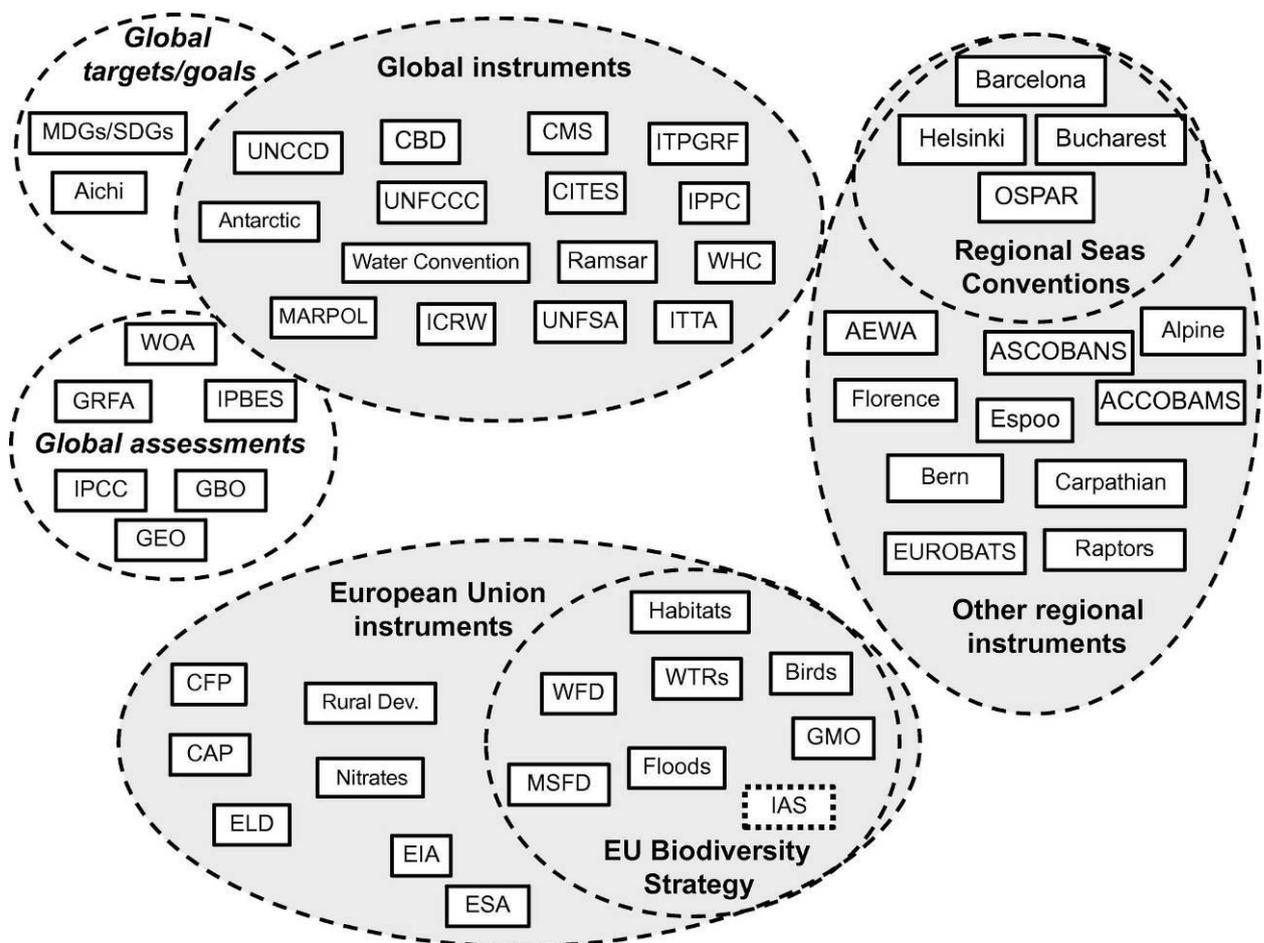
#### **- EU BON**

In the Initiatives subsection it was stressed at the end that Georgia should preferably look at global initiatives such as GEO/GEOSS through European prism, which is in line with Georgia's geographic belonging, and policy aspirations through EU-GE Association Agreement process.

We are therefore exploring in this subsection opportunities European Biodiversity Observation Network (EU BON) could bring to Georgian and Caucasian biodiversity observation networks. Presentation in this subsection closely follows the recently published seminal work by EU BON project (<http://www.eubon.eu>), analysing the role of regional BONs (such as European BON and as a matter of rhetoric eventually probably Caucasus BON as well?) in achieving the Aichi Biodiversity Targets of the United Nations' Strategic Plan for Biodiversity.<sup>7</sup>

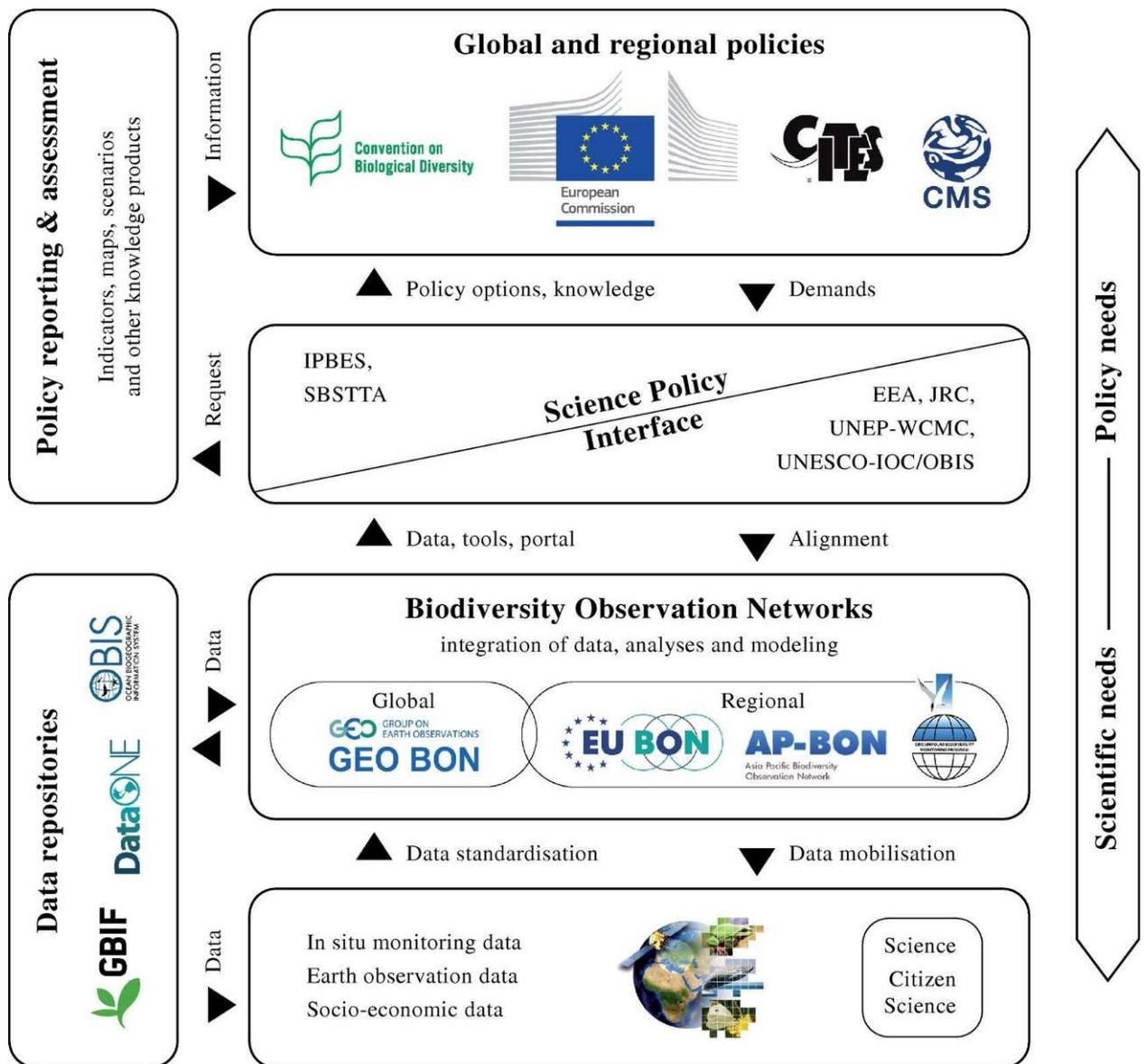
EU BON is the European contribution into GEO BON, largely defining global directions as well. Fig. 1.3 below illustrates in very detailed manner the policy driven needs for biodiversity data, as applicable to European countries setting the stage for EU BON development, and is applicable to Georgia and Caucasus region as well, considering latter as the part of the wider European space (explanation of diagram abbreviations is provided in the source quoted in the figure caption).

<sup>7</sup> Wetzel et. al (2015) Florian T. Wetzel, Hannu Saarenmaa, Eugenie Regan, Corinne S. Martin, Patricia Mergen, Larissa Smirnova, Éamonn Ó Tuama, Francisco A. García Camacho, Anke Hoffmann, Katrin Vohland, Christoph L. Häuser . The roles and contributions of Biodiversity Observation Networks (BONs) in better tracking progress to 2020 biodiversity targets: a European case study. *Biodiversity*, Vol. 16, Iss. 2-3, 2015. Special Issue: Connecting the Dots: Integrating Biodiversity Observations to Better Track the CBD 2020 Targets, <http://dx.doi.org/10.1080/14888386.2015.1075902>.



**Fig. 1.3** Biodiversity data and reporting needs in Global and European policy contexts (source: Wetzel et. al (2015) <http://dx.doi.org/10.1080/14888386.2015.1075902>)

It is obvious from analysis in this report, that Georgia and Caucasus are characterised by large temporal, spatial and thematic gaps in biodiversity data, including the availability and access to even existing data (see e.g. Figs. 1.1 and 1.2 above). Country and the region should therefore strive first of all to make all available data discoverable and accessible through national and rather international repositories through application of appropriate tools and data portals. As Georgia and Caucasus countries are small and under-resourced, they should constantly keep open eye on all developments at the European and Global levels and utilise available tools and instruments to manage biodiversity data discovery and accessibility issues. Fig. 1.4 below shows this larger picture of science and policy interaction at the European and Global levels, so that countries of Caucasus can promote themselves both in national and regional context in term of building their own and common BONs. And importantly, Caucasian countries could position at the Biodiversity Information System for Europe (BISE, <http://biodiversity.europa.eu/countries>) and indicating progress with Aichi targets (<http://www.foeeurope.org/sites/default/files/progress-towards-aichi-targets-oct2014.pdf>).



**Fig. 1.4** Science-policy interface for biodiversity data mobilisation through GEO/EUBON (source: Wetzel et. al (2015) <http://dx.doi.org/10.1080/14888386.2015.1075902>)

European and global tools for biodiversity data sharing cannot be used for granted, capacity building activities are required at all levels – *users* (such as researchers, citizen scientists, NGOs), *infrastructure* (BD DB managers) and *institutions* (with mandate to run or set policies for biodiversity monitoring programs).

EU BON developed Data Mobilisation Toolkit<sup>8</sup> specifically for biodiversity data management capacity building purposes. In next subsections other capacity building and training resources are described briefly and references provided to environmental data sharing applications. As far as biodiversity data sharing is concerned, Georgia and Caucasus countries should take note of the plans for the development of European Biodiversity Portal (EBP) by EU BON, including both best practices and training materials for biodiversity data management. Principles on which open access is promoted would be based on Bouchout Declaration for Open Biodiversity Knowledge Management.<sup>9</sup> Georgian organisations and individuals are encouraged to join this declaration at

<sup>8</sup> <http://eubon.cybertaxonomy.africamuseum.be>

<sup>9</sup> <http://www.bouchoutdeclaration.org/declaration>

<http://www.bouchoutdeclaration.org/sign> and start practicing it by applying open data sharing principles e.g. by licensing machine-readable data under Creative Commons or equivalent conditions (i.e. CC-0, CC-BY, CC-BY-NC).

EBP is expected to become operational by 2017 and it will be promoting for biodiversity data discovery the metadata standards such as ISO 19115, EML (Ecological Metadata Language) and OGC CSW (Open Geospatial Consortium's Catalog Service for Web, <http://opengeospatial.org>). Of particular notice is the plan of EU BON to integrate within the EBP data brokerage system such as GEOSS GI-cat (more at [http://essi-lab.eu/do/view/GIcat/WebHome#Success\\_stories](http://essi-lab.eu/do/view/GIcat/WebHome#Success_stories)).<sup>10</sup>

Architecture of the EU BON's EBP portal would envisage as its main users the researchers and policy makers, but also citizen scientists and NGOs, gaining access at various levels to not only data and metadata discoverable and accessible, but also digestible with brokerage and analysis workflows, models and tools.

Two more issues are important in the EU BON context. First is emergence and spreading of 'data paper'<sup>11</sup> publishing practice,<sup>12</sup> promoted by many disciplines including biodiversity, e.g. using GBIF Integrated Publishing Toolkit (IPT, see latest version at <http://www.gbif.org/ipt>). Georgian and Caucasian researchers are recommended to use and to require in their monitoring programs the publication of data papers as a demonstration of the successful completion of biodiversity research and monitoring efforts at key milestones. Recent further contribution into data paper field was provided by the development of a metadata-to-manuscript conversion tools within IPT, streamlining data paper generation directly from metadata records, applied through the peer review and entire publication process including archiving of final versions.<sup>13</sup>

Secondly, Georgian and Caucasus researchers and monitoring programs (including the funding administrators from both GoG and donor supported initiatives) are strongly encouraged to follow EU BON recommendations outlined in recent papers devoted to open access to biodiversity data.<sup>14</sup> Main principles recommended by EU BON are reproduced in summarised form at the end of the Recommendations section of this report.

## **- European Research Projects**

In addition to EU BON project, the European 7<sup>th</sup> Framework Programme contributed with substantial number of other research projects to support INSPIRE and GEO/GEOSS processes, such as the enviroGRIDS (<http://envirogrids.net>), IASON (<http://www.iason-fp7.eu>), EOPower (<http://www.eopower.eu>), GEONetCaB (<http://www.geonetcab.eu>), OBSERVE (<http://observe-fp7.eu>), BALKANGEONET (<http://balkangeo.net>), EGIDA (<http://egida-project.eu>), PEGASO (<http://pegasoproject.eu> and its geoportal at <http://pegasosdi.uab.es/geoportal>) and many others. All of these projects include substantial capacity building component. In SDI context particularly noteworthy is perhaps the continuously updated training package 'Bringing GEOSS services into practice' ([ftp://orion.grid.unep.ch/GEOSS\\_services/Tutorial.pdf](ftp://orion.grid.unep.ch/GEOSS_services/Tutorial.pdf)), developed by the University of Geneva, Switzerland, utilising entirely free and open source tools and data.<sup>15</sup> Georgian and Caucasian researchers and practitioners in the field of biodiversity are strongly advised to

<sup>10</sup> <http://ijdir.jrc.ec.europa.eu/index.php/ijdir/article/download/281/319> (Nativi, Craglia and Pearlman, 2012)

<sup>11</sup> <http://www.gbif.org/publishing-data/data-papers> and <http://phys.org/news/2015-10-manuscript-click-button.html>

<sup>12</sup> <http://bdj.pensoft.net> and Pensoft ARPHA Writing Tool at <http://arpha.pensoft.net>

<sup>13</sup> Vishwas Chavan et al. The data paper: a mechanism to incentivize data publishing in biodiversity science, BMC Bioinformatics (2011). <http://dx.doi.org/10.1186/1471-2105-12-S15-S2>.

<sup>14</sup> Egloff et al. Data Policy Recommendations for Biodiversity Data. EU BON Project Report, Research Ideas and Outcomes (2016). <http://dx.doi.org/10.3897/rio.2.e8458>. See also <http://phys.org/news/2016-03-biological.html>.

<sup>15</sup> <https://unige.ch/tigers/en/enseignements/geossinpractice>

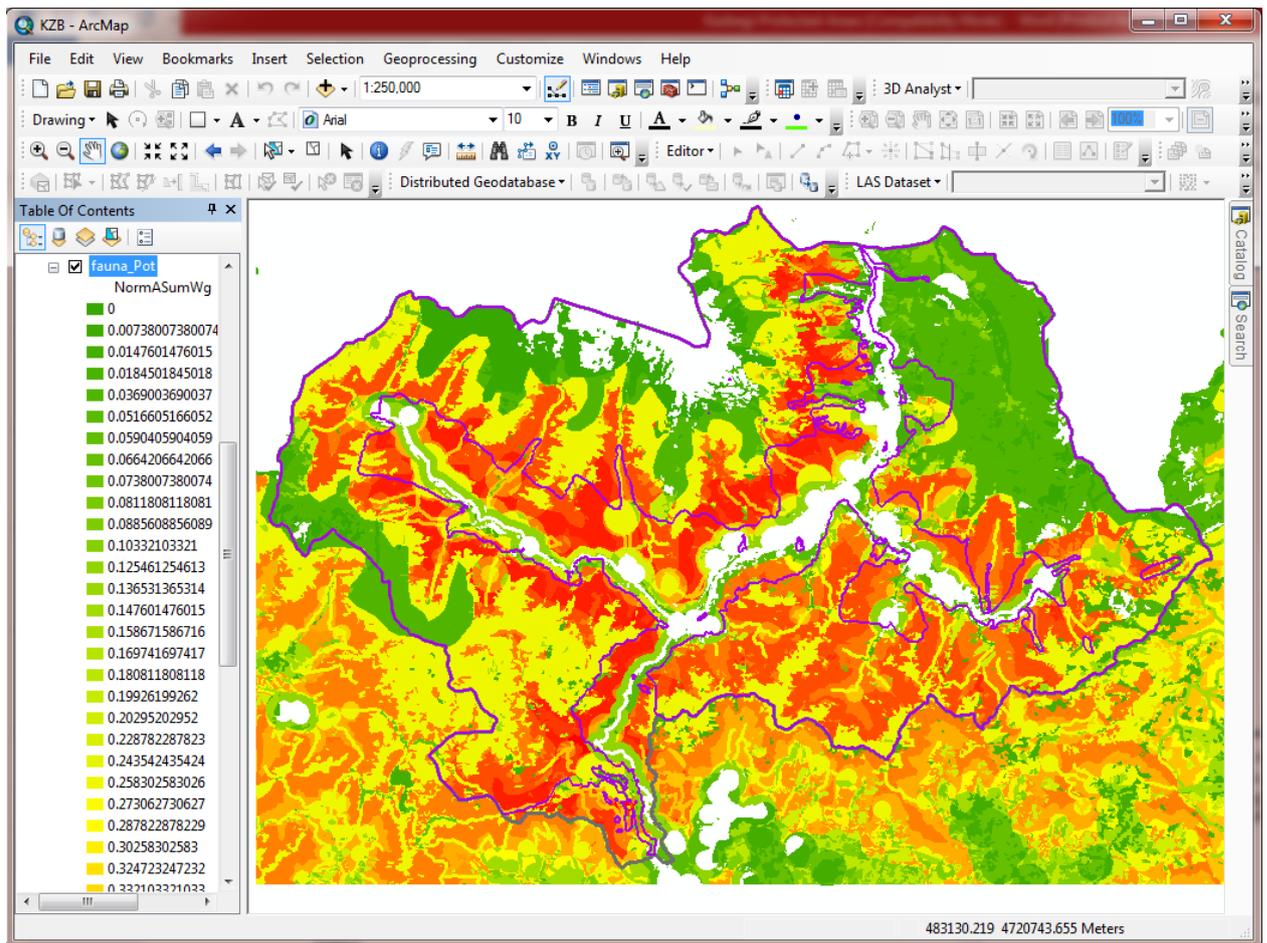
explore all these and many other projects to familiarise with existing tools and instruments which can indeed be utilised in practice. Recommendations on specific and most useful tools and resources are presented in the Recommendations section of this report.

### **- Biodiversity Data Integration**

There is indeed a substantial learning curve in acquiring skill and experience with SDI tools and services, but why bother for biodiversity and other type of metadata and data collection and open sharing? For non-specialist persuasion and to gain support of decision-makers, recent example of Kazbegi Protected Areas baseline data study, undertaken by GIS and RS Consulting Center GeoGraphic under the KfW/GFA supported SPPA-Georgia project is described hereby. Almost similar experience and methodology was reported by ISU team working on UNDP supported Protected Areas project in Adjara A.R. (personal communication of T. Bakuradze, GeoGraphic). Both of these exercises collated key BD datasets to set spatial explication of conservation objectives through boundary definition and conservations zoning (see Figs. 1.5 and 1.6 further below). Excellent results achieved would have been enhanced substantively even further if more data and services would have been openly available to researchers involved in these studies.

Kazbegi PA baseline studies applied so called ABC (Abiotic-Biotic-Cultural) methodology for baseline study, including the application of GIS spatial modelling tools and visualisation and interpretation of integrated results. Spatial variability of all three subsystems listed above were overlaid in a specific way to finally derive spatial patterns based on analysis of key sites to establish territorial and functional zoning units in the proposed conservation designation. Criteria for key site identification were elaborated for each sub-component. Responsiveness to these criteria defined high value areas for each element and their integral combinations, to establish the level of conservation zoning category allocations and spatial organisation of various zoning compartment as well as ultimately verification of proposed boundary layout for designation.

For biotic component in particular the target species were determined as those which are dependent on resources in the protected area, or constituting part of those populations, which are critical for Georgia as a whole in terms of species survival, or vast majority of population falls in spatial terms under this particular protected area. By overlaying potential distributions areas of target species and using spatial analysis techniques integrated index values were produced for the distribution of key species, and colour coded as green (low), yellow (average) and red (high) importance values of the indicated conservation area (Fig. 1.5). Such an integral combination of expert scores and abundance values gives strong quantitative tool to biodiversity experts and conservation managers to support designation process with evidence based arguments.



**Fig. 1.5** Conservation area significance with regard to target species

Based on such spatial analysis of biodiversity dataset overlays zoning boundaries and respective categories were proposed for the Kazbegi protected areas, based on both ecosystem as well as species level distribution analysis and environmental and cultural heritage values of the considered conservation areas. Proposed therefore were the following protected territories:

1. **Kazbegi National Park** with area 73,658 ha and the following zones:
  - a. Strict protection
  - b. Managed nature protection
  - c. Visitors
  - d. Traditional use
  - e. Administrative
2. **Truso and Sno Protected Landscapes**
3. **Kazbegi Multiple Use Territory**

In this particular case of Kazbegi Protected Areas, for instance, there is a compelling argument that protected landscape designation is the most appropriate regime for the Truso Gorge as this area of the proposed protected areas was clearly established as the conservation hot spot in this multi-criteria analysis of biotic, abiotic and cultural data layers (Fig. 1.6).

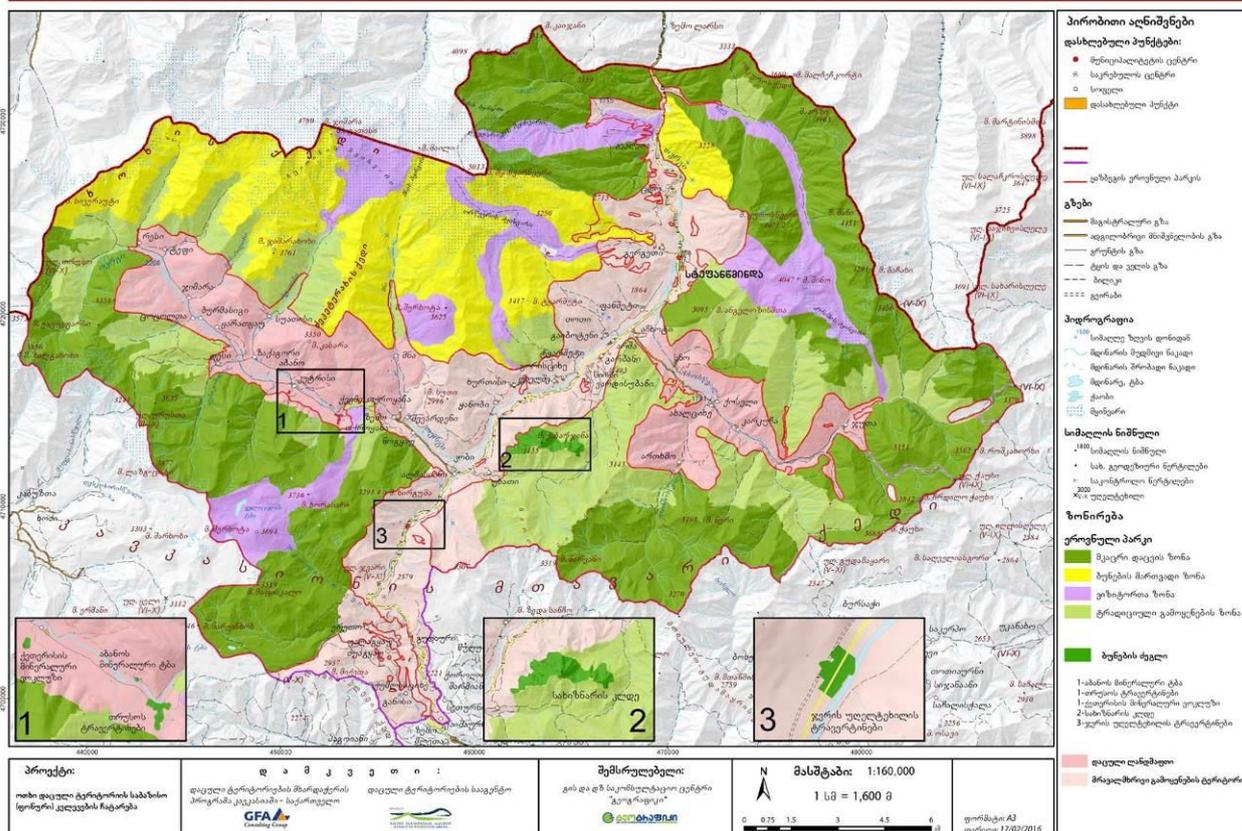


Fig. 1.6 Proposed zoning for Kazbegi Protected Areas based on BD data integrated

Truly, this study illustrates shortcut path from biodiversity data and geospatial tools application to decision-making in support of the nature conservation in Georgia and the Caucasus.

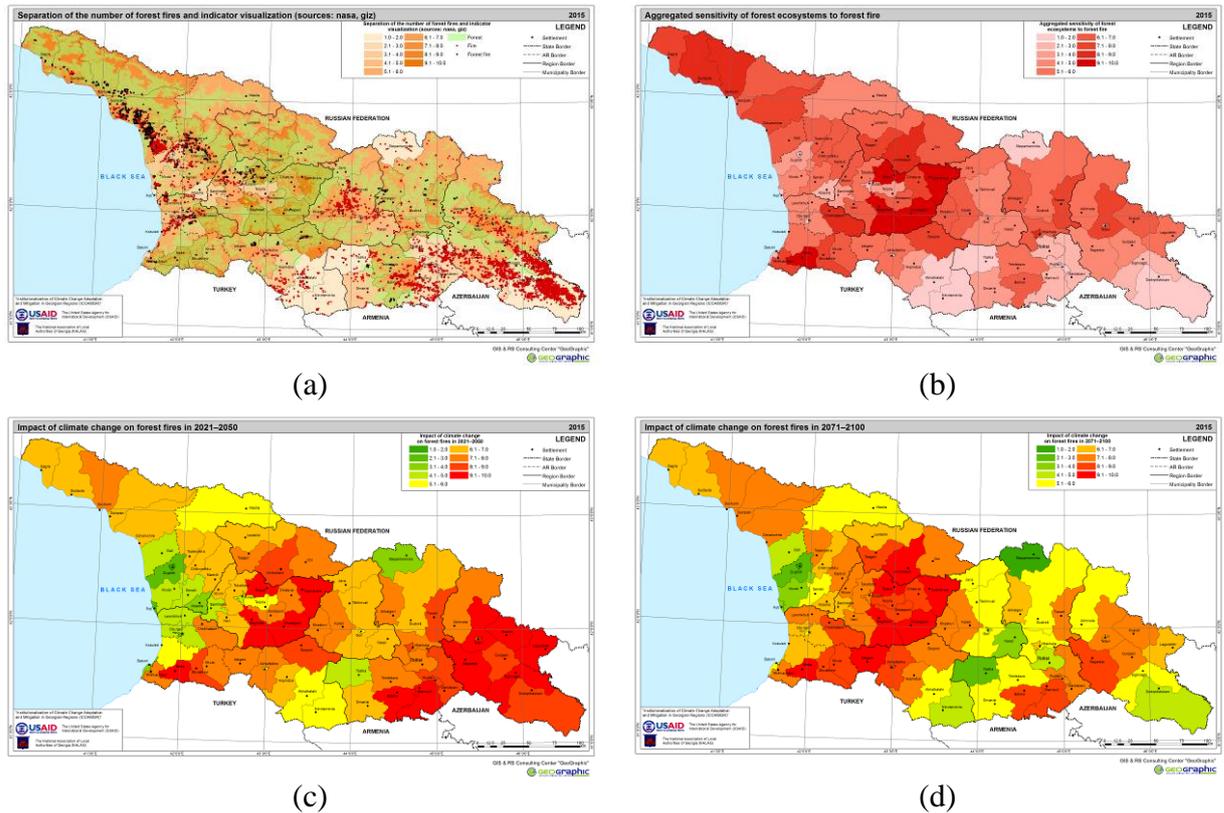
**- Climate Change Assessment**

Above example illustrates systematic use of biodiversity data resources in deriving needed results in methodologically consistent manner. But documenting and sharing metadata and data can have spin-off consequences as well. It is never known in advance what other unintended use the shared data can demonstrate. With big data in mind, even fact of sharing datasets can extend the scope of data exploitation.

Informal knowledge and access to GIZ sponsored 5 m resolution forestry cover datasets of 2011 enabled the author of this report to contribute in an unexpected way into the USAID supported climate assessment project ICCAMGR.<sup>16</sup> Careful look into Figs. 1.7, where results of combined application of this forestry cover with the NASA’s land fire data (<http://earthdata.nasa.gov/firms>) acquired from global RS sources, and utilizing GIZ climate change vulnerability assessment methodology and instruments<sup>17</sup> reveal, that such an analysis is useful not only for assessing forest fires, but also for the establishment of much better practices in managing harmful agricultural fires in holistic manner (including integration of forestry, agriculture and emergency response sectors).

<sup>16</sup> Institutionalisation of climate change adaptation and mitigation in Georgian regions (<http://nala.ge/current/476>)

<sup>17</sup> GIZ (2015) “Training Manual on the Integrated Vulnerability Assessment Methodology”. GIZ, in cooperation with Adelphi/EURAC. United Nations Economic and Social Commission for Western Asia (ESCWA), 2015. [https://www.unescwa.org/sites/www.unescwa.org/files/events/files/riccar\\_training\\_manual.pdf](https://www.unescwa.org/sites/www.unescwa.org/files/events/files/riccar_training_manual.pdf)



**Fig. 1.7** Climate change impact on forest fires in Georgia (source: USAID ICCAMGR)  
 (a) Forest cover (sources NFA/GIZ) and fires 2000-2015 (NASA/FIRMS)  
 (b) Forest fire sensitivity indicator (aggregation of forest fires and forest cover)  
 (c) Impact modelled per Georgian municipalities for period 2021-2050  
 (d) Impact modelled per Georgian municipalities for period 2071-2100

NFA of Georgia is strongly advised to prepare as soon as possible for distribution and sharing GIZ supplied 2011 forest cover data into public domain, once QA/QC process is finalized. This would demonstrate essentially the first sharing key environmental data to stakeholders and wider public. It is strongly believed, that sharing will have more ‘unexpected’ consequences, as there are people outside (and even inside) the government system, which can contribute into data assimilation and novel product production. Incidentally, this action by NFA would render financing agency such as GIZ motivated to further support Georgia and Caucasus ecoregion with new projects and new tools development. Author of this report is committed to contribute personal time and experience in deploying forest cover datasets using enviroGRIDS portal so that data and metadata can be harvested through various SDI nodes including Georgia’s NSDI (in both raster & vector formats).

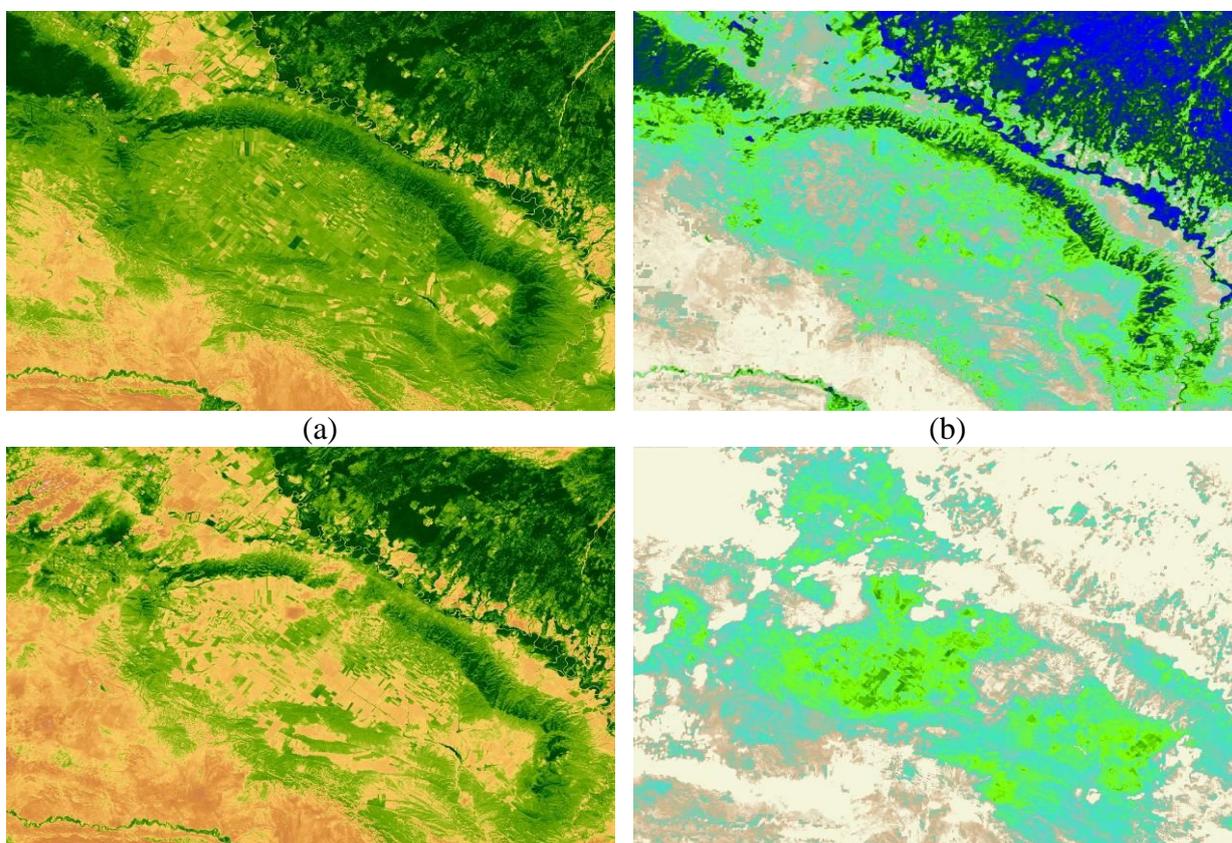
Next and final subsection describes the current global trend of more quality data resources getting increasingly available from various global *ex-site* sources, which can become paradigm shifter if and when successfully combined with *in-site* biodiversity datasets.

### - Remote Sensing

LANDSAT. It should again be pointed out from the outset, that data and information systems are in strong transformative phase and future developments could be quite disruptive (in positive connotation of the term), unless carefully planned and approached innovatively. And current trend is overwhelmingly with the open sources software products for processing data and free public sharing of publicly funded datasets.

Good example of this is Landsat. Decade ago projects could spend quite some resources to obtain this data, which since 2008 became freely available, setting the new paradigm in earth observations. Same path was taken by EU Sentinel mission with even better resolution datasets and linked toolsets freely available, all in GEO context. This promises to generate even better quality products than current 30 m resolution Landsat, such as, for instance, decades of reanalysis history of deforestation – a resolution almost unimaginable in Georgian reality just few years ago. Recently similar resolution was achieved with distribution of Landsat based 30 m land cover products from US (2013, <http://un-spider.org/category/free-tagging/basevue>) and China (2010, <http://www.globallandcover.org>). Just one year ago the GlobCorine with 300 m resolution was the best quality product. European Sentinel promises to improve this resolution down to 10 m.

Free access to Landsat imagery sparked exponential growth of access and use of this excellent product and recent trend includes free access to services almost unimaginable a year ago (such as deforestation/afforestation products of Global Forest Watch by University of Maryland and CLASLite tool by Carnegie Malone University for remote sensing of forest cover degradation).



**Fig. 1.8** NDVI (a) and Fractional EvapoTranspiration (b) for Shiraki Valley (sources: <http://eefflux-level1.appspot.com> using Landsat scenes of 2014-06-02 & 2014-07-14)

The most recent example of this type is the global access to Landsat based EvapoTranspiration (ET) product by University of Nebraska in collaboration with Google Earth Engine, accessible at <http://eefflux-level1.appspot.com>. Screenshots of this tool applied for Shiraki Valley in Georgia is provided on Figs. 1.8 above (evapotranspiration mapping essentially allows tracking water resources accessible to crops naturally or through irrigation).

SENTINEL. Example of Landsat free data access set the game-changer precedent for ambitious European Copernicus programme of earth observation satellites and tools. European Union

already launched four satellites Sentinel 1A & 1B (radar), 2A (optical), 3A (altimeter) providing extremely useful constellation of remote sensing instruments, which are worth exploring, see Sentinel missions at <https://sentinels.copernicus.eu/web/sentinel/missions>, Copernicus data hub at <https://cophub.copernicus.eu> and toolbox at <https://sentinel.esa.int/web/sentinel/toolboxes> as well as tool downloads at <http://step.esa.int/main/download>.

TRMM. Another disruptive example is Tropical Rainfall Monitoring Mission (TRMM) and its recent follow up better resolution Global Precipitation Mission.<sup>18</sup> Satellite with radar instruments to measure precipitation is quite comparable with in-situ measurement of precipitation in Georgia. Georgian NEA should think twice when further delaying public access to its real-time & historic records of hydrometeorology data. There are signs that even hydrological data can be measured with remote sensing. Solution for Georgia seems in quality *in-situ* products and wide sharing of these quality products with the public and professional community to use its products.

As a final note, yet another recent paper by EU BON consortium critically reviews and discusses the applicability of remote sensing methods in biodiversity.<sup>19</sup> Further sources and examples on these subjects can be found in Annex A, where references on the applications and tools of Earth observations in biodiversity are comprehensively compiled (more up-to-date bibliography can be found at the original source: [http://www.hcpinternational.com/links/links\\_eopower](http://www.hcpinternational.com/links/links_eopower)).

It is indeed hoped that provided examples of open source tools and free and open public datasets can be the source of inspirations for stakeholders when selecting biodiversity data management arrangements and institutional options for Georgia and the Caucasus.

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<sup>18</sup> TRMM and many other science products are accessible through NASA's <http://GIOVANNI.sci.gsfc.nasa.gov>.

<sup>19</sup> Rocchini et al. (2016), Satellite remote sensing to monitor species diversity: potential and pitfalls, Remote Sensing in Ecology and Conservation, V2, pp 25–36, 2016, <http://onlinelibrary.wiley.com/doi/10.1002/rse2.9/full>.

## 2. Recommendations

This section summarises key findings and recommendations of this report. It first starts with the summarisation of SWOT analysis of the options for lead institutions considered in the context of NBMS, followed by proposed recommendations in terms of the development of the metadata catalogs, dataset sharing repositories as well as tools for better networking at the national as well as international level for Georgia and even the Caucasus Region.

### 2.1 Options

Main result of the analysis conducted in this report was presented in the Table 1.1 summarising institutional options above in subsection 1.6 of this report. Combined with the detailed findings contained in the Annex C, SWOT Scoring, it can be concluded, that key institutions identified for the proposes of leading and hosting the NBMS are the following three, which were rated the highest: EIEC, NEA and ISU.

It was also alerted in subsection 1.6, that decision-making process should not be reduced to mere quantitative exercise, and as ratings of these three key stakeholders are quite close to call lead institution, it is considered appropriate to propose network based, rather than single agency based solution.

The following roles and responsibilities could then be envisaged for each above listed institution.

EIEC: As mandated by the implementation of the UNDP sponsored project, EIEC could take the lead role in smoothly running the NBMS network (see 2.4 subsection below). At the same time, web portal of the EIEC at <http://eiec.gov.ge> could host the entry point for the NBMS as part of the wider EIEC portal on environmental data sharing. An important role of EIEC to facilitate regular meetings and smooth functioning of the NBMS Working Group (proposed below) should not be underestimated. Designation of the Working Group through appropriate legal instrument can easily be harmonised with the plan of action under UNDP project, avoiding any duplication.

NEA: This is the key agency of the MoENRP with best technical capabilities in the environment sector with regard to environmental data storage and distribution. Strong role of the NEA, and its Database Department in particular, would be to allocate and smoothly run all the storage and computation services required for the establishment of the NBDS, starting first with metadata cataloging facility, and subsequently with the dataset web services (see subsection 2.2). Latter could tap on outputs of the European initiatives such as enviroGRIDS and PEGASO to develop the mirror facility for hosting Georgian BDMS datasets. While implementing above actions, it needs to be clearly kept in the perspective the need for integration with the National Spatial Data Infrastructure initiative implemented coordinated by the NAPR (see more at <http://nsdi.gov.ge>).

ISU: As the institution hosting probably the best Georgian portal and database on biodiversity available at <http://biodiversity-georgia.net>, as well as availing perhaps the best biodiversity data collection infrastructure of research institutions (Zoology, Botany and Ecology, to name some) and the network of researchers, ISU could take the lead in supporting both EIEC and NEA in collating step-by-step all available biodiversity metadata and data resources, making them as far as possible freely and openly available through EIEC environmental metadata and dataset web portal using NEA servers and data storages, allocated for the NBMS.

ISU could also take the lead in International Networking and could start as the first step with exploiting the European initiative entitled Permanent Networking Facility (PNF), developed under the European IASON project and hosted by University of Novi Sad (UNS) at <http://iason-fp7.eu/pnf>. With support and leverage of GIZ programme, ISU could facilitate collating and populating PNF with Georgian and ultimately Caucasus Initiatives and Institutions, as part of the EU's wider Balkan, Mediterranean, Black Sea PNF, connecting Georgia and Caucasus. In this regard, it is suggested to consider establishing MoU between UNS and ISU regarding the cooperation in the establishment of mirror PNF facility for the Caucasus Biodiversity.

In the Caucasus regional research cooperation context it is indeed worth mentioning that Swiss-supported SCOPES<sup>20</sup> programme launched in 2015 “Sustainable Caucasus” project (coordinated by UNIGE), to strengthen cooperation among scientific institutions from Armenia, Azerbaijan, Georgia, Iran, Russian Federation and Turkey in the wider context of the Scientific Network for Caucasus Mountain Region (SNC-mt),<sup>21</sup> established in 2014. Georgian partners include Ilia and Tbilisi State Universities. The project also initiates the Caucasus Mountain Forum (CMF) series, with its first edition to take place in Georgia on 27-30 November 2016. The project is in the process of setting up a pilot for a Caucasus Spatial Data Infrastructure (C-SDI), which could become important instrument to mainstream biodiversity and other data sharing at regional level.

## 2.2 Data and Metadata

Following are some steps which could be implemented to improve and to kick-start the data and the metadata generation and sharing for NBMS.

The following existing European system is proposed to immediately utilise for data and metadata collection: GeoNode at <http://portal.envirogrids.net> (see link <http://blacksea.grid.unep.ch/layers>). It can be the task of ISU to organise with GIZ support the collection of existing data and metadata resources (and/or even newly developed), which could immediately be uploaded and distributed through this portal. MoU between ISU and UNIGE could help facilitate this task.

Another portal, which can and should also be used for immediate sharing of Georgian biodiversity and other environmental data is <http://pegasosdi.uab.es/geoportal>. This and above resources provide further detailed information on how they operate.

It should be noticed, that resources uploaded on one portal can be harvested by another portal, and can ultimately be harvested by the NBMS GeoNode, once setup by ISU in collaboration with NEA and made accessible, preferably through EIEC web portal.

## 2.3 Initiatives

Specific actions are proposed in this subsection for consideration of GIZ IBiS, which could technically support establishment of the systems indicated above.

UNDP project would provide technical equipment for the needs of EIEC. This effort, if found insufficient, could be complemented by GIZ.

ISU would benefit from server hardware and software procurement for the establishment of the dedicated SDI node at the School of Natural Sciences and Engineering, aiming at setting up the

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<sup>20</sup> <http://www.snf.ch/en/funding/programmes/scopes/Pages/default.aspx>

<sup>21</sup> <http://caucasus-mt.net>

‘enterprise’ level geospatial hardware and software facility with virtual connections for its research communities from IoZ, IoB and IoE.

Similarly, NFA would benefit from forestry agency-wide ‘enterprise’ geospatial server hardware and software upgrade, so that it can serve entire agency with geospatial datasets, and could organise licensing intranet portal within its own premises, but with links to system run by MoF. As the first task in this direction, NFA could serve its forest cover imagery and vector layers, provided by the completed GIZ programme, as its first publicly available dataset. Next logical step would be the NFA to provide its forest inventory data to the public through its web services. NFA system should better be a standalone capability, with more emphasis on forestry capacity.

Same approach has to be pursued for APA as well (agency-wide ‘enterprise’ geospatial server hardware and software upgrade, serving entire agency with geospatial datasets, intranet portal for the entire institutional network of protected areas, with links to system run by MoJ/NAPR). NFA and APA could harmonise data capture and inventory activities (such as aerial photography and forest and wildlife inventory, for instance). APA system should also better be a standalone capability, quite similar to NFA, including more emphasis on biodiversity monitoring capacity, as well as on PA boundaries and zonings.

In addition to forest inventory, APA should follow the NFA example by developing common specifications for geospatial work (such as PA boundaries, for instance, or forestry inventory, which could find its inspiration in the respective INSPIRE technical guidelines).

Similarly, APA could actively work with GIZ, CNF and other technical assistance community to develop common specifications for biodiversity monitoring (could be harmonized with ongoing CNF work in this direction, see also international networking).

Both NFA and APA are urged to take part in NBMS and NFMS in compliance with INSPIRE data specifications and guidelines (<http://inspire.ec.europa.eu/Themes/Data-Specifications/2892>), in particular those for protected sites, species distribution, bio-geographical regions, habitats and biotopes, land cover and land use.

## 2.4 Networking national

As all other institutions considered in this analysis are important stakeholders, justifying their inclusion into NBMS effort, in addition to three lead stakeholders indicated above, it is proposed to establish on a permanent basis and with proper legal mandate the NBMS Working Group, meeting periodically to facilitate the establishment and smooth functioning of the National Biodiversity Monitoring Network (NBMN), acting as the kind of *partnership*.

Few recommendations could be considered as advisory in the implementation of NBMS:

- EIEC could take the lead in initiating proper legal establishment paperwork and organising on a regular basis (quarterly at least) the meetings of the NBMS Working Group, providing its minutes and monitoring of the implementation of agreed action.
- Above three institutions could take lead in NBMS development, but all concerned stakeholders should have the strong opportunity to contribute into the network and system development. EIEC should facilitate participation of each member institution and each member expert, while NEA and ISU should support such participation with expertise and technical means available to them.

- Not least, the activities of the NBMS Working Group should feed into the NSDI process and ultimately contribute into the establishment of the *biodiversity* component of the NSDI in full compliance with INSPIRE directive and related national activities in this respect.

- It is also important in this regard, that NSDI should not be perceived as purely governmental process; there should be involvement of NGOs and private sector representatives active and competent in SDI and biodiversity monitoring.

## 2.5 Networking international

As the first step, as mentioned above, the ISU, with strong support of EIEC, would take the lead in utilising existing European initiatives and facilitating the population of the IASON PNF with Initiatives and Institutions active within the NBMN. Comprehensive presence and self-registering of Georgians into IASON PNF would be the indicator of active participation and sign of quick success.

It is worth mentioning in this regard, that IASON PNF for the Balkan, Mediterranean, Black Sea and hopefully Caucasus Regions, <http://iason-fp7.eu/pnf>, is closely watched by the EU's Joint Research Centre (JRC), which is the lead European institution in charge of the implementation of INSPIRE Directive (please explore the links <https://ec.europa.eu/jrc>, <http://inspire.ec.europa.eu>, <http://inspire-forum.jrc.ec.europa.eu>). Therefore, populating the PNF with Georgian biodiversity resources would strongly contribute into networking of Georgian organisations with European research institutions and hopefully identification and participation in joint calls issued by the DG RESEARCH and other European governance bodies.

As for the global level, as the agency hosting the GEO Principle for Georgia, NEA Database Department should take the lead, with the strong support of EIEC, in connecting Georgia to GEO/GEOSS initiatives, such as GEO BON (<http://geobon.org>), and by actively reporting to GEO the progress with initiatives such as NBMS and its establishment, as well as, importantly, registering, whenever ready and required, Georgian data and metadata repositories with the GEO/GEOSS portal, guided by the following links:

<https://www.earthobservations.org>  
<http://geossregistries.info>  
<http://geossregistries.info/geosspub>

<http://www.geoportal.org>  
[http://www.geoportal.org/web/guest/geo\\_home\\_stp](http://www.geoportal.org/web/guest/geo_home_stp)  
<http://geossregistries.info/holdings.html>

It is again reiterated hereby as a recommendation that the national networking process should be well integrated into global processes such as GEO/GEOSS and GEO BON, and preferably approaching global institutions within the European INSPIRE and EU BON framework.

In this regard Georgia and Caucasus countries should pay careful attention to the plans of EU BON to develop the European Biodiversity Portal (EBP), which is expected to become operational by 2017 as a clearinghouse of the best practices and training materials for biodiversity data management, but importantly, building the infrastructure for the application of metadata standards as well as biodiversity data discovery and brokerage. National and regional metadata systems of Georgia and Caucasus Region could then be integrated into EU BON EBP.

Georgian and Caucasian biodiversity researchers and biodiversity (and forestry) monitoring programs are urged to actively publish freely and openly their biodiversity and forestry data through web services and global data portals such as GBIF, but also to document database and dataset developments through publication of peer reviewed 'data papers' through GBIF's Integrated Publishing Toolkit (<http://www.gbif.org/ipt>). Such publications could be considered

as success indicators for locally, nationally and internationally supported biodiversity research and monitoring programs. It is therefore appropriate to complete this section with the reiteration of the current European and global trend with free and open data publication, reproducing below the EU BON data policy recommendations *inter alia* for *researchers* and *funding agencies*:<sup>22</sup>

### Researchers

- Researchers should refrain from asserting intellectual property rights for biodiversity data and information collected and/or published by them. By default, all content referring to biodiversity information should be openly accessible.
- As far as material produced by researchers is protected by copyright or by database rights, the right owner should make these works or databases freely accessible and reusable by publishing them under a CC-BY<sup>23</sup> or CC0.<sup>24</sup>
- Publicly funded research institutions should refrain from asserting intellectual property rights for biodiversity data and information collected and/or published by them. By default, all content referring to biodiversity information should be openly accessible.
- Publicly funded institutions should encourage re-use of biodiversity data and information for research purposes with a requirement for attribution of the source, but should impose no other requirements on re-use.
- As far as material owned by publicly funded institutions is protected by copyright or by database rights, the institutions should dedicate these works or databases to the public domain by publishing them under CC0.

### Funding Agencies

- Whenever possible, funders should support and require use of the most liberal data use and re-use licenses, particularly by putting data into the public domain through the CC0.
- Develop policies to require funded researchers to make the data underpinning scientific publications available in machine readable formats in public repositories at the time of initial publication.
- Support and require enhancement to the maximum possible extent of machine-readability of both data and associated metadata.
- Ensure and require that data management plans (DMPs) to include clear statements and a work plan for archiving and sharing research data. The DMPs should include: descriptions of data to be produced in the proposed study, any data standards used, mechanisms for providing access to and sharing of data (including provisions for protection of privacy, confidentiality, security, intellectual property, or other rights), provisions for data reuse and redistribution, and plans for archiving and long-term preservation of the data. As the technical infrastructure available to research will continue to evolve, so it is expected DMPs to evolve.
- Support and encourage the use of established public repositories and community based standards. Funders should encourage all funded researchers to make use of existing data standards relevant to their research community, such as standards for collecting and representing data and information describing the data set (i.e. metadata), as well as promote the interoperability of digital data in and across public repositories.
- Develop approaches and support technologies to ensure the discoverability of data to make them findable, accessible, and citable. Funders should support also the development of data discovery indexes to provide a mechanism to enhance discoverability and facilitate appropriate attribution to those responsible for the dataset and link the citations to associated publications.
- Explore the development of a data commons, a shared space for research output including data, software and a narrative that follows the FAIR principles of Find, Access, Interoperate and Reuse.

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<sup>22</sup> Egloff et al. Data Policy Recommendations for Biodiversity Data. EU BON Project Report, Research Ideas and Outcomes (2016). <http://dx.doi.org/10.3897/rio.2.e8458>. See also <http://phys.org/news/2016-03-biological.html>.

<sup>23</sup> <https://creativecommons.org/licenses/by/4.0>.

<sup>24</sup> <http://creativecommons.org/choose/zero>.

## Annex A. Biodiversity EO References

[**Note on bibliography:** courtesy of Mark Noort, HCP international. More up-to-date version can be found at the original source: [http://www.hcpinternational.com/links/links\\_eopower](http://www.hcpinternational.com/links/links_eopower)]

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## Annex B. Stakeholder Consultations

This annex reports on findings of consultations held with stakeholders during the assignment (presented in the meeting date chronological order).

### B.01 UNDP 3MEA-GE Project

**Interviewee:**

Nino GVAZAVA

Title: Project Manager

**Date:**

2016.11.16

Main project underway is entitled "Harmonization of information management for improved knowledge and monitoring of the global environment in Georgia" (shortly referred to as 3MEA-GE, where MEA refers to Multilateral Environmental Agreements).

Project document is provided in the following UNDP country folder for Georgia:

<https://info.undp.org/docs/pdc/Documents/GEO>

at the following link:

[https://info.undp.org/docs/pdc/Documents/GEO/4883\\_CCCD\\_Georgia\\_ProDoc\\_FINAL\\_ENG\\_18 Jun 2015.doc](https://info.undp.org/docs/pdc/Documents/GEO/4883_CCCD_Georgia_ProDoc_FINAL_ENG_18_Jun_2015.doc)

This project is directed towards satisfying national reporting needs for three global environmental agreements/conventions: Biodiversity, Desertification and Climate Change.

Two components: of the project are to address

- Information management system development
- Human capacity development

Single system to be created with access by respective users to respective parts of datasets.

Project is mostly concerned with the collection of existing data, but could also engage in baseline data collection if such needs are identified.

In case of CBD all sources of data are considered, including forestry. Assessment needs include whether data is in the format needed by respective convention. Periodicity to be assessed.

In December 2015 it was expected to complete the study with initial assessment, of technical and financial aspects of the information flow needs (undertaken by Ana RUKHADZE, biodiversity and environment expert, formerly with MoENRP Biodiversity Service, in charge with convention reporting, now with MDF of Georgia).

Another (institutional) assessment is also underway, NGO Green Alternative is providing expert study (contact person Irakli MACHARASHVILI) to determine roles and responsibilities with regard to three conventions and what are data and information requirements, plus capacity building needs review.

In March 2016 large meeting planned to be organised presenting results of these two studies.

The concept developed for the information system would undergo stakeholder consultation.

There will be three technical groups established for three conventions. Composition would be governmental, academic, businesses, technical, etc.

Specific software is planned to be created, tested and launched. This would include GIS system as well. Each measurement would be georeferenced.

Project started by end of September 2015 and is expected to finish by end of 2018. Total budget is \$1.8m. Approximately \$750k is allocated for information system component, rest - capacity building component.

Project design envisages to host / to administer information system at the EIEC. This is largely fixed with project document. Main function of the EIEC would be to collect rather than generate data and information.

There was inception meeting held on 21 July 2015 and more technical meeting held on 12 November 2015 (43 and 42 participants respectively, lists provided by interviewee and are documented in report files).

Roles and responsibilities need to be defined with regard to data flows (3 conventions). Changes in laws and regulations would be proposed. EIEC would have administrative role. Data would be hosted at their respective institutions of origin. Objective is to have maximally public access, with the exception of sensitive data. Approach will be that EIEC role would be more clearinghouse rather than agency hosting entire database.

Access would be by those parties which would need certain data, therefore access levels would be allocated to users with proper authority and authentication.

INSPIRE directive and need to harmonise with INSPIRE was mentioned. Ministry of Justice works in this direction (NAPR). There is a working group/forum established, MoENRP and NEA participate. Discussion was also concerned with GEO/GEOSS and membership of Georgia in it. (Consultant's comment: NEA Chairperson to participate in Plenary and Ministerial on 11-13 December 2015, which indeed was the case.)

CBD has its clearinghouse, but Georgia is not actively participating in clearinghouse mechanism (CBD CHM). There is currently no focal point which would administer access to clearinghouse.

There was a discussion with regard to open access to data. Also discussion concerned with the reliability and responsibility for data quality. Example of Natura 2000 and data access was mentioned as an example, as well access to Emerald Network data under development for Georgia.

Relevant stakeholder contact details were identified for EIEC, NEA, APA, NACRES (contact for NBSAP 2 issues), Iliia State University (own studies, sometimes commissioned by MoENRP),

MoENRP Biodiversity Protection Service operates (through outsourcing) webpage for biodiversity indicators <http://biomonitoring.moe.gov.ge>.

IUCN-Caucasus has project supporting assembly of forest information system.

Need for coordination between this project and GIZ future initiatives is needed so that effort duplication is avoided and synergy is promoted.

Data is available on soils with Agrarian University but access is not straightforward.

Examples considered included issues with access to hydrological, meteorological data.

Importance for at least clearinghouse for meta-data collection was supported as a first step.

Further information about the project can be obtained from the project document (see link above).

It was agreed that interviewee would participate in the meeting discussing the study findings. It was also promised to fill small survey form or forward to relevant parties to complete survey (feedback not provided).

## B.02 MoENRP Biodiversity Service

**Interviewee:**

Joseph KARTSIVADZE  
Head of Biodiversity Protection Service (BPS)

**Date:**

2015.11.25

CBD Clearinghouse Mechanism (CHM) is assumed to be the main avenue for data reporting on biodiversity. This mechanism should be set-up for Georgia as well. It is hoped that UNDP project can support the launch and active maintenance of CHM for Georgia. Currently Georgia is not listed in this network as active participant (see <https://www.cbd.int/chm/network> and that the webpage quoted there earlier for Georgia <http://chm.moe.gov.ge> is not currently functional).

One lesson quoted from past initiatives is that it might be possible site/portal is available, but maintaining it is a separate effort and this function should better be outsourced from the BPS.

It was suggested to meet and discuss with EIEC as this entity is supposed to host the environmental including biodiversity clearinghouse for Georgia (UNDP project mentions EIEC with this function).

Past efforts to gain access to data held at other institutions was not straightforwardly successful, despite BPS tried MoU mechanisms with ISU, TSU and other scientific establishments. ISU seems to have better datasets, but mechanisms to access data needs streamlining. BPS has only access to those datasets which were commissioned by the MoENRP.

In case of Emerald Network, for instance, MoENRP/BPS will finally get access to datasets as this project is proceeding on behalf of MoENRP and for MoENRP. The project is supported by the European Council. NACRES would provide further details on the project.

GIS is weak point of the BPS. Training of personnel would be desirable as well as some access to GIS tools. Currently BPS does not have GIS software.

Biodiversity monitoring program is supported by the MoENRP, but these are mostly data for paperwork (areas, etc.). Last two years inland surface waters initiatives are being supported.

BPS collaborates on aquatic/ ichthyology data with Batumi monitoring centre (part of NEA).

CITES studies (plant species) are being conducted by Institute of Botany in collaboration with Kew Royal Botanical Gardens (UK) and Microsoft Research (UK). (Following web link was identified by the Consultant in this regard <http://www.kew.org/science-conservation/research-data/science-directory/projects/significant-trade-cites-plants>.)

In terms of access to information, general legislation on administrative obligation to satisfy information requests is guiding regulation for BPS. In general, if data is not secret, it can be shared.

BPS Head is not aware if there are data sharing working group or other intersectoral mechanism in place.

There are no strong links with NEA except ichthyology data through Batumi centre. Otherwise NEA does not have biodiversity data. BPS is in favour to have access to NEA resources, enabling biodiversity data storage and sharing.

BPS does not have any specific preference which agency would be clearinghouse, this role could be given to EIEC, but technically data storage is better being arranged with NEA.

In terms of coordination of possible intra-agency (MoENRP) or with inter-sectoral (MoJ/NAPR) working group or other mechanism/forum of dataset producers/administrators, from technical point of view EIEC serving as clearinghouse would be acceptable, but policy coordination to rest with BPS.

Other initiative mentioned was CNF/GEF project for protected areas monitoring data collection (to be initiated soon).

BPS does not have access so far to GFA protected areas support project data, as it is reporting to APA. Would be nice to have single place where at least metadata is collected.

No interaction reported with GFW.

Discussed was issue with who should better organise forest aerial photography. Coordination would be needed to apply joint efforts by forestry and protected areas to implement cost effectively forest cover monitoring. It would be better to have own personnel (forestry versus protected areas), but challenge to overcome would be to apply same methodology for forest inventory (though processing load can be shared, each agency engaging own personnel). So to summarise, methodology should be harmonised, institutional efforts shared/distributed between agencies per respective area. APA would be able to lift its share (8 percent of the country).

BPS has sporadic interaction with international biodiversity database network (such as GBIF). Actually GIS/spatial datasets are not part of CHM mechanism, and BPS would not want to develop strong GIS capacity (only user capability), but BPS would welcome to have access to intranet portal with well-maintained biodiversity data and metadata services. EIEC could be good place to host such as service, while NEA could provide backup with database/data storage.

With regard to integration with EU, roadmap developed by MoENRP includes multiple references to NBSAP-2 implementation. In particular, tasks include adoption of national biodiversity legislation; bird conservation needs assessment; establishment of specially protected areas for conservation of birds and respective conservation measures, completion of inventory of Emerald Network and their designation, establishment of monitoring of protected species. All these tasks potentially require strong monitoring information system. Only GIZ is supporting BPS with these efforts, which is very much appreciated (€150k for one year allocated recently through certain mechanism).

BPS not aware of INSPIRE directive or its biodiversity/protected area guidelines and not aware also of GEO/GEOSS/GEOBON processes. Consultant promised to provide relevant information in the report (see main part).

With regard to access to global resources, BPS considers more desirable to organise such an access to international expertise through European channels as part of European networks and expertise (such as INSPIRE and Emerald Network, as examples).

BPS also mentioned example of recent project on invasive species (Institute of Botany supported by GIZ), which produced certain GIS mapping. Results were submitted to BPS by GIZ.

It was also discussed to have some generic specification developed for potential contactors on how to receive GIS datasets, metadata etc. BPS would welcome such specification of digital database deliverables such as GIS products and metadata.

EIEC could also be good recipient of all possible data and reports so that project and institutional memory is maintained. Such standard specification could be developed by/for EIEC as well. (Consultant promised to include some general provisions in the report.)

In the MoENRP central apparatus there is not much expertise or capacity with databases, these issues are more of a speciality of NEA.

Further contact details and recommendations to discuss biodiversity data issues were provided for APA, ISU, Batumi monitoring centre.

It was agreed that interviewee would participate in the meeting discussing the study findings. It was also promised to fill small survey form or forward to relevant parties to complete survey (feedback not provided yet).

## **B.03 Environmental Information and Education Centre**

**Interviewee:**

Ia PAPIASHVILI  
Director EIEC, MoENRP  
Irma MELIKISHVILI  
Head of Information Service

**Date:**

2015.11.25

Aim of the establishment of EIEC was to make environmental information widely available. EIEC is not striving to 'own' all data but to receive information from producers and make it widely available through its web portal. All types of information are meant: raw data, processed, analytical reports, etc.

General approach to data sharing is that if data processing costs for sharing are involved, these costs might be charged. Basic document defining functions of the EIEC is its charter, approved by the MoENRP. Charter is available on EIEC website.

Centre's webpage contains following data so far: environmental legislation database is complete, database of environmental permits and EIA documents is essentially operational and accessible through webpage. In terms of biodiversity so far very simple/basic information is available. There is no metadata, but available is data about environmental governmental agencies and organisations, NGOs. The latter is searchable database. Other metadata type database is not available.

EIEC is involved in UNDP project concerning 3 conventions and these data management functions will go to the centre, which includes biodiversity, climate and desertification data.

As for system itself, by end of December 2015 core database is being prepared and private company ITIC is in charge of the contract with EIEC. Training is involved in the contract so that after commissioning website and core system is maintained by the centre.

As for equipment, so far Financial-Analytical Service of the Ministry of Finance is providing support with its cloud system. Under consideration is setting up environmental reporting system (air, waste, water, etc.) and next year hopes are that relevant software will be set-up (including with UNDP project support). MoF system is safe and protected, therefore instead of proceeding with own hardware, current decision is to set-up system with support of MoF facilities. Same approach was taken for forestry data management system (i. e. storage with MoF), which will be part of unified governmental database.

There was a temporary 3 month working group established (summer of last year, with participation of central apparatus, APA, all other agencies) at the initiative of EIEC and order of the Minister to undertake preliminary assessment of what data is available and where (apparently under UNDP project preparation scope). Centre would welcome resumed functioning of such intra-sectoral environmental data working group on a more permanent basis.

As for inter-sectoral coordination (such as under NSDI, National Spatial Data Infrastructure, for instance), current EIEC director was involved in her earlier capacity of adviser to minister (working groups on legislation, education, GIS, others?). EIEC former GIS staff (now with APA) was involved in GIS working group. Currently there is no GIS specialist but IT. NSDI is not closely partnering with EIEC at this stage. Centre believes because this was not

environmental data process, rather general spatial data context. Centre is not aware of specific arrangements with NSDI.

One issue with intersectoral commissions/councils mentioned is that between regular meetings considerable time can pass and key personnel can change (such as Deputy Ministers, for instance).

[It is the recommendation of the Consultant to have institutional representation into inter-sectoral commissions and/or intra-sectoral working group(s), rather than personal, as is usually the case.]

Soils dataset example was mentioned by the Consultant where intersectoral coordination would be needed (MoJ, MoA, MoENRP, while data expertise actually is with Agrarian University). Another example mentioned was forest cover map which is available with GIZ support. EIEC was not aware of existence of this data.]

There are no specific biodiversity data available currently on the EIEC web portal, though there is excellent compilation of various reports on biodiversity thematics.

Some discussion was ensued regarding importance of GEO/GEOSS/GEOBON, INSPIRE/NSDI/EIONET and participation of EIEC in these international initiatives to improve coordination.

In terms of personnel capacity, currently there are 21 staff members. Environmental Information Service of EIEC has 3 staff members including head. Current budget of EIEC is 630,000 GEL. EIEC is occupying 2 floors in the new leased office (it is near Ilia State University HQ building). Same office is occupied by REC-Caucasus as well. Own revenues are used to cover office cost.

Discussion was also concerned with access to datasets and constraints involved. Some extreme examples with other environmental agencies were discussed. EIEC currently does not have legal constraint to publicly share data.

Mentioned was also potential use of external/global resources, such as the land cover developed by international organisations (GlobCorine 300m resolution, now GLC 30m resolution is available and alike).

EIEC does not have access to cadastral data operated by MoJ/NAPR.

It was agreed that interviewees would participate in the meeting discussing the study findings. It was also promised to fill small survey form or forward to relevant parties to complete survey (feedback not provided).

## B.04 ISU, Institute of Ecology

**Interviewee:**

Levan MUMLADZE  
Ass. Prof. Institute of Ecology  
Ilia State University

**Date:**

2015.12.02

In general Flora and fauna datasets are quite weak in Georgia. Only database which is relatively rich is <http://Biodiversity-Georgia.net>, created and maintained by ISU (team lead by Davit Tarkhnishvili, Dean, School of Natural Sciences and Engineering, Prof. of Ecology and Evolutionary Biology). Amphibians and reptiles are quite well represented in the database (continuously enriched by fieldwork). Ants' database is based on literature sources. Incomplete but still relatively good base is for birds as well as database for mammals. Other datasets are incomplete and not reliable as are based on old taxonomic sources. Bats dataset available, linked to above mentioned website (see <http://www.campester.org/index.php?name=species&lang=eng> compiled by NGO Campester and Institute of Zoology).

There is quite good database on Caucasus molluscs. Interviewee has access to database, which is stored and maintained at Hamburg University (point coordinates are accessible but can only be picked up manually). Source: <http://www.caucasus-snails.uni-hamburg.de/CaucasianLandSnails-Dateien/Checklist.html>.

Fish/ ichthyology are available from literature sources. Javakheti lakes, some rivers are covered.

Ticks research is personal professional interest of the interviewee and has very detailed georeferenced database, but this is ongoing research and will only be available once published. Author intends to include excel file as supplemental data to research paper and this will include georeferenced attributes, enabling GIS map production. Submitted to Zootax and is expected to be published soon (data over 500 species, 400 points). This is result of 18 years work (last 5 years by interviewee). Data will be distributed freely including via above mentioned web portal.

Agrarian University is also working on insects, but not complete and unpublished yet, so not available publicly yet.

Relatively difficult is the issue with plant species. There seem no databases available on plants. Example of rhododendron was mentioned, where only 5 points could have been found from literature sources.

GIZ supported forest cover was mentioned in this regard and interviewee expressed enthusiastic desire for rendering this dataset publicly available once completed.

In terms of data access, there are no legal constraints, but without research publication completed, data access cannot be made public. In some cases researchers just do not have incentive to publish their research data as this requires extra effort.

Interviewee is in favour to better coordinate species and biodiversity database issues and to designate above webpage as clearinghouse for all, but proper coordination is missing including with ministry.

ISU is essentially already de-facto coordinating biodiversity database collection. Generation of datasets is task which can hardly be handled by non-professionals. Example of Syke institute of Finland was mentioned that is involved in the management of databases. Similarly, in Georgia governmental agency can hardly manage such datasets without scientists.

In general positive attitude was expressed if agency like EIEC would engage in coordinating network for biodiversity data in the format of permanent working group. This function involves education, environmental protection, biodiversity database. University may not be able to do such task on permanent basis. This would be good function for EIEC provided there is no effort to 'monopolise'.

Other species data collection team mentioned was entomology group in Agrarian University.

There are some international projects ongoing, but not concerned with databases.

International databases mentioned were GBIF, Fauna Europaea, PESI (Pan-European Species directories Infrastructure), our portal data was being delivered, but project is now over and active cooperation halted with the project completion. In general European databases do not regard Georgia and Caucasus as part of their area of direct interest, therefore participation is not active. Exception is perhaps European Register of Marine Species (ERMS, <http://www.marbef.org>). Still, preference was given to participation in global networks such as GEO/GEOSS through European research mechanisms, institutions and initiatives.

Georgian research institutions are less capable to contribute into permanent monitoring as this requires much higher financial means. Therefore participation in observation networks is problematic, despite the Caucasus being white spot/gap area. Ministry is sometimes funding some research (dolphins, for instance), but this cannot be considered as observation network type activity. There seems to be gap between managerial/governance capacity and research capacity.

Some individual scientists are members of international organisations. Interviewee for instance is member of International Conservation Society and some other networks, but this does not help much with actual/practical research support.

Databases for invertebrates are best probably with this institute, and for vertebrates with the ISU faculty, and that is it. Other players such as NGOs can have fragmented project based datasets and therefore less reliable. Formats used is shapefiles formats using ArcGIS (which is more user friendly) and now try to go to transition to open source such as Quantum GIS.

Metadata is filled only in case dataset needs to be organised for publication and data publication. Metadata is very important in terms of time factor, as essential attributes can be lost in time. In general positive attitude was expressed with regard to metadata catalogs (possibly operated by EIEC). Scientists would support such metadata sharing as this may stimulate interest into research. Data publication is not yet frequently practiced, but in case of molluscs with German scientists Data Paper was published in Tentacle (<http://www.hawaii.edu/cowielab/Tentacle.htm>).

It would therefore be appropriate to use metadata publications (like biodiversity portal), this would stimulate interest into ongoing research work.

There is interaction with APA, but except for large mammals (camera trap, say in Lagodekhi, is on advanced level), many species are not covered. It is advisable to stimulate scientific research in protected areas. Ideal would be to set up monitoring schemes in PAs. Nowadays cooperation

is only on project based efforts, so it is not a regular process. It might be interesting to populate/accumulate data with good registering of datasets.

Javakhishvili TSU does not have much database capacity.

Among external data sources was expressed desire to have access to NEA data (temperature, precipitation, etc.). It is a pity data is not accessible for scientific purposes. NEA in addition to hydrometeorology also is collecting aquatic and other animal species and after not very detailed scientific analysis animals are discarded. A little bit of more coordination with ISU and zoology scientists would be wiser use of resources, generating and much better monitoring and science products. So not only data is hidden from user, but also useful scientific material is lost. Species classification is not straightforward task, scientific support is needed to NEA. Do not have access to Georgian hydromet data, only 1 km grid <http://www.worldclim.org> data is being used. And this data is very much needed for modelling. So access to NEA datasets is urgently needed for Georgian scientists.

Following packages are used for modelling: MaxEnt, R, SPSS, some others. GIS is applied for visualisation.

It was agreed that interviewee would participate in the meeting discussing the study findings. It was also promised to fill small survey form (feedback provided).

## B.05 Agency of Protected Areas

**Interviewee:**

Khatuna TSIKLAURI  
Main Specialist, Research & Monitoring  
PA Development and Planning Service, APA

**Date:**

2015.11.30

There is no specialised database software available, so research and monitoring data is collected in MS Excel (needs updating). Mainly these are inventory of species. New protected areas were added, for which inventory lists are not yet complete. Indicated are Red List and endemic species per each PA. This data is usually updated with new management plans. Each PA is supposed to have annually updated 'Bunebis Matiane' (direct translation - Nature History Book), but not every PA has natural resources specialist and also scientific quality is relatively low. There should be climatic data but PAs do not have proper equipment and professional skills. Hydrology is also collected, as well as species observation data by rangers. Some rangers have GPS, some have not. Camera traps are good source of monitoring data, but coverage is not comprehensive.<sup>25</sup> In every January updated annual Bunebis Matiane and statistical forms are submitted by PAs. Key species quantities are submitted. In spring phyto-pathological surveys are conducted (hazardous species and fungi) and reports are submitted in July.

In Imereti caves PA data measurement systems were installed with Czech support, measuring hydrological and meteorological parameters. Kolkheti Fund is supporting surveys of nesting and migrating birds, small mammals, ichthyology and currently management plan update is under way for Kolkheti NP. In Borjomi-Kharagauli NP transmission line project has obligation to do regular monitoring and tender is currently underway to select contractor team.

APA is also issuing permits on scientific studies and condition in permit is to report their results, but unfortunately in many cases such reports are not submitted or submitted after intense personal requests. Iliia University is usually submitting well (large mammals study in Kazbegi, dolphins). Institute of Botany is providing reports. Spiders (whole Georgia, and Mtirala and Kintrishi in particular) and moss studies were conducted by German scientist Stefan Otto, providing data in public domain as well!<sup>26</sup>

WWF has database on scientific research in protected areas. Till 2013 APA was filling in this data for WWF-Caucasus, but not since then. Report included which research permissions are issued, which themes, etc. There used to be web-link reflecting this data (Khatuna Tsiklauri and Avtandil Mikaberidze were filling this electronic form till 2013). This would be good source of information for this study, interviewee reports. This data can easily be made public.

DB development is planned under KfW/GFA project. Perceived problem reported by APA is to include in this database checklist of species in all PAs, but this is not currently planned. Plan is to have administrative database established, with biodiversity component as well, but not in the format currently operated/attempted by APA.

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<sup>25</sup> Consultant advises to consider interesting open source camera trap data collection and analysis tool Wild.ID, available at <http://www.teamnetwork.org/wildlife-monitoring-solutions>.

<sup>26</sup> Excellent webpage available at <http://caucasus-spiders.info>, but most recent datasets at <http://caucasus-spiders.info/faq> are indicated as zipped gz files, but in reality these are SQL format DB files and cannot be opened as archives (file extension change is needed to open as SQL). This is good example how biodiversity data access can be organised. Preferable would be if data is available directly in GIS compatible format rather than as SQL. Author of the database was kindly invited to fill online survey, but feedback was not provided.

Species distribution ranges are not in the GIS format currently. Some PA specialists can do this, but there are no means to enter such data. GIZ training on biodiversity indicators was referred to. It is desired to have not only checklist, but some sort of georeferencing and distribution pattern.

APA research and monitoring is working with CENN on tourist brochure depicting trails and potential tourist path intersections with species of interest.

There is MoU with <http://GeoStat.ge> for national reporting. MoUs exist with Tbilisi Iliia State University, Batumi State University, Kutaisi State University and other universities such as Telavi State University and Georgia University (Saakashvili's mother's university), meetings were organised by APA for stimulating thesis work, but not much is happening in response. Even tables were provided which data is missing/gaps, but not much feedback. Universities may want to get funding for this, but APA does not have funds to support such action, they should identify funds themselves and then this would be value added for APA.

Say, whenever zoologists get permit for scientific work, they report back with reports. But data is not reported. Recently, as an example, ISU IoZ studied small mammals in caves and publication was shared by the author, but this is not in data format.

Twinning project provided management plans for Ajameti, Lagodekhi, Mtirala and Sataplia (funding source could not be cited) and these provided checklists and maps as part of report (it is not clear if GIS maps were provided as well).

APA is trying to provide indicator data as requested, it is though felt that indicators currently used are somewhat simplistic.

Another international initiative on data collection mentioned was CNF working on Lagodekhi Tusheti, Vashlovani and Borjomi-Kharagauli.<sup>27</sup>

NACRES has program on nature monuments and special commission was set up reviewing proposals. 20 monuments are established for now (IoG, ISU, other members).

**Interviewee:**

**Date:**

Lika SALIA  
Main Specialist, GIS and DB Management  
PA Development and Planning Service, APA

2015.11.30

This unit is in charge of organising and maintaining GIS geodatabases for PA boundaries, sizes, tourist infrastructure (GIS files only, no CAD drawings, latter probably maintained in Economic Service of APA). No non-spatial database. Other datasets used include cadastral data of NAPR, including forestry fund boundaries, which are kept updated also at NAPR.

There is no direct access to NAPR cadastral data, but APA and NAPR have MoU according to which person is designated at NAPR which is providing APA with access to proper cadastral datasets (Mr. Buba Chkheidze is contact person at NAPR). This usually happens once per week, accessing geodatabase of entire Georgia by downloading. APA does not have right to transfer to third parties this file (although enforcement of this is not straightforward in general). APA is also providing NAPR with updated boundaries, but this does not happen on a periodic, rather *ad hoc* basis. For NAPR important are forest fund boundaries and PA boundaries are also considered as

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<sup>27</sup> CNF recently (early January 2016) announced ToR for consultant to design BKNP monitoring BD, call distributed via CENN.

kind of forest fund boundaries. APA preference is not to have forest fund and PA boundaries mixed up into same form/context, as PA boundaries are not the same as typical forest fund assets (say, PAs can include alpine meadows, wetlands, water fund lands and other land categories, same marine part of Kolkheti National Park certainly is not the 'forest fund').

APA in its recent boundary demarcation efforts is trying to differentiate forest and alpine meadows and some other possible categories. Boundary demarcation is proceeding with several contractors in charge. Kolkheti National Park boundaries were completed recently, including electronic registration. Earlier NAPR was pretending of seeing or sometimes not seeing paper boundaries (earlier it was not obligatory to deliver digital files; this rule was introduced after first cadastral boundaries for KNP were established). For this reason, even registration process for APA was at halt due to 'confusion' with private boundaries. These confusions emerged because electronic boundaries of KNP were not 'visible' in the NAPR geodatabase. Now this issue seems resolved, reportedly by APA.<sup>28</sup>

As for the demarcation progress, contractors' works are complete for Tbilisi NP, Kolkheti NP, Borjomi-Kharagauli NP, Kobuleti NR. Tusheti registration will start. Babaneuri registered, Batsara and Ilto are being processed. KfW/GFA supported 4 PAs 3 demarcations will be completed in 2016 (Kazbegi, Kintrishi, Pshav-Khevsureti) and 1 is under way (Algeti). Once Algeti is complete, administrative processing will start including nature monuments which are part of Algeti. Funding is mostly with GoG source, except Machakhela (UNDP project, done by GeoGraphic, submitted week ago for registration) and KfW/GFA 4 PAs. All but these latter 4 (where recategorisation and expansion are forthcoming) all ongoing demarcations would be completed by summer 2016.

APA has some requirements for say demarcation work, but there is no harmonised ToR or specifications. This issue was discussed further and joint conclusion is to have standard specs for such works or similar works.

Tenders for boundary demarcations are won by different companies and they use variable tools, therefore it is difficult to keep track of approaches used. It might be good to standardize this task.

UNDP and EU ClimaEast are doing GIS work in Vashlovani pasture management project (NACRES) and GIS results were provided.

For Emerald Network project (NACRES), GIS data exists but was not delivered to APA. Initially project was coordinated with APA, but now it is coordinated by BPS and APA cannot get results (boundaries, data). Reason is perhaps that Emerald Network sites go beyond protected areas boundaries. Actually APA believes most of the Emerald Network sites are current PAs. Aim was to have biodiversity data available to APA, but APA is not contract party anymore. There was tripartite contract EU, APA and NACRES, but now triad is EU, BPS and NACRES. APA GIS specialist received some credentials to access EEA/EIONET site, but it is not clear if these credentials are still valid and operational.<sup>29</sup>

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<sup>28</sup> Consultant's note: Demarcation contractor completed its work, but seems like APA still needs to submit demarcated cadastral parcels (9+15 parcels in Samegrelo and in Guria respectively) to GoG for final clearance, otherwise these are still registered as State Lands, belonging to Ministry of Economy and Sustainable Development, which is known to be not the best 'custodian' of conservation lands. There are large numbers of confusions/disputes on KNP cadastral registration maps popping-up in NAPR cadastre web-services at <http://maps.napr.gov.ge>. This issue is beyond the scope of this study, but full completion of KNP demarcation may need URGENT attention.

<sup>29</sup> Same data reportedly was not shared with KfW/GFA 4 PAs project consultants as well (GeoGraphic).

There is no working group/forum where APA could raise such data coordination issues.<sup>30</sup>

As for metadata, its preparation and submission culture is lacking in general.

**Interviewee:**

Paata DVALADZE  
GIS and DB Management  
PA Development and Planning Service, APA

**Date:**

2015.11.30

Reference was made to EIEC which is in charge of information exchange in the Aarhus Convention context, probably they are best placed to coordinate data and information exchange network inside the sector and data communication to public. Priority function of the EIEC is information sharing, and then education. Currently there are no technical personnel to handle technical tasks, but there was procurement ongoing to set up the system.

There would not be a need to set-up own databases, rather to create intranet and web services which would be provided to all sectoral stakeholder units such as APA, BPS etc.

Discussion was ensued with regard to establishment of environmental data sharing working group with key governmental and non-governmental stakeholders, but certain scepticism was felt from interviewee, unless issue is addressed comprehensively. Interviewee stressed that even the notion of environmental data and information is not adequately defined in the legislation. There would be a need of series of legal and regulatory changes (some law amendments, Minister's order and alike) to make data sharing principles well established. And biodiversity data is the sub-component of this larger issue.

It is believed that just creating forum and preparing minutes/protocols would not help. There should be clear action plan developed on environmental data exchange issues and progress monitored by high level decision-makers. [Consultant intervened, that Emerald Network data issue can be a good test of effectiveness of working group or other type of forum. If such an issue would be raised on a meeting, issue of access to data would be quickly resolved after genuine and open discussion.]

On the subject of metadata it was mentioned that NSDI process is underway and they would deal with setting up metadata catalogue. Interviewee participated in two working groups, but lately MoJ/NAPR project was inactive. He participated in WG-s on GIS and on Education. INSPIRE directive is used as a model to follow, but so far process is not close to actual dataset delivery. Work is going on categorisation of layers, which standards to use (sub-group on standards is established as well). There are INSPIRE guidelines, but these are not directly applicable to Georgian reality. Separate working group was on legislation, some draft was prepared but not acted upon. NSDI standards should be followed by all agencies. Lack of activity is probably because of high level staff turnover in MoJ/NAPR. Mr. Giorgi Petriashvili was mentioned as contact person at mid-management level. It was supported to strengthen NSDI initiative and fit into it environmental and biodiversity data harmonisation and sharing.<sup>31</sup>

It is therefore felt that NSDI should be supported. At operational level this would mean direct and regular change between APA and NAPR on PA boundaries, for instance, accompanied with relevant metadata.

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<sup>30</sup> APA and BPS offices are physically very close to each other, with premises in the same MoENRP building.

<sup>31</sup> EU-GE association agreement does not refer to NSDI or INSPIRE, but GoG Resolution 262 of 2013 does both.

Some background on MoENRP/EIEC use of MoF Financial-Analytical Service resources was given. Within the EU supported project initiative (EEA/SEIS? Other?) there was a MoU signed between MoENRP and MoF for sharing MoF technical and MoENRP data resources. EIEC was named to administer this initiative and currently EIEC site was developed by MoF (some LEPL) and that is current state of affairs. But price is involved in allocating server/cloud resources (LEPL is public entity but can recover its costs on non-profit basis). This is quite protected system (treasury is using for its financial data). EIEC should be strengthened and this is obvious candidate to coordinate such tasks. Participation of EIEC in NSDI process is currently limited probably because of GIS capacity, but at least EIEC can participate in education working group.

It was agreed that all three interviewees from APA would participate in the meeting discussing the study findings. It was also promised each interviewee would fill survey form (feedback provided by Paata Dvaladze).

## B.06 GIS-Lab

**Interviewee:**

Giorgi MIKELADZE  
Executive Director, GIS-Lab

**Date:**

2015.12.03

Discussion started with considerations on NBMS institutional options. BPS was mentioned as good candidate as they have commissioned some studies with non-governmental actors which contribute into progressing BD DB. Species data within Emerald Network context was developed by NACRES (referred as the owner of database), but NACRES was submitting data to BPS and GIS-Lab was helping with opening files and therefore there was some GIS capacity in the BPS. It was mentioned by the Consultant that BPS itself is in favour of EIEC.

ISU Institute of Botany is collating species database within <http://Jstor.org>. This is scientific journal, also involved in natural resource databases. Giorgi Mikeladze was contact person developing plant species from herbarium database for ISU IoB including geo-locations and historic data. Training was uptaken in Saint Louis Universities Missouri Botanical Garden within its project for Caucasus. Special forms were provided, populated with data and uploaded on Jstor Global Plants (<https://plants.jstor.org>). Thousands of specimens data was entered into database (including 100 year old historical collation species and modern ones). Contact person has full access with credentials. IoB has special high resolution scanner and herbarium is operating this scanner and apparently still submitting to Jstor global database more data. Operations continue after completion of project, which is good sign of sustainability, although it may be that Jstor uploads do not happen now. Data entry was performed with special software tool. This is good approach for data entry into database. Export into XML and other standard formats are possible.

There are several local projects with datasets. Series of VolksWagen Stiftung projects are still ongoing<sup>32</sup>. DB is not held here in Georgia, rather in Germany. This is ongoing research and education process in multiple directions including German and Georgian researchers and students and may have some constraints with data sharing. From GIS-Lab experience of involvement as local data processing unit, there is rich data and information, including in-situ spectral libraries developed for remote sensing imagery classifications and interpretations (plant species, erosion rates/classes and other parameters). Data is held and maintained in Germany (data on Kazbegi, Bakuriani). Old aerial photos of 1960s were also processed by GIS-Lab together with IoG and are now available in German database. This is multi-disciplinary project. RapidEye imagery was used. For Mleta for instance Digital Globe WorldView imagery was used. GIS-Lab provided orthorectification, it still has this data available, but no sharing allowed per contract conditions. Gissen University is holding database and all rights. Imagery supplier conditions could be constraining further distribution. It may be that agreement established with ISU is missing proper data sharing clauses.

GIS-Lab advises to send survey forms for filling to Annette Otte, asking to complete. [Consultant's note: GIZ concurrence with communication would be desirable. More than that, it would be highly desirable to have raw database mirror here in Georgia, preferable even in public domain, obviously whenever publication priority is settled. NB: This data and information would have been an asset for GIS and RS Consulting Center "GeoGraphic" working under KfW/GFA 4 PAs project, contributing to German Government supported major conservation effort. As a

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<sup>32</sup> <https://www.uni-giessen.de/faculties/f09/institutes/ilr/loek/projects/finished-projects/amies>  
<https://www.uni-giessen.de/faculties/f09/institutes/ilr/loek/projects/current-projects/amies-ii>

general principle, access to data by public and at least by Georgian stakeholders should be condition of every agreement with assisting party, moreover when supported by grant funding.]

GIS-Lab recalls that spatially explicit datasets could have been generated by German Greifswald University Institute of Botany mire science team, working for more than a decade in Kolkheti and Kobuleti PA wetlands. [Consultant's note: Researcher from the Institute of Botany was kindly invited via email to fill online survey, and detailed feedback was provided, see Annex E entries. In addition to provided information, very detailed Kolkheti habitats vector map is worth mentioning; datasets are available and could be put into public domain and as web services.]

GIS-Lab participates in UNDP & EU ClimaEast project in Dedoplistskaro. Pasture productivity, plant cover, species distribution maps, detailed soil maps, dominant plant communities, carbon stocks over soils and in soil biomass. This project is ongoing and very likely datasets will be transferred to MoENRP. [Consultants note: without central storage node, with time such deliverables may be lost. EIEC could be such a node. Good example of this is WB coastal project, which produced ample of data of relevance for Kolkheti biodiversity, but there is no data storage node to transfer data and information sine after project completion some 10 years ago.]

Interviewee is supportive of intra-sectoral permanent working group on environmental and BD DB management, so that finally all metadata and sources of data is well coordinated and known to BD community. Substantial time of GIS-Lab is spent on chasing down datasets, if even at all available, through personal network/links, rather than centralised node which could be consulted. Respective recommendation would be relevant, but it was also mentioned that something similar is being planned under UNDP 3 conventions project.

GIS-Lab has not participated in NSDI process, even never heard about the initiative. Only interaction with NAPR related issues was working with former MoENRP/NEA Spatial Service unit on georeferencing topographic maps. Later on this unit was transferred/dissolved into NAPR, and what remained in MoENRP/NEA is dealing with scanning and digitalising geology fund maps.

[Consultant's note: NSDI cannot be purely governmental process only, there should be involvement of NGOs and private sectors. For instance, GeoGraphic, probably the oldest GIS company in Georgia, is not part of the process.]

Discussing national level data, mentioned was 15 m resolution forest mask available with GIS-Lab (based on Aster imagery). GIZ developed forest cover has even better resolution (6 m).

Other global database mentioned was GBIF. GIS-Lab worked with GBIF as well, its approach is quite similar to Jstor, except that prepared data was sent to partners in Swiss university and they uploaded into GBIF. Georeferencing was necessary condition, but it was not possible to provide geo-locations. This activity was concerned with high mountain (Kazbegi and Racha) plants data in climate change context (Alps, Caucasus, Himalayas participated<sup>33</sup>). Most data was based on spatial geo-location of data owned by prominent Georgian botanist Prof. Giorgi Nakhutsrishvili.

[Consultant's note: GEO/GEOSS and GEOBON issues were discussed. Example of free access to Landsat and Sentinel imagery were highlighted by the Consultant as examples of value added by initiatives such as GEO/GEOSS. US NASA Giovanni portal was also briefly discussed. INSPIRE issues were also mentioned and discussed in the biodiversity and protected areas guidelines context.]

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<sup>33</sup> <http://www.gbif.org/event/59763>, see also <http://www.gbif.org/country/GE/summary>

It was mentioned that GIS-Lab worked a lot together with NACRES and therefore this NGO has a range of geospatial products of biodiversity relevance. Emerald Network (EN) was mentioned, as well as Vashlovani and Lagodekhi at the level of species distribution, RS imagery and their classification. EN in particular involved large number of experts, contributing data, which is sometimes of very general nature and less accurate in terms of geo-location, but this is good inventory of existing capabilities. This project was also uploading data into specific European/EEA database again using specific forms (EIONET?).

WWF-Caucasus also has GIS capability (Giorgi Beruchashvili). They have access to wide range of satellite imagery. There are also regional and national projects underway (eco-corridors, forestry maps, etc.). No GIS-Lab experience with CNF, had some experience with CENN, but details not known.

[Consultant's observations: Concern was also discussed that lack of access to BD data (even if scares and incomplete) is setting dangerous precedent for impact assessment of large infrastructure and energy projects, such as hydropower: If BD baseline is not known (and BD baseline is weakest point in this regard) – impacts cannot be evaluated and what is lost cannot be evaluated either.

Mechanisms for formal involvement is needed of research institutions when either doing or when reviewing EIAs. IoB, IoZ, others, need to be formally consulted in the process. Access to EIA baseline data should be part of new EIA/SEA legislation. Particularly important is to oblige developers submit for review raw biodiversity and related data, so that this contributes into biodiversity baseline studies in the country. These and several other recommendations were expressed in the HPP study funded by Norsk Energi in which consultant participated, but results are not public.<sup>34</sup> Same issues could be addressed by HPP cumulative impact assessment study, supported by Germany.]

Issue was discussed what type of BD data is required from related fields. GIS-Lab considers that NEA data is very much required in almost all BD studies. NEA business model and pricing policy applied to its hydromet database products was critically discussed. This includes climate, soils, hydrology, which is basic ingredient of any decent BD modelling effort. NEA has big shopping list of its data on its website (per quite recent, 2014 regulation). For instance, estimated cost of daily precipitation can count for millions of GEL, quite unrealistic for NGOs or SMEs to tap this data and develop any services in their use. Many of the projects are just not proceeding as critical data is not accessible.

[Consultants observation: Public access to NEA data is very important issue. MoENRP policy few months or a year ago was in this direction, but now again closed data management model is preference of MoENRP/NEA. NEA more actively participates in GEO/GEOSS and this seems beneficial for the agency, as all global players in GEO 9 societal benefit areas are available in this network, but this should not be one way direction: paradigms on data accessibility are fast changing globally and Georgia should lead the trend, not stay behind. Even HPP EIAs are 'purchasing' limited amount of data, so data is probably not the main revenue source for NEA.]

[When discussing accessibility of Georgian hydrometeorology data, it was mentioned that on some Russian site there is a vast amount of Armenian hydromet data available for free. In this regard consultant paid attention to NASA Giovanni portal with many *ex-situ* earth observation

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<sup>34</sup> <http://www.energi.no/en/sustainable-hydropower-development-in-georgia>  
<http://occrpcaucasus.org/project/462-2> and <http://occrpcaucasus.org/project/საზოგადოებრივი-დამალული>

datasets, such as precipitation, temperature and other variables, at least for last 10-15 years. NEA should beware that many of their in-site data may become obsolete if they will continue with closed data policy. Obviously *in-situ* would remain better than *ex-situ* data, but if not available, people will revert to more available datasets. Even discharge data may be cracked by remote sensing. By the way, MoENRP/NEA has project with Norwegian government together with Ministry of Energy to digitize all hydrological and meteorological datasets of NEA. This means, that these critical datasets would be intimately available to developer minded agency, but not the public and/or environmental NGOs.]

It was agreed that interviewee would participate in the meeting discussing the study findings. It was also promised to fill small survey form (feedback provided).

## B.07 NACRES

**Interviewee:**

Irakli SHAVGULIDZE  
Coordinator of Species & Ecosystems  
Conservation Program

**Date:**

2015.12.07

It was mentioned that NACRES rarely has projects directly dealing with geodatabases, but almost all projects have such aspects engrained, depending on project design. Only case when main output was database is Emerald Network development in Georgia. NACRES is in charge of periodically updating respective database. But currently database is not accessible to everyone. Now Phase II is proceeding (phases usually span several years Phase I 2009-2011, Phase II 2013-2016). There is a need to have this process permanently, as data available in Georgia either is non-existent or of poor quality. NACRES is sometimes frustrated with the quality of data available. For instance, some species are mentioned in records to be 'around Tbilisi', which is very vague description and species can be anywhere and even lost now. It is impossible to geolocate such 'data'. Such scientific references (sometimes even dissertation thesis) are hardly usable today (sometimes authors are long gone). Therefore database of EN has many gaps, moreover that project is ongoing and as soon as Georgia EN sites are designated, it is likely to expect that database would become public domain. MS Access DB is used to collect data, so it cannot be directly shared with public in this form, some user friendly tools would be needed. But this is not our competence, but that of project sponsors (European Council funded EU/CoE Joint Programme for the preparation of the Emerald Network of Nature Protection Sites, Phase II, entitled 'Development of Emerald Network in Georgia'<sup>35</sup>, and similar projects are proceeding in almost all EU neighbouring countries including Norway, Switzerland. EN is essentially implementation of methodologies of Natura 2000 in non-EU countries. EN BD includes both EN site boundaries, but also georeferenced species databases, habitats, etc. Standard data formats and software are used with pre-defined fields.

Access to data is restricted to NACRES and MoENRP, with allocated credentials.<sup>36</sup>

New legislation on biodiversity is expected to define EN sites as international designations. PAs are not equivalent to EN. GoG wants to limit EN only with PAs, but this is methodologically not correct, as Bern Convention has its criteria which are in essence Birds and Habitats Directives, so sites may not be Protected Areas, but can have sufficient protections for Bern Convention and these two EU directives. So PAs do not automatically equal EN sites and recent studies have actually identified important potential EN habitats which are outside of PAs. It is also important to note that EU-GE AA directly calls for establishment of EN. Situation is similar with Ramsar designation and national instruments. PA designations are getting more and more difficult and EN can be instrument to protect more habitats.

Some new sites are being initiated (such as in Racha, Svaneti) and there are major HPP interests and run-of-river schemes could be quite compatible with EN approach, if sensitive habitats are excluded.

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<sup>35</sup> <http://lv-twk.oekosys.tu-berlin.de//project/twinning/documents/pdfs/EUNIS/emerald.pdf>  
<http://pjp-eu.coe.int/documents/1461016/3529611/Georgia.pdf/607b06f2-7474-4620-95bd-feeb626e00b3>  
[http://pjp-eu.coe.int/documents/1461016/4159207/Report\\_2013\\_Emerald\\_developments\\_NACRES.pdf/d0ded329-fcdd-49a2-aac5-46db6fe3cf60](http://pjp-eu.coe.int/documents/1461016/4159207/Report_2013_Emerald_developments_NACRES.pdf/d0ded329-fcdd-49a2-aac5-46db6fe3cf60)

<sup>36</sup> <http://cdr.eionet.europa.eu/ge/coltlvahq/coltlvamg>

At this stage EN database cannot be public, as it is work under progress and it is ultimately up to MoENRP and EU/CoE to make data public or otherwise.

Other NACRES initiatives include human-wildlife conflict areas database at Vashlovani (sheep-wolf interactions on seasonal basis). All data gathered by NACRES is georeferenced. Such data is due to its nature confidential. Other types of data are plant distribution maps for Lagodekhi and Vashlovani as well as pasture monitoring data for Vashlovani. In Borjomi-Kharagauli within GEF project (CNF) and with GIZ support are going to implement monitoring program for key species (deer, hare, lynx).

[Consultant's note: One issue briefly touched was terminology in Georgian. This is particularly important in the fields such as biodiversity and even more so in database and geospatial sector, which are fast developing and use special vocabulary. EIEC and NSDI related initiatives could address this issue with establishing glossary of terms as well as standardising geographic locations in Georgia and spelling in Georgian/English. Same is indeed true for biodiversity and its species and habitats naming conventions in multiple languages, so that database entries are correctly processed, including in Latin.]

NACRES considers that needs of specialist organisations can be different from public information needs. Also, different organisation could process datasets in different formats due to project specificities; therefore it is indeed needed that some central node takes care of collecting (or coordinating) such fragmented efforts into single location. Scale is important factor: something covering entire Georgia can be quite different from site-specific data needs. NACRES or other NGO may not be interested in conducted projects in 'monitoring' modality, rather as standalone projects, but this central authority or node should be able to 'absorb' project specific data into overall national system/picture.

Conceptual approach is needed what is being monitored and how this is structured. There are national indicators defined with GIZ support, which have quite specific national level scope in itself, but on the other hand, site specific indicators are also needed, such as for protected areas, for instance. These levels need to be well interfaced, feeding site specific data into national system. There are many hurdles here: collection of data, storage of data, management of data, and analysis of data. But today it remains not clear what is the overall purpose and capacity to analyse these data. Strong institutional support is needed here. PA monitoring efforts is quite fragmented as well. Better situation is with monitoring of forest pests. Data should not be collected for data collection's sake.

There are issues with Red List as well, which is good starting point, but real assessment may bring quite different lists of species as well. Another issue is with permitting of biodiversity data collection work (such as aquatic data collection, which may need using quite manipulative methods such as control catches).

When discussing potential institutional set-ups for NBMS, consideration of NACRES is that NEA has limited interest in biodiversity datasets per se (except aquatic data collection), they could potentially handle data management tasks. APA can hardly play national role as their geographic mandate is limited to PA boundaries. Limited personnel capacity should also be taken into account with APA (they have difficulty even when handling their own system). BPS also can hardly host technical DB management tasks, but can certainly support with institutional coordination issues. EIEC is clearly supported by MoENRP, but they need to develop credibility so that such tasks are indeed entrusted. Maybe they need to put more emphasis with environmental education rather than environmental information?

Potential issue is that there can be quite substantial effort involved in delivering datasets or even metadata in required format. Whoever is to administer the national system should think about allocating some resources so that data collection is not just volunteer efforts (even metadata preparation tasks can require several days' effort).

Another issue raised was that it may not be absolute condition that this should necessarily be public entity. NGOs could play the role here as well. Example is Emerald Network. Say, NACRES could easily be mandated to be designated as custodian of EN database. Same is true with research institutions (universities and their research entities, for instance). Consultant promised to consider in the analysis the option of components of NBMS being outsourced for management to research and non-governmental entities, while overall network coordinated by the government unit(s). NGOs could even take care of such systems with their own funding leverage, provided government officially supports delegation of such function to them.

[Consultants note: As at this stage NBMS might be fragmented for quite some time, there was an agreement that emphasis should probably be on metadata catalogue development and gradually transition to fully integrated NBMS. There was also an agreement that sharing data can frequently be sensitive due to various reasons (ownership, costs involved, sensitivity for public sharing), while metadata is almost never sensitive to share, provided it was adequately created. Metadata is also good indicator of the quality completion of the data collection work (even when it is ongoing, metadata can be created for the product in transitional state/work in progress, for instance in case of EM, metadata can largely be populated at this stage as well.)

Concern was still expressed why NGO and private sector would be willing to apply effort to metadata collection, while most data is generated by this sector rather than public entities. Usually public biodiversity data is of poor quality. Positive reference was given to efforts of former BPS staff Ana Rukhadze (usually under project based initiatives), who was largely in charge of CBD, Ramsar and other multilateral environmental agreements reporting and was interacting with all involved stakeholders while preparing these reports.

EIEC was welcomed to play the role of creating biodiversity metadata catalogue, moreover that it has high level support in the MoENRP. NEA would also be acceptable option. All depends how the system would be set up and how sensitive approach would be to stakeholders. There should be collaborative spirit rather than top-down imperative approach. NACRES even already has policy not to seek funding from government sources (due to negative experience in the past). In this case collaborative approach is critical to be reciprocated, moreover that significant effort is normally required to process even existing data to satisfy yet another governmental request for data sharing. Well setup-up metadata catalogue could stimulate contribution from non-public actors.

In terms of personnel, at NACRES there are two persons trained in GIS application. For higher level data processing expertise they resort to GIS-Lab and/or WWF GIS experts. Computer capacity needs improvement, but still capable of running basic ArcGIS package (extensions need upgrading, but is expensive). Open source GIS and web-services not practiced yet.

Interaction with international biodiversity DB facilities is sporadic, on as needed basis, perhaps most intensive interaction was in this regard with EN. No exposure to INSPIRE or GEO/GEOSS initiatives such as GEOBON. Not participant to NSDI effort.

As for further contacts/interviewees, Green Alternatives was mentioned in forestry expertise context, as well as WWF, GIS-Lab, Z. Gurielidze of Tbilisi Zoo and ISU, D. Tarkhnishvili and O. Abdaladze of ISU.

It was agreed that interviewee would participate in the meeting discussing the study findings. It was also promised to fill small survey form or forward to relevant parties to complete survey (feedback not provided).

## **B.08 NEA, Climate Unit**

**Interviewee:**

Lia MEGRELIDZE  
Department Hydrometeorology, NEA, MoENRP

**Date:**

2015.12.17

Aquatic resources are addressed by hydromet unit (R. Diasamidze) as well as fisheries and Black Sea monitoring unit (A. Guchmanidze) in Batumi, as well as environmental pollution department in Tbilisi. More details could not be provided (see interview at ISU Institute of Ecology on better effort of sharing and coordination with regard to aquatic data collection).

Interviewee recalled climate change impact on ecosystems workshop/training organised by GIZ. It was also recalled hydrological modelling project needed land and forest cover but could not identify such datasets.

There is a rich hydrometeorology database at NEA but large share of data is on paper and needs data rescue. Obninsk, Russian Federation is WMO hub collecting data from Georgia. Database system is called CliCom and it was transferred to Georgia, but not all data transferred, some cannot be extracted/opened. In 2013 CliData was implemented with Czech support project (this climate DB management software is Czech updated version of CliCom, provided also NEA with sever capacity, approximately 1 month training of personnel). All climatic parameters measured at weather station network (3-hourly) are stored there (Temperature, Pressure, Precipitation etc.).

There is a separate Database Management Service with the Administrative Department. There are separate DBs for pollution monitoring, hydrology, meteorology. But each unit is dealing with database management issues as well (quality check, primary processing, data entry, distribution, etc.). In this particular unit data of climate, meteorology and agriculture is managed. Climate change issues are death with by 2-3 experts, but not as a separate entity. There is Climate Policy unit in the MoENRP, which is supported by NEA experts as needed with climate products. One person is in charge of climate modelling. Other experts are more dealing with databases producing climate data products for users, etc.

It was agreed that modelling efforts (climate, hydrology) need so much data that with current rates it is unrealistic for many users to purchase needed large amount of data from NEA.

NEA is not freely sharing data today, but Georgian data can be accessed from global sources such as WMP GTS (Global Telecommunication System) for instance, or EUMetSat sources. Interviewee promised to share links to such dataset info while filling the online form. Though some advanced knowledge of data formats and related metadata is required to utilise such free resources, this way one can bypass expensive cost of data purchase from NEA of Georgia.

Another mechanism of easier access to data is to establish MoU with NEA (say for research, education or other non-profit public use purposes), providing project outputs, training or other benefits in return to data sharing by NEA. In such case there would be conditionality not to transfer or sell data to third parties etc. Recent UNFCCC national communication of Georgia was mentioned as an example of some data sharing and in this case MoENRP letter was required authorising release of some data as part of the national communication report.

[Consultant's consideration: recent participation in USAID supported climate change assessment project for Georgia was not that optimistic, despite public sources of grant funding under direct support of MoENRP, sharing NEA data was not the smooth ride.]

Research institutions could also cope on data provision by NEA, provided some reciprocal value added product can be shared back with NEA, rather than just sharing for free in one direction.

In NEA context metadata is concerned with inventory of weather station characteristics (location, equipment, data consistency, etc.) and data products (periodicity, durations, etc.). It is not clear whether metadata can be transferred to other parties, as today NEA is sharing data only on commercial basis.

UNDP project was mentioned as important initiative connecting biodiversity and climate change.

NEA is member of many international networks, such as WMO and many networks inside, such as EUMetSat, GTS, JCOMM, etc. There is range of fees paid by NEA for such memberships. No awareness of NSDI process, but some awareness of INSPIRE and GEO/GEOSS (it was known that NEA Chairperson participated in GEO plenary and ministerial summit in Mexico, 11-13 December 2015).

Discussing institutional mechanisms for biodiversity data management, such as some working group (to address data availability issues, coordination of work etc.) is in general welcome, but top-down decisions would be required.

There is some regional early warning system under development and live Georgian data is expected to be feeding into the system.

The Norwegian Water Resources and Energy Directorate (NVE) under Ministry of Petroleum and Energy of Norway is supporting Georgia with project on hydropower data digitisation. Ministry of Environment and Natural Resources Protection and Ministry of Energy are involved as partners, as well as NEA. Cost-efficiency calculations are main objective for new HPPs. All available climate data needed for hydrological model set-up and calibration was handed over by NEA. Unfortunately hydrological data was not in the relevant digital format. For that purpose generation of hydrological data from hard copy into digital format was supported by the project. Data is residing now on NEA servers. Energy sector is complaining that NEA as Georgian agency is selling data to HPP developers. Despite of this, all data was taken by Norwegian partner as an input into the hydrological model. It is not available to Energy sector, as there is not capacity at Ministry of Energy to use this data there. Main beneficiary of the project was Ministry of Energy (contract was established with them). NEA is technical beneficiary.<sup>37</sup>

[Consultant's opinion: all key stakeholders now have full digital access to data except public. Without ensuring public access to data, in the long run environment sector risks to lose the capacity in hydrology due to gradual transition of human capacity. Besides, does an energy sector share back HPP operational data? It is impossible to monitor HPP sector performance without access to such datasets. Confusion and lack of expertise in environmental flow and expected cumulative impacts makes prospects for aquatic biodiversity close to miserable in the long run. Access to hydrological and climate datasets by public is necessary but not sufficient condition for safeguarding biodiversity of Georgian riverine ecosystems.]

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<sup>37</sup> [http://publikasjoner.nve.no/faktaark/2013/faktaark2013\\_03.pdf](http://publikasjoner.nve.no/faktaark/2013/faktaark2013_03.pdf)  
<https://www.nve.no/media/2542/in-facts-2014-georgia.pdf>

Another issue discussed was HPP EIAs and involvement of Hydromet personnel in EIA review.

It was agreed that interviewee would participate in the meeting discussing the study findings. It was also promised to fill small survey form or forward to relevant parties to complete survey (feedback provided).

## B.09 NEA, Databases

**Interviewee:**

Giorgi (Gigi) Geladze  
Head of Data Base Administration Division  
Strategic Planning and Systems Management  
Department, NEA

**Date:**

2015.12.21

DB administration unit hosts NEA's hydrology, meteorology and pollution data, both historical and operational. There is one automatic sampling station (air quality, Tbilisi). Other stations are of manual data submission type. 25-35% of historical hardcopy records (based on past annual reports) are processed in electronic form. Hardcopy storage is in bad condition and needs urgent attention (water leak damage, etc.). Volume to process is quite large, some 25-30 persons for 5 years work would be required for complete digitisation. Digital storage volumes required are not large, as these are mostly alphanumeric tables which are not voluminous. Incoming data is filtered and screened by specialists, and then deployed into various databases and is ready for use.

Developments in database unit are usually project based. Czech and Norwegian projects were mentioned as recent example, which provided for software supply and server capacity development.

NEA hosts also avalanche database, licences database, latter also dealing with digital rescue of geological fund maps being scanned with 2 high resolution scanners (tender selected contractor).

There are 24 servers in NEA. Usually various servers supplied by various projects run various software and it is impossible to integrate them into single system. Geological data is in GIS format (using NEA servers), but hydromet database is alphanumeric, running special software, which is possible to convert into GIS format, but this may affect specialised processing system. Databases are also not compatible. Rioni flood project was developed recently with Norwegian support. 500 cross-section profiles were produced by NEA. Consultant is using Mike program and ArcHydro to process. Spanish consultant is working from Spain accessing and processing NEA data. Another flood prevention project is proceeding in Svaneti.

There is one aquatic biology specialist with NEA (invertebrates), formerly worked ISU IoZ, collecting georeferenced database.

**Interviewee:**

Giorgi Machavariani  
IT and Servers Division  
Giorgi Zedginidze  
Data Processing Division  
National Environmental Agency (NEA)

**Date:**

2015.12.21

Discussion was concerned with National SDI system, a project started in 2014 and expected to establish NSDI by 2018. INSPIRE is the model followed, with 34 themes,<sup>38</sup> almost half being environmental including protected areas, biotopes, habitats, species distribution, soils, land cover, etc. NAPR is more advanced compared to NEA with tools and methods needed for NSDI

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<sup>38</sup> <http://inspire.ec.europa.eu/index.cfm/pageid/2/list/7>

set-up. All three interviewed persons attended few days ago NAPR organised 2<sup>nd</sup> NSDI conference, on 17 December 2015, 1<sup>st</sup> one held exactly year ago on 11-12 December 2014.<sup>39</sup>

Key 11 agencies were identified by NAPR as holders of NSDI resources (although in many cases functions are there but actual data is lacking, so having NSDI prototype by 2018 questionable).

Project is supported by EU. Brochure was shared. Process is led by NAPR. There are working groups established on public relations, education, technical, GIS, some others. Metadata would be collected at NAPR facilities. NAPR is willing to allocate metadata storage space. By December 2015 OGC compliant metadata catalogue services were expected to be launched but could not manage technically within deadline. Metadata services would include validators as well. Prototype schema for metadata is already available as NSDI geonode.

Interviewees agree that INSPIRE process should be followed by biodiversity data holders as well and it would be desirable to host metadata with NAPR servers (or maybe NEA servers in coordination with and using NAPR tested tools). There was also agreement that first step to take is to populate metadata with NAPR via NEA technical capacity and EIEC administration.

Deadline of 2018 means web services of NEA should be available with NSDI. Data sharing and access level (to institutions, to public) would be subject to political decisions, but now technically NEA is not yet ready to provide such data web services. But there is a good basis for future web services as NEA has its databases of hydrometeorology and pollution data in good condition. There is a need to develop necessary interfaces/infrastructure.

It was also agreed that any new biodiversity data collection efforts should be complete with metadata, and be compliant with INSPIRE, and should use NAPR tools under development.

It was also discussed, that currently NEA is self-funded, but source of funds are few large license holders.

[Consultant's opinion is that this is unsustainable business model. These few licence holders may at some point refuse to fund large public institution like NEA, while GoG may find it difficult to revert to public funding and there is some possibility that NEA may disintegrate or at least face gap in financing. Consultant's opinion is that strong public funding is better option, tied with free and open data disseminating policies with regard to products paid by taxpayers.]

Among other agencies best capacity is probably with Tbilisi Municipality, as they are already ready to provide NAPR with web-services (their portal was available at the following address: <http://mgis.tbilisi.gov.ge/MeriaMapping/architecture/ArchitectureMap.jsp>).

NEA digital resources are much stronger than those of EIEC or any other part of environment sector. It is therefore worth considering NEA technical resources and EIEC administration resources (EIEC did not participate in NSDI this year, while participated in last year conference).

NAPR is strong agency and prospects are high that they will manage setting up NSDI system, and environment sector should capitalise with this development. In addition to technical capacity, they are developing legislation, and there is national SDI commission at Deputy Minister level.

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<sup>39</sup> <http://nsdi.gov.ge/ge/presentations/listing/2> and <http://nsdi.gov.ge/ge/presentations/listing/1>

Soils theme is covered both by MoENRP and MoA. Roads are managed by MoESD and MoRDI, so there are many complementarities but also duplications.

Interviewees were well aware of INSPIRE, but not aware of GEO/GEOSS. NAPR is member of EuroGeographics (<http://www.eurogeographics.org>).

[Consultant's opinion is that as NSDI takes and will further strong lead in INSPIRE, MoENRP and NEA in particular should take equally strong lead in GEO/GEOSS and actively coordinate with MoJ/NAPR and INSPIRE process. MoENRP/NEA should report on GEO/GEOSS activities to next opportunity of NSDI meeting. Once NSDI is ready, it should be registered as GEO service. Biodiversity data network should pay strong attention to GEOBON, as well as biodiversity themes of INSPIRE and NSDI.]

Following references were mentioned in the MoJ NSDI team at NAPR: Ivane Tsintsadze, Giorgi Petriashvili from Special Services Department of NAPR.

Other participants of NSDI and good partners of NEA are MIA Emergency Response authority. CENN project was mentioned as example of cooperation on geo-hazards atlas development.

Brief visit was paid to server facility of NEA. All 24 servers are hosted in one small room, but are well preserved and maintained by personnel compared to available resources. There is some air conditioning in this room, but special system is needed to prevent server failure. Management knows about the issue and is already planning to invest in some \$50k equipment for specialised indoor environment management system for servers. Some discussion was concerned with backup system for NEA servers. Unfortunately backup is not available and this needs urgent attention – NEA's hydromet and pollution data is too important asset for system chance failure. It is also much preferable to organise the backup storage in different building physically.

It was agreed that interviewees would participate in the meeting discussing the study findings. It was also promised to fill small survey form or forward to relevant parties to complete survey (feedback not provided).

## B.10 WWF-Caucasus

**Interviewee:**

Nugzar Zazanashvili  
Conservation Director  
Giorgi Beruchashvili  
Regional GIS Officer  
WWF-Caucasus Programme Office (PO)

**Date:**

2015.12.18

After introduction on study objectives discussion started with the WWF's conservation director, who considers, that technically biodiversity data clearinghouse may be hosted by EIEC (as part of wider environmental information), but the Ministry and its BPS still should stay responsible from policy perspective with regard to biodiversity monitoring. Also, data collection should be coordinated by BPS, but EIEC could if so decided host metadata catalog so that it is known what is generated where and results are stored where, kind of data library. Principle applied should be that if something is not registered even at the library/metadata level, this can be considered as essentially non-existent data. Ultimately responsibility for functioning of the determined system components should be BPS. Not all data may be in public domain, but for all data there should be responsibility on its stewardship.

In case some working group is established to better coordinate data collection and management with the professional network, developing Terms of Reference would be helpful, whitening down what are the tasks to be achieved by this forum, what is available, what can be reported as database, etc. This would allow tracking progress against Biodiversity Data WG ToR, if created.

WWF-Caucasus is collecting data through various projects in South Caucasus, such as protected areas projects, which usually have data components. There are also projects in the context of freshwater key biodiversity priority conservation areas.

WWF-Caucasus has dedicated data portal at <http://wwfcaucasus.net>. WWF-Caucasus also has 1:500,000 digital atlas available for the Caucasus.

Discussion continued with WWF-Caucasus PO Regional GIS Officer. WWF-international has its intranet LENS system for its family members (<http://wwfscience.org>), an internal portal using ArcGIS online visualisation platform. For example, WWF-Germany developed web-application serving purchased satellite imagery, but these resources are available only within the WWF family intranet. It also contains forum for GIS specialists within the WWF-network.

Databases are normally created and developed for each project WWF-Caucasus is undertaking. This includes, protected areas projects, freshwater ecosystem projects, forestry projects. Species lists are being developed in all cases. No specific data management projects as such, but there is an initiative the regional Caucasus Biodiversity Monitoring Network (CBMN, see more description at the link [http://wwfcaucasus.net/index.aspx?type=about\\_project](http://wwfcaucasus.net/index.aspx?type=about_project)). Results are presented in html publicly. Unfortunately updating information is difficult. At least once in 2-3 years if not annually it should be updated, but not always possible, depending on project availability.

WWF's ArcGIS portal is called GLOBIL and is available at <http://globil.panda.org>, which redirects user to <http://panda.maps.arcgis.com/home>. It contains interesting layers, but WWF

authentication is needed to access all data resources. GLOBIL system based on ArcGIS was developed by the WWF-Netherlands.

GLOBIL approach is to collect innovative web-mapping ideas and distribute advanced knowledge through the WWF-family. Group is available for WWF ecoregions such as Caucasus. Partners are available in Armenia and Azerbaijan. Regular meetings are being held (recent one was in Netherlands). System is quite recent (one year in operation). GIS Ambassadors are designated in each region.

Intranet portal has various subsystems, such as forum, documentation, scientific papers, monitoring data, access to online software resources such as ArcGIS, ERDAS, Leica, imagery such as DigitalGlobe. WWF-Caucasus can apply for these resources. Imagery and software resources are mostly free to WWF-family, or almost 10 times cheaper when applying the vendor through WWF application. WWF-USA has agreement with ESRI to provide special arrangements for its software. Sharing with third parties therefore is problematic. Some tools and news are also shared in the forum on recent developments and innovations. Capacity building and training requests can also be made through the system.

It is possible to develop and upload data of own pilot projects (undergoes quality check). Recent example includes statistical modelling of gazelle movements, for instance. There are also regional projects where field data is generated. Metadata is being compiled whenever clients require it. Such a metadata catalogue was compiled for freshwater ecosystems project, 6 countries.

Experience beyond GIS includes modelling of freshwater ecosystems. Models used include AIM, INVEST (ecosystem services), ArcGIS Spatial Analyst (watershed delineation etc.).

Initiative to develop biodiversity metadata catalogue for Georgia was welcomed in general, so that it is better known what is available and where. WWF-Caucasus is always responsive to applications for data sharing, whenever this is possible. Metadata can almost always be shared. Applications with potential conflict of interest with conservation objectives would be declined (such as in case of EIAs for environmentally harmful projects).

WWF-Caucasus GIS team includes two persons, GIS manager and one assistant, GIS officers in branch offices as well. Short visit was paid to GIS team with convenient office space, in-house workstation, and good plotter available with the team.

It was agreed that interviewee would participate in the meeting discussing the study findings. It was also promised to fill small survey form or forward to relevant parties to complete survey with emphasis on regional and innovative projects (feedback not provided).

## B.11 KfW/GFA Consulting Group, Georgia

**Interviewee:**

Ramaz GOKHELASHVILI  
KfW Support Programme for PAs in Caucasus  
GFA Consulting Group  
Representation Office in Georgia

**Date:**

2015.12.21

KfW is funding Support Programme for Protected Areas in Caucasus, including the further development and even establishment of 4 PAs in Georgia (Kazbegi, Pshav-Khevsureti, Kintrishi and Algeti) as well as support to APA.

Latter aspect is in particular dealing with the equipment of the APA HQ and PAs with electronic information management system (IMS). GFA is advising the establishment of the system by adapting the TRIPLE I as well as providing proper server capacity. Conceptual presentation files were shared (included in the study files) describing intended system objectives and components. Proposed IMS is multipurpose (such as grants management, for instance), and can even be used to manage enforcement action tracking and tracking biodiversity monitoring such as species encounter recording across the system. Pilot will be run for 4 PAs and based on results could be extended to cover the entire system for national implementation. Same system can be used for infrastructure inventory as well.

First level would be APA, second level PAs (with same PA subcomponents as well), activities level and sub-activities level (enforcement, conservation, natural resources and alike). GIS could be used to integrate spatially IMS components. Testing is planned for 2016 in 4 PAs.

[Consultant's observation: Such a system is needed to track record of even various datasets, such as Kolkheti PA GIS, for instance, created almost a decade ago, but now can only be traced not within APA institutional records, but rather with persons contributing into its development, including the Consultant of this study.]

It is clear opinion of the interviewee that APA cannot handle national level task as areas outside of APA are concerned as well. BPS probably does not have capacity. Personal recommendation of this stakeholder is to consider uniting BPS and APA into single entity, so that biodiversity and conservation could be handled in an integrated manner at the national level. In this case it would have been obvious where to locate NBMS (calling it something like National Biodiversity Conservation Agency). Issue with current APA system is that they handle now both policy and management, which are functions ideally separated institutionally. This has implications for data management issues as well.

EIEC could be logical location for coordination of environmental data and information management, provided personnel and functional turnover is stabilised and avoided. EEA SEIS development is the example of high hopes for future, but institutional modifications make long term planning problematic, which is very critical for data management and sharing institution.

Research institutions should be considered as potential candidates for biodiversity data management as well (ISU). Biodiversity portal is good example of such capacity. They could be considered as good counterparts of EIEC (offices are also located in close proximity). They could work in tandem: institutional coordination by EIEC and technical capacity with ISU. Good candidate for technical capacity is NEA as well. One could also think about network solution:

say, APA taking care of PAs, EN taken care of by NGO, institutional cooperation and metadata collection taken care of by EIEC and NEA (using NSDI arrangements) and alike. EIEC could take lead role in biodiversity data network establishment and cooperation.

Reference was also made to I phase of GIZ programme, setting basic indicators for biodiversity, but it is also recognized that process is long term and closely tied with availability and management of biodiversity and other related data and datasets.

It was agreed that interviewee would participate in the meeting discussing the study findings. It was also promised to fill small survey form or forward to relevant parties to complete survey (feedback provided).

## B.12 KfW/GFA/GeoGraphic (Baseline Datasets for 4 Protected Areas)

**Interviewee:**

Tamar BAKURADZE  
GIS and RS Consulting Center GeoGraphic

**Date:**

2015.10.27

[Source: KfW/GFA 4 PA baseline project, report prepared by Tamar Bakuradze, GeoGraphic.]

This project is expected to produce comprehensive protected areas datasets (including metadata) for KfW/GFA supported 4 protected areas. Final report is expected by end of December 2015. Outputs of this activity could be considered as flagship example how to generate and document biodiversity and related data and metadata and, hopefully, make it publicly available.

Task 3 of the project aims the development of geodatabase and maps. In particular, data would be gathered into a united geodatabase, which could be stored and processed in GIS. Geodatabase structure would be developed for each project protected area. Consisting of baseline GIS layers as well as thematic layers. File extension/format for geodatabase would be \*.gdb (e.g. file names would be Kintrishi\_PA.gdb, Algeti\_PA.gdb, Kazbegi\_PA.gdb, Pshav-Khevsureti\_PA.gdb). Each protected areas datasets would also include files in \*.shp and \*.lyr extension/format.

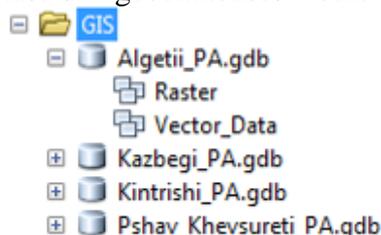
Data would be represented by baseline layers and various thematic maps. Each thematic map would be represented by attributive data, characterising, as required in the project terms of reference and methodology proposal, by abiotic and biotic environment, cultural and social components. Several map scales would be employed, which would subsequently be utilised by the Agency of Protected Areas (APA) of Georgia, as well as administrations of respective protected areas for the purposes of the creation and distribution/sharing of various thematic maps.

Specifically, symbol styles would also be created for PA mapping (as 'style' files), which could be applied not only to 4 protected areas addressed in the project, but also to all other protected areas of the country, utilising ready-made legends. For that purpose baseline maps would be created in several options for review and approval by the client.

Agreements are therefore required with regard to following baseline map presentations:

- Baseline maps are 1:50,000 scale, which are based on symbology of the former soviet topographic maps, updated with most recent aerial photography, available to producer company.
- WGS 84 UTM Zone 38 projection (for 4 protected areas and for Kintrishi additionally WGS 84 UTM Zone 37 projection as well).

Datasets in geodatabases would be structured as raster and vector layers (see schema):



Raster datasets contain the following:

- Digital Elevation Models (DEM) for each 4 protected areas with 30 m resolution (Aster GDEM)
- Former soviet georeferenced topographic maps in 1:50,000 scale
- Processed orthophotos from aerial photography:
  - For Kintrishi National Park additionally would be handed over 2015 aerial photography data owned by GeoGraphic (pixel size 25 cm) and 1:10,000 scale DEM.
  - For Algeti National Park handed over would be 2007 aerial photography data (pixel size 50 cm).
- Satellite imagery:
  - For Kazbegi Protected Areas handed over would be 2010 satellite imagery (DigitalGlobe-WorldView) (pixel size 50 cm).
  - For Pshav-Khevsureti GeoGraphic only avails soviet time topographic maps, therefore applied would be Landsat, Sentinel and other imagery of public distribution from global sources.

On the basis of the results of data interpretation and assessment, thematic maps would be produced for each protected area, opportunities and constraints for selected key species as part of biotic and cultural layers, as well as opportunities and constraints for abiotic layers. These thematic maps would support production of integral indices for opportunities and constraints so that boundary and zoning tasks can be addressed in rigorous manner.

Metadata is yet another important instrument for data management, as it describes data about datasets to indicate dataset characteristics such as sources, locations, creation dates, which raw data used for dataset generation and alike. Each dataset produced in the project for protected areas would have metadata fully populated in special file, developed per ISO standard, but convertible to any other format and stored as XML file, later natively integrated into the GIS software such as ArcGIS.

In terms of GIS software products, ESRI family ArcGIS version 10.3 software product would be applied, while maps compiled in this product (so called .mxd files) would be printing into the file format most acceptable to the client.

It was agreed that interviewee would participate in the meeting discussing the study findings. It was also promised to fill survey form (feedback provided).

## B.13 ISU Institute of Zoology (Terrestrial Fauna)

**Interviewee:**

Andrei KANDAUROV  
Institute of Zoology, ISU  
NGO Campester

**Date:**

2015.10.09

[Source: email dated 2015.10.09 by A.S. Kandaurov.]

In addition to internet based sources of information, the expert provided various samples from databases and characterised internet based sources of biodiversity data and information. All these files are recorded in study files, while internet base data review is outlined first below, followed by other sources of biodiversity data, such as universities/institutes and museums.

### Internet Sources

The following internet based biodiversity information can be identified for Georgia:

#### **The Register of the Fauna of Adjara**

(in Georgian and English languages):

<http://faunageorgia.org/index.php?pageid=5&lang=Geo>

<http://faunageorgia.org/index.php?pageid=5&lang=Eng>

Contacts: Kandaurov A.; Bukhnikashvili A.

Sample: [http://www.faunageorgia.org/index.php?pageid=3&saxeoba=Mertensiella caucasica \(Waga, 1876\)](http://www.faunageorgia.org/index.php?pageid=3&saxeoba=Mertensiella caucasica(Waga,1876))

Reference: Bukhnikashvili A. (scientific editor), 2012, The Register of the Fauna of Adjara, Volume 1 // Institute of Zoology of Ilia State University [editor N. Beltadze] Contributors: Bukhnikashvili A. (head of project), Kvavadze E., Eliava I., Natadze I., Kandaurov A., Beltadze N., Begelauri Kh. // Tbilisi, Contour : 503 pp. ISBN 978-9941-0-3974-4 UDC: [591.9+592/599](479.223) a-974

#### **Georgian Biodiversity Database**

(in Georgian and English languages):

<http://biodiversity-georgia.net>

Contact: Tarkhnishvili D.

Sample page: <http://biodiversity-georgia.net/index.php?taxon=Mertensiella caucasica>

#### **NGP Campester** (Field Researchers Union)

(in Georgian and English languages):

<http://www.campester.org/index.php?name=database&lang=eng>

Small mammals – rodents, insectivores, and bats.

Distribution maps and a list of points of finds.

Sample page: [http://www.campester.org/distribution\\_map.php?species=Arvicola terrestris](http://www.campester.org/distribution_map.php?species=Arvicola terrestris)

Contacts: Kandaurov A.; Bukhnikashvili A.; Natradze I.

Reference: Bukhnikashvili A., Kandaurov A., Natradze I., 2008, Action Plan for Georgian Bats //Campester, Tbilisi, Georgia, “Universali”: 103

### **NGO WWF Caucasus**

Caucasus Biodiversity Monitoring Network: <http://wwfcaucasus.net>

Contacts: Zazanashvili N.; Kandaurov A.

Description: Maps of protected areas and the official information about their infrastructure, and a set of indicators of the state of protected areas in the three countries (Armenia, Azerbaijan and Georgia) for 2008-2012.

### **NGO NACRES**

<http://www.nacres.org> and <https://www.facebook.com/nacres.org>

Main site is at the moment Under Construction.

Page with a database of species in three countries (Georgia, Armenia, Azerbaijan) is still active:

[http://www.nacres.org/bank\\_bot.html](http://www.nacres.org/bank_bot.html)

Sample page: <http://www.nacres.org/smam08.html> (Caucasian squirrel *Sciurus anomalus*)

NACRES Director informs that the NGO has prepared a database for the European Emerald Network (equivalent to Natura 2000), but information it is not available in public domain to judge data volume and composition.

The data on migratory birds used to be with SABUKO - Society for Nature Conservation

<http://www.sabuko.org/index.php/en/about-us-sabuko-org-3/mission-aims>

at the webpage <http://www.batimiraptorcount.org>

<http://www.batimiraptorcount.org/research/monitoring/raptor-count-results>

## **Ilia State University**

### **Institute of Zoology**

(Director Gogi Bakhtadze)

### **The Register of the Fauna of Adjara**

<http://faunageorgia.org/index.php?pageid=5&lang=Geo> (see in internet sources above)

### **New data on Fauna of Georgia**

New Data on Animal Biodiversity of Georgia, Eliava, Cholokava, Kvavadze, Bakhtadze, Bukhnikashvili, <http://www.science.org.ge/moambe/2007-vol2/eliava.pdf>

### **Small mammals' data by Bukhnikashvili**

Bukhnikashvili. A. 2004. On Cadastre of Small Mammals (Insectivora, Chiroptera, Lagomorpha, Rodentia) of Georgia. // Publ. House "Universal". Tbilisi: 132 pp.

**Data on Bats:** I. Natradze.

**Data (incomplete) of the Institute of Zoology collections:** A. Kandaurov – finding points, the results of measurements of the skulls and carcasses, wood mice and insectivores.

Sample database fields in Excel are as follows:

**For mice** - date of the data entry, number of order, number map, species, region, district, place of capture, label number, field label number (as in registration journal), date of capture, biotope, Gender, Age, L-length body, C-Length tail, P-length back foot, A-Height ear, W-Body weight, length of the skull is greatest length of the skull Kanda basal width of the zygomatic, width of the occipital, width of interorbital, width of the nose, length of nasal bone length of the diastema, length incisal openings, length number of upper molars, length of the drum cameras "height

occipital", the length of the skull face, dorsum coloration, painting belly, painting paws Breast spot, the characteristic of spots form toe on, place spots, coronal suture (form) interparietal bone (form), width interparietal bones, nasal suture holes rear edge burin, tool holes, dental health, temporo-crown seam, note 1, note 2.

**For shrews** - the date of acceptance of the work, number of order, date of entry in the table of Excel, no card storage location, number labels, number field labels (registration journal), genus, species on the card, who determine the type of the card, the age, the kind who determine the kind of graduated., region, district, place of capture, distance to housing, distance to the water biotope, altitude (m), who captured, date of capture, sex, L-length body, C-tail length, A-height of the ear, P-length back foot, W-body weight, length of the skull Kanda-basement, greatest length of the skull, greatest width, maximum height, width interorbital, face width, width of nose, length of the upper row of teeth, the width of the upper row of teeth, length facial skull, lower jaw height, main length, length of interm, teeth, painting carcass, angle of the mandible, teeth - form teeth - diameter, brush on the tail, note 1, note 2.

There is also electronic map in GIS, same as Alexander Gavashelishvili (see below).

**Birds' data** (hardcopy on paper) is available with A. Abuladze.

**Fish data** is available with Bela Japoshvili.

**Institute of Zoology**

(Director Davit Tarkhnishvili)

**Georgian Biodiversity Database** - <http://biodiversity-georgia.net> (see above).

Tarkhnishvili, D. List of Georgian locations of *Ommatotriton ophryticus*. GBD database 2013: 133 locations of banded newt with geographic coordinates, elevations, and titles are provided.

Alexander Gavashelishvili has maps in GIS - mammalian find points (mainly same as in the book by Bukhnikashvili A., 2004, Proceedings of the inventory Georgia mammals (Insectivora, Chiroptera, Lagomorpha, Rodentia), Tbilisi, Georgia, Campester, « Universal ", 138 pp.) and a few personal observations.

Sample of attribute information:

| OBJECTID | SPECIES             | STATUS_PNT | SITE | ENG_NAME          | ST_NM_GE | GEO_NAME           | X      | Y       |
|----------|---------------------|------------|------|-------------------|----------|--------------------|--------|---------|
| 1        | Vespertilio murinus | 1          |      | PARTICOLOURED BAT | Tbilisi  | Cveulebrivi Ramura | 485787 | 4614200 |

**Data on birds catching:** Zura Javakhishvili

**Data on gastropods:** Levan Mumladze

## **Museum of Georgia**

The curator of the zoological collections Veriko Pkhakadze

There is a database collection

Entomologists:

Eter Didmanidze and Valeri Petrov have information on insects (mostly - butterfly)

Ichthyologist - Nargiza Ninua - information on fish and aquatic invertebrates.

She also oversees the collection of the Museum of Vertebrate Animals.

## **Plants Data**

### **Institute of Botany**

Director Nukri Sikharulidze

**Herbarium database:** Davit Kikodze

**Botanical Garden** (Tbilisi)

**NGO Orchis:** Maia Akhalkatsi, Marina Mosulishvili.

It was agreed that the expert would participate in the meeting discussing study findings. It was also promised to fill small survey form or forward to relevant parties to complete survey (feedback provided).

## B.14 Caucasus Nature Fund

**Interviewee:**

Tea BARBAKADZE  
National Program Coordinator Georgia  
Harald LEUMMENS  
Project Manager  
Caucasus Nature Fund (CNF)

**Date:**

2016.02.24

Earlier background of Mr. Leummens was with UNDP Caucasus water project (9<sup>th</sup> water project incidentally) and general impression is that same things are being redone due to limited sharing and communication of datasets.

Similarly, there seems to be 8 or so biodiversity data management relevant initiatives currently going on simultaneously.

CNF itself is not collecting datasets, these are done through NGOs such as NACRES (therefore this NGO would have datasets and information). In future it is planned to obtain shapefiles and excel or other database results would be collected and documented for further communication.

CNF also prefers to be 'told' what is the preferable format for data collection rather than invent the format and 'impose' it to relevant Georgian institutions and authorities.

CNF has positive attitude towards establishing BD DB WG so that institutions, rather network 'memory' is kept on past, ongoing and future initiatives in this direction.

CNF works with APA but experience shows that as of to date APA is only interested in boundaries geospatial data and products such as land cover or monitoring datasets are not of agency interest, at least its GIS personnel/unit is not instructed to take custody of other datasets.

Therefore CNF is supportive that APA develops clear specifications for geospatial data for monitoring, boundaries and all other relevant database layers. [Consultant's observation is that currently even for boundaries data is not yet requested per standard specification, task delegated to contractor to deliver per its own expertise and experience.]

CNF considers that APA should be more selective with donor community and to take clear decisions not to take products in various shapes and models just because of the assistance offered.

(At this point discussion was joined by National Program Coordinator.)

Regarding the preferred institutional arrangements for hosting NBMS, CNF team considers that institution under government umbrella rather than non-governmental, and obvious candidates are either NEA or EIEC. Role of the centre is not clearly crystallised yet, including in terms of legally, do not have sufficient capacity for the function but same is true for NEA as well in the biodiversity field. Institutional policy change volatility is the problem and organisation selected should be stable institution. GoG as the beneficiary should clearly indicate preferably single organisation as the counterpart of biodiversity sector projects and try not to change rules of the game in the long run.

APA should have people in sufficient number and experience for dealing with protected areas datasets. Info should be delivered in a format interoperable with Georgian databases.

It was also ensued from the discussion that land legislation has the gap that there is no specific category for protected areas and these are treated as 'forestry' units.

As for integrating geospatial data from various biodiversity themes none of the institutions under consideration have sufficient capacity, NEA does not have it (in biodiversity), EIEC does not have it, APA has only one person more competent in boundary demarcations. This is not considered sufficient to manage land data units in geospatial analysis. That capacity needs to be developed. As GIZ embarks on institutional strengthening of GoG first thing to come up with is the integration of agency workflows. APA is the only agency which would deal with PAs and then through MoENRP this datasets should be integrated with the national cadastral system, in parallel same taking place with forestry units' datasets.

In this regard the issue of NSDI development for Georgia was mentioned by the consultant, but as with certain other stakeholders, NSDI initiatives were not know to CNF at this stage. Consultant reiterated that harmonising sectoral datasets could probably be handled through integration with the NSDI process, coordinated by NAPR/MoJ per INSPIRE model. CNF is very much supportive of the NSDI idea in case they will set the stage for data and sharing standards and interoperability requirements.

It was a clear example when GoG and its beneficiary agencies should be informing donor community that initiatives such as NSDI are taking place and advice on need for harmonisation of approaches.

[Consultant strong advice in this respect is the biodiversity sector to take the lead and thrive for harmonisation with NSDI, as this is the sector with not the strongest power leverage and its argumentation power can enhance with the quality of implementation, including in the database management field. For instance, availability and good documentation of biodiversity datasets could be critical in handling the pressures from development projects such as the HPP sector.]

As for the CNF's ongoing plans, these are at the stage of defining what to monitor and where. Earlier effort was performed by NACRES but database and metadata was not requested yet. With ongoing efforts international consultant is selected and attempt is to approach monitoring efforts for Borjomi-Kharagauli and Lagodekhi NPs in a structured way, in addition to biodiversity to monitor threats as well and determine how to address them. Activities were planned for mid-March 2016 and this should give CNF the ability to define key indicators for biodiversity monitoring program for these two protected areas, potentially observing spatial patterns as well. CNF also considers to use modern technology to strengthen protection regime as well as remote sensing tools.

SMART tool would be used to store already in the field data about poachers, animals, immediately gathered in digital format with GPS. SMART system was developed by WWF, there are several tools in the package, such as cellular communications, apps, excel database with GPS data points can be produced as well (see <http://www.smartconservationsoftware.org>). It was mentioned that GFA is developing comparable but different system, but apparently these systems should be built interchangeably and coordinated at APA level.

Discussion moved to aquatic biology, where lack of sufficient local experts is evident and that institutions like ISU and NEA should cooperate to maximize pool of involved experts.

Briefly touched was data on Emerald Network. Work is ongoing and that's perhaps the reason that data is not published yet.

One weak point noticed was need for agreement on defining Land Cover classification system for the country. The selected system could be that defined by FAO, or EU/CORINE, one shared by largest community. Such systems have inherent vagueness, but one should better be selected and followed. For instance, Lagodekhi (25 classifications) and Borjomi-Kharagauli defined own systems not based on any particular system when delineating land covers and landscapes. This decision should finally be made by country and followed consistently by every user. Then all information can be fed into system of choice.

[Consultant's observation is that land cover systems are evolving fast at the global level and now it is available in 30 m resolution, such as Chinese GLC30 from 2000 and 2010 and US BaseVue of 2013. These are also good examples of sharing rather than hiding data.]

CNF agreed and brought the examples of US Landsat (30 m) and EU Sentinel (now 10 m). In this respect, CNF recently has selected American expert to help with landscape unit mapping system based on Landsat. Finally system should better be handed over to qualified Georgian expert familiar and willing to maintain it with remote sensing expertise.

CNF is aware of GEO/GEOSS initiatives and have heard about GEO BON. Consultant shared recent GEO BON report on remote sensing (see references Annex A). CNF was informed on details of GEO developments and responsible agencies in Georgia. CNF was encouraged to take GEO/GEOSS and INSPIRE frameworks when defining their system preferences.

Information was shared in this regard about the development of comprehensive GIS and RS database for 4 protected areas by GeoGraphic as part of the GFA baseline study and CNF was invited to request APA access to these datasets. Of interest for CNF could be the ABC methodology applied by GeoGraphic with weighted multi-criteria overlay analysis for application towards habitat delineation, priority setting and ultimately conservation zoning and boundary outlining. Brief discussion was followed regarding access to EN data as well, where data is provided to BPS rather than to APA as well. CNF informs that they requested and got access to EN data in its current form.

Ultimately CNF intends to cover all protected areas to be monitored and assessed on effectiveness of the management by establishing indicators to check on reaching long term quality outcomes. Supported currently are 9 protected in Georgia. Relatively light support is provided to 3 PAs sponsored by KfW, as they have this major support: Algeti, Kazbegi, Kintrishi, starting from this year Pshav-Khevsureti as well, while other 6 PAs with more CNF support are Lagodekhi, Vashlovani, Tusheti, Borjomi, Mtirala and Javakheti. CNF is striving to establish indicators system to establish performance based governance of protected areas.

Consultant inquired why Kolkheti is not covered. Reason communicated was that it is covered by Kolkheti development fund provided by SOCAR due to oil terminal compensation.

[Consultant expressed concern that earlier World Bank credit and GEF grant funding was the reason for EU and other donors not to support Kolkheti protected areas, and now oil money is preventing reputable conservation fund to support Kolkheti, although CNF is supporting in a limited manner KfW sponsored 4 PAs. Georgian authorities and CNF are strongly urged to reconsider the approach, Kolkheti should be rewarded for attracting funds such as WB credit and oil industry sources, not penalised because of this, as this shows commitment to improve management of the protected area, moreover that there are many challenges in its buffer areas

and resources are never enough for needed support. And SOCAR's Kolkheti compensation fund certainly is not enough to cover ecosystem services lost due to oil terminal development and site remediation once oil business is over. It was also mentioned that SOCAR fund should better be used to pay for credit borrowed by GoG for Kolkheti protected areas establishment.]

When discussion recommendations on the necessity of metadata CFN raised strong arguments that GoG, APA for instance, should be aware of every project and every detail and deliverable so that institutional memory is kept despite the sources of funding of various initiatives, whether national or international. The consultant is in full agreement with this approach and recommendations and APA's personnel in charge should make this happen and this should not be the function of personnel, rather institutional memory, and metadata collection could be the good first step in that direction.

It was agreed that interviewee would participate in the meeting discussing the study findings. It was also promised to fill small survey form or forward to relevant parties to complete survey (some feedback provided).

## B.15 National Forestry Agency

**Interviewee:**

Merab MACHAVARIANI  
Deputy Head  
National Forestry Agency  
Irakli SISVADZE  
Head of Forest Inventory Department  
National Forestry Agency

**Date:**

2016.02.25

Deputy Head considers that official umbrella in charge of biodiversity (therefore apparently biodiversity data as well) is BPS. In case some institutional change is introduced (there are considerations to merge FPS and BPS), objective of biodiversity monitoring and related data management should stay with respective legal heir.

Some comparative discussion emerged. For instance, FPS does not have DB unit and its capability is provided by NFA. FPS certainly should be setting the data management policy but probably cannot engage in DB building itself. BPS also would like to shape data management policy, but not build data bases itself. Consultant added that current inclination of MoENRP is to have EIEA in this capacity for BD as well, with which Deputy Head of NFA expressed strong reservations, as integrative and analytical capabilities are certainly not enough there.

Mentioning in this respect recent discussions to merge FPS and BPS, Deputy Head considers that monitoring capability for BD should be provided with this merger. He considers that overarching aim of monitoring is to reveal tendencies and then reshape monitoring program to adjust these changing circumstances. Task then could be given to FPS, to APA and even to Local Authorities, to monitor certain key indicator species in space and time (it was reported that LAs may soon become forest management organs on areas not under FPS or APA control). Analytical team in FPS/BPS merged entity would then do the proper analysis, having such capability, including spatial planning capability, so that if certain habitats are disturbed and species and genetic pools shift and relocate, to be able to cope with such spatial analysis. This complex analysis can hardly be handled by EIEA. In principle this can be done, but probably institutional entity should better be different. Monitoring terms of reference should be coming from entity with biodiversity expertise. NEA may not handle such site specific tasks as well.

Consultant intervened that discussion is not concerned who and how designs forest or biodiversity information system. Discussion is concerned how to channel metadata management for all environmental datasets, so that it is known who owns and shares (or does not share) what datasets and databases. Such task could be handled by both EIEA and NEA.

Therefore discussion returned to specific BD DB capabilities and arrangements at NFA. NFA has electronic database, mostly concerned with timber production, therefore contains forest allocations for cutting, amounts allocated, maps for spatial attribution, timing of allocation, 'passport' of the forest unit, who purchased the use rights ('ticket'), who use allocated amounts, who did not. Also there is electronic database how many timber cutting enterprises are in Georgia, when and what was processed.

This database is hosted by the Ministry of Finance of Georgia. MoENRP pays annually 200,000 GEL to MoF for providing this service. DB access credentials are generated by MoF. Consultant could not gain access to the system to have a look, so this system is not reviewed in this report

(as a reason of not providing access was mentioned possibility of data alteration in case of granting such an access).

This database is reported as interesting instrument. NFA annually is asking LAs to provide lists of households who need firewood. Summarising these lists gives around 700,000 families across Georgia. Comparing with Soviet period, Deputy Head recalls 600,000 families with such dependency on firewood. Therefore figures from LAs are questionable considering high level of emigration from the country and declining population. Certain manipulation with these lists is therefore suspected. Same can be said about usefulness of this DB for area allocations, as experienced analysts can see and notice certain inconsistencies.

This forest resource allocation database is in MoF, but data entry into the system is managed by NFA personnel. Some 30 personnel is working on entering data for firewood and timber product use. License holders also are entering their data directly into the system and NFA can see these entries. There are some 40 licence holders (respectively 40 personnel). There are also 700 units for timber cutting and they also use system for their data entry. Supervision/inspection personnel is also using the same system. In summary, some 100 persons are working on data entry. System is simple, some excel form-file is uploaded with new data and one can see remaining amount of allocated resources and used resources. Currently there is no spatial component, only some Google maps web service, but development of spatial capability is under consideration. Desire is to link this system to data in approved management plans.

Consultant enquired why at least some information from licensing database is not accessible publicly (despite that portal is publicly announced <https://portal.anr.ge>, but registration option is not possible for the public). Head of Forest Inventory Department informs that at this stage only management plans are available publicly, in PDF version. There are only two contractors working for NFA currently in charge of management plans and related GIS data generation, GeoGraphic and M3. NFA has regulation regarding the terms of reference for the management plan preparation, GoG Decree No. 179 dated 2013 on Forestry Inventory, Planning and Monitoring Rule (see references provided in sub-chapter Mandates above). The specific terms of reference per this decree has to be approved by the Order of the Head of NFA (e.g. sanitary cuts in case of forest pests spread). After the Order is approved, tender can be announced for management plan preparation. As of to date, 4 such orders were issued, for Kharagauli, Borjomi-Bakuriani, Aspindza-Akhalkalaki and Akhaltsikhe. Private companies are obliged to deliver all data used for management plan.

The management plan is communicated to local Municipality and is disclosed on the website. It contains approval procedures, and if quality is satisfactory after primary review, the document is disclosed through <http://moe.gov.ge> website of the Ministry for 20 days, when public meeting is organised. Stakeholders can provide comments and suggestions in writing. Finalised document is transferred to FPS/MoENRP which approves after review of comments and the document.

Dataset is not published with the draft management plan. Primary reason quoted was that technically there is no capability to do this. NSDI might be useful for providing means for such disclosure, but responsible agency is NAPR/MoJ.

Under NSDI it is planned for 2018 to have integral system for the entire country. Currently some general criteria and approaches are being defined. Finish and Swedish consultants are helping. They apply INSPIRE standards. Recently meeting was organised by NAPR. GoG Decree is under development to further facilitate the process. NFA is invited to participate in the NSDI network.

In terms of available database personnel, NFA's Forest Inventory Department has 3 such staff members (Mr. Vladimer Vashakidze, Mr. Levan Japaridze and Head of Department Mr. Irakli Sisvadze). Though other staff of the department (total 10) is also using GIS. Main tasks is the collection of data (e.g. through inventory contractors), analysis and transfer to other units of the NFA.

One technical problem faced with the inventory database submissions is that forest inventory data cannot be opened with the forest inventory software version available to NFA (developed earlier by GeoGraphic in 2006/7 under WB project), as new version of ArcGIS and Access cannot open older format inventory data. Head of Forest Inventory Department considers that 100,000 GEL might be required to update the inventory software. This means thematic maps cannot be generated by NFA using inventory data. Head claims that inventory table with format in line with regulations is sufficient for the NFA. But some other company (M3) for the same purpose is using other software (called 'Soli'). But it is also important for NFA to be able to visualize inventory data in GIS, but apparently this is not fully possible today.

NEA is providing data to NFA, such as annual average temperature etc. But raw data (such as daily river discharge) is not requested or required, therefore is not provided.

In response to question regarding projects in support of database management, Deputy Head of NFA informed that in a few days GFW and GIZ are organising meeting of relevance on this subject and more details can be learned there (02 March 2016). Other quoted initiatives included SMBP. NFA informed that they received forest cover under the programme, but 5 m resolution and related imagery of 4 bands is not sufficient for them and there are not much uses of the dataset, from the perspective that for other years they have aerial digital photography of 0.5 m resolution and comparison is not in favour of GIZ supplied data. NFA can access NAPR data (such as aerial photography) and there is a memorandum of understanding between ministries of environment and justice. If NFA takes or intends to take new imagery they are obliged to clear with NAPR and provide all data (there was no instance of forestry aerial photography though).

[Consultant's recommendation: Since NFA does not consider 5 m resolution data as containing 'sensitive' information, they are indeed urged to disclose publically datasets and see whether public can make better use of it. Consultant's personal opinion is that such datasets, if disclosed, would attract the attention of professional community. At least one use of this dataset is reported and described in Examples sub-section, provided in this report.]

NFA does not perform inventory for APA. There seems no coordination in place if NFA decides to take aerial photos, with APA needs ignored. There is not working group for such coordination.

Actually from biodiversity monitoring perspective nothing specific is in place, despite several completed programs. Deputy Head of NFA defines following potential issues. Monitoring directions needs to be clearly established, so that scarce resources are not stretched on wider activities. Red List should be reevaluated. Species subjected to monitoring have to be selected. Forest rangers and others in charge locally need to be trained in monitoring these species, provided with checklists. Appropriate database system should also be defined. Directions and priorities needs to be defined by NFS/MoENRP. There are 5-7 staff in BPS and around 10 in FPS. Earlier there were 50 staff in BPS (with 6 units working on PAs, flora, fauna, aquatic, and 3 conventions CBD, CITES, Ramsar, desertification was addressed separately). Deputy Head is therefore in favour of creating combined unit indicatively calling it Biodiversity Protection and Forest Policy Department. Deputy is essentially not supporting UNDP idea such as designating EIEC in charge of data coordination, including the biodiversity sector.

There is the key role to be played by academic institutes, such as zoology, hydrology institutes and others, as long time series are needed to make any conclusions. Unfortunately short 2 weeks studies for hydropower, for instance, are not sufficient to make professional conclusions. Deputy Head strongly urges to pay particular attention in recommendations to strengthening scientific institutions, as they are losing professionals due to aging and young generation is not attracted. Consultant fully concurs with this finding, and actually provided similar recommendation in the review based on 20 Hydropower EIA analysis with support of the Norwegian Ministry of Foreign Affairs, but as explained above, this report was not made public by the Norsk Energi. Advice went even further there, advising statutory function to these research institutes.

Another important study mentioned was TEEB (The Economics of Ecosystems and Biodiversity, see <http://www.teebweb.org/countryprofile/georgia>), but for such assessments as well time series datasets are needed.

NFA was not against and was actually supportive of creating intersectoral stakeholder group in support of biodiversity data management.

Short discussion session was held with the staff member around the desktop forestry information system currently operated by the NFA. Main part of the system is the forest inventory database. Special MS Access based software (developed by GeoGraphic as part of the earlier WB project) to enter field data and produce inventory tables in a statutory format accepted in Georgia. Field data processed includes forest vegetation species, height, diameter, frequency, age, understory and growth composition, exposure, aspect, erosion class, shrubs, berries, etc. All this 'taxation' parameters are entered into the Access and processed into required table format according to forest land quarters, literas, processed according to species, slope aspect, etc. Forest plot areas can also be calculated. System meets most of the current requirements of inventory NFA personnel. Kharagauli and Borjomi-Bakuriani areas were processed with this software and now work is underway in Adjara A.R. forest inventory. Data due to some incompatibility cannot be currently processed in NFA, but contractor personnel undertaking the field work is able to operate this data entry and pre-processing system. Still NGA needs this package in operational state so that in case of necessity can introduce changes in datasets or even to monitor contractor performance.

They also desire to have export into Excel capability to link inventory data to spatial data of forest units, but consultant advised that Access is quite native to ArcGIS and there should not be need to have data exported into Excel. Currently species, age and management actions fields are linked with forestry spatial units. Layer are organized as per Region, Forestry Unit, Forestry Plots, Quarters and Literas, and it is reported that there is no key column to connect spatial and attribute data tables. It is the consultant's opinion that the issue is in software installation and use training, but even more importantly also in metadata production and proper documentation.

As for other datasets used by NFA, they get access to download NAPR datasets and these updates usually happen on a weekly basis. APA is using for inventory NFA methodology, except forestry management actions attribute fields. They are interested more in species. There is no common LAN in the two institutions so that they can easily access each other's data.

Following dataset were mentioned as used on a regular basis: forest inventory, cadastre, mining and entrails of NEA (writing letter officially). To cover one region with inventory almost 1 year and respective financial resources are needed, and to cover entire Georgia work can last 10 years and this is the periodicity of the inventories. Qualified personnel is also in scarce supply. GIZ project produced 5 m forestry data was also mentioned.

Technically it is not possible to currently make inventory datasets publicly shared through web services etc., but it is feasible and NAPR channels can be used which has good system for cadastral data sharing through web services. There seems no extreme sensitivity with sharing this data, resource users would actually welcome public access to such data.

As for the technical resources, NFA database unit has 3 computers, but no server capability. Software capabilities include ArcGIS 9.3 and 10.2 versions, Photoshop. MoENRP also does not have servers (only NEA). Volume of database is also on the increase and these PCs are not enough. Remote sensing software is also not available, including tools for producing/processing aerial ortho-imagery.

Data on forest fires is the responsibility of the Forest Care and Restoration Department. It seems that as data is not easily shared between departments, currently there is not much demand for such sharing as well. It is hoped that such server and network sharing would stimulate inventory data use.

It was agreed that interviewees would participate in the meeting discussing the study findings. It was also promised to fill small survey form or forward to relevant parties to complete survey (feedback not provided).

## B.16 ISU, School of Natural Sciences and Engineering

**Interviewee:**

Davit TARKHNISHVILI, Dean  
School of Natural Sciences and Engineering  
Director, Institute of Ecology  
Iliia State University

**Date:**

2016.02.26

Dean informed on importance of IPBES process, have recently (October, 2015) participated in one of its meeting in Bonn, representing BPS/MoENRP (IPBES is Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, <http://www.ipbes.net>).

Dean is not aware yet of details of UNDP 3 conventions project. But for UNDP ISU is doing Machakhela baseline study. Aware of former Aarhus Centre but not much of its heir EIEC under MoENRP. Office of EIEC is nearby with ISU HQ and the faculty. At the same time, ISU faculty and its institutes have close interaction with BPS of MoENRP and are involved in intense discussions with GIZ. BPS leadership (there are changes in its top management) used to be able to deal with stakeholders such as fisheries, hunting and other resource user stakeholders. All this means institutions are subjected to personnel and affiliation changes and these are not favourable for establishing more permanent setups. Scientist are therefore distancing themselves of involvement in policy making process due to unstable arrangements.

Dean frequently used to have discussions with BPS department urging them to have ICT capacity at BPS to enhance their DB capability. But it was also communicated by the Consultant that BPS currently does not have desire to deal with information system.

Recent positive development was integrating IoB and IoZ with IoE and ISU. Premises of both IoZ and IoE are being rehabilitated currently (IoZ was quite recently expelled from their own building, therefore housing them into the ISU is excellent development, hope is permanent).

Biodiversity database of ISU IoE is probably the best portal and database available in Georgia. DB and portal is taken care of by IoE staff Giorgi Chaladze (he is working on small half-time salary, and to sustain his family income has to employ himself as environmental consultant of HydelbergCement). He was not available during the meeting, but via phone and email provided quick feedback and key reference paper describing the system. PHP hypertext pre-processor is used for web programing and MySQL database for storing and visualising portal data.<sup>40</sup>

According to cited reference (see last footnote) several small projects were utilised to support the development of this national database, with latest support coming from GIZ SMBP to implement biodiversity indicators. Another nice feature of the website is to maintain cross-links with other initiatives, such as Red List (<http://biodiversity-georgia.net/index.php?redlist=1>), utilising and interfacing with international portals such as the Fauna Europaea (<http://www.faunaeur.org>), Pan-European Species directories Infrastructure (PESI, [www.eu-nomen.eu/pesi](http://www.eu-nomen.eu/pesi)) and GBIF, as well as national initiatives such as Campester.

Dean demonstrated functionality of the biodiversity database and portal. Queries can be made per species. Basic details can pop-up including species names in several languages (Georgian, Latin, English, other). Some distribution patterns in simple Google maps format is also provided. Known references are cited. Systematics is connected to Fauna Europaea naming database for

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<sup>40</sup> [https://www.academia.edu/16392840/Georgian\\_Biodiversity\\_Database](https://www.academia.edu/16392840/Georgian_Biodiversity_Database) (registration might be required to access).

international compatibility (<http://www.faunaeur.org>). Conservation status is indicated as well. Uploading GIS data is possible through multiple XY pairs and even shapefile.

Credentials are given at several levels such as editorial entry, but ‘crowd’ involvement is also encouraged from the public, with lower level credentials, attributing special status to public entries, later on confirmed through professional moderation and validation. Crowdsourcing is stimulated through Facebook page as well.<sup>41</sup>

As for the background of the database, it first started in 2004 in the form of checklists, then BP supported further development, WWF also supported. GIZ support is mentioned above. ISU is also supporting with small salary the database and portal administrator. Public involvement through Facebook portal has stimulated data entry significantly for last two years. Currently there are no external projects, but there is a master’s program to mobilise public support for database through social media.

ISU is member of Fauna Europaea and PESI. Has some experience with GBIF as well, but experience is not that positive, as some kind of quality control is missing and sometimes sightings are placed in faraway locale. GBIF representatives visited Georgia (mostly working with botanists) and had meetings with ISU as well, but engagement so far is not active.

ISU mentioned its data papers publication initiative as well, entitled ‘Caucasus Biodiversity’,<sup>42</sup> which is interesting and innovative development, but Dean himself is advising students to use for such data publications internationally accepted higher impact factor avenues for publication. Still, there is already at least one data publication in this journal.<sup>43</sup> ISBN registration would be forthcoming if data journal is used more intensively.

IoE is involved in ecosystem geospatial modelling as well, Lekso Gavashelishvili is leading the ISU research in this area. Global datasets are used such as DEM (e.g. SRTM), WorldClim (<http://www.worldclim.org>) for global climate data. Recently initiated was the study of pine and spruce distribution modelling. NEA data is rarely used, perhaps due to difficulty to access and the costs involved. Several publications were shared with the consultant. Cooperation is also strong with GIS-Lab, mostly on a project basis, concerned with remote sensing of biodiversity with various modelling, photogrammetry and spectral analysis methodologies.

Not much was heard about the INSPIRE process at the national level, only participated in one meeting. ISU is not actively invited to be part of the initiative. It is important though to reflect biodiversity database initiatives into NSDI process. Besides, there are important INSPIRE guidelines concerned with species and habitats. It is also worth ISU exploring links with EU JRC expertise. Latter is actual technical administrator of the INSPIRE Directive. Similarly not much was known about GEO/GEOSS initiatives.

[Consultant’s observation: INSPIRE and GEO/GEOSS gap seems like closing with the recent initiatives of forthcoming workshop on ‘Caucasus SDI’, planned for 6-7 June 2016, with UNIGE support. Care should be taken though if the process is not integrated well with the NSDI process in Georgia. In this regard, ISU is supportive of establishing cooperative agreements such as MoUs with European Universities qualified in SDI and related European and Global initiatives. ISU seems willing also to play the role of clearinghouse on biodiversity database and to cooperate with respective policy coordination institutions, such as EIEC/MoENRP.

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<sup>41</sup> <https://www.facebook.com/Georgian-Biodiversity-საქართველოს-ბიომრავალფეროვნება-100675320004125>

<sup>42</sup> <http://biodiversity-georgia.net/newsletter/index.php?journal=gbn>

<sup>43</sup> [http://biodiversity-georgia.net/newsletter/index.php?journal=gbn&page=article&op=view&path\[\]=1&path\[\]=1](http://biodiversity-georgia.net/newsletter/index.php?journal=gbn&page=article&op=view&path[]=1&path[]=1)

One issue not fully covered during the consultation was marine biodiversity, and it was agreed that the issue would be addressed in consultation with Mr. Zurab Gurielidze shortly after the consultation meeting and before final report production. Same applies to ex-situ conservation institutions like zoos and botanical gardens, which have their own needs in database toolsets.]

ISU was earlier actively involved in the Georgian Red List coordination process. Unfortunately this platform was misused by the government to exploit scientists opinion in ‘endorsing’ projects of questionable quality and with potential of impacting biodiversity, therefore interest was lost towards the process and when confronted with the question what to do with intersectoral council, not much opposition was expressed with Minister’s offer to shut it down. It is strongly advised by the Consultant though not to give up in the effort to close the gap between the science, policy and governance. Government should genuinely demonstrate follow up on stakeholder forum observations, so that stakeholders remain motivated by demonstrating genuine progress to them. If this would be the case, ISU is supportive of the BD DB working group, otherwise many such forums were seen in the past.

Discussion finalised with the discussion on the necessity to maintain certain status quo in institutional compositions in the foreseeable future, so that institutions are allowed time to adjust and improve their standing and qualification. It is welcomed to pursue reforms, but proposals should be justified in writing and options analysis, as is the case with this GIZ study, subjecting it to review and scrutiny of stakeholders.

It was agreed that interviewee would participate in the meeting discussing the study findings. It was also promised to fill small survey form or forward to relevant parties to complete survey (feedback provided).

## Annex C. SWOT Scoring

| Criteria  | APA | Strengths   | Weaknesses   | Opportunities   | Threats  |
|---|-----|---|--|---|--|
| <b>Policy</b> experience/influence (in data management terms) | 0   | Close links with MoENRP   | Mandate concerned with protected areas                         | Extend influence outside PAs  | Weak influence beyond PAs sector                             |
| <b>Institutional</b> experience (in data management terms)    | 0   | Some experience in biodiversity monitoring  | GIS is not independent unit                                    | Extend links beyond PAs   | Limited resources to satisfy even PA needs                   |
| <b>Personnel</b> capabilities (quality and quantity)          | 0   | GIS unit available, recently added 1 personnel (now 2)                              | Monitoring unit lacks data management capability               | International assistance can support capacity building                                      | Not much interest to extend beyond PAs                       |
| <b>Technical</b> capabilities (hardware, software)            | 0   | GIS workstation, plotter  | No enterprise GIS, more networking and hardware needed         | International assistance can support hardware/software                                      | GIS capacity with PAs may be expensive to increase           |
| <b>Data</b> resources available                               | 0   | Mostly GIS boundaries only (more currently under way)                               | Data organisation, limited links to monitoring                 | International assistance can support with methodologies                                     | Limited mandate to cover monitoring beyond PAs               |
| <b>Sustainability</b>   | 0   | APA seems established institution (see threats though)                              | Weak institutional argument beyond PAs                         | Continued international assistance and support  | There were attempts (e.g. in 2011) to undermine APA          |
| <b>Ownership</b>  | -1  | Ownership attached to boundary demarcation but less to other type of data yet       | Currently not much interest to extend beyond PAs               | PAs could extend BD data stewardship to rest of country                                     | May lack interest to extend mandate to areas beyond PAs      |
| <b>Government</b> acceptance                                  | -1  | Most likely support only extended for PA  | Institutional resistance to extend mandate beyond PA databases | Unlikely support beyond PAs could set interesting precedence                                | Changes in policy would affect mandate to manage non-PA data |
| <b>Public</b> acceptance                                      | -1  | Public opinion may not support extending data management mandate too far beyond PAs | Scientific community would not support mandate beyond PAs      | It might be interesting to stimulate crowd sourced support by the public inside/outside PAs | Public not to accept and may resist national BD data mandate |
| <b>Relevance</b> to host NBMS                                 | -1  | Certain GIS and monitoring data experience and network                              | No experience beyond PAs                                       | Integration across PA and non-PA areas  | No natural mandate beyond PAs                                |

| Criteria  | BPS | Strengths   | Weaknesses   | Opportunities   | Threats   |
|---|-----|---|--|---|---|
| <b>Policy</b> experience/influence (in data management terms) | 0   | MoENRP policy instrument (see threats however)  | Current policy is not conducive to for BD DB management                                      | Use policy influence in support of BD DB  | Recent rumours of combining BPS with FPS may affect BD in favour of resource use focus      |
| <b>Institutional</b> experience (in data management terms)    | -1  | Institutional part of MoENRP  | Not much interest and ability currently to host BD DB  | Willingness to support elsewhere development of BD DB capacity                                | Recent change in BPS leadership can reduce institutional influence                          |
| <b>Personnel</b> capabilities (quality and quantity)          | -1  | Limited GIS experience  | No dedicated DB personnel  | Can support establishing standard requirements for BS data capture                            | May fail to retain qualified BD data management personnel                                   |
| <b>Technical</b> capabilities (hardware, software)            | -1  | Regular office PC equipment   | Insufficient hardware and no software resources  | Can become best beneficiary of BD DB management system  | Institutional setup not supportive to maintain technical capabilities                       |
| <b>Data</b> resources available                               | -1  | Capability to influence data generation and standards through institutional coordination          | Insufficient technical skills to support BD data collection standards                        | Provide policy and coordination support for BD data collection and management community       | Other competing tasks may overwhelm capacity to support BD DB coordination efforts          |
| <b>Sustainability</b>   | -1  | Quite long term institutional history and experience  | Not much inherent interest in BD DB management   | International links and obligations (conventions)   | Sustainability strongly depends on higher level decisions                                   |
| <b>Ownership</b>  | -1  | Need for BD data for quality of meeting international BD status reporting obligations             | Lack of sufficient interest and need on a daily basis to access BD DB                        | Interest would increase if BS DB provided in user friendly manner meeting BPS reporting needs | Institutional changes may undermine interest in long term activities such as BD dB control  |
| <b>Government</b> acceptance                                  | 0   | In case of focused effort of the government, strong advantage of institutional location in MoENRP | Competing functions to engage in BD DB management issues on long term basis                  | Could support cross-sectoral (but non-technical) coordinating function of BD DB management    | Changes in MoENRP structure would affect long term ability to manage BD DB                  |
| <b>Public</b> acceptance                                      | 0   | Institutional location would allow public acceptance in case DB competence can increase           | Scientific community frustration if data management expectations not matched with competence | Public would be supportive in case strong competence in BB DB management demonstrated         | Insufficient interest and capability to provide the BD DB management function               |
| <b>Relevance</b> to host NBMS                                 | 0   | Excellent institutional location and natural support of stakeholders                              | Weak institutional interest to host data management function                                 | Can influence common approaches to BD data handling. Interest in BD indicators                | Limited mandate beyond BD, pressure to transfer function to environmental data holding unit |

| Criteria  | EIEC | Strengths   | Weaknesses  | Opportunities   | Threats  |
|---|------|---|---|---|--|
| <b>Policy</b> experience/influence (in data management terms) | +1   | Support of MoENRP and new UNDP project to act as hub for environmental data sharing           | Certain scepticism of other key stakeholders whether EIEC can perform the policy setting role | Declared openness to data sharing in Aarhus convention spirit may bring fresh results       | Changes in policy at national level and host agency can lead to severe loss of influence           |
| <b>Institutional</b> experience (in data management terms)    | 0    | Institutional mandate and setup includes wider environmental data sharing responsibility      | Too many tasks beyond data management as well as wider emphasis on not only BD data           | Successful implementation of UNDP project could help set up the network for BD data sharing | Shakeup of institutional structures after completion of UNDP and other donor projects              |
| <b>Personnel</b> capabilities (quality and quantity)          | 0    | Few personnel (2-3) whose direct responsibility is to deal with environmental data sharing    | No personnel with SDI experience due to recent staff turnover                                 | UNDP project may stimulate enrolment of new personnel skilled in data management            | Loss of qualified personnel after completion of UNDP and other donor funded projects               |
| <b>Technical</b> capabilities (hardware, software)            | -1   | Minimizing hardware costs by outsourcing server hardware assets to MoF                        | Reliance on external hardware and software capacity may result in too high running costs      | Very modest resources under new UNDP project to provide for needed hardware/software        | Too much reliance on external technical resources (such as MoF) may not be sustainable             |
| <b>Data</b> resources available                               | 0    | Some experience and willingness to provide information resources (permits, organisations)     | No access or arrangements yet to tap the national data resources.                             | UNDP project if implemented at full capacity may lead to new arrangements for data sharing. | Currently not very active involvement in NSDI process may result in lost opportunities             |
| <b>Sustainability</b>   | 0    | Core support available from MoENRP complemented by ongoing donor funding                      | Lack of owned office space and technical equipment, too much reliance on project funding      | Success with UNDP project may stimulate continued support of GoG and donor community        | Financial sustainability is not evident and there is a threat of support melt once project is over |
| <b>Ownership</b>  | 0    | Institutional mandate is supportive of the data management functions                          | Not much institutional history and scepticism of stakeholders. Turnover of key personnel      | UNDP project implementation with success may stimulate stakeholder ownership/support        | Ownership with data management functions may subside upon project completion                       |
| <b>Government</b> acceptance                                  | +1   | Direct designation and political support by previous and current leadership of MoENRP         | Limited support from other data management agencies (both from inside and outside the sector) | Enhanced support of other governmental agencies in the course of the UNDP project           | Inability to integrate with newly initiated NSDI process may reduce governmental support           |
| <b>Public</b> acceptance                                      | 0    | Combining environmental educations and data sharing may help with gaining public support      | Limited support yet from stakeholders e.g. scientific and data management community           | Demonstrated public benefit from free and open data sharing may open unique opportunities   | Continued current reluctance from data holders to share data may lead to public frustration        |
| <b>Relevance</b> to host NBMS                                 | 0    | Direct mandate stipulated in statutes to stimulate data sharing (environmental, including BD) | Too many (sometimes <i>ad hoc</i> ) tasks beyond data management responsibilities             | UNDP project's CBD emphasis may increase ownership with regard to BD data and its sharing   | Support for DB data may subside after UNDP project implementation is completed                     |

| Criteria  | NEA | Strengths   | Weaknesses  | Opportunities  | Threats   |
|---|-----|---|---|--|---|
| <b>Policy</b> experience/influence (in data management terms) | 0   | Large influential sectoral agency in charge of environmental monitoring & data management | Too much reliance on revenues from selling data (not major) and from large NR licence holders   | Major opportunity to open up data repositories to public and stimulate open data sharing           | Continued refusal to share data defying global trend may result into loss of influence in long run        |
| <b>Institutional</b> experience (in data management terms)    | 0   | Key national agency in environmental monitoring and data handling. Part of WMO network.   | Lack of free and open access to monitoring and data resources. Weak experience with BD data     | Opportunity to quickly become leading source of environmental monitoring data                      | Undermined reputation from sharing data with development ministries and not with public                   |
| <b>Personnel</b> capabilities (quality and quantity)          | +1  | Small but experienced database unit hosting and running almost all NEA and MoENRP servers | Overloaded personnel. Lacking experience with SDI   | Involvement in NSDI process can help building SDI capacity including for BD data handling          | Too many tasks (running 24 servers) may diffuse attention from other tasks such as BD DB                  |
| <b>Technical</b> capabilities (hardware, software)            | +1  | Hosts and runs dozens of data servers with key data on hydro-meteorology and other data   | DB experience is recent, largely supported by external projects; some expert input still needed | Available storage and server capacity is fairly sufficient to host any kind BD DB instances        | System backup capacity is not available yet and can result in major loss of data holdings                 |
| <b>Data</b> resources available                               | +1  | Key data on hydrometeorology, pollution, some aquatic biology                             | Data not easily accessible to scientific community and not accessible to public                 | Adopting free and open access policy promises huge potential for agency and its data visibility    | Withholding free and open access to <i>in situ</i> data may lower demand in favour of <i>ex situ</i> data |
| <b>Sustainability</b>   | 0   | Long term heritage history in hydrometeorology. Variable but regular governmental support | Current funding model does not seem sustainable and is reliant on large private sector actors   | Providing its historical <i>in situ</i> data holdings may unleash potential of public/private uses | Recent dependence on large NR licence holders and no national budget core funding                         |
| <b>Ownership</b>  | 0   | Institutional mandate is supportive of the data management functions                      | Not much institutional history or emphasis of BD data. Too large institution for quick change   | Can play crucial role in providing real data for NSDI including serving BD data                    | Funding ups and downs may result in lack of interest in maintaining BD data                               |
| <b>Government</b> acceptance                                  | 0   | Designated institution to organise data collection and storage nationally (but not BD)    | Government policy is to rely on revenues from data selling and large licences. No open sharing  | Can be strong instrument of the government to introduce policies of free and open access to data   | Reduced to zero government support with core funding may become existential threat                        |
| <b>Public</b> acceptance                                      | 0   | Public familiar with the agency due to long term history and heritage                     | Certain distrust in the scientific community due to difficult or no access to raw data          | Potential for quick success with free and open data sharing, opening unique opportunities          | Continued current policy of withholding data sharing would erode stakeholder acceptance                   |
| <b>Relevance</b> to host NBMS                                 | 0   | Direct mandate and experience with environmental data management (but excluding BD)       | Too many responsibilities may diffuse interest in and attention to BD data management           | Involvement in BD data management would increase range of agency experiences                       | As BD is not direct responsibility of the agency, may not take long term interest                         |

| Criteria  | ISU | Strengths  | Weaknesses   | Opportunities   | Threats   |
|---|-----|--|--|---|---|
| <b>Policy</b> experience/influence (in data management terms) | 0   | Recognised player and leader in Georgian scientific community in BD monitoring & data sharing      | Limited direct political and funding support from national agencies such as MoENRP             | Probably strongest national expertise in BD data collection and ambition to manage / share      | Recent trend of support for science may disappear fast in case of any economic downturn         |
| <b>Institutional</b> experience (in data management terms)    | +1  | University faculty umbrella, overseeing range of institutes (botany, zoology, ecology)             | Limited willingness to engage in coordination with entities beyond education and science       | Scientific expertise could be crucial for engaging national international BD DB networking      | Without efforts to reduce gap between science and decision-making can lead to problems          |
| <b>Personnel</b> capabilities (quality and quantity)          | +1  | Strongest researcher base in Georgia and few good personnel capable of hosting BD databases        | Too many other faculty and research responsibilities beyond BD subjects. Low salary base       | Can play crucial role in data generation and data management per international best practice    | Without good core funding and international support qualified personnel would leave the job     |
| <b>Technical</b> capabilities (hardware, software)            | 0   | Basic functionality available at the university, mostly PC based                                   | Capabilities would benefit from better equipment and software (basic SDI server hard/software) | Could demonstrate SDI serving capability with existing data, if provided with resources         | Reduced governmental support to upgrade core equipment and tools on a continual basis           |
| <b>Data</b> resources available                               | 0   | Biodiversity checklist based database is well maintained and shared with scientists and public     | Limited attention to metadata, no system in place to serve BD and other related datasets       | Expansion with server hardware and open source software could set up public BD SDI node         | Without stronger connection to international networks capacity would decline in time            |
| <b>Sustainability</b>   | 0   | Biodiversity research is engraved into institutional structure of university and its institutes    | More statutory responsibilities need to be given to research community (monitoring, EIA)       | Sustainability would increase if research community is entrusted BD data management functions   | Without increased core funding capacity to retain qualified staff would be reduced further.     |
| <b>Ownership</b>  | 0   | Operating so far the best system for national BD checklist sharing demonstrates the inherent stake | Without governmental support and efforts, growth cannot be sustained in existing BD data       | International networking and collaboration could enhance the quality of BD data management      | Lack of core funding would risk reduced interest beyond personal scientific interest to run DBs |
| <b>Government</b> acceptance                                  | 0   | Apparently scientific community is considered as key stakeholder under any BD DB setup scheme      | MoENRP is in favour of more formal players under its direct supervision (UNDP project)         | Providing BD SDI node setup function would enhance stake and responsibility of scientists       | Side-lining the role of scientific community to mere participation in bureaucratic forums       |
| <b>Public</b> acceptance                                      | 0   | Existing BD portal is being used for public involvement, even crowd sourcing amateur inputs        | Scientific efforts are not synchronised with governmental efforts, limiting public exposure    | Opportunity to involve public in real amateur science with quality crowd sourcing tools applied | Scientists distancing from decision-making process may lead to public distrust                  |
| <b>Relevance</b> to host NBMS                                 | 0   | Experience with hosting both BD data and kind of metadata  | More interest in science/research rather than operational monitoring and DB maintenance        | Can play crucial role in applying SDI tools via networking with international science community | Government may refuse to support monitoring role of scientific establishment                    |

| <b>Criteria</b>   | <b>NGO (i/n)</b> | <b>Strengths</b>   | <b>Weaknesses</b>  | <b>Opportunities</b>   | <b>Threats</b>   |
|---|------------------|--|--|--|--|
| <b>Policy</b> experience/influence (in data management terms) | 0                | Several international and national NGOs have strong policy influence on BD data              | Data management policy including for BD widely viewed as governmental function                     | NGOs could contribute if not directly, than indirectly into strong BD data policy effort       | International and national NGO policies and rules in practice may limit open BD data sharing |
| <b>Institutional</b> experience (in data management terms)    | 0                | Several international projects and BD data cases implemented in Georgia and in Caucasus      | Efforts implemented and portals developed do not provide access to data due to various constraints | Data gathered by NGOs can be of strong quality complementing national efforts if shared openly | NGO experience developed sometimes does not have direct spill over effect on government      |
| <b>Personnel</b> capabilities (quality and quantity)          | 0                | Strong NGO teams and ability to mobilise BD monitoring expert capacity                       | Resources for NGO activities can be inferred as competing with allocations for government          | High level international expertise and experience can be mobilized by NGOs                     | Regular recruiting experts with NGO funding can negatively influence public experts morale   |
| <b>Technical</b> capabilities (hardware, software)            | 0                | Some strong local BD data management team in international NGOs                              | Access by international NGOs to data and tools may not be shared free due to licensing constraints | Certain very useful tools and datasets can be made accessible to national stakeholders         | National responsible agencies may remain under-resourced and may develop some animosity      |
| <b>Data</b> resources available                               | 0                | Access to rich intranet data resources (including up-to-date high resolution satellite data) | Inability to distribute to those in need at national level due to licensing/ownership constraints  | As open and free data sharing culture proliferates, this may open new opportunities for BD     | International data sharing may not be matched with the same approach by national agencies    |
| <b>Sustainability</b>   | 0                | International support is usually sustained at certain level with some fluctuations           | International support is never sufficient, but remains only funding source in BD field             | Repeated program funding in support of BD data management is critical for sustainability       | Long term program financing should be given priority over project based financing            |
| <b>Ownership</b>  | 0                | NGOs in BD filed have high stake in their activities even with scares funding                | Reliance on project funding does not contribute into long term activities such as BD monitoring    | NGOs could be provided with statutory right to maintain some competent systems (e.g. Emerald)  | Without clearly stipulated rules for public data sharing NGOs are not immune from monopoly   |
| <b>Government</b> acceptance                                  | -1               | Some NGOs have generated track record and trust of the government in key areas               | It still might be difficult to transfer some national statutory responsibilities to NGO actors     | Data sharing infrastructure combined with sharing culture can deliver BD data partnership      | Legal constraints may preclude government agencies to transfer statutory data power to NGOs  |
| <b>Public</b> acceptance                                      | 0                | NGOs are respected by public, they have strong mechanisms in place for public participation  | Some databases developed by NGOs sometimes cannot be shared with key stakeholders                  | NGOs could achieve excellent results by involving professional public through crowd sourcing   | Not sharing BD data with key stakeholders and public can have negative impact on acceptance  |
| <b>Relevance</b> to host NBMS                                 | 0                | In some specialised areas NGOs technically can provide national BD data management function  | Unless BD data is openly & freely shared, NGOs could risk being considered closed entities         | Government could benefit by outsourcing some BD data management to NGOs                        | Government's lack of data management competence can result in NGOs not sharing data          |

| <b>Criteria</b>   | <b>Fund (i)</b> | <b>Strengths</b>   | <b>Weaknesses</b>   | <b>Opportunities</b>  | <b>Threats</b>   |
|---|-----------------|--|---|---|--|
| <b>Policy</b> experience/influence (in data management terms) | +1              | Intergovernmental agreement in place to support activities including BD data management            | Due to some policy reasons international community reduce data management activities            | Can shape best practice BD data management policy with spill over effect to rest of the country | Regional scope may limit to a certain extent influence on national BD data policy              |
| <b>Institutional</b> experience (in data management terms)    | 0               | International statute with steady supply of funds including for BD monitoring, data and indicators | Short institutional history, being established on pilot scale activity level                    | Setting up operations in line with best international practice                                  | Experience developed may not have spill over onto government                                   |
| <b>Personnel</b> capabilities (quality and quantity)          | +1              | International expertise would be readily available including in BD monitoring and data fields      | Constrained by the capabilities of local PA personnel.  | Involve best international and national expertise in its BD data related activities             | Expertise involved may not be always sensitive to local issues                                 |
| <b>Technical</b> capabilities (hardware, software)            | 0               | It is expected to develop state of the art hardware and software                                   | So far not much technical equipment and capacity at this early stage                            | Opportunity for introduction of best international practice                                     | Limited geographical scope, at this stage only some priority PAs covered                       |
| <b>Data</b> resources available                               | -1              | Data collection activities being initiated for two protected areas                                 | Coverage at this stage is limited and will not go beyond PAs                                    | Once data collection and indicator system developed, would be of utility elsewhere              | Monitoring systems developed may not be applicable outside PAs, covered by the Fund            |
| <b>Sustainability</b>   | 0               | Strong funding base for sustained operations   | Quantity of funding is not going to be sufficient for all PAs and certainly outside PAs         | Long term presence and sharing of experience in BD data collection and management               | International/regional issues may influence sustainability of fund and data collection efforts |
| <b>Ownership</b>  | 0               | Major stake in developing data collection and indicator system to monitor fund's efficiency        | Limited ownership beyond selected priority PAs and certainly beyond PA system                   | Continued presence and support to data collection in selected PAs                               | Lack of incentives to openly share data with stakeholders                                      |
| <b>Government</b> acceptance                                  | 0               | Intergovernmental agreement in place to support activities including BD data management            | Operations cannot be extended beyond PA system  | Georgia can benefit by hosting the fund, beneficial from BD data management perspective         | Other governance sectors may not be as supportive as MoENRP and APA                            |
| <b>Public</b> acceptance                                      | -1              | Georgian communities are usually welcoming international assistance efforts                        | Sensitivity could be involved in data capture in particular when addressing resource use issues | Improvements demonstrated through quality data collection can have lasting public benefits      | Failure to collect quality data may render expensive efforts not reaching public acceptance    |
| <b>Relevance</b> to host NBMS                                 | -1              | Intergovernmental agreement would provide statutory support for data management efforts            | Limited geographical scope with selected PAs would not allow national level expansion           | Best practice system implementation can be replicated at national level                         | Data sharing limitations may create misunderstandings with local scientific community          |

| Criteria  | NFA | Strengths  | Weaknesses  | Opportunities  | Threats   |
|---|-----|--|---|--|---|
| <b>Policy</b> experience/influence (in data management terms) | 0   | Importance to maintain strong database due to economic importance of the agency                    | Influence in the economic terms may not be extended into BD data management domain            | Opportunity to influence BD data generation & management for all forest areas of the country         | Changes in policy at national level and host agency can lead to severe loss of influence        |
| <b>Institutional</b> experience (in data management terms)    | 0   | Long terms experience with forest inventory and ongoing efforts to create digital data repository  | Attention of the institution is absorbed by economic factors and BD data has less prominence  | National coverage (except PAs and non-forest ecosystems) provided BD data is prioritized             | History of institutional instability may again repeat and deviate attention from BD data        |
| <b>Personnel</b> capabilities (quality and quantity)          | +1  | Personnel available (2-3) whose direct responsibility is to deal with forest inventory database    | Due to lack of enterprise level GIS other personnel not much exposed/benefit of GIS system    | Availability of large number of data entry personnel in-house and with licences companies            | Lack of willingness to retrain personnel into BD data capture, storage and management           |
| <b>Technical</b> capabilities (hardware, software)            | 0   | Pair of PC-based systems to run forestry GIS. Contract with MoF on intranet with licensing DB      | Reliance on external hardware and software capacity results in too high running costs (€200k) | Enterprise GIS capability would strongly enhance exposure of personnel to geospatial tools           | Too much reliance on external technical resources (such as MoF) would be ineffective            |
| <b>Data</b> resources available                               | 0   | Forest inventory system under development. Would be much strength if BD data is combined           | Seems less likely that BD data of this agency would include flora and flora other than trees  | Value of forest inventory system would enhance if it includes BD of flora and flora other than trees | Current culture is not sharing publicly forestry data. Approach would extend to BD if mandated  |
| <b>Sustainability</b>   | 0   | Forestry inventory DB is inherent need for operations of the agency and system would be maintained | Less optimistic is the sustainability of BD data for species other than trees                 | With more understanding of the value of BD data for ecosystem services can result in perfect DB      | With institutional fluctuations first to suffer would be BD data management long run continuity |
| <b>Ownership</b>  | 0   | Institutional mandate is strongly supportive of the forestry data management functions             | Same institutional mandate is not yet supportive for BD data collection and storage functions | With more understanding of the value of BD data ownership for total forest economic valuation        | With institutional fluctuations first to suffer would be BD data management ownership           |
| <b>Government</b> acceptance                                  | 0   | MoENRP would probably be supportive to tap BD data management as well                              | Economic agencies (e.g. MoF) may be reluctant to support mandate beyond trees DB              | Opportunity to involve local authorities in BD data flows in addition to central authorities         | Sustained liberal economic thinking in the government agencies may impact BD issues             |
| <b>Public</b> acceptance                                      | -1  | Combining economic resource inventory with emphasis on BD values may gain public support           | Scepticism from scientists and public in extending forest DB mandate into BD domain           | Demonstrated public benefit from free and open data sharing may open unique opportunities            | Public scepticism if non-sharing culture in forestry data is transferred into BD data domain    |
| <b>Relevance</b> to host NBMS                                 | 0   | Large personnel, good ties with local level authorities can contribute into data streams           | More interest in economic data, less interest in BD data of direct non-economic value         | Opportunity to extend BD data management geographic scope to include large forested areas            | Tendency to monopolize datasets hidden from public access can extend to BD domain               |

# Annex D. Biodiversity Data Survey FORMS

## INSTRUCTIONS

### Biodiversity dataset survey, Georgia

GIZ 'Sustainable Management of Biodiversity Project in South Caucasus' commissioned short study to assist in defining 'Options for the Management of Biodiversity and Forestry Data in Georgia'.

The study includes a rapid inventory of currently available BIODIVERSITY, FORESTRY and RELATED databases/datasets (non-geospatial and geospatial including vector and raster datasets) available at local, national and global level of aggregation.

Results of this study and survey will inform forthcoming GIZ programme on 'Integrated Biodiversity Management in South Caucasus'.

You are kindly invited to complete this online survey.

The survey is made of three concise parts to inform the following:

\* Your ORGANISATION and contact details (<http://goo.gl/forms/49kqj11c>)

\* 1. Biodiversity, forestry and related databases/datasets OPERATED/COLLECTED by your organization (<http://goo.gl/forms/as8Znkfop>)

\* 2. Biodiversity, forestry and related databases/datasets ACCESSED/USED by you/your organisation (<http://goo.gl/forms/yfZNd47Xdk>)

(Note: One can iterate submission steps 1 and 2 as many times as needed.)

Desired deadline is 15 January 2016.

Please complete survey submissions in English or Georgian languages or their combination.

Personal data will not be disclosed or published without your consent.

Thank you for supporting us with your specialist contribution.



NEXT

## ORGANISATION

### Biodiversity dataset survey, Georgia

\* Required

#### 1. Your ORGANISATION

Name of your organisation: \*

Your answer

Department:

Your answer

Main area of work/interest: \*

Your answer

Contact person (SURNAME Name): \*

Your answer

E-mail address: \*

Your answer

Mobile: \*

Your answer

Data of key interest (biodiversity and/or non-biodiversity): \*

Your answer

Data of potential interest (biodiversity and/or non-biodiversity):

Your answer

Is your organization a member of biodiversity and/or other data observation/exchange network(s)? \*

Yes

No

If yes, please, specify the name(s) of biodiversity and/or other data observation/exchange network(s) and its level (local, national, regional, other?):

Your answer

Which is the main application area of these data?

Your answer

Which is the mode of data use (operational, research, other?)?

Your answer

How do you access data?

Your answer

BACK SUBMIT

# 1. DATABASES/DATASETS OPERATED/COLLECTED BY ORGANIZATION

|   |  |   |
|---|--|---|
| <div data-bbox="705 347 763 400"></div> <h2 data-bbox="210 448 712 483">Biodiversity dataset survey, Georgia</h2> <p data-bbox="210 507 271 523">* Required</p>  <p data-bbox="293 564 434 604">Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH</p> <h3 data-bbox="210 655 712 683">1. Datasets OPERATED/COLLECTED by your organisation</h3> <p data-bbox="210 719 555 743">Name of your organisation/department: *</p> <p data-bbox="210 759 465 778">Your answer _____</p> <p data-bbox="210 823 331 847">Type of data: *</p> <p data-bbox="210 863 483 991"><input type="radio"/> Vector<br/><input type="radio"/> Raster<br/><input type="radio"/> Tabular<br/><input type="radio"/> Other : _____</p> <p data-bbox="210 1038 456 1062">Name of database/dataset: *</p> <p data-bbox="210 1078 465 1098">Your answer _____</p> <p data-bbox="210 1142 389 1166">Description of data: *</p> <p data-bbox="210 1182 712 1201">Your answer _____</p> | <p data-bbox="869 355 1048 379">Metadata available: *</p> <p data-bbox="869 395 927 451"><input type="radio"/> Yes<br/><input type="radio"/> No</p> <p data-bbox="869 491 943 515">Weblink:</p> <p data-bbox="869 531 1115 550">Your answer _____</p> <p data-bbox="869 595 1048 619">Geographical scope: *</p> <p data-bbox="869 635 1115 654">Your answer _____</p> <p data-bbox="869 699 1077 722">Time period (from - to): *</p> <p data-bbox="869 738 1115 758">Your answer _____</p> <p data-bbox="869 802 972 826">Frequency: *</p> <p data-bbox="869 842 1115 861">Your answer _____</p> <p data-bbox="869 906 1003 930">Downloadable: *</p> <p data-bbox="869 946 1137 1034"><input type="radio"/> Yes<br/><input type="radio"/> No<br/><input type="radio"/> Other : _____</p> <p data-bbox="869 1078 987 1102">Free access: *</p> <p data-bbox="869 1118 1137 1174"><input type="radio"/> Yes<br/><input type="radio"/> Other : _____</p> <p data-bbox="869 1222 1025 1246">Web services URL:</p> | <p data-bbox="1525 355 1771 375">Your answer _____</p> <p data-bbox="1525 419 1787 443">GEOSS Societal Benefit Areas: *</p> <p data-bbox="1525 459 1630 754"><input type="checkbox"/> disasters<br/><input type="checkbox"/> health<br/><input type="checkbox"/> energy<br/><input type="checkbox"/> climate<br/><input type="checkbox"/> water<br/><input type="checkbox"/> weather<br/><input type="checkbox"/> ecosystems<br/><input type="checkbox"/> agriculture<br/><input type="checkbox"/> biodiversity</p> <p data-bbox="1525 799 1608 823">Remarks:</p> <p data-bbox="1525 839 2018 858">Your answer _____</p> <p data-bbox="1525 927 1608 951"><b>SUBMIT</b></p> |
|---|--|---|

## 2. DATABASES/DATASETS USED BY OR RELATED TO THE WORK OF ORGANIZATION

|  |   |  |
|--|---|--|
| <div data-bbox="705 347 761 399"></div> <h3 data-bbox="212 446 716 486">Biodiversity dataset survey, Georgia</h3> <p data-bbox="212 502 268 526">* Required</p>  <p data-bbox="291 566 436 606">Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH</p> <h4 data-bbox="212 654 638 686">2. Datasets ACCESSED/USED by your organization</h4> <p data-bbox="212 718 560 742">Name of your organisation/department: *</p> <p data-bbox="212 758 459 782">Your answer _____</p> <p data-bbox="212 821 336 845">Type of data: *</p> <p data-bbox="212 861 481 997"><input type="radio"/> Vector<br/><input type="radio"/> Raster<br/><input type="radio"/> Tabular<br/><input type="radio"/> Other : _____</p> <p data-bbox="212 1037 459 1061">Name of database/dataset: *</p> <p data-bbox="212 1077 459 1101">Your answer _____</p> <p data-bbox="212 1141 392 1165">Description of data: *</p> <p data-bbox="212 1181 705 1204">Your answer _____</p> | <p data-bbox="862 359 1041 383">Metadata available: *</p> <p data-bbox="862 391 929 454"><input type="radio"/> Yes<br/><input type="radio"/> No</p> <p data-bbox="862 486 940 510">Weblink:</p> <p data-bbox="862 526 1108 550">Your answer _____</p> <p data-bbox="862 590 1041 614">Geographical scope: *</p> <p data-bbox="862 630 1108 654">Your answer _____</p> <p data-bbox="862 694 1075 718">Time period (from - to): *</p> <p data-bbox="862 734 1108 758">Your answer _____</p> <p data-bbox="862 798 974 821">Frequency: *</p> <p data-bbox="862 837 1108 861">Your answer _____</p> <p data-bbox="862 901 996 925">Downloadable: *</p> <p data-bbox="862 933 1131 1037"><input type="radio"/> Yes<br/><input type="radio"/> No<br/><input type="radio"/> Other : _____</p> <p data-bbox="862 1077 985 1101">Free access: *</p> <p data-bbox="862 1109 1131 1181"><input type="radio"/> Yes<br/><input type="radio"/> Other : _____</p> <p data-bbox="862 1220 1019 1244">Web services URL:</p> | <p data-bbox="1512 359 1769 383">Your answer _____</p> <p data-bbox="1512 414 1792 438">GEOSS Societal Benefit Areas: *</p> <p data-bbox="1512 454 1635 758"><input type="checkbox"/> disasters<br/><input type="checkbox"/> health<br/><input type="checkbox"/> energy<br/><input type="checkbox"/> climate<br/><input type="checkbox"/> water<br/><input type="checkbox"/> weather<br/><input type="checkbox"/> ecosystems<br/><input type="checkbox"/> agriculture<br/><input type="checkbox"/> biodiversity</p> <p data-bbox="1512 798 1601 821">Remarks:</p> <p data-bbox="1512 837 2016 861">Your answer _____</p> <p data-bbox="1523 925 1601 949">SUBMIT</p> |
|--|---|--|

## Annex E. Biodiversity Data Survey RESULTS

### ORGANISATIONS

| Name of your organisation:                              | Department:  | Main area of work/interest:                 | Contact person (SURNAME Name): | E-mail address:  | Mobile:       | Data of key interest (biodiversity and/or non-biodiversity):  | Data of potential interest (biodiversity and/or non-biodiversity): | Is your organization a member of biodiversity and/or other data observation/exchange network(s)? | If yes, please, specify the name(s) of biodiversity and/or other data observation/exchange network(s) and its level (local, national, regional, other?):   | Which is the main application area of these data?   | Which is the mode of data use (operational, research, other?)? | How do you access data?   |
|---|--|---|--------------------------------|--|---------------|---|--|--|--|---|--|---|
| GIS and RS Consulting Center GeoGraphic                 | NA   | GIS and Remote Sensing                      | Mamuka Gvilava                 | <a href="mailto:mgvilava@geographic.ge">mgvilava@geographic.ge</a>                   | 599546616     | Land Cover, irrigation, multispectral satellites, soils.  | Radar, species distribution, habitats.                             | Yes  | BSIMAP   | Black Sea Integrated Monitoring and Assessment Programme  | Both operational and research.                                 | Webpage <a href="http://www.blacksea-commission.org/bsimap.asp">http://www.blacksea-commission.org/bsimap.asp</a> |
| GIS & Remote Sensing Consulting Center "GeoGraphic"     | Environmental Protection   | Environment, Spatial Planning, GIS Analysis | Tamar Bakuradze                | <a href="mailto:tbakuradze@geographic.ge">tbakuradze@geographic.ge</a>               | +995599503289 | Protected Areas, Base mapping, Various municipalities spatial planning documentations                                       | Global Sources of various Environmental data                       | Yes  | Local (spatial data service provider)  | Environment, Conservation, Planning   | planner, operational   | internet  |
| Ilia State University                                   | Institute of Ecology   | Ecology                                     | Levan Mumladze                 | <a href="mailto:lmumladze@gmail.com">lmumladze@gmail.com</a>                         | 555515861     | Georgian biological diversity (all life forms)  | Environmental data (climate, terrain etc.)                         | Yes  | PESI – International, biodiversity-georgia.net – national  | Biodiversity  | Research   | Online, private   |
| Agency of Protected Areas                               | Agency of Protected Areas  | GIS   | Paata Dvaladze                 | <a href="mailto:apa.dvaladze@gmail.com">apa.dvaladze@gmail.com</a>                   | 591963336     | GIS   | GIS, Biodiversity  | No   |  | Protected Areas   | operational  | GIS   |
| The National Environmental Agency                       | Hydrometeorology   | Climate data management, Climate change     | Megrelidze Lia                 | <a href="mailto:lmegrelidze@hotmail.com">lmegrelidze@hotmail.com</a>                 | +995591404139 | Climate   | Landscape, Soil profile, Groundwater data                          | Yes  | Main Telecommunication Network (MTN), WMO Information System (WIS), Global Observing System (GOS), Global Climate Observing System (GCOS), Regional Basic Climate Network (RBCN), Regional Basic Synoptic Networks (RBSN(S)) | Agriculture, Energy, Building industry, Health, Transport, Communication, Tourism, Insurance, Defense, etc. | Operational  | Via hydrometeorological observation network   |
| Geographic, GIZ   |  | GIS / RS. GIS Expert                        | Sophiko Kenkebashvili          | <a href="mailto:sophiko.kenkebashvili@gmail.com">sophiko.kenkebashvili@gmail.com</a> | 599938716     | GIS Data  |  | No   |  | Georgia   |  |   |
| GFA Consulting Group – representation office in Georgia | Project: Support Programme for Protected Areas in the Caucasus – | Protected Areas                             | Ramaz Gokhelashvili            | <a href="mailto:ramaz.gokhelashvili@gmail.com">ramaz.gokhelashvili@gmail.com</a>     | 599151326     | Species distribution, abundance, threats, endangered species, population dynamics, habitat quality, ecosystems functioning, | Same as above  | No   | n/a  | n/a   | n/a  | n/a   |

| Name of your organisation:   | Department:                        | Main area of work/interest:  | Contact person (SURNAME Name): | E-mail address:  | Mobile:       | Data of key interest (biodiversity and/or non-biodiversity):  | Data of potential interest (biodiversity and/or non-biodiversity): | Is your organization a member of biodiversity and/or other data observation/exchange network(s)? | If yes, please, specify the name(s) of biodiversity and/or other data observation/exchange network(s) and its level (local, national, regional, other?): | Which is the main application area of these data? | Which is the mode of data use (operational, research, other?)? | How do you access data?  |
|--|------------------------------------|--|--------------------------------|--|---------------|---|--|--|--|---|--|--|
|  | Georgia                            |  |                                |  |               | ecosystem values, natural resources use, community related aspects in PA support zones  |  |  |  |   |  |  |
| Institute of Zoology, Iliia State University   | Vertebrate animals                 | Small mammals (Insectivora, Chiroptera, Rodents)   | Kandaurov Andrei               | <a href="mailto:a.s.kandaurov@gmail.com">a.s.kandaurov@gmail.com</a>                     | 599192547     | biodiversity  | biodiversity, zoogeography, conservation                           | No   |  |   | research   |  |
| Institute of Botany and Landscape Ecology, Ernst Moritz Arndt University Greifswald, partner in the Greifswald Mire Centre | Peatland Studies and Palaeoecology | Peatland ecology (hydrology-peat formation-vegetation), peatland conservation (classification, biodiversity, restoration), Wise use of peatlands (functions, paludiculture, e.g. Sphagnum farming) | Krebs, Matthias                | <a href="mailto:krebsm@uni-greifswald.de">krebsm@uni-greifswald.de</a>                   | +491731707910 | vascular plant and moss species, peat type, site conditions (water flow, nutrients, climate), mire type, distribution and state of peatlands ( degree of naturalness, threats), Sphagnum ecology/ growth  |  | Yes  | International Mire Conservation Group (IMCG; <a href="http://www.imcg.net/">http://www.imcg.net/</a> ) – international level                             | Nature conservation, policy-making                | research, operational  |  |
| Iliia State University   | Institute of Ecology               | Ecology, Biodiversity  | Giorgi Chaladze                | <a href="mailto:giorgi.chaladze.1@iliauni.edu.ge">giorgi.chaladze.1@iliauni.edu.ge</a>   | 577771017     | Taxonomic lists, Registration points, Images  |  | Yes  | Fauna Europaea   | Taxon identification                              | Research   | From internet: <a href="http://biodiversity-georgia.net/">http://biodiversity-georgia.net/</a> |
| Caucasus Nature Fund   |                                    | Financial support for Protected Area management  | LEUMMENS Harald                | <a href="mailto:hleummens@caucasus-naturefund.org">hleummens@caucasus-naturefund.org</a> | 995599779610  | Rare, threatened (national & global lists), endemic, charismatic or otherwise valuable/important species and ecosystems/habitats in Pas; Threats to biodiversity in Pas; Management efforts by PA authorities to reduce impacts from threats and conserve biodiversity values | Climate change impact  | No   |  |   |  |  |

# 1. DATABASES/DATASETS OPERATED/COLLECTED BY ORGANIZATIONS

| Name of your organisation/ department:                 | Type of data:          | Name of database/dataset: | Description of data:  | Metadata available: | Weblink:  | Geographical scope:             | Time period (from – to):  | Frequency:        | Downloadable:  | Free access:  | Web services URL:   | GEOSS Societal Benefit Areas:                | Remarks:  |
|--|------------------------|---------------------------|---|---------------------|---|---------------------------------|---|-------------------|--|---|---|--|---|
| GIS and RS Consulting Center<br>GeoGraphic             | Vector                 | GURIA_soils               | Soils of Guria Region, Georgia.   | Yes                 | <a href="http://129.194.231.213:8080/qeonetwork/srv/en/main.home">http://129.194.231.213:8080/qeonetwork/srv/en/main.home</a> | Guria Region of Georgia         | Original hardcopy map 1999, vector map for Georgia 2006, Guria extracted in 2009. | Singular product. | Please contact authors for access to dataset.                | Please contact authors for access to dataset.           | <a href="http://envirogrids.grid.unep.ch:8080/geonetwork/srv/en/resources.get?id=348&amp;fname=GURIA_soils.zip&amp;access=private">http://envirogrids.grid.unep.ch:8080/geonetwork/srv/en/resources.get?id=348&amp;fname=GURIA_soils.zip&amp;access=private</a> | water, ecosystems, agriculture, biodiversity | Soils Map of Guria Region of Georgia, extracted/clipped from the national coverage digital Soils Map of Georgia, scale 1:500,000. Vector version of the Soils Map of Georgia was produced with support of the German KfW funded Land Cadastre and Registration Project of Georgia 2002-2006 (Client: State Department of Land Management of Georgia and GFA Consulting Group GmbH, Germany). Soil classification was correlated with the internationally accepted classification, the World Reference Base (WRB) for Soil Resources. The original source map was composed in 1998 by more than 50 scientists lead by the author of the reference Urushadze T. (ed.), Soil map of Georgia in scale of 1:500 000 (1999) Tbilisi.  |
| GIS and RS Consulting Center<br>GeoGraphic             | Vector                 | Kolkheti_Habitats         | Land and water habitats of Kolkheti wetlands, native scale 1:5,000. Image map is available in TIFF as well.   | Yes                 | <a href="http://iczm.ge">http://iczm.ge</a>   | Kolkheti Lowland                | Produced base on 2000 B&W orthophotos   | Singular product  | Please contact ICZM National Focal Point to get vector files | Free public funded product                              | Not yet   | water, ecosystems, biodiversity              | Produced in 2003 by GeoGraphic under WB GICMP, client ICZM Centre, quality checked by Greifswald University and NGO Tchaobi   |
| GIS & Remote Sensing Consulting Center<br>"GeoGraphic" | All three listed above | PshavKhevsuretiPA.gdb     | These data present GIS database and compilation of maps within the baseline studies of the four protected areas. It will be submitted to "GFA Consulting Group" representation in Georgia and LEPL (legal entity of public law) Agency of Protected Areas under the Ministry of Environment and Natural Resources Protection of Georgia. These data is prepared by the "GIS and RS Consulting Center Geographic" for "Baseline studies on four protected areas" within the project #SPPA/CS/2015-5/RE1 [Support Programme for Protected Areas in the Caucasus – Georgia (BMZ-N 2008.6582.4)]. | Yes                 | <a href="http://www.geographic.ge">http://www.geographic.ge</a>   | Pshav-Khevsureti Protected Area | 01.05.2015-30.12.2015   | Single delivery   | These is not our obligation                                  | Probably APA will launch these data on their own server |   | ecosystems, biodiversity                     | The same Databases is available for Algeti, Kindtrishi and Kazbegi protected areas (AlgetiPA.gdb, KindtrishiPA.gdb, KazbegiPA.gdb), which consist of 5 datasets: layers of thematic maps for A_Abiotic, B_Biotic, C_Cultural components, the basemap of which is 1:50,000 scale; layers of the boundaries are placed in the 01_boundary datasets, and map layers of 50,000 topographic basemap are placed in 02_BaseMap dataset.<br>The data are presented in the form of base maps and different thematic maps compiled on their basis. Separate layers of each theme are also presented with different attributive data, which characterizes the abiotic, biotic and cultural components of the environment system.<br>For each protected area are delivered the data of *.lyr files in separate folder (LYR). Numerous thematic maps are also presented in *.mxd format.<br>Map design was elaborated for A3 format maps, which will be further used by both the Agency of Protected Areas and Territorial Administration of each protected area, in the future for spreading the basemaps for 1:50,000 scale and thematic maps as well. |
| GIS & Remote Sensing Consulting Center                 | Raster                 | PshavKhevsuretiRASTER.gdb | These data is collected within the baseline studies of the four protected areas. It will be submitted to "GFA Consulting Group" representation in Georgia   | Yes                 | <a href="http://www.geographic.ge">http://www.geographic.ge</a>   | Pshav-Khevsureti Protected Area | 01.05.2015-30.12.2015   | Single delivery   | No   | Probably APA will launch these datasets on              | <a href="http://www.geographic.ge">http://www.geographic.ge</a>   | disasters, climate, water, ecosystems,       | Geodatabases are formed for raster data (AlgetiRASTER.gdb, KindtrishiRASTER.gdb, KazbegiRASTER.gdb,   |

| Name of your organisation/ department:                       | Type of data:           | Name of database/dataset:  | Description of data:   | Metadata available: | Weblink:  | Geographical scope:        | Time period (from – to): | Frequency:   | Downloadable: | Free access:             | Web services URL: | GEOSS Societal Benefit Areas: | Remarks:  |
|--|-------------------------|--|--|---------------------|---|----------------------------|--------------------------|--|---------------|--------------------------|-------------------|-------------------------------|---|
| "GeoGraphic"   |                         |  | and LEPL (legal entity of public law) Agency of Protected Areas under the Ministry of Environment and Natural Resources Protection of Georgia. The report is prepared by the "GIS and RS Consulting Center Geographic" for "Baseline (background) studies on four protected areas" within the project #SPPA/CS/2015-5/RE1 [Support Programme for Protected Areas in the Caucasus – Georgia (BMZ-N 2008.6582.4)]. |                     |   |                            |                          |  |               | their server             |                   | agriculture, biodiversity     | PshavKevsuretiRASTER.gdb). For both vector and raster data are prepared several layers of maps in the form of *.lyr files and the maps are compiled in the *.mxd format. The final maps are delivered in mxd, pdf, tiff format. |
| Iliia State University                                       | Tabular                 | <a href="http://biodiversity-georgia.net">biodiversity-georgia.net</a>                                   | species distribution data  | Yes                 | <a href="http://biodiversity-georgia.net">http://biodiversity-georgia.net</a>   | Caucasus                   | from 2007 -              | irregular  | Yes           | Yes                      |                   | ecosystems, biodiversity      |   |
| ILIAUNI (Institute of Botany)                                | Vector                  | JSTOR  | Plant type specimens and scanned herbaria  | Yes                 | <a href="https://plants.jstor.org/">https://plants.jstor.org/</a>   | Georgia                    | Hystorical Data          | For once   | Yes           | Authorized               |                   | ecosystems, biodiversity      |   |
| ILIAUNI (Institute of Botany)                                | Vector                  | GBIF   | High Mountain Vegetation data  | Yes                 | <a href="http://www.gbif.org/">http://www.gbif.org/</a>   | Alpine Area of Georgia     | Hystorical               | Hystorical   | Yes           | Free/Authorized          |                   | ecosystems, biodiversity      |   |
| IEC/GIS-Lab  | Vector                  | Tbilisi botanical garden dendrological collection  | Tbilisi botanical garden dendrological collection inventory data   | No                  |   | Tbilisi Botanical Garden   | 2009-2010                | For Once   | No            | Yes                      |                   | biodiversity                  |   |
| GIS-Lab/UNDP   | Vector, Raster, Tabular | Grassland Carbon Stock Calculation and Preparation of Water Balance Model for Vashlovani Protected Areas | AGB,BGB,SOC, pH, N, Potential evapotranspiration, Actual evapotranspiration, water deficit, water surplus, moisture, supply – demand (Current and Future scenario)   | No                  |   | Vashlovani Protected Area  | 2014 - 2016(2017)        | 2014, 2016(2017)   | No            | After the end of project |                   | climate, water, ecosystems    |   |
| Planning and Development Division; Agency of Protected Areas | Vector                  | Protected Areas of Georgia   | The database includes borders of Protected Areas, infrastructure and trails.   | No                  | <a href="https://www.google.com/maps/d/edit?mid=zT8w8PIHTp_o_kj9Px9wi39ll&amp;usp=sharing">https://www.google.com/maps/d/edit?mid=zT8w8PIHTp_o_kj9Px9wi39ll&amp;usp=sharing</a> | Protected Areas of Georgia | Constant update          | Depended on changes of borders, infrastructures and trails | No            | Yes                      |                   | ecosystems                    |   |
| GIS-Lab/NACRES   | Vector                  | EMERALD  | EMERALD Network of Georgia   | No                  |   | Georgia                    | 2010-up                  | Yearly   | No            | Please contact NACRES    |                   | biodiversity                  |   |
| GIS-Lab/NACRES   | Vector                  | Vegetation Map of Vashlovani Protected area  | Map of dominant vegetation communities in the Vashlovani Protected Area with high resolution multispectral imagery and topoclimatic data.  | No                  |   | Vashlovani Protected Area  | 2013                     | For once   | No            | Please contact NACRES    |                   | biodiversity                  |   |
| GIS-Lab/NACRES   | Vector                  | Dominant vegetation communities of the   | Map of dominant vegetation communities of the Lagodekhi  | No                  |   | Pastures of Lagodekhi      | 2015                     | For once   | No            | Please contact           |                   | biodiversity                  |   |

| Name of your organisation/ department:  | Type of data:                          | Name of database/dataset:  | Description of data:  | Metadata available: | Weblink: | Geographical scope:            | Time period (from – to): | Frequency:       | Downloadable:   | Free access:   | Web services URL:   | GEOSS Societal Benefit Areas:                    | Remarks:  |
|---|--|--|---|---------------------|----------|--------------------------------|--------------------------|------------------|---|--|---|--|---|
|   |  | Lagodekhi Protected Area   | Protected Area  |                     |          | Protected Area                 |                          |                  |   | NACRES   |   |  |   |
| CENN/GIS-Lab  | Vector/Raster                          | Hot spots of forest functional zones   | The categories of forest represent forest areas classified according to their naturally or artificially determined values and functions. Some of forest areas have functional overlapping, which are depicted as Hot Spots on the map | No                  |          | Georgia                        | 2015                     | For once         | No  | Please contact CENN  |   | ecosystems, biodiversity                         |   |
| The national Environmental Agency   | Tabular                                | Clidata  | Data from meteorological observation network  | Yes                 |          | Georgia                        | From 1880 up to now      | Daily, sub-daily | Downloadable are only data from the global databases such as GCOS, GOS... | Free access has only data from the global databases                                    | <a href="http://www.wmo.int/pages/pr og/qcos/index.php?name=ObservingSystemsandData">http://www.wmo.int/pages/pr og/qcos/index.php?name=ObservingSystemsandData</a> | disasters, energy, climate, weather              |   |
| Geographic, GiZ   | Vector                                 | GE_classification_final_UTM38N_v2  | Data --Forest/Non Forest  | Yes                 |          | Georgia                        | 2011-2012                | .                | Data is owned GiZ   | Data is owned GiZ  |   | biodiversity                                     |   |
| GFA Consulting Group representation in Georgia  | baseline data of PAs and support zones | Baseline data of 4 PAs and their support zones   | Data collated using ABC (abiotic/biotic/cultural) approach and mapped in GIS  | No                  |          | 1:500000                       | 2015                     | single           | No  | Data is owned by the Agency of Protected Areas and access is possible based on request |   | disasters, ecosystems, agriculture, biodiversity | Data is collected on behalf of Agency of Protected Areas and is handed over to APA for further use. |
| Institute of Zoology, Ilia State University   | Tabular                                | Small mamals collection of M.Shidlovsky  | Collection vouchers and tables of data  | No                  |          | Caucasus, mainly Georgia       | 1934-2015                | often            | No  | Shuld be asked   |   | ecosystems, biodiversity                         |   |
| Izolda Matchutadze Department of Kolkheti mire and water ecosystem conservation, Institute of phytopathology and biodiversity, batumi Shoata Rustaveli State University | reports                                | habitats of Kolkheti lowland, Emerald Network habitat of Kolkheti lowland, threathened plant species of Kolkheti habitat | Kolkheti Relict forest vegetation habitat rehabilitation projects, Black sea coast line sand dune vegetation, flora and vegetation of Kolkheti habitats, bird list of Kolkheti protected areas  | Yes                 |          | Kolkheti Lowland               | since 2014               | every year       | reports of annual reports of Institute                                    | Yes  |   | ecosystems, biodiversity                         |   |
| Izolda Matchutadze, Society for conservation of Wild nature "Tchaobi" NGO   | reports                                | wild nature "habitat" conservation and wise use, ecotourism, public awareness  | scientific publications , booklets, flyers, protos, maps  | Yes                 |          | Kolkheti lowlands and Highlans | since 2002               | every year       | reports   | Yes  |   | climate, ecosystems, biodiversity                |   |
| Izolda matchutadze&Irakli Miqeladze Institute pf phytopathology   | reports, publications                  | Invasive (alien) plants of Kolkheti lowland  | since 2002  | Yes                 |          | Kolkheti                       | from 2002 to 2015        | every year       | Yes   | Yes  |   | ecosystems, biodiversity                         |   |

| Name of your organisation/ department:   | Type of data: | Name of database/dataset:                                   | Description of data:  | Metadata available: | Weblink: | Geographical scope:  | Time period (from – to): | Frequency:   | Downloadable: | Free access:  | Web services URL: | GEOSS Societal Benefit Areas: | Remarks:  |
|--|---------------|---|---|---------------------|----------|--|--------------------------|--|---------------|---|-------------------|-------------------------------|---|
| and biodiversity, Batumi Shora   |               |   |   |                     |          |  |                          |  |               |   |                   |                               |   |
| Institute of Botany and Landscape Ecology, Ernst Moritz Arndt University Greifswald, partner in the Greifswald Mire Centre, Department of Peatland Studies and Palaeoecology | Tabular       | Inventory peatland Ispani 2                                 | survey on vegetation, peat stratigraphy, height levelling, human impact (e.g. fire, cattle grazing)       | No                  |          | peatland Ispani 2  | 1999-2001                | several measurements in the growing season                                       | No            | partly published: Joosten, H., Kaffke, A. & Matchutadze, I. (2003) The mires of the Kolkheti Lowlands (Georgia). IMCG Newsletter, 3, 19-23. Kaffke, A. (2008) Vegetation and site conditions of a Sphagnum percolation bog in the Kolkheti Lowlands (Georgia, Transcaucasia). Phytocoenologia, 38, 161-176. |                   | ecosystems, biodiversity      | identification of Ispani 2 as the type locality of percolation bogs                               |
| Institute of Botany and Landscape Ecology, Ernst Moritz Arndt University Greifswald, partner in the Greifswald Mire Centre, Department of Peatland Studies and Palaeoecology | Tabular       | Inventory of the peatland Imnati                            | survey on vegetation, peat stratigraphy, height levelling, human impact, certain role of Cladium mariscus | No                  |          | peatland Imnati  | 2004                     | once, summer 2004  | No            | partly published: Haberl, A., Kahrmann, M., Krebs, M., Matchutadze, I. & Joosten, H. (2006) The Imnati mire in the Kolkheti Lowland in Georgia. Peatlands International, 1, 35-38.  |                   | ecosystems, biodiversity      | data on the largest percolation bog of the world  |
| Institute of Botany and Landscape Ecology, Ernst Moritz Arndt University Greifswald, partner in the Greifswald Mire Centre, Department of Peatland Studies and Palaeoecology | Tabular       | Peatlands of Kolkheti Lowlands (beside Imnati and Ispani 2) | survey on vegetation, peat stratigraphy, height levelling, human impact                                   | No                  |          | peatland of Kolkheti as Ispani 1, Churia, Grigoleti, Nabada, Anaklia, Tshernotshet ski | 2000-2008                | mainly one survey each peatland except several summer investigations in Ispani 1 | No            | soon published in the European Mire Book  |                   | ecosystems, biodiversity      | inventory of the different mire types in Kolkheti beside the percolation bogs Ispani 2 and Imnati |

| Name of your organisation/department:  | Type of data: | Name of database/dataset:                                 | Description of data:   | Metadata available: | Weblink:  | Geographical scope:   | Time period (from – to): | Frequency:  | Downloadable:           | Free access:  | Web services URL: | GEOSS Societal Benefit Areas:     | Remarks:   |
|--|---------------|---|--|---------------------|---|---|--------------------------|---|-------------------------|---|-------------------|-----------------------------------|--|
| Institute of Botany and Landscape Ecology, Ernst Moritz Arndt University Greifswald, partner in the Greifswald Mire Centre, Department of Peatland Studies and Palaeoecology | Tabular       | Sphagnum growth and identification of its driving factors | survey on Sphagnum growth and regeneration regarded to nutrient supply, climate, water supply, accompanying plant species                      | No                  |   | peatlands Imnati, Grigoleti, Ispani 1+2   | 2003-2014                | Sphagnum productivity, establishment and regeneration was analysed in 3 growing seasons | No                      | partly published: Krebs et al. (2016): Record growth of Sphagnum papillosum in Georgia (Transcaucasus) : rain frequency, temperature and microhabitat as key drivers in natural bogs) |                   | climate, ecosystems, biodiversity | investigations were linked to the evaluated the potential of Sphagnum farming in the Kolkheti Lowlands |
| Institute of Botany and Landscape Ecology, Ernst Moritz Arndt University Greifswald, partner in the Greifswald Mire Centre, Department of Peatland Studies and Palaeoecology | Tabular       | Inventory of the peatland Peranga                         | survey on vegetation, peat stratigraphy, height levelling, human impact  | No                  |   | peatland peranga in the Kintrishi Nature Reserve, Lesser Caucasus                     | 2008                     | one time inventory  | No                      | soon published in the European Mire Book  |                   | ecosystems, biodiversity          |  |
| Institute of Botany and Landscape Ecology, Ernst Moritz Arndt University Greifswald, partner in the Greifswald Mire Centre, Department of Peatland Studies and Palaeoecology | Tabular       | Tshirukhi peatlands (Lesser Caucasus)                     | survey on vegetation, peat stratigraphy, height levelling, human impact  | No                  |   | peatlands in the Lesser Caucasus (South-East of Tselati, close to the Turkish border) | 2005                     | once  | No                      | soon published in the European Mire book, chapter Georgia   |                   | ecosystems, biodiversity          | inventory of different peatland types in the Lesser Caucasus   |
| Institute of Ecology   | Tabular       | Georgian Biodiversity Database                            | Website  | No                  | <a href="http://biodiversity-georgia.net/">http://biodiversity-georgia.net/</a> | Georgia   | 2006-2016                | Ongoing   | Accessible from website | Yes   |                   | biodiversity                      |  |
| Caucasus Nature Fund   | Tabular       | Borjomi-Kharagauli species data                           | Monitoring data for 2014-2015 on 4 key species in Borjomi-Kharagauli National Park: Red deer, Lynx, Brown bear, Chamois. Implemented by NACRES | Yes                 |   | Borjomi-Kharagauli National Park  | 2014; 2015               | variable  | No                      | through NACRES  |                   | biodiversity                      |  |
| Name of your organisation/department:  | Type of data: | Name of database/dataset:                                 | Description of data:   | Metadata available: | Weblink:  | Geographical scope:   | Time period (from - to): | Frequency:  | Downloadable:           | Free access:  | Web services URL: | GEOSS Societal Benefit Areas:     | Remarks:   |

## 2. DATABASES/DATASETS USED BY OR RELATED TO THE WORK OF ORGANIZATIONS

| Name of your organisation/ department:   | Type of data: | Name of database/dataset:                               | Description of data:  | Metadata available: | Weblink:  | Geographical scope:             | Time period (from - to):                                    | Frequency:  | Downloadable:   | Free access:  | Web services URL:   | GEOSS Societal Benefit Areas:                           | Remarks:  |
|--|---------------|---|---|---------------------|---|---------------------------------|---|---|---|---|---|---|---|
| GIS and RS Consulting Centre<br>GeoGraphic   | Raster        | GLC30   | Global Land Cover in 30 m resolution  | No                  | <a href="http://www.globallandcover.org">http://www.globallandcover.org</a>   | Global including Georgia        | 2000, 2010  | 10 year update  | 2000 (not downloadable)<br>2010 (downloadable)            | Yes   | <a href="http://www.globallandcover.org">http://www.globallandcover.org</a>   | water, ecosystems, agriculture, biodiversity            |   |
| GIS and RS Consulting Center<br>GeoGraphic   | Raster        | BaseVue   | Global 13 class landCover with 30 m resolution.   | Yes                 | <a href="http://www.mdmaus.com/Geospatial/BaseVue-2013.aspx">http://www.mdmaus.com/Geospatial/BaseVue-2013.aspx</a> | Global                          | 2013  | Earlier 1990 and 2000 is available<br>GeoCover-LC commercial product. | Tiles in limited size can be downloaded as GeoTIFF files. | Free from within ArcGIS.com webpage (tiles).  | <a href="http://www.arcgis.com/home/webmap/viewer.html?webmap=1f4a72830e414a75916ff0b701bf9283">http://www.arcgis.com/home/webmap/viewer.html?webmap=1f4a72830e414a75916ff0b701bf9283</a> | disasters, water, ecosystems, agriculture, biodiversity | Product is commercial, but can be accessed and downloaded for free via ESRI ArcGIS Landscape Team portal <a href="https://www.arcgis.com/home/user.html?user=esri_Landscape">https://www.arcgis.com/home/user.html?user=esri_Landscape</a> .<br>1990 and 2000 data are marketed as GeoCover-LC described at <a href="http://www.mdafederal.com/geocover/geocoverlc">http://www.mdafederal.com/geocover/geocoverlc</a> |
| GIS & Remote Sensing Consulting Center<br>"GeoGraphic"   | Vector        | PsavKhevsuretiPA_25000.gdb                              | Digital version of the Soviet topographic map of 1:25k scale was compiled and at the same time their renewal by the latest aerial photography; namely, for example, a topographic map renewed by the data of aerial photo of 2007 (south part) & Satellite images. Projection of the data is – WGS84 UTM, Zone 38N. | Yes                 | <a href="http://www.geographic.ge">http://www.geographic.ge</a>   | Pshav-Khevsureti Protected Area | 01.05.2015-30.12.2015                                       | Single delivery   | No  | Propably APA will laubch on their own server  |   | disasters, water, ecosystems, biodiversity              | Basemaps of 1:25,000 scale were formed for four protected areas, which are presented in the form of geodatabases (AlgetiPA_25000.gdb, KindtrishiPA_25000.gdb, KazbegiPA_25000.gdb, PsavKhevsuretiPA_25000.gdb). Also are prepared *.lyr files in separate folder (LYR).   |
| Geographic, GiZ  | Raster        | GE_mosaic_RGB_final_v2                                  | *.img .<br>Projected Coordinate System: WGS_1984_UTM_Zone_38N   | No                  |   | Satellite Images.               | 2011_2012   | .   | data is owned GiZ   | data is owned GiZ   |   | biodiversity  |   |
| GFA Consulting Group<br>representation in Georgia  | software      | TRIPLE I  | Information management system that is being developed for APA   | No                  |   | All Protected Areas of Georgia  | Available data from 20th century, updated with current data | Daily based updated by PAs after installation                         | No  | Reports based on request  |   | disasters, ecosystems, agriculture, biodiversity        | It is planned to start TRIPL I use in PAs of Georgia from 2016  |
| Institute of Zoology, Ilia State University  | Tabular       | Small mammals collection of M.Shidlovsky                | Collection vouchers (the dry skins and skulls) and wet collections  | No                  |   | Caucasus, generally Georgia     | 1934 -2015  | often   | No  | Should be asked   |   | ecosystems, biodiversity                                |   |
| Institute of Botany and Landscape Ecology, Ernst Moritz Arndt University Greifswald, partner in the Greifswald Mire Centre, Department of Peatland Studies and Palaeoecology | Tabular       | Potential protected areas and Ramsar sites in Javakheti | distribution of wetlands in Javakheti, inventory of wetlands and its vegetation   | No                  |   | Javakheti Volcanic upland       | 2007-2008   | 2 growing seasons   | No  | study of Roland Kaiser: POTENTIAL PROTECTED AREAS AND RAMSAR SITES IN JAVAKHETI VOLCANIC UPLAND |   | ecosystems, biodiversity                                | The survey aimed at the identification of high conservation value wetland sites to be proposed to the Ministry for Protection of Environment and Natural Resources of Georgia as potential protected areas.   |

## Annex F. Contact information

| Name            | Surname       | Position  | Organisation  | Address  | Email  | Mobile                   |
|-----------------|---------------|---|---|--|--|--------------------------|
| Abdaladze       | Otar          |   |   |  |  | 599 248615               |
| Akhobadze       | Sophiko       | Executive Director                                | REC-Caucasus  |  | <a href="mailto:sophiko.akhobadze@rec-caucasus.org">sophiko.akhobadze@rec-caucasus.org</a>   | 599 538528               |
| Barbakadze      | Tea           |   | Caucasus Nature Fund                                      |  | <a href="mailto:tbarbakadze@caucasus-naturefund.org">tbarbakadze@caucasus-naturefund.org</a>                                       | 599 969010<br>577 665434 |
| Batsatsashvili  | Keti          |   |   |  |  | 599 111423               |
| Beruchashvili   | Giorgi        | Regional GIS Officer                              | WWF-Caucasus  | 11, M. Aleksidze St., 0193, Tbilisi, Georgia     | <a href="mailto:gberuchashvili@wwfcaucasus.org">gberuchashvili@wwfcaucasus.org</a>   |                          |
| Chikovani       | Nino          | Service Department                                | NEA   |  |  | 591 404015               |
| Chochua         | Rusudan       |   | Transboundary Joint Secretariat                           |  | <a href="mailto:rusudan.chochua@tjs-caucasus.org">rusudan.chochua@tjs-caucasus.org</a>   | 599237530                |
| Dvaladze        | Paata         | IT  | APA   | 6 Gulua Street, Tbilisi                          |  | 595 012535               |
| Geladze         | Giorgi (Gigi) | Head of Data Base Administration Division         | Strategic Planning and Systems Management Department, NEA | 150 Agmashenebeli Avenue, 0112, Tbilisi, Georgia | <a href="mailto:gigigeladze@gmail.com">gigigeladze@gmail.com</a><br><a href="mailto:g.geladze@nea.gov.ge">g.geladze@nea.gov.ge</a> | 591 404083               |
| Gönner          | Christian     |   | GIZ   |  | <a href="mailto:christian.goenner@giz.de">christian.goenner@giz.de</a>   |                          |
| Gavashelishvili | Alexander     | School of Natural Sciences and Engineering        | Ilia State University                                     |  | <a href="mailto:kajiri2000@yahoo.com">kajiri2000@yahoo.com</a>   | 599 496552               |
| Gokhelashvili   | Ramaz         | Support Programme for Protected Areas in Caucasus | GFA   |  | <a href="mailto:ramaz.gokhelashvili@gmail.com">ramaz.gokhelashvili@gmail.com</a>   | 599 151326               |
| Goradze         | Irakli        | UNDP  |   | Batumi, Adjara AR, Georgia                       |  |                          |

| Name          | Surname   | Position                  | Organisation                                  | Address   | Email  | Mobile                   |
|---------------|-----------|---------------------------|---|---|--|--------------------------|
| Gvazava       | Nino      | Project Manager           | UNDP HIMGE                                    | 15, Paliashvili str., Tbilisi, Georgia  | <a href="mailto:nino.gvazava@undp.org">nino.gvazava@undp.org</a>                         |                          |
| Guchmanidze   | Archil    | NEA                       |   | Batumi, Adjara AR, Georgia  |  | 595 777444<br>592 22266  |
| Janashia      | Nana      | Executive Director        | NGO Caucasus Environmental NGO Network (CENN) | 27 Betlemi Street, 0105, Tbilisi, Georgia   | <a href="mailto:nana.janashia@cenn.org">nana.janashia@cenn.org</a>                       | 599 577722               |
| Japoshvili    | Bela      |                           |   |   |  |                          |
| Japoshvili    | Giorgi    | Entomologist              | Agrarian University                           |   |  | 599 290785               |
| Javakhishvili | Maia      | SEIS National Focal Point | MoENRP  | G. Gulua str. N6 0114 Tbilisi, Georgia  | <a href="mailto:Maia.javakhishvili@moe.gov.ge">Maia.javakhishvili@moe.gov.ge</a>         | 595 119751               |
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