



FORGENIUS

**Improving access to FORest GENetic resources
Information and services for end-Users**

Deliverable D6.1

Design of the web application

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Explanation of abbreviations used

- NFP EUFGIS National Focal Point
- NC EUFORGEN National Coordinator
- FORGENIUS PP FORGENIUS Project Partners
- Other Projects Projects other than FORGENIUS, that may provide GCU characterization data sometime in the future
- All public All external public users of the web application
- All registered All registered public users of the web application
- GCU Genetic Conservation Unit
- DST Decision Support Tool
- IS Information system
- Core data Basic data on GCUs that is provided by the NFPs
- Embargo The 18-month period before the FORGENIUS data will be made public

1 Summary

The objective of this deliverable is to describe the current state of the overall design and contents of the online web application that will be created by the FORGENIUS project, based on the existing EUFGIS information system. The application will primarily serve national and Pan-European conservation of forest genetic resources. In addition, the web application will also make available FORGENIUS results to various stakeholder groups, including the general public.

The report presents the flow of information from the different providers into the information system and the ways of utilizing this information either directly (typically core data on GCUs) or after processing data (indices) with the web application tools. It also lists different identified user groups and their access rights to the web application (according to the current stage of the development). Examples of the functionalities the application will offer are presented as screenshots of the current prototype. These and other functionalities will be further developed in due course of the project.

This deliverable supports interaction between WP6 and the other work packages in FORGENIUS. Coordination of simultaneous tasks is needed to enable a final product that will fully utilize the scientific results of the project and serve the end-users. The final design of the application will be presented in Deliverable 6.2 that is due in month 36.

2 Introduction

Description of the work carried out

The web application will serve as a tool to make available information stored in EUFGIS information system, which is hosted by EFI and administered by the EUFORGEN Secretariat. The user-interface of the web application is designed according to the needs of end-users, within the limits of the information that will be available. In addition to the most important end-user group, namely the EUFGIS National Focal Points (NFPs), several other groups have been identified and their needs evaluated. This process is described in the Milestone MS 6.1 report, after which project's end-user-partners (ONF and VA), representing forest managers and nursery sector, provided additional input.

The design of the web application was done in collaboration with WP5. Meetings were held frequently to characterize all the data concerned, to identify the terms and conditions for uploading data, and the access rights for the different groups of end users. Based on this, the different interfaces needed within the web application were defined and their technical feasibility was estimated.

Sources of information

In addition to the basic information on GCUs that is already available in EUFGIS, the new web application will make available data on characterization of the GCUs produced by the different WPs in FORGENIUS (for a limited number of GCUs and a limited number of species), as well as environmental and remote sensing data originating from third sources. The data produced by FORGENIUS will be uploaded to the redesigned EUFGIS. WPs 1 to 4 have already provided preliminary examples of data that they will produce, to enable the development of the data dictionary (WP5) and the design of the web application. To finalize the design and development of the web application, WP6 is dependent on further WPs 1 to 4 results that will become available during the course of the project. Concerning the remote sensing data, WP1 has produced two deliverables on the characterization of the entire collection by satellite remote sensing (D1.1) and the evaluation of remote sensing data (D1.2). First results of the characterization of the GCUs were provided in deliverable D4.1, "Summary of genetic, climate and remote sensing data for a subset of the selected GCUs/species". Some of the graphic outputs from this deliverable will also be converted into outputs of the web application.

Language of the web application

The current EUFGIS is in English, and the full web application will continue to be in English. For any exceptions, all national languages (besides English) should be and will be treated in the same way. A concern has been raised that not all the target groups will be able to make use of a service in English and, in this view, the needs of forest managers have been especially highlighted. Furthermore, for countries that consider using EUFGIS also to serve the information needs of their national conservation program, the possibility to add information in their national languages is important.

Two types of support for national languages will be offered and the feasibility of an additional third option is still under consideration

First, an interface will be created where NFPs can insert translations for predefined terms. This would support data entering as well as the use of EUFGIS as national IS. Such translations are voluntary, depend on the willingness of the NFPs and will not be a responsibility of the host of the IS. It is good to note that, if the support for a national language will not be continuous, it is possible that when the system evolves (new developments) it will eventually appear as using mixed languages. The documents that are meant only for national purposes can be in any language.

Secondly, for downloadable customized reports (for all users), a possibility to download partly editable reports will be provided. This would mean that the graphs and the values in tables cannot be edited, but the titles, headings and legends can be modified to add translations. The original texts should remain for consistency. This way, while the figures' validity is maintained and unintentional misuse is prevented, they can still be used to reach a wider audience at national levels.

A third option could be to allow the NFCs and/or NCs to translate parts of the web application in their own national language. This would also be on voluntary basis and the responsibility of the national authorities. The scale (e.g. for which parts this would be made possible) and feasibility to realize such service within FORGENIUS will be decided at a later stage of the project.

3 Results

3.1 Design of the web application

The overall design of the input function in the web application is illustrated in figure 1a and the output function in figure 1b. The organization in both figures reflects the user groups that can perform certain functions. There will be two entry points (portals) for the users: an intranet portal for uploading the data and serving as operative area for the database administrators and a public portal where data is viewed and can be downloaded. In each of the two portals there are several interfaces and the roles of the users define which interfaces they can use. Registration is needed for uploading, managing and downloading data whereas viewing the information can mainly happen without registration (see Table 1). Terms and conditions for the use of the information need to be accepted upon registration. In addition, there will be an automatic disclaimer on the source/credits in downloadable reports. The user rights and conditions for both up- and downloading are described in more detail under chapter 3.2.

Users	Definition
National Focal Points	Dedicated persons appointed by the National Coordinators. Responsible for providing and curating GCU and target species data. May also use EUFGIS for custom data upload and storage, visible only to them and National Coordinators for the given country.
National Coordinators	Country representatives in the EUFORGEN Steering Committee
FORGENIUS Project Partners	Institutes that are partners in the FORGENIUS project
Other data providers	Providers of data related to the GCU, but not partners in the FORGENIUS project.
Partners of other projects	Partners of potential future projects that will upload data to EUFGIS
Registered public users	Users that have permission to download data
Unregistered public users	Users that can only view data
EUFGIS managers	The staff that manages the EUFGIS information system

Table 1. Different types of users in the web application

Guidelines for using the web application will be developed in task 6.3 and tested in task 6.4. Help functions will include a downloadable manual and interactive guidance as pop-ups. These are not yet available and are not described in this manual.

Protocols for the genetic and phenotypic characterization of GCUs are provided by WPs 1 to 4, to create an opportunity to enhance the data on GCUs in a harmonized manner. In the future, it will be possible for the NFPs to characterize the GCUs within their national programmes using the FORGENIUS protocol, thus creating new information to support the implementation of the national programme and at the same time to complement the Pan-European view, on voluntary basis. It will be possible to make access to the national data restricted for national use only, but the NFPs are encouraged to share it with the community. All data that is uploaded to EUFGIS can be used for calculations and analyses at European level as stipulated by the Data Sharing agreement (D5.3, under preparation).

Data quality for the core data that will be uploaded by NFPs will be ensured by regular training sessions and harmonised data standards. For uploading characterization data, the quality check will be automatized for spotting clear outliers, - based on the typical range to be defined in the data dictionary for each trait. For any future projects that wish to provide data to EUFGIS, there will be a scientific quality check. The exact ways and procedure to do this will be defined by the EUFORGEN Steering Committee.

The decision support tool (DST) for the management of dynamic genetic conservation units will be a service on its own, for the NFPs and managers of the GCUs. It will give guidance for the management decisions and flag risk factors. To be able to use it, the user is expected to provide information (parameters) on the current status of the GCU. The functioning of the DST is described in more detail in chapter 3.3.4.

In figures 1a and 1b the over-all scheme of the design for the web application is presented. The following aspects were considered:

- Different types of data
- Different sources of data, requiring different interfaces
- Processing functions for data
- Different end users with different access rights and their needs
- Output formats
- Guidelines and help function to assist the users

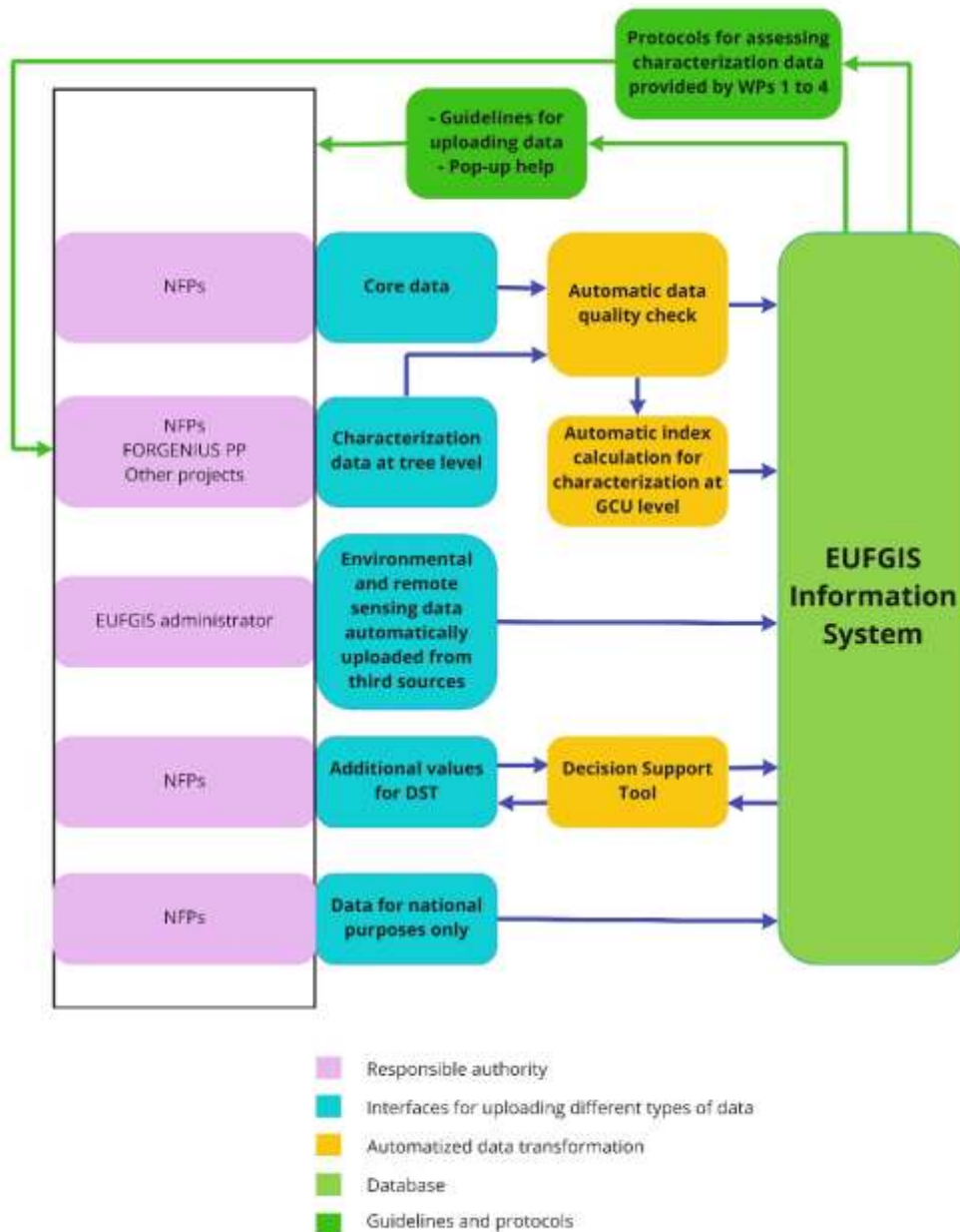


Figure 1a: Overall scheme of the EUFGIS information system web application - input.

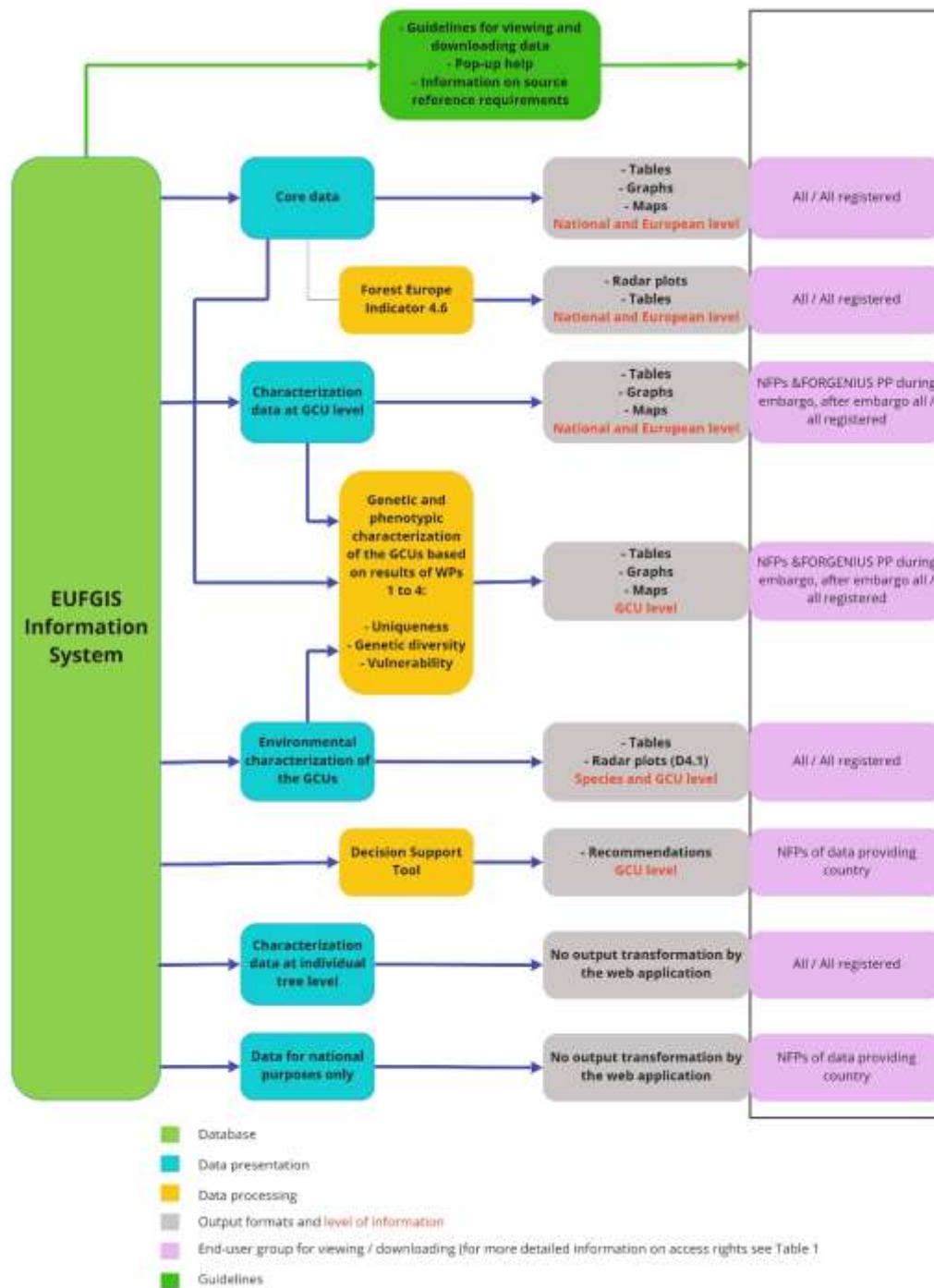


Figure 1b: Overall scheme of the EUFGIS information system web application - output.

3.2 Access rights and responsibilities

Different (groups of) data providers and end users will have different access rights to the EUFGIS IS via the web application (Table 2). This is needed to prevent accidental alteration of data, as well as to guarantee the proper use of the data and results, also considering the legal aspects of at least part of the data, such as restricted coordinates and data under temporary embargo, and the data providers (NFPs).

Data		Description	Who uploads the data	Visualisation format (potential)	Who can view	Who can download
Core	Coordinates not restricted	Basic data on the GCU and its target species	NFP	tables, graphs, maps	All	All registered
	Coordinates restricted	Coordinates or polygon of the GCU	NFP	tables and graphs (without coordinates)	All, without coordinates	All registered, without coordinates
Environmental and climatic	Historical, from databases	Obtained from existing online databases - e.g. climate, weather, soil, vegetation, landcover, fire risk	Automated (EUFGIS manager)	tables, graphs, maps	All	All registered
	Remote sensing	Obtained from online system	periodically (JRC – after project EUFGIS manager)	tables, graphs maps	All, if coordinates not restricted - NFP & NC if coordinates restricted	All registered, if coordinates not restricted - NFP & NC if coordinates restricted
Phenotypic	individual tree	phenotypic data from individual tree measurements/assessments	FORGENIUS PP or NFPs when data obtained following FORGENIUS protocols	tables	FORGENIUS PP + NFP & NC of providing country	FORGENIUS PP + NFP & NC of providing country during project life + Embargo- All registered, after embargo
	indices	aggregated from tree level data	Automated (EUFGIS manager)	tables, graphs	FORGENIUS PP + NFP & NC of providing country	FORGENIUS PP + NFP & NC of providing country during project life + Embargo- All registered, after embargo
Genetic	individual tree	genetic data based on individual tree sampling and analysing	FORGENIUS PP, NFPs when data obtained following FORGENIUS protocols	tables	FORGENIUS PP + NFP & NC of providing country	FORGENIUS PP + NFP & NC of providing country during project life + Embargo- All registered, after embargo
	indices	aggregated from tree level data	Automated (EUFGIS manager)	tables, graphs	FORGENIUS PP + NFP & NC of providing country	FORGENIUS PP + NFP & NC of providing country during project life + Embargo- All registered, after embargo
Modelled	indices	Indices derived from process-based modelling	FORGENIUS PP	tables	FORGENIUS PP + NFP & NC of providing country	FORGENIUS PP + NFP & NC of providing country during project life + Embargo- All registered, after embargo
Decision Support Tool	indices	computed from core, environmental, phenotypical and genetic data	Automated (EUFGIS manager)	tables	NFP & NC of the providing country	NFP & NC of the providing country
	provided values	additional values for cares where indices are not yet available	NFP	tables	NFP & NC of the providing country	NFP & NC of the providing country

Table 2: Data descriptions and related access rights for the EUFGIS information system web application.

The EUFGIS web site will be available to all interested. However, not all the data in EUFGIS will be available to everybody, and only an identified subset of users will be allowed to upload data to EUFGIS. The registration process is mainly concerned in matching the different types of data to the different roles of users in the system, making sure certain actions can be performed only by authorised users.

A *public user* is anyone that is accessing the EUFGIS portal without providing any identification. This type of user will be allowed to consult all the public data in the portal.

To download the data, the public user will need to register to become a registered public user. When the data will be used in a scientific publication, the source of the data must be identified and cited. On the EUFGIS side, it is important to record who has downloaded what, when, and

if that user has agreed to all the required provisions for publishing the data. This is true not only for EUFGIS specific data, but also for externally sourced data EUFGIS collates to the datasets: those data providers might also have their requirements. For this reason, any user who wishes to download data from the EUFGIS portal will have to register and subsequently provide his/her credentials before initiating the download. Also, for each download, this user will have to agree on a set of requirements determined by what data is included in the dataset, this operation should be logged and made available to the administrators of the EUFGIS web site in case of need. The registration of such *public registered users* should be free to anybody, through replying to a confirmation e-mail.

While the EUFGIS portal will be free to all and anybody will be able to register for downloading data, the EUFGIS intranet portal for uploading data will be reserved only for *registered private users*. These users will be responsible for providing data and performing administrative tasks. The intranet portal will only be accessible after a login process. The credentials of these users will be provided by the EURFORGEN Secretariat or by EUFGIS Managers. Once the user is identified, his/her capabilities, in other words what they are allowed to do, will be determined by a set of *roles* which determine what data they have access to and whether they are allowed to upload such data. Users of this type will be identified by name, e-mail, affiliation and a password. Once registered, they will be assigned one or more roles that determine what operations they can perform in the intranet portal. For instance, National Focal Points are responsible for uploading Gene Conservation Units data and Target Species data and they may create user credentials for the National Coordinator. The National Coordinators will be able to view all the data the NFPs upload but will not be allowed to upload or edit data.

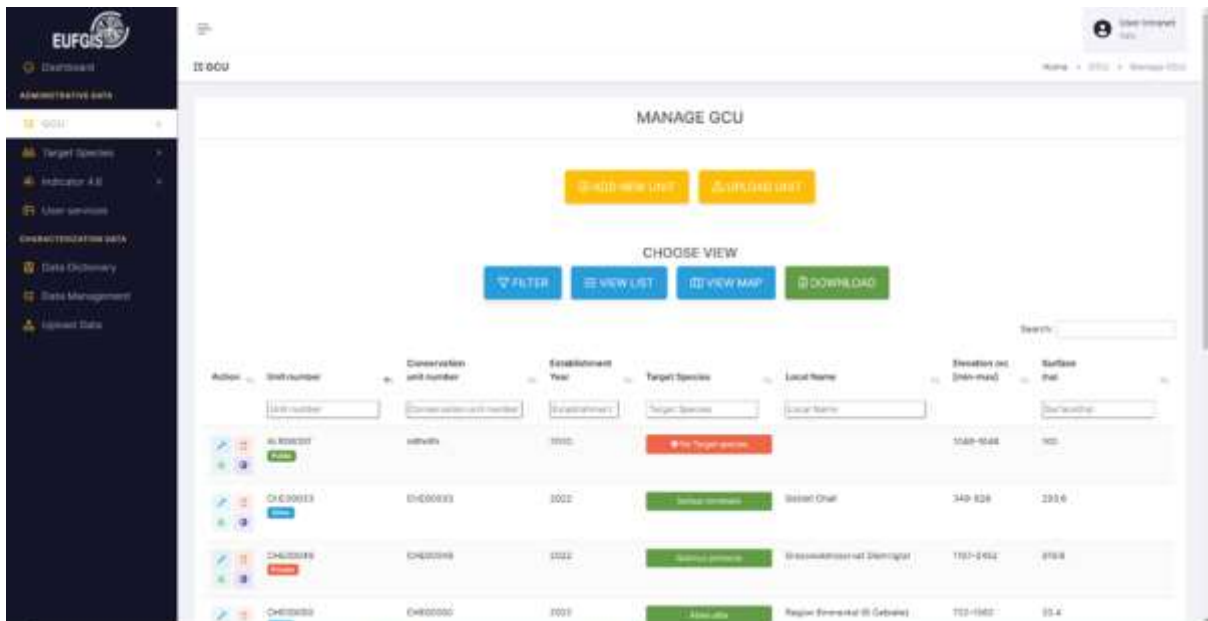
Essentially, the user registration process should ensure the following:

- A registered user must be identifiable. He/she should be accessible via an e-mail address and, in the case of data uploaders, their affiliation to an institution should also be recorded.
- Downloading and uploading data or creating user credentials can only be performed by a registered user and these operations should be logged.
- The role associated with the user determines the rights to view, download and upload
- All operations requiring login credentials should be logged, recording the user, the time stamp and the operation performed: this should be agreed by the user during the registration procedure.

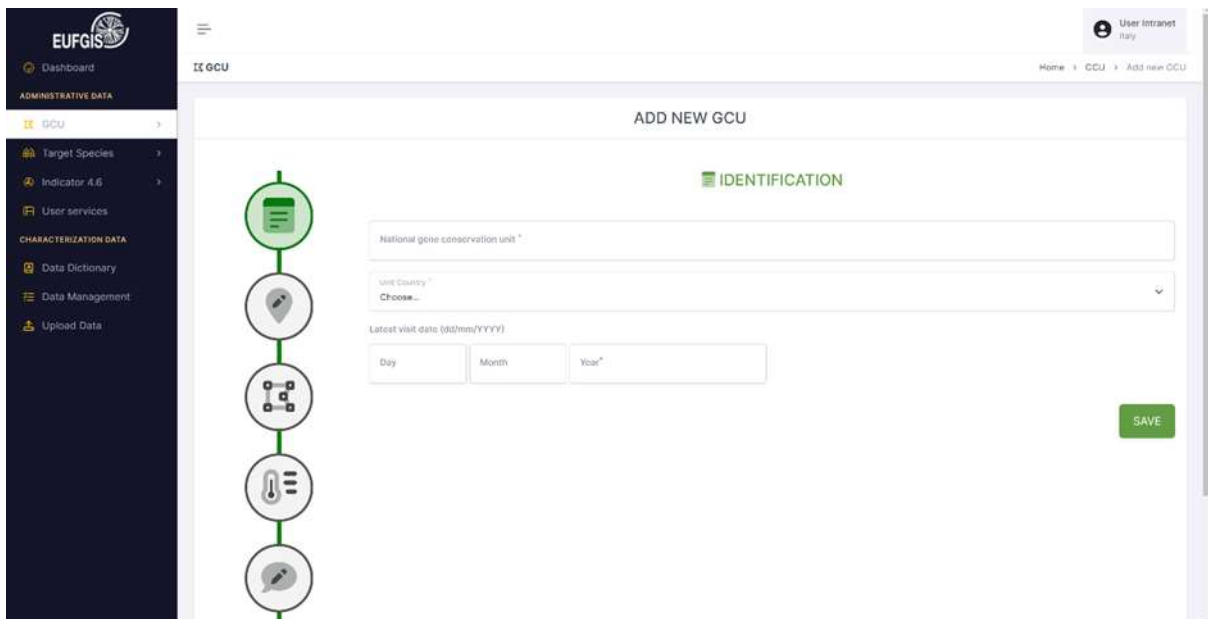
3.3 Selected parts of the web application

In the paragraphs below examples are given of the design of the different functions within the web application. The examples are mainly given as screenshots from a first draft demo of the web application that is presently being developed. In addition, a potential output for presenting comparison between GCUs was made using hypothetical data. For the presentation of the environmental data the results from deliverable D4.1 are given as an example.

3.3.1 Interface for uploading and managing data



Screenshot 1: First page of the section to manage core data of the GCUs



Screenshot 2: Page to add a new GCU to the information system

Screenshot 3: Page to provide information on the location of the GCU

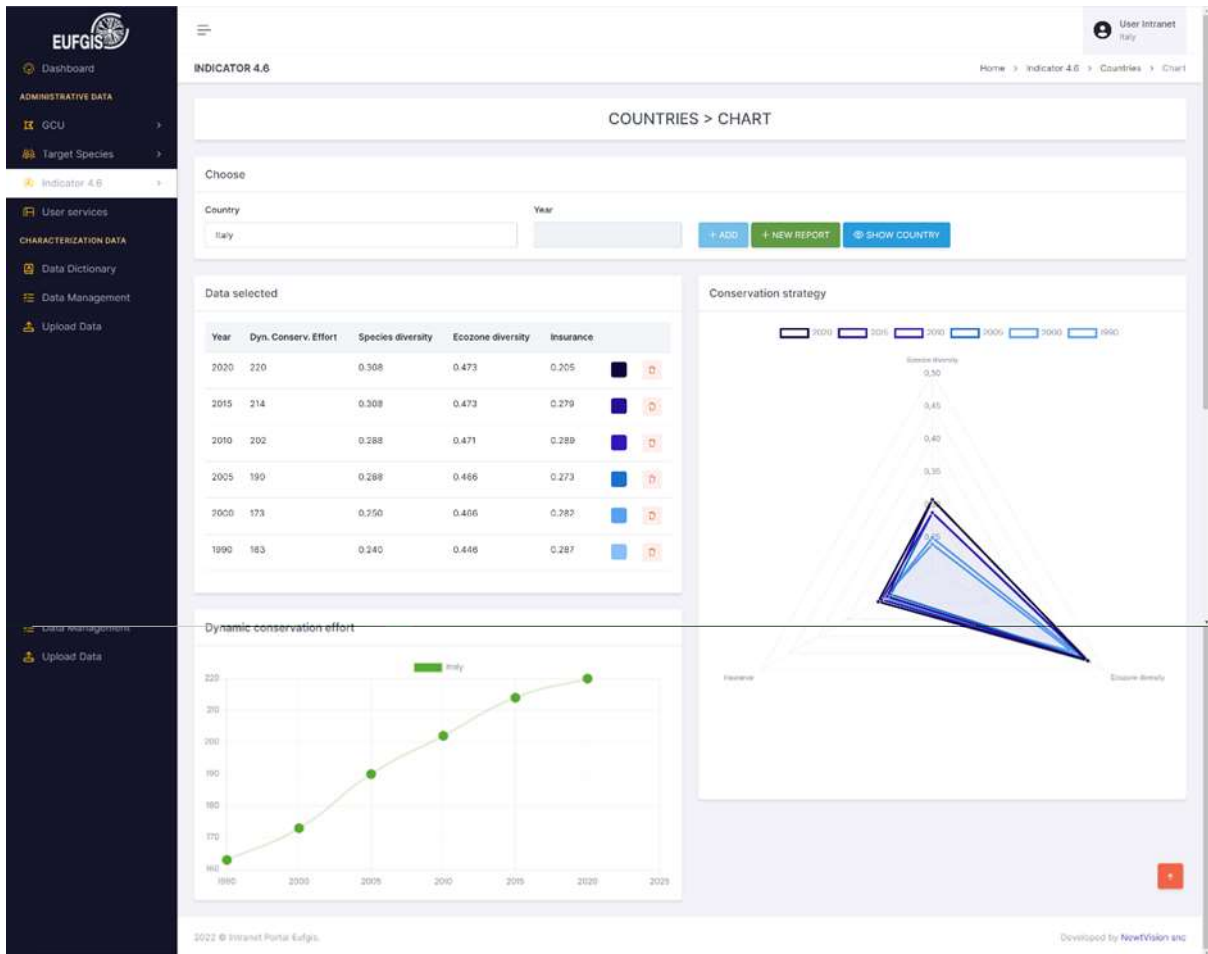
Screenshot 4: Page to manage the polygon of the GCU, including link to upload a polygon file.

0	Action	Unit number	Conservation unit number	Establishment Year	Species	Population unit number	Latest Visit
1		ALB00002	zsfhuth	2020	No target species		2020
2		TUR00281	281	2014	Quercus cerris		2014
3		LTU00017	28PG0009	2006	Pinus sylvestris	28PG0009	2006
4		SWC00133	SK 553 2014	2014	Quercus robur		2014
5		ROU00089	RO-FA-D230-1	2007	Fagus sylvatica	RO-FA-D230-1	2007
6		AUT00008	17b	1996	Fagus sylvatica		1996
7		TUR00278	278	2013	Alnus incana		2014

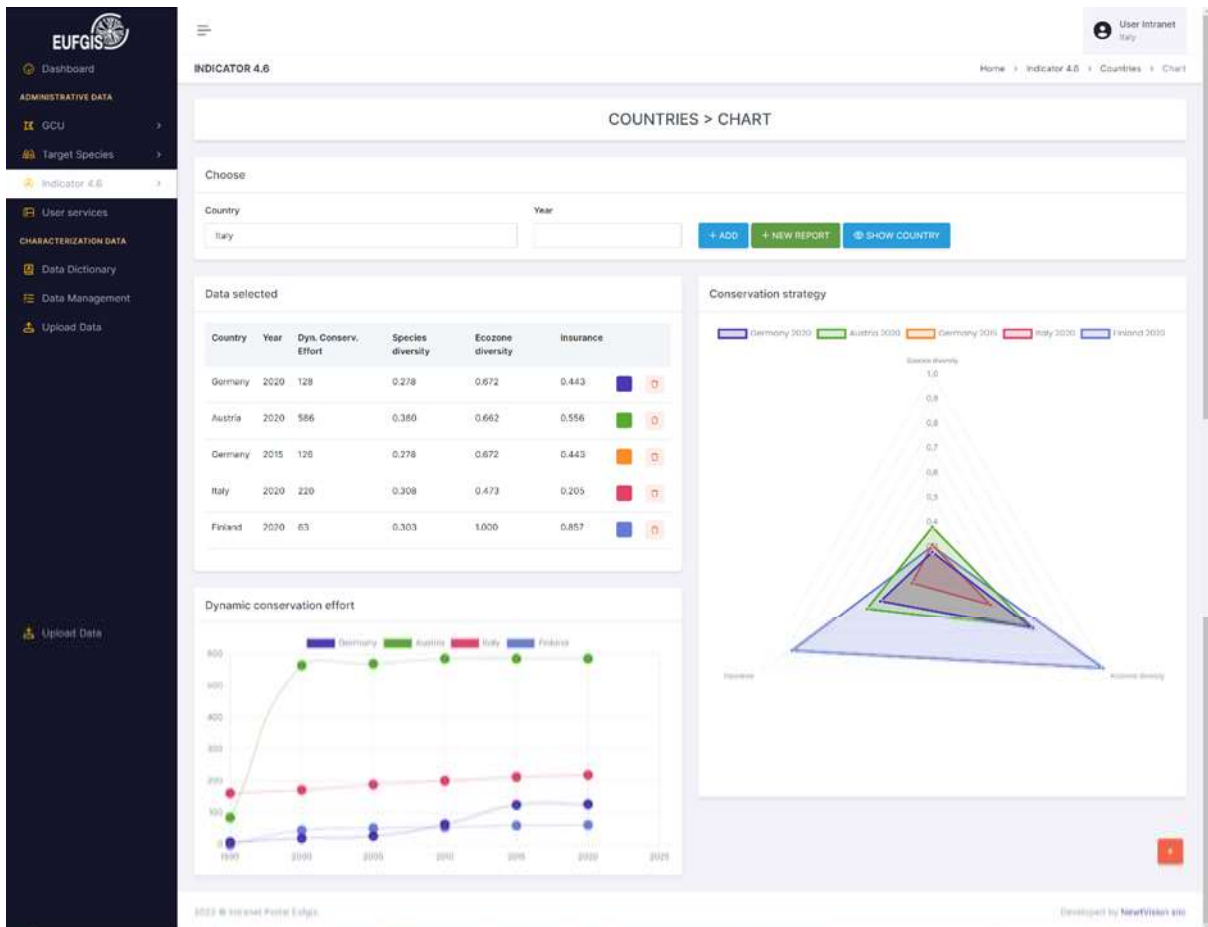
Screenshot 5: Opening page to manage the target species of the GCUs

Screenshot 6: Pop-up filter for managing target species of the GCUs

3.3.2 Forest Europe Indicator 4.6



Screenshot 7: Example of an output for the Forest Europe indicator 4.6



Screenshot 8: Example of an output for the Forest Europe indicator 4.6 comparing different countries

3.3.3 Example for the layout of the graphic output for environmental data

Below two figures that were copied from FORGENIUS deliverable D4.1 as examples of possible outputs for the web application.

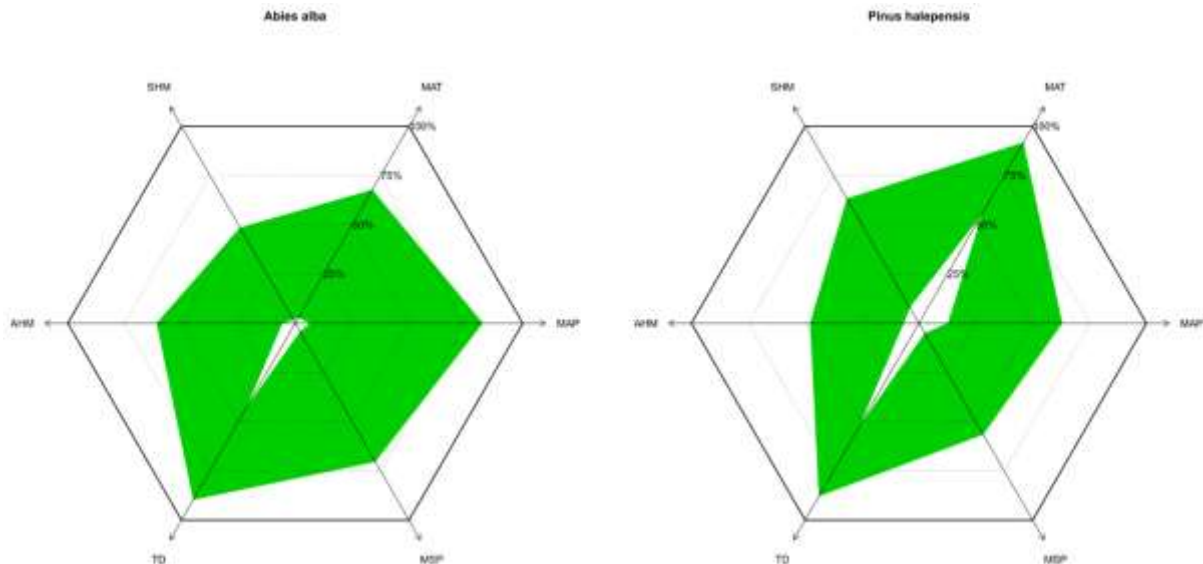


Figure 2: Radar plots representing the coverage of climatic ranges by the *Abies alba* and *Pinus halepensis* selected GCUs (MAT = mean annual temperature, MAP = mean annual precipitation, MSP = mean summer precipitation, TD = temperature difference, AHM = annual heat moisture, SHM = summer heat moisture; <https://ibbr.cnr.it/climate-dt/>). (source: FORGENIUS D4.1)

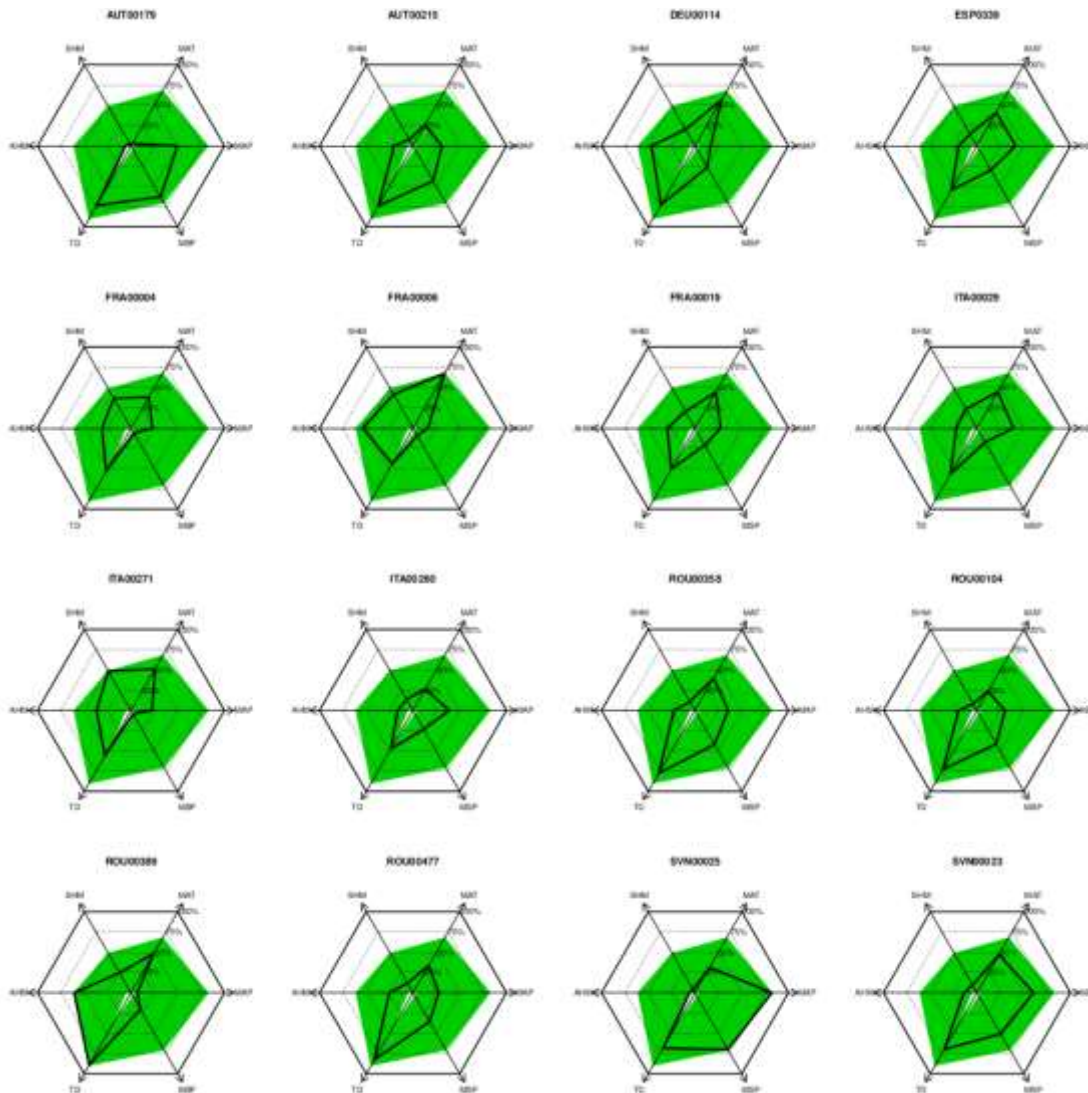


Figure 3: Radar plots representing the 16 GCUs selected for *Abies alba* with their EUGIS code. The ecological characteristics of each GCU (black line) has been overlapped on the full environmental envelope (green polygon) covered by the FORGENIUS project (MAT = mean annual temperature, MAP = mean annual precipitation, MSP = mean summer precipitation, TD= temperature difference, AHM = annual heat moisture, SHM = summer heat moisture). (source: FORGENIUS D4.1)

3.3.4 Example for the layout of the graphic output for genetic indices

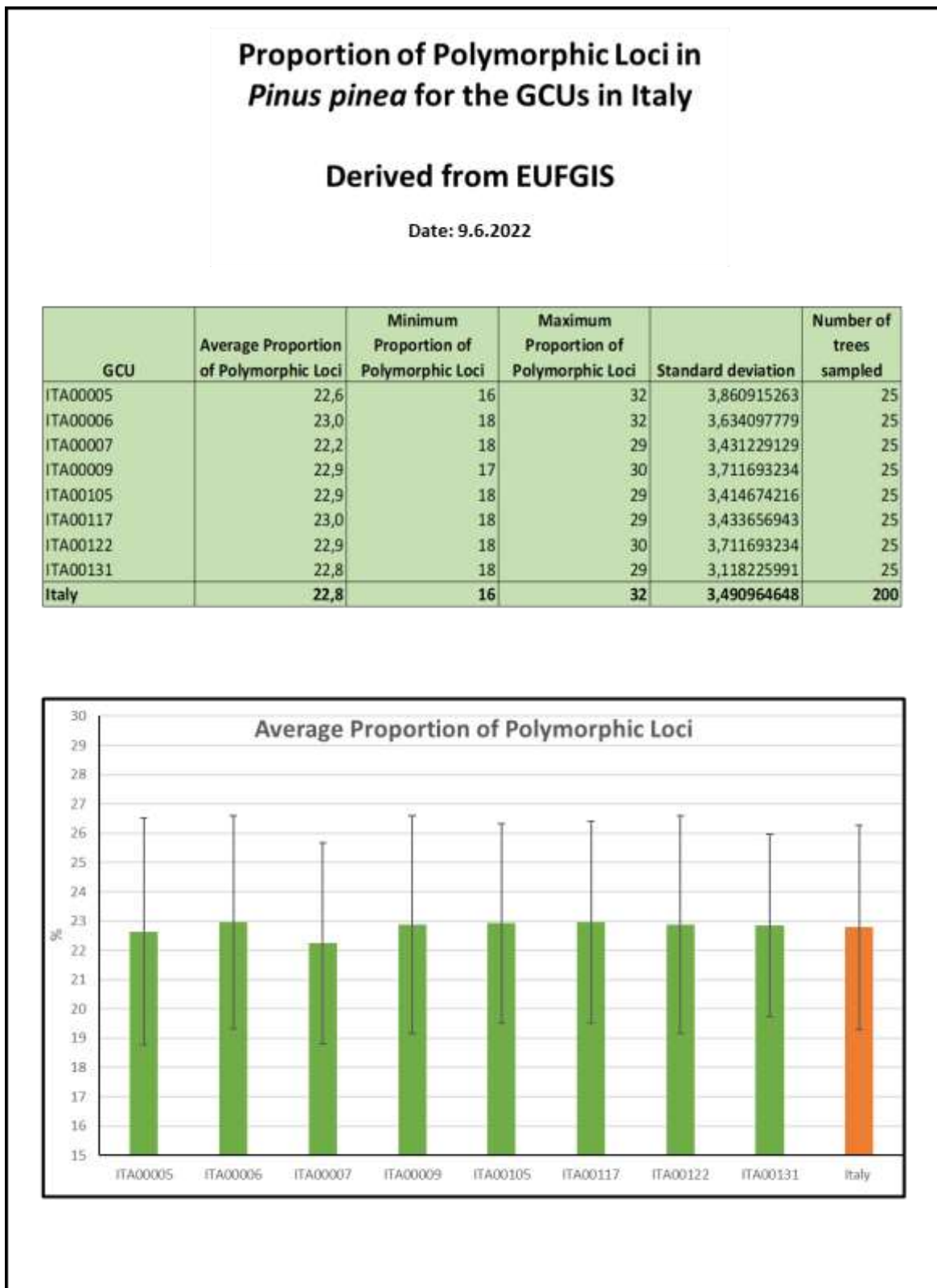


Figure 4. presents an example showing a possible output for aggregated data. The example is from existing GCUs with *Pinus pinea* as the target species, but the data is fictitious.

3.3.5 Decision support tool

The decision support tool for the management of dynamic genetic conservation units (<https://www.euforgen.org/publications/publication/decision-support-tool-for-the-management-of-dynamic-genetic-conservation-units/>) will be integrated into the redesigned EUFGIS and will function through a dedicated interface. Upon entering a value for one of the indicators, the user will be guided by this interface through a decision matrix that will lead him/her to proposed management actions. The interface will also allow the user to record the success of the selected management action. A disclaimer about the responsibilities for management actions will be added in the interface.

Strictly speaking, the decision support tool interface will also allow upload of data necessary for calculating/evaluating indices (e.g. lack of established natural regeneration, presence of pest/disease, a stochastic process such as fire, avalanche that decimated the target species in a GCU) while some data for calculation of indices will be imported from the core GCU data (e.g. number of reproducing trees, number of reproducing trees falling below minimum requirements).

4 Conclusions

The first version of the design of the web application is now available and can be used as a basis for further development. In the draft design the wide spectrum of different end-user needs, which were identified earlier, have been considered and their technical feasibility estimated. The design has also reconciled various legal aspects and restrictions with the needs.

The draft design gives the means for effective coordination of the input from scientific work packages (WP1-4) with the user-oriented work packages (WP5-7) and helps to identify specific interactions between the tasks in WP6. Technical realization of the web application (Task 6.2) and developing guided protocols for using the web application (Task 6.3), based on the current state of the design, have already started. In conclusion, this report serves multiple aspects of the ongoing work on development of the web application, which will eventually be a major outcome of FORGENIUS.

5 Partners involved in the work

The work was led by Luke in close cooperation with GIS, EFI and NV. Luke was the main responsible for writing the report. GIS provided the link to WP5 and specific knowledge on EUFGIS. EFI was responsible for the technical aspects to be considered in the design. NV checked the technical feasibility of the design and prepared the first prototype from which the screen shots were taken. ONF and VA (/ETIFOR) provided important end-user views on both the contents and the design of the web application. The coordinator strongly supported the work. BFE, INIA, INRAE and CNR commented the draft report.