Integrated Biodiversity Management, South Caucasus

Mobilizing Azerbaijan Biodiversity Data

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Report

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DEUTSCHE ZUSAMMENARBEIT

Implemented by:
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

December 2017

Executive summary

In the last 15 years researchers from Germany (mainly from the University of Greifswald and the Michael Succow Stiftung) have collected significant biodiversity information from Azerbaijan. Whilst a part of this information was published, the raw data has been stored in scattered databases that were not openly accessible.

To close this gap ESTOK UG was contracted to “mobilize” this data. With the focus put on vegetation data, around 1350 vegetation plots from 11 data sets were quality-checked and harmonized to be made available. While the metadata of these plots were compiled and published online in the metadatabase Global Index of Vegetation-Plot Databases (givd.info), the physical databases are stored under the custodianship of ESTOK UG to be made available upon request to researchers and public institutions. In order to make the data available for GIS applications, at the example of 260 plots an approach was developed for data transformation into GIS files. With respect to faunistic data, German ornithologists work in parallel on publishing big parts of the ornithological data in relevant online databases (ebird.org, trektellen.org).

The mobilized biodiversity information might help improving in-depth knowledge on ecosystems in Azerbaijan, strengthen the national efforts in biodiversity inventory and monitoring and meanwhile stimulate national scientists to similar research approaches.

Table of Content

List of Figures

List of Tables

List of Abbreviations

GIS	Geographic Information System
MENR	Ministry of Environment and Natural Resources
MSF	Michael Succow Foundation

1. Introduction

The Southern Caucasus is one of the world's biodiversity hotspots, yet this biodiversity is under threat because of unsustainable development. Conservation of the biodiversity in this hotspot requires spatially explicit biodiversity information to be available to stakeholders such as for example the Ministry of Environment and Natural Resources of Azerbaijan (MENR) and academia in Azerbaijan to support their efforts in planning for conservation and development. However, while for Azerbaijan significant biodiversity information exists this is not available for a variety of reasons. For example, significant information from Azerbaijan on vegetation and animal species has been collected by the Michael Succow Stiftung (MSF) and the University of Greifswald. However, this information has only been partly available in publications, but the majority of original data has been stored in scattered databases that were not openly accessible.

IBiS is working in cooperation with the MENR on the development of databases for environmental information. In the framework of this cooperation it has been agreed to mobilize this legacy biodiversity information and make it available to the Ministry of Ecology and Natural Resources.

The ultimate objective of this consultancy was to mobilize legacy biodiversity information from Azerbaijan that has been collected by parties in Germany and in Azerbaijan and make this information available to the MENR. The first goal of this assignment was to compile, quality control and archive this biodiversity data in the possession of the MSF and researchers at the University of Greifswald. The second goal was to provide on the job training to a taxonomist from Azerbaijan in the process of compilation, quality control and uploading biodiversity information.

This report is to summarize the information on the data collected as well as to synthetize the activities conducted in the course of the project. Therefore, the mobilization process of biodiversity data (chapter 2) is described separately for the data on vegetation and fauna. This is not only because the diverging character of the data required a different processing approach, but mainly because the focus was set on the compilation of vegetation data, which requires more time to be compiled. Hence, the description on the processing of vegetation data is given in greater detail, entailing explicit information on the collection, handling and harmonization of the data as well as on the process of making the data available. Furthermore, the report contains a written account on the job training of the national expert from Azerbaijan (chapter 3). Here, information is given on how the national expert was guided and integrated into the working procedure as well as on which tasks the expert performed. The last chapter (chapter 4) deals with the inherent potential of the data for further application. On the one hand, it discusses general aspects of the scientific significance of such a data pool. On the other hand, this chapter concludes the political implications for the MENR regarding biodiversity and natural resource management.

2. Biodiversity data

2.1 Vegetation data

2.1.1 Data collection

Acquisition of data started in August and continued till the end of November 2017. Whilst the biggest share of the data set has been acquired through direct contact to the authors/researchers themselves, another big part of the data set has been provided by Michael Succow Foundation. The most complicating and time consuming issue during data collection was that the data very often came without (or with difficult to assign) GPS coordinates.

2.1.2 Data handling & harmonization

All authors/researchers who provided data are requested to sign a “Declaration of consent”. Basis for this document are “Terms of Data use” with clear rules for interested users of the respective data. Both documents are attached in Appendix 6.6.

Collected data sets were sorted according to the respective ecosystems or landscapes which they describe. Further processed were only those data sets which contained GPS coordinates or to which respective coordinates could still be assigned with help of explicit way point or plot names. In many cases coordinates had to be converted to one standard format (decimal degree). Reports, final theses and publications were screened for obtaining metadata (e.g. on time, scope, assessment methodology), additional to information contained in the header data of the respective data sets. All available information was summarized in an Excel table (see Appendix 6.4).

Bringing species names with their abundant synonyms to a uniform taxonomy is a big challenge. Plant determination of the provided data sets was done with help of e.g. Grossheim (1939–1967) or Karjagin (1950-61), but also other keys were used. Therefore, one of the most time consuming steps was to synonymize the given species names with the reference list of the former Soviet Union (Czerepanov 1995).

The single data sets are mostly stored as Excel tables. Only a part is stored in Turboveg format (Hennekens & Schaminée, 2001), an internationally acknowledged database system for vegetation data which allows for standardized header and species data storage as well for export in various other data formats. The original intention to bring all the Excel tables to Turboveg format was postponed for the sake of transforming the data to GIS compatibility within the frame of this project.

2.1.3 Creation of databases in GIVD and interactive map

To raise the visibility of the vegetation plot data, five metadata set compilations were published on the online metadatabase Global Index of Vegetation-Plot Databases (givd.info). The given single data sets were grouped according to the ecosystems or landscapes which they describe. For an overview see Figure 1. Short database reports describe each of the five metadatabases (see Appendix 6.2). More detailed descriptions of every database can be obtained online.

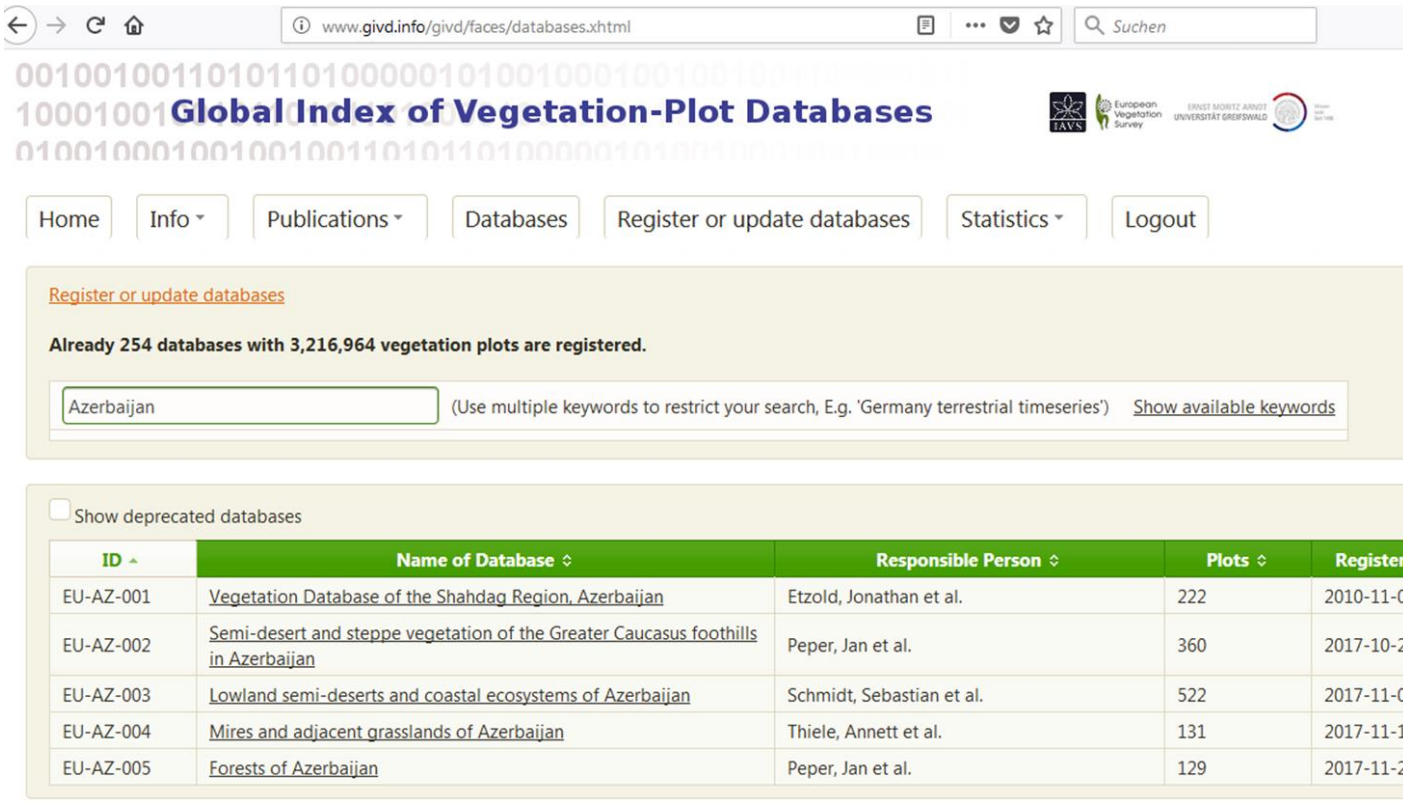

Figure 1: Overview on existing vegetation databases – five metafile data set compilations on GIVD.info

An online interactive map giving overview of the geographical distribution of each database and showing details for each database compartment was created (see Appendix 6.3 for link). Some screenshots on the options are presented in the Powerpoint presentation (Annex 6.1).

Overviews of the spatial distribution of the single data sets summarized in their specific metafile data set compilation are depicted in Figures 2 and 3.

While a detailed table on the origin and the content of the data sets is attached in Annex 6.4, an overview table can be found below in Table 1.

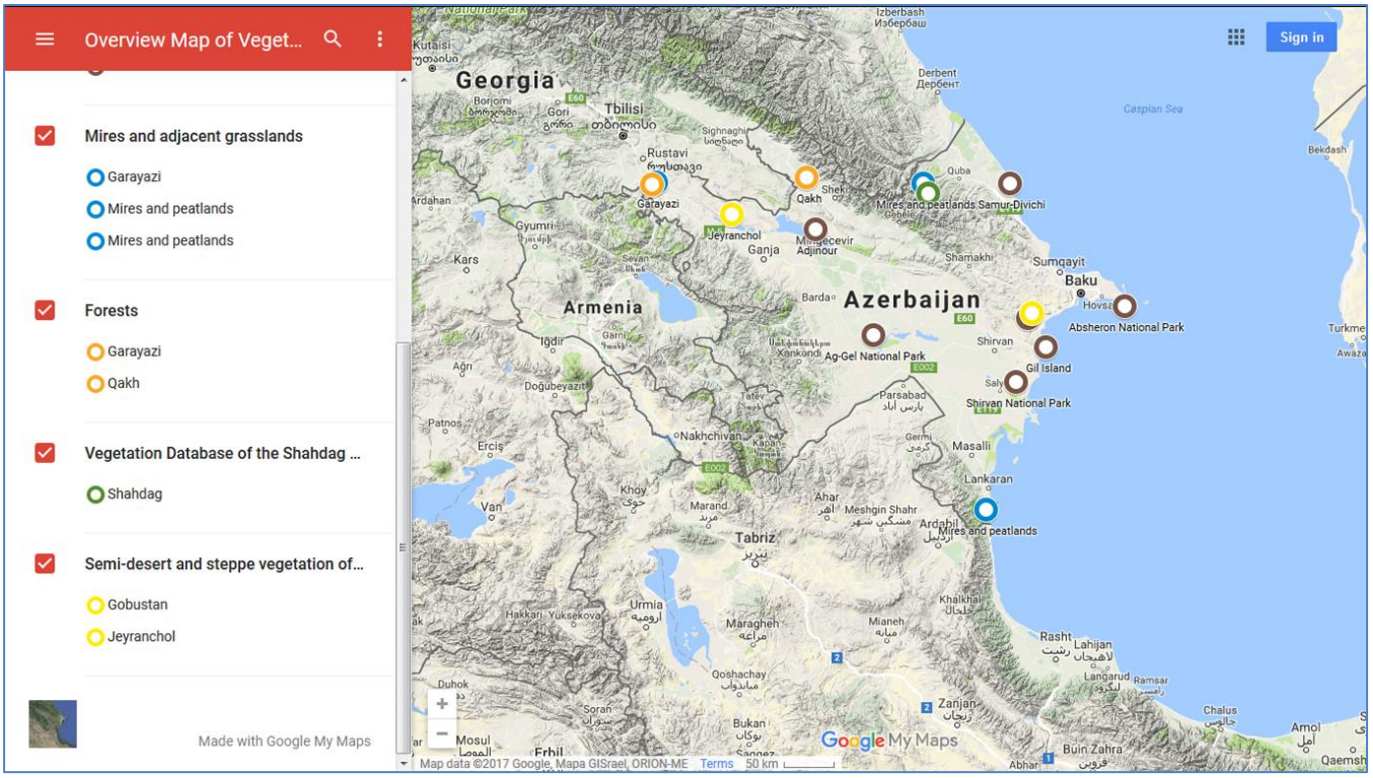

Figure 2: Screenshot of interactive map with distribution of single data sets (in EU-AZ 001, 002, 004, 005).

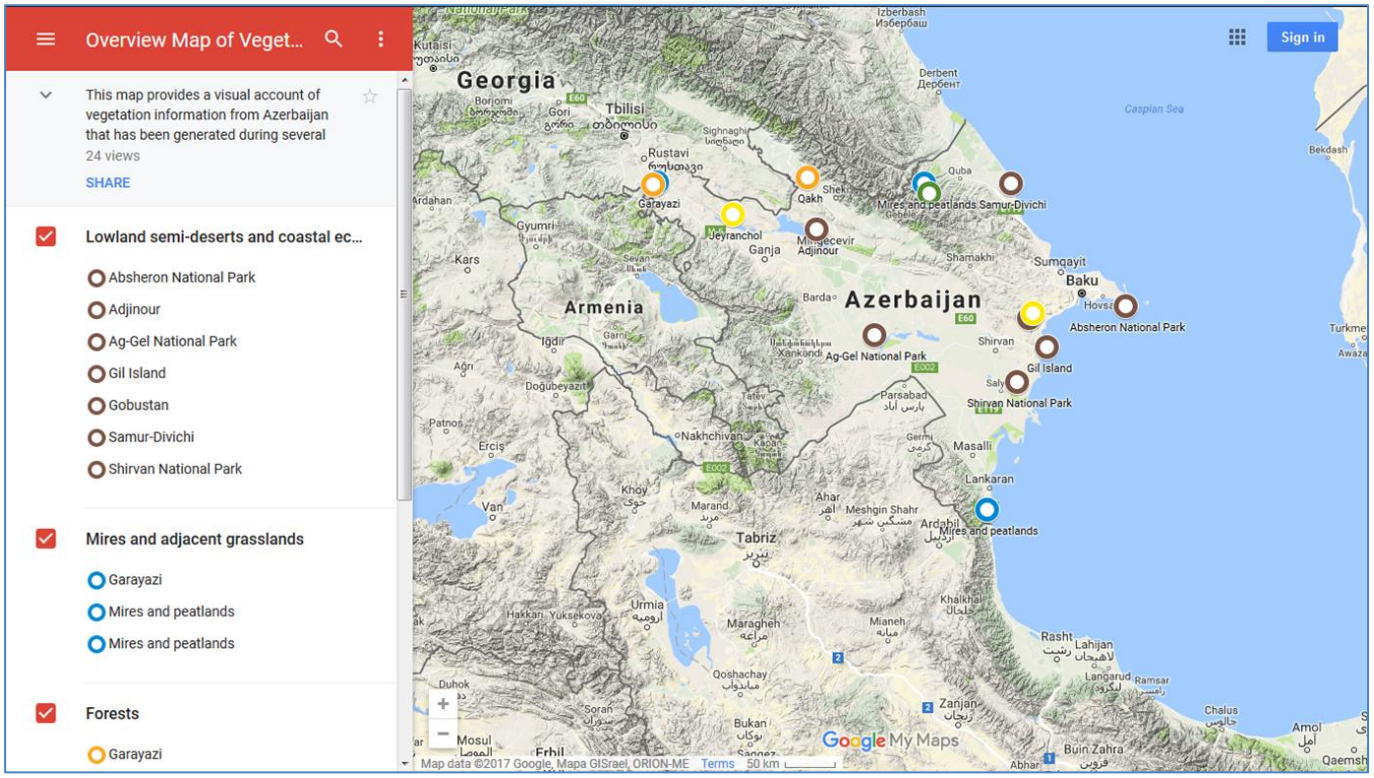

Figure 3: Screenshot of interactive map with distribution of single data sets (in EU-AZ 003, 004)

Table 1: Overview on origin and content of the data sets; only the second part was transformed for GIS use yet (more detailed version in 6.4).

Avai-lability	ID (GIVD)	Name of GIVD data base	Region/district/ villages	Ecosystem	Total plot num-ber	Period	Author	Owner (Uni. = University of Greifswald)	For-mats	Cover\ height	Attributes
Not avai-lable for GIS yet	EU-AZ-001	Vegetation Database of the Shahdag Region, Azerbaijan	Greater Caucasus/ Guba (Xinaliq etc.), Gusar (Sudur, Laza etc.)	High mountain grasslands	222	2007-2008	Jonathan Etzold (PhD)	Jonathan Etzold\Uni.	tv	Cover in percent/ height	Altitude, slope inclination & aspect, microrelief, soil depth, pH, soil grain size, SOC, CaCO3, C, N, P, K, EC, etc., land use categories
	EU-AZ-002	Semi-desert & steppe vegetation of the Gr. Cauc. foothills, Azerbaijan	Gobustan and Cheiranchöl	Semi-desert, salt shrubs, steppe	360	2007-2008	Jan Peper (PhD)	Jan Peper\Uni.	tv	Cover in percent/ mean height	Altitude, slope inclination & aspect, microrelief, faeces cover, soil depth, pH, soil grain size, SOC, CaCO3, C, N, P, K, EC, etc., land use categories
	EU-AZ-003	Low land semi-deserts and coastal ecosystems of Azerbaijan	Ag Göl NP (Agjabedi)	Steppe, swamp	87	2004	Andrea Strauss (report; Ag Göl)	Michael Succow Foundation	xls, pdf	Cover in percent/max. height	Altitude, slope inclination & aspect (partly), microrelief, soil pH (partly) moisture & texture, biomass, feaces cover, C, N, EC, CaCO3, land use categories
			Shirvan NP/Salyan	Semi-desert	229	2004	Sebastian Schmidt (Dipl; Shirvan)	Sebastian Schmidt\Uni.	pdf, xls	Cover in percent/max. height	Altitude (partly), microrelief, soil pH (partly), soil moisture & texture, substrat, feaces cover, biomass, hydrological regime, EC, C, N, CaCO3
			Adjinour plain/Qax/Sheki/Mingechevir	Steppe, semi-desert	48 (37 normal, 11 spec. list)	2006	Jan Peper (MAVA; Adjinour)	Michael Succow Foundation	xls, doc	Cover in percent (37)	Altitude (partly)
			Devechi liman/Shabran	Coastal vegetation, meadows, wetland	5	2006	Jan Peper (MAVA; Dunes)	Michael Succow Foundation	xls, doc	presence\ absence	no
			Gil island	Coastal vegetation, mud volcano	6	2006	Jan Peper (MAVA; GIL)	Michael Succow Foundation	xls, doc	presence\ absence	no
			Gobustan	Semi-desert, salt shrubs, steppe	41	2006	Jan Peper (MAVA; Gobustan)	Michael Succow Foundation	xls, doc	Cover in percent	Altitude, slope aspect (categories: 1-8), distance from stables
			Absheron NP	Semi-desert, coastal vegetation	106	2007	Maria Langhammer (Dipl; Absheron)	Maria Langhammer\Uni.	xls, pdf	Cover in percent/max. height	Altitude, slope inclination & aspect, root penetration, soil moisture, cover of shells, salt crusts, bare rock, EC, CaCO3, C/N

Avai-lability	ID (GIVD)	Name of GIVD data base	Region/district/villages	Ecosystem	Total plot number	Period	Author	Owner (Uni. = University of Greifswald)	Formats	Cover\ height	Attributes
Avai-lable for GIS	EU-AZ-004	Mires and adjacent grasslands of Azerbaijan	Garayazi/ Agstafa	Meadows and reeds	50	2005	Jan Peper (Dipl)	Jan Peper\Uni.	xls, tv, shp	Cover in percent/max. height	water level above surface, soil texture, Land use categories
			Greater Caucasus (Guba, Gusar, Alti Agach), Talysh	Mires and peatlands	81	2007	Annet Thiele (MAVA)	Michael Succow Foundation	xls, shp	presence\ absence	Altitude, peat depth
	EU-AZ-005	Forests of Azerbaijan	Garayazi Protected Area/ Agstafa	Kura Riparian Forest	58	2005	Jan Peper (Dipl)	Jan Peper\Uni.	xls, tv, shp	Cover in percent and height	texture (only field assessment), carbonate per horizons, texture horizons, land use categories
			Qax	Riparian Forest on Alluvial Fan	71	2007	Michael Zimmermann (Dipl)	Michael Zimmermann\Uni.	xls, pdf, shp	Cover in percent and height	Altitude, slope inclination & aspect, microrelief, texture (field assessment, also laboratory particle size), carbonate per horizons, texture horizons, humus assessment, land use categories

2.1.4 Transformation of vegetation data for GIS application

The two databases EU-AZ-004 (131 plots) and EU-AZ-005 (129 plots, see also second part of Table 1) were transformed for GIS application (for the respective shapefiles see Appendix 6.5). As this transformation process is relatively time-consuming, not all existing data sets could be transformed within the given time frame. The GIS application allows for depiction of the single plots properties (species composition, site conditions) as well as for searching the distribution of single plant species within the given plots. These functions and potential applications are demonstrated in the slides 11 to 17 of the Powerpoint presentation (Annex 6.1).

In a next step the remaining 1101 plots (from databases EU-AZ-001-003) could also get transformed and made available for GIS application.

2.1.5 Further vegetation information to be processed

As mentioned under 2.1.2, not all acquired data sets could get further processed. These vegetation data come from further diploma theses, from scientific project works, and from scientific study tours and excursion trip reports (see for lower part in table of Annex 6.4).

Reasons for not-processing were either lacking coordinates, or lacking time for bringing necessary data to a standard level (e.g. coordinate formats, species determination). The currently known potential sums up to around 350 more vegetation plots. Partly the provision of the lacking information is already promised; for the other part just more time is required.

2.2 Faunistic data

A wide range of faunistic data was collected during previous research activities. However within the given time frame, the focus of this project was laid on the extensive vegetation data. Fortunately thanks to German colleagues a big part of the vast ornithological information is soon available to public (see below).

2.2.1 Ornithological information

Between 2001 and 2017 a big proportion of ornithological observations from Azerbaijan were collected in an offline ornithological database, which currently stores around 33,000 records.

After common obstacles of inconsistent coordinate formats are overcome, these data will be soon available on the global online database www.ebird.org.

Functions and potential applications of ebird are demonstrated in the slides 20 to 22 of the Powerpoint presentation (Annex 6.1).

Another valuable source of ornithological information from Azerbaijan stems from the bird migration counts conducted between 2008 and 2017 at Besh Barmag, an increasingly well-known bird migration bottleneck of global importance (Heiss 2013). Soon also the earlier observations from here will be available on http://trektellen.org/count/view/1533/ (see also slide 23 in Annex 6.1).

2.2.2 Further ornithological information to be mobilized

There is still a huge amount of bird observations hidden in notebooks, scientific study tours and excursion trip reports. Further ornithological data can still be mobilized from scientific project works (e.g. Schmidt & Uppenbrink (eds.), 2009) or from diploma and Ph.D. theses.

2.2.3 Other faunistic information

The same sources as mentioned under 2.2.2 still hold unrevealed record data of other animal groups, like insects, reptiles, amphibians or mammals. A good target online database for this kind of information could be www.gbif.org.

3. On the job training of national expert from Azerbaijan

The national expert Dilare Hajiyeva arrived to Germany on October 8th and returned to Baku on November 5th 2017.

3.1 Introduction into working procedure

As the publishing of information on fully processed vegetation data has been an integral part of this project, the national expert received an introduction into features of the chosen database *Global Index of Vegetation-Plot Databases* (GIVD; www.givd.info) by Florian Jansen, a member of its steering committee. This introduction also included an explanation of the main features and structural requirements of the data for the software Turboveg, which has initially been the target format.

These initial explanations were followed by a detailed introduction into the studies, the structure of their data and the required processing procedure. As the data came in various shapes (e.g. vegetation tables, presence/absence data, report style species lists) and from various sources (e.g. dissertations, diploma theses), it has not only been necessary to instruct the national expert in different approaches of sighting and structuring the data, but also in how to screen the sources for important information. Together, a working strategy and the metadatabase (see Appendix 6.4) have been developed.

3.2 Work progress

The national expert worked on many tasks, initially under guidance of the ESTOK team, but increasingly proceeded independently.

Working steps included, for the initially intended import of data into Turboveg, but necessary for the general harmonization the vegetation data:

- isolating viable files with species and/or abundance data from data sets,
- tutorial on data processing at first database example (i.e. preparation of vegetation file, order, verification and inclusion of GPS data, important steps while combining data, harmonisation of species data, cross checking reference lists, extraction of important information from side documents/reports),
- developing step-by-step approach on data processing,
- short introduction into different qualities of vegetation data (cover scales/presence-absence data),
- explanation of how to manually extract GPS coordinates from Google maps for coarse localisation of species lists (presence-absence data),
- increasingly more independent continuation and consolidation of working approach for data processing (partly with remote support).

One of the most important tasks of the national expert has been the harmonization of given species names with the reference list of the former Soviet Union (Czerepanov 1995) (see 2.1.2).
Furthermore the expert jointly contributed to the creation of the four new metadatabases in GIVD (see 2.1.3).

4. Potential of data for further application (Conclusions)

In general, the provided data could become important backbones in strengthening the national efforts in biodiversity inventory and monitoring. They could stimulate national scientists in further mobilizing the vast treasure of biodiversity information from the last decades and making them available in more contemporary data formats. Such a modern biodiversity database could considerably contribute to coping with requirements of the reporting duties like for the Convention on Biological Diversity or the Ramsar Convention. It could also ease regularly updating the Red Data Books. More detailed application potentials are given below.

However it has to be stressed, that the author is not aware on the biodiversity information databases currently used by the MENR or scientific institutions in Azerbaijan.

4.1 Vegetation data

As mentioned under 2.1.2 most of the vegetation data is currently stored in Excel tables. However, for facilitating the exchange of the vegetation data with other scientists, it is still recommended to bring all available vegetation plots to Turboveg standard. This would also ease its further processing; even a future upload to online databases like www.gbif.org is possible.

Meanwhile the vegetation data is stored under the custodianship of ESTOK (Jonathan Etzold) and provided to any interested parties upon agreement of “Terms of Data use”.

Potential application of the data is manifold.

One application is the use within the frame of monitoring the succession of vegetation. Such successions are mostly expressed in changes of the species composition but also of structural parameters. Changes of the environment, connected with land use changes, or possibly also in the light of climate change, might become visible.

As example, the extensive vegetation assessment in Shirvan (contained in database EU-AZ-003) took place in 2004, one year after the establishment of the national park. Before that several 10,000 head of livestock were kept in the area as winter pasture. With establishment of the national park this grazing was prohibited and mainly only the natural megaherbivore Goitred Gazelle is shaping the vegetation since. Hence, this is one of the few lowland places in the country where the natural semi-desert and steppe vegetation can develop undisturbed from zoo-anthropogenic influence, and the natural potential of the landscape is demonstrated. From this scientific point of view it would be a very interesting endeavor to repeat the vegetation assessment after then 14 years at the same sites with the same set of methods.

Similarly interesting results can be expected from the other covered lowland national parks Ag Göl (assessment 2004) and Absheron (2007). Therefore, those data bases could be especially interesting to the MENR managing the respective protected areas.

Continued studying of the winter and summer pasture areas (mainly covered in the two most detailed databases EU-AZ-001 and 002 regarding plot numbers and site information, but also in 003) might yield other valuable insights. With according to official statistics ever increasing livestock numbers, further degradation and decreasing productivity of the pasture resources is more than likely to be detected by means of species composition shifts and increased bare soil or erosion tracks cover values.

Repeated assessments of the then partly strongly degraded forest sites (EU-AZ-005) might reflect Azerbaijan's recent efforts of gasification in rural areas, which decreased the pressure on forest resources.

In general, all mentioned examples would be very rewarding study objects for national scientists, as they could make use of the already collected information and efforts are less compared to completely new study sites. This is especially true for the very time-intensive determination of species. Especially M.Sc. and Ph.D. students could use the provided vegetation data for such comparative studies within the frame of their final theses.

4.2 Faunistic data

Here as well the great endeavor will be to merge existing data bases (e.g. on the large data amount of water bird counts by scientific institutions), company assessments (e.g. by BP on water bird monitoring in the Caspian Sea, road construction Environmental Impact Assessments) with biodiversity information provided from scientists or skilled visitors from abroad, whose information is stored in "citizen science" online platforms like www.ebird.org, www.trektellen.org or www.gbif.org.

5. References

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Schmidt, S. & Uppenbrink, M. (eds.) (2009): Potential analysis for further nature conservation in Azerbaijan. Michael Succow Foundation, Geozon Science Media, Greifswald, DE. 164 p.

6. Appendices

6.1 Overview on the project “Mobilizing Azerbaijan Biodiversity Data” as Powerpoint presentation

The presentation is attached as “IBiS Presentation_ESTOKBiodiv-DB_v5.pptx”.

6.2 Overview on existing vegetation databases – Five metadata set compilations on GIVD.info

All five short reports describing the metadata of 1361 plots are attached as “GIVD Short reports.zip”.

6.3 Overview on existing vegetation databases – interactive map

The interactive map showing details for each database compartment is found at

https://www.google.com/maps/d/edit?mid=1KPg5mNqQ2HkUfjPDj7ZloG_caLc&ll=40.29315934318006 5%2C48.1719194823047&z=8.
Example screenshots are also presented in the slides 11 to 17 of the Powerpoint presentation (Annex 6.1).

6.4 Overview on vegetation metadata in Excel

Metadata of all database compartments contained in the five metafile data set compilations as well as further not processed data is listed, attached as “metaDB Azerbaijan_20-01_JE.xlsx”.

6.5 Databases AZ-004 (131 plots) and AZ-005 (129 plots) processed for GIS compatibility

These two databases were transformed for GIS application. The respective shapefiles are attached as “AZ_BiodivDB_v1_2017-11-20.zip”. Functions and potential applications are demonstrated in the slides 6 to 9 of the Powerpoint presentation (Annex 6.1).

6.6 Terms for data provision and use

The two respective documents are attached as “Declaration of consent_Terms of Data use.zip”.

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