

D 4.1.3:
Establishment of upgraded central system and inter-related
subsystems



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Table of Contents

1. INTRODUCTION.....	7
2 SYSTEM'S DESCRIPTION	9
2.1 Architecture	9
2.2 Hardware infrastructure	10
2.3 Software.....	12
2.4 Database	13
2.5 Web Applications	15
3 IRRIGATION APPLICATION.....	19
3.1 Irrigation recommendation in the wider study area.....	19
3.1 Irrigation application usage.....	21
4 APPLICATION OF CODES OF GOOD AGRICULTURAL PRACTICES	23
5 APPLICATION OF SOIL EROSION RISK ASSESSMENT.....	25
6 CONCLUSIONS	28

LIST OF TABLES

Table 1: Server specifications	11
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LIST OF FIGURES

Figure 1: Architecture of central system.....	10
Figure 2: Representation of the ArcGIS Server operational structure.....	17

LIST OF IMAGES

Image 1: Meteorological station.....	11
Image 2: Irrigation application welcome screen.....	21
Image 3: Irrigation application data input	22
Image 4: Welcome screen of CGAP application.....	23
Image 5: CGAP application's initialization	23
Image 6: General description of parcel.....	24
Image 7: Main interface of application.....	24
Image 8: Application's recommendations	25
Image 9: G2 application catalogue	26
Image 10: G2 application destination	26
Image 11: G2 model initialization	26

List of abbreviations and acronyms

LP	Lead Partner
i-BEC	interBalkan Environment Center
CGAP	Codes of Good Agricultural Practices
P2-P6	Partner 2-6
WIMS	Web Information Management System
ISP	Internet Service Provider
DBMS	Database Management System
NDVI	Normalized Difference Vegetation Index
SEBAL	Surface Energy Balance Algorithm for Land
GIS	Geographical Information System
WMS	Web Mapping Services
XML	Extensible Markup Language
IMS	Internet Map Services
OS	Open Sources
CGI	Common Getaway Interface
RDBMS	Relational Database Management System
DSS	Decision Support Systems

Executive Summary

This report summarizes all the actions that have been taken by the LP (i-BEC) concerning the establishment of the upgraded central system and inter-related subsystems, the system's architecture and the manuals concerning the usage of the tools/services provided to all project partners that are involved in pilot applications. In particular, the three tools/services are:

- Precision irrigation: a digital model for the application of precise irrigation in space and time which is further upgraded, customized and applied within the Greek and Albanian territories,
- Application of Codes of Good Agricultural Practices (CGAP): a digital tool for the evaluation of the implementation of CGAP in Cyprus and North Macedonia territories
- Application of soil erosion risk assessment: a digital model for large-scale risk assessment of soil erosion is customized for use within the Bulgarian territory.

1. INTRODUCTION

The initial purpose of the developed methodological system was the creation, storage and organization of data of different spatial-temporal scale and different nature (eg hydrological, soil, etc.) in such a way as to create data in geographic information systems based on a specific data model and metadata. Added to that the system was meant to support the uniformity of the produced thematic maps while common and valid data is used by users. Furthermore, the system was developed to comply with the following standards and have the abovementioned capabilities:

- Immediate data retrieval
- Saves time from creating data that already exists
- Combines data of different nature with simple and easy steps on the part of the user
- Facilitates their export to web geographic information systems (WebGIS)
- Meet the data provision needs of the GEO organization (GEOSS Portal)
- Are compatible with international data storage and retrieval standards
- The changes / improvements that the original file undergoes are recorded
- Accompanied by appropriate metadata

The data is stored in structured database which consists of individual information systems which are interconnected with appropriate communication channels that allow on the one hand the direct and uninterrupted operational interconnection of the systems and on the other hand support the use of appropriate spatial or descriptive search queries.

The following report describes in detail all the actions that have been taken by the LP (i-BEC) concerning the establishment of the upgraded central system and inter-related subsystems, the system's architecture and the manuals concerning the usage of the tools/services provided to all project partners that are involved in pilot applications. In particular, the three tools/services are:

- Precision irrigation: a digital model for the application of precise irrigation in space and time which is further upgraded, customized and applied within the Greek and Albanian territories,
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- Application of soil erosion risk assessment: a digital model for large-scale risk assessment of soil erosion is customized for use within the Bulgarian territory.

2 SYSTEM'S DESCRIPTION

2.1 Architecture

A central system is hosted at LP premises that will be dedicated for the data management of the services provided to project partners. In addition to data management, the central system can host the three services which are namely:

- 1) Precision irrigation – Application of precision irrigation model in Albania with the participation of local farmers by P5 and P6
- 2) Application of Codes of Good Agricultural Practices – Application of CGAP in specific areas of North Macedonia and Cyprus respectively by P5 and P6
- 3) Application of soil erosion risk assessment – Application of large-scale soil erosion risk assessment model in Bulgaria by P4

A set of system components were set together with a central database to function as a stand-alone and fully operational system of systems. At the core of the system is the central database that is designed to host and serve all data collected from the three services, according to data collection protocol delivered to project partners from LP. At next level, three Web services are developed. The first Web service is a Web Information Management System dedicated to exchange georeferenced data between end users and concerning authorities. The data handled from WIMS are an ensemble of point or area measurements with their descriptive information and metadata. The second Web service is a decision support application that concerns the services CGAP. This service will handle data input of corresponding end users, and with the operation of a decision support system will provide a final recommendation and compliance regarding the application of CGAP. The third Web Service is associated to precision irrigation tool, and its operation is based on the collection of meteorological, environmental and irrigation water usage data, to provide recommendations for irrigation policy by taking in consideration the provided crop coefficients and evapotranspiration in near real time.

Schematically, the above described system is depicted at Figure 1:

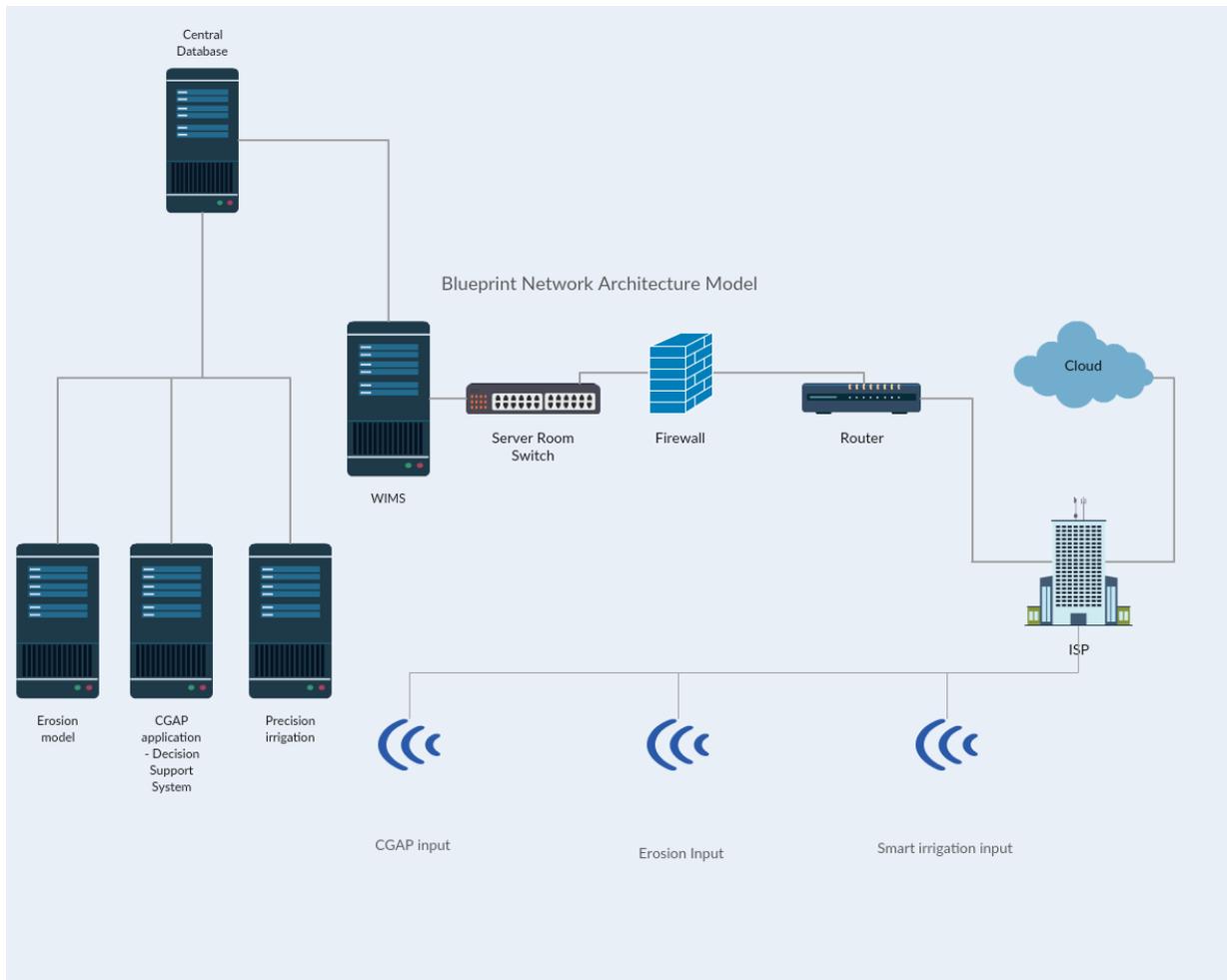


Figure 1: Architecture of central system

2.2 Hardware infrastructure

The physical system components can be divided in two distinct categories. The first category contains the system parts that are located at LP premises and compose the central DBMS and the second category are the peripheral parts that collect telemetry data and transport them to the DBMS and are mainly the meteorological stations.



Image 1: Meteorological station

The central DBMS can support plug and play connection of new meteorological or even updated versions of the existent, establishing future operability of the system and minimizing the decommissioning risk due to peripherals outdated.

The central system is built on a physical server with increased data processing capability in terms of CPU and GPU performance and sufficient storage space, covering the services needs for a time horizon of minimum 10 years, with the option of upgrade with insignificant cost. The system's characteristics are namely:

Table 1: Server specifications

Component	Specifications
Operating System	Windows 2008 R2 Server Enterprise & Datacenter edition (64-bit)
CPU	2 x Intel Xeon CPU E5-2630 v3 @ 2.4GHz
RAM	12gb
Storage space	20tb

2.3 Software

The software choice was made in respect of the essentiality of the reliability and interoperability of the system. The software packages that were chosen are widely accepted and known for their reliability and their developers constantly release updated versions and provide their support so that the implementation and maintenance process will be properly supported. Additionally, such choices support the interoperability between the components of the system and meet the infrastructure criteria. Furthermore, the scalability of the system was taken into account so that it can easily support future upgrades and additions

2.3.1 ASP.NET

ASP.NET (originally called ASP+) is the next generation of Microsoft's Active Server Page (ASP), a feature of their Internet Information Server (IIS). Both ASP and ASP.NET allow a Web site builder to dynamically build Web pages on the fly by inserting queries to a relational database in the Web page. ASP.NET is different than its predecessor in two major ways: it supports code written in compiled languages such as Visual Basic, C++, C#, and Perl, and it features server controls that can separate the code from the content, allowing WYSIWYG editing of pages. Although ASP.NET is not backwards compatible with ASP, it is able to run side by side with ASP applications. ASP.NET files can be recognized by their .aspx extension. The description of the tools and programming languages that were used to initially develop upgrade and support the system is provided in the following paragraphs of this document.

2.3.2 SQL

SQL which stands for Structured Query Language. SQL is a language used to interact with a database in terms of communication. It is the standard language for relational database management systems and is used to perform tasks such as update data on a database, or retrieve data from a database. Although most database systems use SQL, most of them also have their own additional proprietary extensions that are usually only used on their system. However, the standard SQL commands such as "Select", "Insert", "Update", "Delete", "Create", and "Drop" can cover most common needs related to database management. A variety of established database products support SQL, including products from Oracle and Microsoft SQL Server

In a distributed database system, a program often referred to as the database's "back end" runs constantly on a server, interpreting data files on the server as a standard relational database. Programs on client computers allow users to manipulate that data, using tables, columns, rows, and

fields. To do this, client programs send SQL statements to the server. The server then processes these statements and returns replies to the client program.

2.3.3 Microsoft SQL Server

Microsoft SQL Server is a relational database management system (RDBMS) from Microsoft that's designed for the enterprise environment. SQL Server runs on T-SQL (Transact -SQL), a set of programming extensions from Sybase and Microsoft that add several features to standard SQL, including transaction control, exception and error handling, row processing, and declared variables. SQL Server is a relational database management system developed by Microsoft. As a database, it is a software product whose primary function is to store and retrieve data as requested by other software applications, be it those on the same computer or those running on another computer across a network (including the Internet).

2.3.4 Microsoft Visual Studio

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop console and graphical user interface applications along with Windows Forms applications, web sites, web applications, and web services in both native code together with managed code for all platforms supported by Microsoft Windows, Windows Mobile, Windows CE, .NET Framework, .NET Compact Framework and Microsoft Silverlight it can also develop windows presentation foundation(WPF) application.

2.4 Database

The relational database can be described as an organized collection of geographic data designed to incorporate, store, update, manage, analyze and properly allocate information. Additionally, all the spatial data both in vector and raster format which are included in the database and presented through the WebIMS application are georeferenced in the same projection system, namely WGS '84. The World Geodetic System (WGS) 84 is currently the reference system being used by the Global Positioning System and it is geocentric and globally consistent within ± 1 m.

The geographic data used in the project apart from the spatial information of the data also integrate descriptive (non spatial) information of the associated spatial data. The descriptive information is presented in the form of attribute tables and metadata. Attributes tables are incorporated small databases or tabular files containing information about a set of geographic features, usually arranged so that each row represents a feature and each column represents one feature attribute. In raster datasets, each row of an attribute table corresponds to a certain zone of cells having the same value.

On the other hand, metadata provide information that describes the content, quality, condition, origin, and other characteristics of data or other pieces of information.

From a conceptual point of view, the project data will be ranked into 3 main categories.

- Administrative data,
- Field and remotely sensed data (imagery and telemetry) relevant with irrigation
- Historical crop data.

General administrative data consist of:

- Hydrological data about the respective river basins.
- Local governance organization data (municipality data etc.).
- Crop parcel data (property ownership data, OSDE parcel code).

The irrigation dataset will mainly include telemetry, time series data, spatially delimited by the station locations, as well as remotely sensed data about wetness and evapotranspiration. More specifically:

- Meteorological parameter data (radiance, sunshine, barometric pressure, wind speed-direction, rainfall, temperature, humidity).
- Soil Moisture data.
- Evapotranspiration data. Albedo, NDVI, and surface temperature data will be extracted from Landsat 8 Multispectral imagery data, and subsequently combined with meteorological data from the image acquisition date, to provide evapotranspiration maps (SEBAL).
- Wetness and water stress index data extracted from thermal remote sensing raw data.
- Finally, the historical crop dataset will provide information relevant with the agricultural practices that were used during the last five years such as:
 - Fertilization practices (cultivated species, fertilization programs, fertilizer sources, quantity, etc.).
 - Pesticide use (cultivated species, pesticide used, and quantity).

- Productivity data (cultivated species, crop yield).

The historical crop data will have a relational table format which will be joined with the crop parcel data, through the common “OSDE code field”.

2.5 Web Applications

2.5.1 Web GIS Application

Purpose of the WebIMS platform is to distribute the both the geographical and descriptive information concerning the project to the appropriate authorities. The WebIMS platform interconnects the available data from the project (field measurements, maps etc.) and also the telemetric data in near real time. In addition, it provides a visual interactive interface for the early warning expert system. The WebIMS platform provides the tools for interactive navigation through the region and allows the user to customize the visualization of the data and also extract that data in form of maps and automatically generated reports.

WebGIS technology extends to the Internet functionalities typical of a Geographical Information System (GIS). Both commercial and open source WebGIS packages foster the integration of a number of technologies, services and programming languages so that water related datasets can be both managed and published in the cloud.

As far as the open source WMS, also known as IMS, is concerned, the use of the XML in the early 2000s was, at the time, an emerging standard for data interchange on the internet and triggered the development of OS applications for broadcasting spatial data. During the same period, the development of the Mapserver OS platform by the University of Minnesota with financing from NASA, was based on the CGI and demonstrated a more intelligent and interactive application for displaying dynamic spatial maps over the Internet. It was only a couple of years later, when the release of the Google Earth program and of the Google Maps application brought about a revolution in terms of web mapping services applications and technologies. At the same time, all the major commercial GIS and mapping software companies (ESRI, ERDAS, AUTODESK, IGIS) entered the mapserving world and created appropriate packages in order to fully support IMS.

With the use of IWS technology, the options of exchanging, integrating, or analyzing data in a new form through the network facilitate, expedite, and favor the process of decision taking. Users can combine data and information accessible via Internet with local data, view them, and make

consultations and the pertinent analysis. This distributive system of information, compared with tools that are "stand-alone" or installed in a personal computer, offers the following advantages, among others:

- Sharing and exchange of data.
- Access to applications and tools for analysis and decision making for a much more extensive public.
- Facilitates continued updating of information, helping to reduce redundancies (duplications) and improving access to databases.
- Facilitates the updating of applications and disclosed information.
- The IMS architecture comprises three levels:
- Server Applications: These are responsible for channeling and attending the operations that the user requests on the data.
- Client Applications: They constitute the working environment of the user. Any navigator that supports standard HTML can act as client. It will also need to support Applet (Plugin) of Java or ActiveX technology if the services being accessed contain these components. Through Internet, and with the navigator as interface, the Client sends requests to the Server Application to obtain the information that the Client wants to view, consult, or analyze.
- Databases: The server applications access the data that can be stored in files or in spatial databases (spatial data engine, SDE).

2.5.2 The ArcGIS server platform

For the needs of the present work, the ArcGIS Server 10 was used to publish on the internet both the background information and the alerts concerning potential flood events. WebGIS approaches for the evaluation of flood events with the use of different tools combinations have been used in various cases as denoted in literature. The ArcGIS Server 10 platform allows the management of geodata in a variety of database management systems, Figure 1. ArcGIS for Server provides a full range of GIS server capabilities that allows to transform maps, imagery, data, and GIS tools that are being used in

ArcGIS for Desktop into fast, reliable Web services that are accessible through any workstation point in the world that was internet connection.

The WebIMS server retrieves data directly from the constructed geodatabase (Action 5.4). The geodatabase is the common data storage and management framework for ArcGIS. It combines "geo" (spatial data) with "database" (data repository) to create a central data repository for spatial data storage and management. A geodatabase stores geometry, a spatial reference system, attributes, and behavioral rules for data. ArcSDE allows you to store and manage spatial data and provides the gateway between the GIS geodatabase and the RDBMS in order to share and manage your spatial data as tables. ArcSDE is integrated with the ArcGIS Server and works with a variety of different databases including Oracle, Informix, IBM DB2, and Microsoft SQL Server. The specific work was conducted with the use of a Windows Server 2008 R2 Enterprise & Datacenter edition (64-bit (EM64T)).



Figure 2: Representation of the ArcGIS Server operational structure

As for the hardware requirements, the ArcGIS Server 10 has some specific requirements in order to be installed. Firstly, the physical server which hosts the ArcGIS server must be at least a Windows 2003 Server Standard, Enterprise edition (32-bit and 64-bit). Our physical server is a Windows 2008 R2 Server Enterprise & Datacenter edition (64-bit) which fulfills completely the specific requirements. Furthermore, the minimum RAM requirement for ArcGIS Server is 2 GB. In our case, the physical server is equipped with 12 GB of RAM.

The major advantages of the selected WebIMS platform are evident at the web editing and geoprocessing stages. Web editing means that spatial and attribute edits and updates to the geodatabase can be performed via the web with the use of the feature and geometry services. Feature service allows geographic features from web browsers to be added, deleted and updated, while the geometry service helps applications do geometric calculations such as buffering, simplifying,

calculating areas and lengths, merging, splitting, and projecting. The geometry service is often used in combination with the feature service to support sophisticated GIS editing over the web. Moreover, the Geodatabase Model and the corresponding API data type support standalone tables, either with or without relationship classes to the spatial data. This means that users can select a feature for Query or Edit and also access its related tables for Query/Edit. The geodatabase also supports "Attachments" which makes it easy to submit documents, pictures etc across the web associated with spatial features or locations. The user, for example, can use his smart phone for spotting a problem to a drainage channel, taking a picture and submitting it directly to the relevant authority for confronting the emerging situation.

To sum up, well designed and associative dynamic maps, which are easy to understand and user-friendly, (e.g. using blue colors for normal water depths and red colors for potential flood discharges), and which are easily accessible through any web browser are very useful. These maps can be compared with maps showing past local flood events. In this way people's interest can be stimulated and the maps can help to raise awareness, encourage action and increase the level of knowledge about floods, or can even lead to the user seeking further information. Moreover, a link between general flood information, like flood extents and corresponding water depths derived by a hydrological model on the one hand, with the WebIMS platform on the other, can be considered to be a near real time reliable communication system for delivering warning messages and alerts about potentially affected locations to local and regional governmental agencies.

2.5.3 Decision Support Applications

Due to the diversity of decision-making approaches and the wide range of domains in which decisions are made, the concept of DSS is very broad. Loosely defined, a decision support system can be characterized as a computerized system that helps the decision makers in making decisions. Decision support systems support a decision by gathering information, generating alternatives and supporting the choice making process by estimating, evaluating and comparing alternatives.

Over the past few years there has been considerable interest in the use of Decision Support Systems. However, the unique characteristics of spatial decision problems require new approaches and methodologies to be developed. Such characteristics include:

- A large number of decision alternatives
- The outcomes or consequences of the decision alternatives are spatially variable
- Each alternative is evaluated on the basis of multiple criteria

- Some of the criteria may be qualitative while others may be quantitative
- There are typically more than one decision makers (or interest groups) involved in the decision-making process
- The decision makers have different preferences with respect to the relative importance of evaluation criteria and decision consequences
- The decisions are often surrounded by uncertainty

3 IRRIGATION APPLICATION

3.1 Irrigation recommendation in the wider study area

In order to establish an expert irrigation system first a telemetric network of meteorological stations in the region must be operational, followed by the development of a decision support system based on the proposed irrigation treatment depending on the crop and the irrigation time. The meteorological stations must measure the following parameters in order the algorithm of irrigation to work. The parameters are:

1. Latitude of the telemetry station (in degrees)
2. Elevation of the telemetry station (in meters)
3. Height of the sensors on to the telemetry stations (in meters)
4. Temperature (oC) max, min and mean measurements
5. Wind speed (in m/s)
6. Sunshine (hours per day)

This system will be developed in three basic steps.

Step 1: Calculation of Reference Evapotranspiration

The first step in identifying the needs of each crop for irrigation water is the determination of the reference evapotranspiration. The reference evapotranspiration is calculated regardless of the crop, but refers to a specific study area where the crop is located. To calculate the required evapotranspiration a series of data is required, which are data of the topography of the studying area and the weather conditions.

The developed network of meteorological telemetry stations in the region will provide near real-time data of all the required measurements data, which characterize the morphological and meteorological conditions in the area. Based on these measurements the evapotranspiration is calculated in near real-time reference.

Step 2: Development of crop coefficients and determination of Crop Evapotranspiration

Water losses to the atmosphere through evaporation and transpiration vary depending on the type of the crop. For this reason, the reference evapotranspiration considered in a single region of the same microclimate and topography will be modified by appropriate factors (plant factors) to determine the actual water losses of each crop through evaporation and transpiration, i.e. to determine the crop evapotranspiration.

Vegetable rates are determined by taking a series of parameters such as the type of crop, the climatic conditions of the region and the growth stage of the plants. Through the proper system the plant coefficients are automatically determined for the study area and hence the actual evapotranspiration of each crop is determined.

Step 3: Calculate the needs of crop for irrigation water in near real time

The tools developed in steps 1 and 2, can be used for estimating irrigation water needs in near real time.

A producer or user of any decision-making system will introduce the necessary descriptive data in the system and will receive the corresponding advice for irrigation.

A producer or user will select the weather station that gives representative data for the location in which the crops for which he wants to calculate the needs for irrigation water. By choosing the meteorological station the reference evapotranspiration will be determined for the region to which the particular crop field is located.

Then the farmer will insert the elements of crop, such as crop type and sowing date, and the decision-making system will identify plant coefficients, and therefore the actual evapotranspiration of the crop.

Finally, the farmer, by introducing elements of the field and irrigation practices, such as the size of the field and the date of the last irrigation, the crop water needs data will be converted into volume of irrigation water that should be added to the crop at the time of the use of the decision support system.

3.1 Irrigation application usage

The application can be accessed via <http://irrigation.re-sourcebalkanmed.eu/>

The user is invited to insert the elements of crop, such as crop type and sowing date, and the decision-making system will identify plant coefficients, and therefore the actual evapotranspiration of the crop. Then, by introducing elements of the field and irrigation practices, such as the size of the field and the date of the last irrigation, the crop water needs data will be converted into volume of irrigation water that should be added to the crop at the time of the use of the decision support system.

Application of precision irrigation



A digital service for estimating irrigation water needs in near real time.

The farmer is invited to insert the elements of crop, such as crop type and sowing date, and the decision-making system will identify plant coefficients, and therefore the actual evapotranspiration of the crop.

Then, by introducing elements of the field and irrigation practices, such as the size of the field and the date of the last irrigation, the crop water needs data will be converted into volume of irrigation water that should be added to the crop at the time of the use of the decision support system.

Image 2: Irrigation application welcome screen

Application

Fields marked with an * are required

Name *

Email *

Location of irrigation site (Province, municipality) *

Select meteorological station *

Describe meteorological station

Crop type *

Sowing date *

Irrigation Area (in hectares) *

Date of last application of irrigation *

Message

Submit



Irrigation application. Proudly powered by [Go-Source](#)

Image 3: Irrigation application data input

4 APPLICATION OF CODES OF GOOD AGRICULTURAL PRACTICES

The online service can be accessed via <http://cgap.re-sourcebalkanmed.eu/> and navigate through the welcome screen Image 4



C.G.A.P. Data evaluation and updating Expert system

Digital tool for the evaluation of the implementation of the Codes of Good Agricultural Practices (CGAP)

Instructions

User is asked to fill out a form. One can fill in, as many of the forms (corresponding to the articles in the codes) as they wish. Once the filling is completed, one can verify that the codes are correctly applied, by pressing the Submit button.

Start



Image 4: Welcome screen of CGAP application

Through “start” the user can initialize the input procedure of the service Image 5



C.G.A.P. Data evaluation and updating Expert system

Digital tool for the evaluation of the implementation of the Codes of Good Agricultural Practices (CGAP)

Instructions

User is asked to fill out a form. One can fill in, as many of the forms (corresponding to the articles in the codes) as they wish. Once the filling is completed, one can verify that the codes are correctly applied, by pressing the Submit button.

Start



Image 5: CGAP application's initialization

Through the next page, the user completes field data regarding soil type and crop type Image 6



Insert field data

Location
▼

Soil type
Light / Sandy ▼

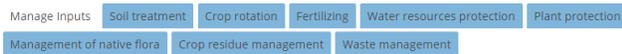
Crop type
Cereals ▼

Fill form



Image 6: General description of parcel

The final part of the service requires the completion of all tabs and field contained in the third page Image 7



Manage Inputs

Records of inputs used shall be kept together with their corresponding purchase documentation. Those shall be kept for at least 2 years after the year of completion.

Yes No

Submit



Image 7: Main interface of application

The recommendation is printed accompanied with a compliance related penalty score Image 8.

Goal	Control	Penalty
Soil protection	Deep tillage below 40 cm should be avoided if there is no need to eradicate deep weeds and break impermeable soil horizon. In case of deep tillage, the ground shall not be reversed due to the break of an impassable territorial horizon.	None, recommended
Protection of soil erosion	The field shall not be left without plant cover during the winter period, during which the risk of aquatic erosion is increased.	None, recommended
Protection of soil fertility	Crop rotation not implemented	10%
Rational fertilizers management	Excess fertilization. A maximum of 16 nitrogen units should be applied, administer the lubrication in at least two doses and the basic lubrication not exceeding 5 nitrogen units	10%
	Non-compliance with water bodies distance limit when applying fertilizer products.	10%
	Non-compliance with water bodies distance limit when storing fertilizer products.	10%

Non-application of codes. Total penalty: 40 %

Back

Image 8: Application's recommendations

5 APPLICATION OF SOIL EROSION RISK ASSESSMENT

Installation: The user can access and acquire the erosion related ArcMap extension via this link:

<http://g2.re-sourcebalkanmed.eu/> and follows the described procedure:

1. The user downloads the erosion.zip file.
2. The user decompresses the desktop (eg with the 7-zip tool, right-click on the file and Uncompress Here).
3. The user opens the ArcCatalog (v10.1).
4. The user creates the path to find the decompressed toolbox through the Connect Folder found in the standard menu of ArcCatalog in the form of an icon.
5. The user finds the toolbox and double-clicks on it.

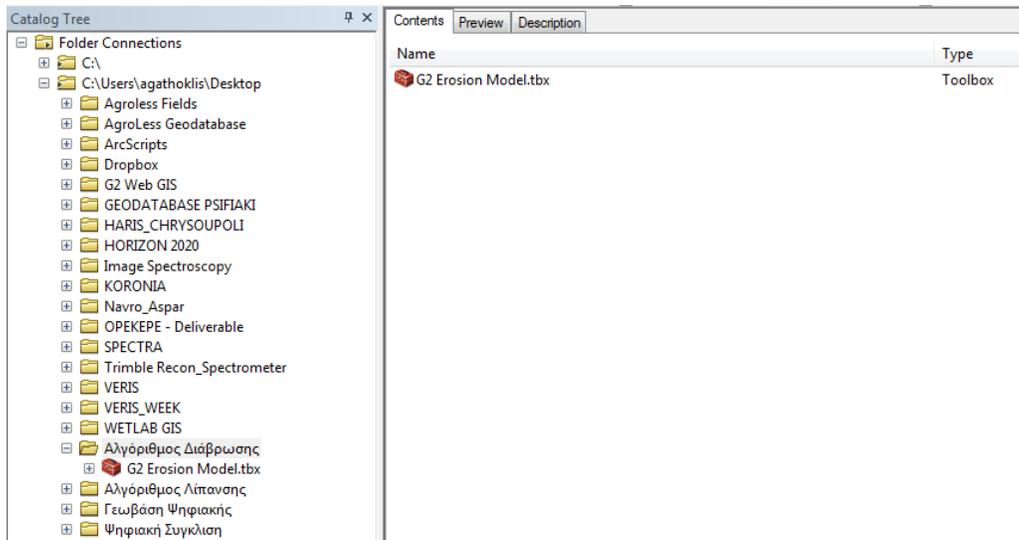


Image 9: G2 application catalogue

1. The user selects the G2 tool by double-clicking on it:

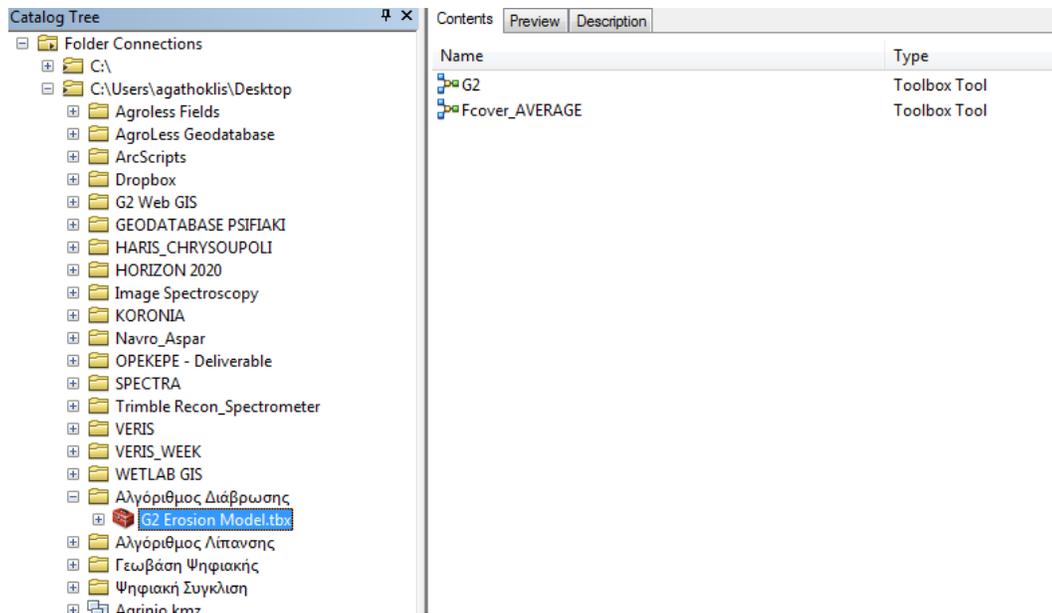


Image 10: G2 application destination

The digital application has been developed for ArcGIS software. This software is shaped as an ArcGIS toolbox:



Image 11: G2 model initialization

The following inputs are required for the operation of the system:

- Rainfall erosivity (R) Layer
- Soil erodibility layer (S)
- Topographic influence layer (topographic influence, T)
- Slope Intercept I Layer
- The Corine_LandCover_2000 vector database
- 3 raster layers from time series of years (with monthly time step) of the biophysical parameter FCover (Fractional Vegetation Cover) by the Modis satellite

The user selects the inputs in tool G2 as well as the output layer (Erosion Risk Layer, E) and then presses the "OK" button to run the program.

6 CONCLUSIONS

The developed management system, along with the customized set of services aims to provide an easy-to-use toolbox and provide modern solutions to explicit problems such as calculation of irrigation dose, soil detachment due to erosion and compliance to CGAP. The actions that were taken by LP were oriented to leverage the produced infrastructures from the implementation of previous projects, ““Environmental information system for the support of entrepreneurship and competitiveness implemented within the framework of the operational programme “Digital Convergence” and “Joint reference strategies for rural activities of reduced inputs- AGRO-LESS - implemented within the European Territorial Cooperation Programme Greece-Bulgaria 2007-2013” namely, and enhance the capacity of Public Administration bodies in the broader area of Balkan and Mediterranean region. The tools delivered to stakeholders require minimum technical background from end users, and can be immediately put in operational use. Three services were redesigned and delivered, from which two were delivered as Web applications, ergo they can easily be accessed from standard PCs or mobile devices. The third application that concerns erosion modeling that is intended to support soil erosion risk assessment is delivered in an ArcMap extension and is accompanied with detailed step-by-step information regarding the installation and usage.

The aforementioned services and related system and subsystems have been successfully introduced by Greek Public Authorities and aim to transfer the already tested and approved methodologies to the Re-Source project involved partners and the interested parties.